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project manual

MAINE-ENDWELL CENTRAL SCHOOL DISTRICT

2022 Capital Improvement Project – Phase 4

High School

project no. 23-44-7954

January 8, 2025

(Issued for Bid – September 12, 2025)

volume 1 of 1

set no.

Job No. 23-44-7954

PROJECT MANUAL

PROJECT

Maine-Endwell Central School District
2022 CAPITAL IMPROVEMENT PROJECT – PHASE 4
HIGH SCHOOL

K-12 Building: SED # 03-11-01-06-0-010-030

ARCHITECT

KING & KING ARCHITECTS LLP
358 West Jefferson Street
Syracuse, New York 13202
(315) 682-6180

License Expiration Date: 5/31/2026

CONSULTING ENGINEERS

Landscape Architect:
APPEL OSBORNE
102 West Division Street, Suite 100
Syracuse, New York 13204

Structural Engineer:
ST. GERMAIN & AUPPERLE CONSULTING ENGINEERS, PLLC
5711 West Genesee Street
Camillus, New York 13031

Mechanical/Electrical/Plumbing Engineer:
IBC ENGINEERING, P.C.
3445 Winton Place, Suite 219
Rochester, New York 14623

Environmental Engineer:
DELTA ENGINEERS
860 Hooper Road
Endwell, New York 13760

To the best of our knowledge, information and belief, the plans and project manual are in accordance with applicable requirements of the New York State Uniform Fire Prevention and Building Code, the State Energy Conservation Construction Code and construction standards of the State Education Department and the New York State Department of Labor Industrial Code Rule 56.

Date: January 8, 2025
(Issued for Bid – September 12th, 2025)

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FOR

PROJECT

Maine Endwell Central School District
2022 Capital Improvement Project – Phase 4
Senior High School

KING + KING ARCHITECTS, LLP
358 West Jefferson Street
Syracuse, New York 13202

Date: January 8, 2025
(Issued for Bid – September 12, 2025)

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ADVERTISEMENT
INVITATION FOR BIDS

The Maine-Endwell Central School District invites sealed bids, in duplicate, for:

General Construction (GC)
Mechanical Construction (MC)
Plumbing Construction (PC)
Electrical Construction (EC)
Site Construction (SC)

For: **2022 Capital Improvement Project – Phase 4**
High School – Alterations

SUBMISSION OF BIDS
Bids will be received by the Owner until **2:00 PM**, Local Time, **Thursday, October 16, 2025** by Superintendent Mr. Jason VanFossen at the Maine Endwell CSD District Office (located within the High School), 712 Farm to Market Road, Endwell, NY 13760.

Contractors should refer to 2008 Wicks Reform and New York State Labor Law Section 220-i for additional submission procedures and requirements not otherwise outlined in the contract documents.

OPENING OF BIDS
Bids will be opened and read aloud at 2:05 PM, Local Time, Thursday, October 16, 2025 at the Maine-Endwell CSD High School Auditorium, 712 Farm to Market Road, Endwell, NY 13760

EXAMINATION OF CONTRACT DOCUMENTS
Contract Documents may be examined at the following locations:

King + King, Architects LLP
358 West Jefferson Street
Syracuse, NY 13202
315.682.6180
315.682.7891 (f)

Plan and Print Systems, Inc.
6160 Eastern Avenue
Syracuse, NY 13211
315.437.5111
315.463.1510 (f)

Associated Building Contractors of the Triple Cities
15 Belden Street
Binghamton, NY 13903
607.771.7000
607.771.7001 (f)

LeChase Construction
31 Lewis Street, Suite 303
Binghamton, NY 13901
Brian Grinter, PM
607.238.6555

Northern NY Builders Exchange
22074 Fabco Road
Watertown, NY 13601
315.788.1330
315.788.9357 (f)

Builders Exchange of Rochester
180 Linden Oaks
Suite 100
Rochester, NY 14625
585.586.5460
585.586.1580 (f)

Syracuse Builders Exchange
6563 Ridings Road
Syracuse, NY 13206
315.437.9936

Mohawk Valley Builders Exchange
10 Main Street, Suite 202
Whitesboro, New York 13492
315.736.2441

315.437.5044 (f) 315.736.2445 (f)

Tri-County Builders Exchange Plan Room, c/o
Pickett Building Management
6459 State Highway 23
Oneonta, NY 13820
607.432.6641
607.433.6284 (f)

OBTAINING ELECTRONIC CONTRACT DOCUMENTS

Contract Documents may be downloaded from the Plan and Print Systems, Inc. website for a **non-refundable** cost of $49.00. Electronic Contract Documents on a flash drive may also be obtained from Plan & Print (Telephone: 315.437.5111, Fax: 315.463.1510) upon payment of a **non-refundable** $49.00 plus shipping and handling per flash drive. Contact Plan & Print for shipping and handling costs. Checks shall be made payable to **Plan & Print Systems, Inc.**

OBTAINING PAPER CONTRACT DOCUMENTS

Contract Documents may be obtained at Plan & Print Systems, Inc., 6160 Eastern Ave, Syracuse, NY 13211 (Telephone: 315.437.5111, Fax: 315.463.1510) upon receipt of a $100.00 deposit per set. Checks for deposit for Contract Documents shall be made payable to Maine Endwell CSD. Cash will not be accepted as a deposit. Prospective Bidders will be issued a maximum of two (2) sets each. Subcontractors, Material Suppliers, etc., will be issued a maximum of one (l) set each.

Contract documents will be delivered via UPS Ground service upon request and receipt of an additional non-refundable delivery and handling charge, payable by separate check to Plan & Print Systems, Inc. Contact Plan & Print for shipping and handling costs.

Any sets required in excess of the above-mentioned maximums are to be obtained directly by interested parties at the full cost of printing, **at their cost**, directly from Plan and Print Systems.

Only complete sets will be issued.

At the time the order is placed, plan holder shall advise Plan and Print Systems of status as to prime bidder, subcontractor, or material supplier and to trade affiliation. Postal address, telephone number, fax number, and email will also be required.

ADDENDA

Addenda for this project will be emailed to each plan holder of record, except as noted. Addenda containing full sized drawings will be issued in hard copy format only and sent via UPS. It is the responsibility of each prospective bidder to submit an accurate email address when requesting Bidding/Contract Documents and to download each addendum. Addenda will be sent to the e-mail address on record.

RETURN OF CONTRACT DOCUMENTS

Upon returning sets promptly and in re-usable condition to **Plan & Print Systems, Inc.** within **30 days** after the date of the Bid opening, deposits will be refunded as follows:

l. Any Bidder will be refunded his or her deposit in full.

2. All other persons receiving any or all the Contract Documents, including Subcontractors and Material Suppliers, will be refunded their deposit in full.

All Contract Documents received (except for Documents held by Successful Bidders) must be returned to **Plan & Print Systems, Inc**., at the above address.

For Contract Documents which are not returned to the printer within this 30-day period, deposits will NOT be refunded.

RIGHT TO WAIVE OR REJECT
The Owner reserves the right to waive any informality in or to reject any or all Bids.

BID SECURITY
Each Bidder must deposit with its Bid, security in an amount and form subject to the conditions provided in the Contract Documents.

WITHDRAWAL OF BIDS
Withdrawal of Bids will be subject to the conditions provided in the Instructions to Bidders.

COMPLETION TIME
The work of this project shall be completed by the dates set forth in Section 011100 entitled "Summary of Work."

PRE-BID MEETING
A Pre-Bid Meeting will be held to answer questions that may arise during the bidding period. The meeting will be held at 1:00 PM on Wednesday, October 1, 2025 at Maine-Endwell CSD High School, Auditorium 712 Farm to Market Road, Endwell, NY 13760.

Access to the Auditorium will be through the High School Main Entrance where all attendees will be required to provide a driver's license and pass through the district's security system.

INSPECTION OF SITE
Bidders will be able to visit the Site at the convenience of the Maine-Endwell Central School District with a minimum of forty-eight hours prior notification to Brian Grinter, Project Manager at LeChase on site in M-E CSD.

REQUESTS FOR INFORMATION
Requests for interpretation, information or clarification (RFI) of the Contract Documents must be made in writing to King + King Architects. Responses to RFIs will not be made over the telephone. Responses to RFIs will be advisory only and will not modify the Contract Documents. The Contract Documents stand as published except as modified by written Addenda before bid and Modifications after execution of the Agreement.

RFIs may be mailed to:

Mr. Michael James, Project Manager
King + King Architects LLP
358 W. Jefferson Street
Syracuse, New York 13202
or e-mailed to Mr. James's attention at mjames@kingarch.com

AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:

THE OWNER:

THE ARCHITECT:

King + King Architects, LLP
358 West Jefferson Street
Syracuse, New York 13202
Telephone Number: 315-671-2400

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7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

.1 the Bidder has read and understands the Bidding Documents;

.2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;

.3 the Bid complies with the Bidding Documents;

(Paragraph deleted)

.5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and

.6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

§ 2.2 Conditions Affecting the Work: All Bidders shall visit the site and take such other steps as may be necessary to ascertain the nature and location of the Work, and the general and local conditions which can affect the Work or the cost thereof. All visits must be made with arrangements as specified in the Advertisement or Invitation to Bid. The site visitation shall be limited to those persons or firms who are "Plan holders of Record" or accompanied by "Planholders of Record." In addition, Bidders shall examine all Contract Documents in relation to the site, the structure and condition of the ground, the obstacles which may be encountered and all other conditions having a bearing upon the performance of the Work, superintendence of the Work, requirements for heat, time of completion and all other relevant matters. Failure to take such steps shall not relieve Bidders from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any understanding or representations concerning conditions made by any of its agents, representatives or employees prior to the execution of the Contract, unless included in the Contract Documents.

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§ 2.3 The Bidder's attention has been directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Paragraph deleted)

§ 3.1.2 Any required deposit shall be refunded to Bidders as specified in the Advertisement or Invitation to Bid. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect in writing of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least ten (10) or more business days prior to the date for receipt of
(Paragraphs deleted)
Bids, or earlier if more time may be required, to permit all necessary investigation and to allow sufficient time for a reply to reach all perspective Bidders before submission of their Bids.

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them. Oral explanations or instructions given before award of the Contract will not be binding upon the Owner, the Architect or their representatives.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Substitutions will be considered upon written request as specified in Section 012500, "Equivalency" and as specified in the General Conditions, Article 3, subparagraph 3.4.2 as amended by the Supplementary General Conditions..

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the

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work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 Intentionally deleted.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1

(Paragraphs deleted)

The Architect will endeavor to mail or electronically notify every plan holder of record of any addenda issued. However, it shall be the Bidder's responsibility to make inquiry as to any addenda issued. All such addenda shall become part of the Contract Documents and shall be bound by such addenda whether or not received by the bidders..

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than three days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted in duplicate on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by

(Paragraphs deleted)

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Bid security in the form of a Certified Check of the Bidder or a Bid Bond duly executed by the Bidder as principal and having a Surety Company thereon qualified to do business in the State of the project, in an amount not less than 5% of the amount of the Base Bid, pledging that the Bidder will enter into a Contract with the Owner on the terms stated in the Contract Documents and will, if required, furnish Bonds as described in Article 7 covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract within l0 days after he has been offered a Contract or fails to furnish such bonds, if required, the amount of the Bid security shall be forfeited to the Owner as liquidated damages, not as penalty. The amount of the Bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Subparagraph 6.2.

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 Retainage of Bid Security: Such check or Bid Bond will be returned to all except the three lowest Bidders within five (5) days after the opening of the Bids. The remaining security will be returned to the three lowest Bidders within forty eight (48) hours after the Owner and the accepted Bidder have executed the Contract, or if no Contract has been so executed, within forty five (45) days after formal Bid opening, so long as Bidder has not been notified of the acceptance of his Bid.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Paragraph deleted)
As specified in the Advertisement or Invitation to Bid.

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3

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(Paragraphs deleted)
Bidder shall not modify, withdraw or cancel his Bid or any part thereof for forty-five (45) days after the time designated for the receipt of Bids in the Advertisement or Invitation to Bid and the Bidder so agrees in submitting his Bid.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 Within fourteen days of issuance of the Letter of Intent/Notice to Proceed, prior to the Owner's execution of contract, the Contractor shall submit the following information to the Architect in writing:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.2.1 Within seven (7) days of issuance of the Letter of Intent/Notice to Proceed, submit names of superintendent, project manager, or any other corporate representative that will be directly involved in execution of the project.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate

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Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

§ 6.3.5 Within seven (7) days of issuance of the letter of Intent/Notice to Proceed the Contractor shall submit required Insurance certificates.

§ 6.3.6 Submission of any proposed equivalents shall follow guidelines as indicated in Specification Section 012500 - "Equivalency".

§ 6.3.7 Cost Breakdown: Within twenty-four (24) hours of receipt of bids, the three (3) low bidders shall provide a cost breakdown of their bid into Costs associated for each building.

§ 6.3.8 Submission of information in relation to subcontractors, materials, costs, etc., shall be as specified in the Supplementary General Conditions of the Contract Documents, unless directed otherwise.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 The Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(Paragraphs deleted)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A311, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A132-2019, Standard Form of Agreement Between Owner and Contractor, as modified.
(Paragraphs deleted)

.2 AIA Document A232-2019, General Conditions of the Contract for Construction, as modified.

.3 Drawings – see Drawing Index in the Project Manual.

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(Paragraphs deleted)

.4 Specifications – see Index in the Project Manual.

.5 Addenda, if any.

(Table deleted)

.6

(Paragraphs deleted)

Other Exhibits:

Bid Form

(Paragraphs deleted)

NYS Prevailing Wage Schedule

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GENERAL CONSTRUCTION BID FORM

FOR

PROJECT

Maine Endwell Central School District

2022 Capital Improvement Project – Phase 4
High School

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

GENERAL CONSTRUCTION WORK (GC)

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE NO. GC-01	Contingency Cash Allowance	$ 48,000.00

ALTERNATES – None.

UNIT PRICES – None.

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____

_____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the
DAVIS-BACON ACT
(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

MECHANICAL CONSTRUCTION BID FORM

FOR

PROJECT

Maine Endwell Central School District

2022 Capital Improvement Project – Phase 4
High School

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

MECHANICAL CONSTRUCTION WORK (MC)

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE NO. MC-01	Contingency Cash Allowance	$ 180,000.00

ALTERNATES - None.

UNIT PRICES – None.

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the

DAVIS-BACON ACT

(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

PLUMBING CONSTRUCTION BID FORM

FOR

PROJECT

Maine Endwell Central School District

2022 Capital Improvement Project – Phase 4
High School

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

PLUMBING CONSTRUCTION WORK (PC)

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE NO. PC-01	Contingency Cash Allowance	$ 10,000.00

ALTERNATES – None.

UNIT PRICES – None.

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____

_____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the

DAVIS-BACON ACT

(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

ELECTRICAL CONSTRUCTION BID FORM

FOR

PROJECT

Maine Endwell Central School District

2022 Capital Improvement Project – Phase 4
High School

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

ELECTRICAL CONSTRUCTION WORK (EC)

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE NO. EC-01	Contingency Cash Allowance	$ 20,000.00

ALTERNATES – None.

UNIT PRICES – None.

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____

_____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the

DAVIS-BACON ACT

(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

SITE CONSTRUCTION BID FORM

FOR

PROJECT

Maine Endwell Central School District
2022 Capital Improvement Project – Phase 4
High School

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

SITE CONSTRUCTION WORK (SC)

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE NO. SC-01 Contingency Cash Allowance $ 40,000.00

ALTERNATES (See Project Manual Section 012300)

The Bidder shall submit the following Alternate Bids in accordance with Contract Documents. Alternate bids, if accepted by the Owner, shall become a part of the Contract and shall comply with all of the applicable Contract Documents.

Note: Where the Alternate work does not add to or subtract from the cost of the Base Bid of this work, write the word "None" in the space for Total Add or Deduct. Where the word ADD and the word DEDUCT appear together below, cross out non-applicable word.

ALTERNATE NO. SC-01: LONG JUMP PIT REPLACEMENT
The Bidder shall state the amount to be ADDED to the Base Bid if this Alternate is accepted.

Total ADD_____DOLLARS ($_____)

ALTERNATE NO. SC-02: CHAIN LINK FENCE AND GATE IMPROVEMENTS
The Bidder shall state the amount to be ADDED to the Base Bid if this Alternate is accepted.

Total ADD_____DOLLARS ($_____)

ALTERNATE NO. SC-03: MILLING/TOPPING OF ASPHALT AT PEDESTRIAN AREAS OUTSIDE OF TRACK
The Bidder shall state the amount to be ADDED to the Base Bid if this Alternate is accepted.

Total ADD_____DOLLARS ($_____)

ALTERNATE NO. SC-04: MILLING/TOPPING OF ASPHALT AT ATHLETIC TRACK
The Bidder shall state the amount to be ADDED to the Base Bid if this Alternate is accepted.

Total ADD_____DOLLARS ($_____)

ALTERNATE NO. SC-05: SYNTHETIC TURF
The Bidder shall state the amount to be ADDED to / DEDUCTED from to the Base Bid if this Alternate is accepted. (circle one)

Total ADD / DEDUCT_____DOLLARS ($_____)

ALTERNATE NO. SC-06: RESILIENT TRACK RESURFACING
The Bidder shall state the amount to be ADDED to /DEDUCTED from the Base Bid if this Alternate is accepted. (circle one)

Total ADD / DEDUCT_____DOLLARS ($_____)

UNIT PRICES (See Project Manual Section 012200)

The Bidder shall set forth the cost of all unit prices listed below. Should the work listed below be increased or decreased from the amounts shown on the Contract Drawings and/or Project Manual, upon written notice from the Architect, the undersigned Bidder agrees that the prices quoted below (including all insurance, applicable taxes, equipment, overhead and profit), shall be the basis of his compensation or deduction, as the case may be, for such increase or decrease in his work. All work added shall be at the quoted unit prices, and all work deleted shall be at the quoted unit prices less ten percent (10%). Changes shall be processed in accordance with Contract Documents.

ITEM	UNIT OF QUANTITY	TOTAL
SC-01: Undercutting	per cubic yard, installed	$_____
SC-02: Soil Stabilization Fabric	per square yard, installed	$_____
SC-03: Medium Duty Asphalt	per square yard, installed	$_____
SC-04: Self-Adhering Waterproof Membrane	per linear foot, installed	$_____
SC-05: Milling, Tack Coat and Top Coarse Asphalt	per square yard, installed	$_____
SC-06: 4’ Height Vinyl Clad Chain Link Fence	per linear foot, installed	$_____
SC-07: 4” Storm Water Management Trench (SMT)	per linear foot, installed	$_____

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the

DAVIS-BACON ACT

(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

for the following PROJECT:
(Paragraph deleted)

THE CONSTRUCTION MANAGER:

THE OWNER:

THE ARCHITECT:

King + King Architects, LLP
358 West Jefferson Street
Syracuse, New York 13202

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract and Performance and Payment Bonds. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. The Contract Documents do include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, and the Contractor's bid or proposal.

The Contract Documents form the Contract for Construction. The Contract Documents represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract Documents may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract Documents intended to facilitate performance of their duties.

(Paragraph deleted)

§ 1.1.2 The Contract. Where the term "Agreement" or "Contract" is used in the General Conditions, and other Contract Documents, it shall mean the separate Owner-Contractor Agreement between the Owner and each Contractor identified in Conditions of the Contract (General, Supplementary and other conditions).

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

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§ 1.1.11 Milestone Schedule. The Milestone Schedule prepared by the Architect and Construction Manager contained in the Bid Documents which is intended to coordinate the completion of the Work on the Project.

§ 1.1.12 Construction Milestone. A due date or benchmark for critical path work items identified by the Architect and Construction Manager which Contractors must satisfy in order to complete the Project by the substantial completion date.

§ 1.1.13 Construction Schedule. A comprehensive schedule of all of the Work which each individual Contractor must complete in order to complete their Work in accordance with the Milestone Schedule. This Construction Schedule must be in sufficient detail breaking down items of Work and in an electronic format with predecessor logic in a format reasonably requested by the Construction Manager.

§ 1.1.14 Coordinated Construction Schedule. The Coordinated Schedule created by the Construction Manager based upon each Contractor's approved Construction Schedule which coordinates all of the Work activities to be completed by the substantial completion date.

§ 1.1.15 Project Schedule. The Project Schedule which incorporates and includes the Architect's design work through the substantial completion of the Project.

§ 1.1.16 MISCELLANEOUS DEFINITIONS

§ 1.1.16.1 The term "Herein" shall mean the contents of the Contract Documents and / or the contents of the particular section where this term appears.

§ 1.1.16.2 The term "Indicated" as used Herein shall mean shown on the Drawings or described in the Contract Documents.

§ 1.1.16.3 The term "Concealed" as used Herein shall mean items hidden from sight in such locations as trenches, chases, shafts, furred spaces, walls, slabs, above ceilings and where in sight in crawl spaces or service tunnels.

§ 1.1.16.4 The term "Exposed" as used Herein shall mean not "concealed" as defined Herein and the spaces behind normally closed doors such as interiors of cabinets.

§ 1.1.16.5 The term "Product" as used Herein shall include materials, systems and / or equipment."

§ 1.1.16.6 The term "Furnish" as used Herein shall mean furnish and deliver to the jobsite all products necessary that are connected with the Work including unloading, handling, transporting unwrapping and inspecting those products to be installed.

§ 1.1.16.7 The term "Install" as used Herein shall mean furnish all labor and perform all operations connected with assembly, erection, anchoring, installation of products or work, finishing, curing, finishing, cleaning and similar operations including supplying all necessary tools, rigging and equipment to do the work, and connect up, test, place in operation and service such products.

§ 1.1.16.8 The term "Provide" as used Herein shall mean furnish, without limitation, all labor, products, materials, equipment, transportation, services, etc. required to install, complete the work, and /or to test and place in operation/service.

§ 1.1.16.9 The term "Piping" as used Herein shall mean pipe, rigid conduit, fittings, valves, hangers and other accessories, which comprise a system.

§ 1.1.16.10 The terms "equal", "proper", "satisfactory", "workmanlike" and words of similarly implied interpretation, judgment or opinion, shall be understood to mean "in the opinion of the Architect.

§ 1.1.16.11 As used Herein, the terms "General Contractor" and "General Construction Contractor" have the same meaning.

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§ 1.1.16.12 Persistently fails. The phrase "persistently fails" and other similar expressions, as used in reference to the Contractor, shall be interpreted to mean any combination of acts and omissions, that cause the Owner and/or the Owner's Authorized Representative to reasonably conclude that the Contractor will not complete the Work within the Contract Time, for the Contract Sum or in what they reasonably deem not to be in substantial compliance with the requirements of the Contract Documents.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Where items are specified by the use of a reference standard not bound in the specifications, the date of the reference standard shall be the latest edition at the time of signing the Contract except as specifically indicated otherwise.

§ 1.2.5 The reference in the Specifications regarding the division or separation of the Work among types of trades or occupations is only for the suggested purpose of coordinating the Work of the different trades, etc. but it shall be the Contractor's entire responsibility for the proper coordination and completion of all the Work described in the "Specifications" whether performed by the Contractor or Subcontractors, if any.

§ 1.2.6 In the event of inconsistencies within or between parts of the Contract Documents or between the Contract Documents and applicable standards, codes and ordinances, the Contractor shall (1) provide the better quality or greater quantity of work or (2) comply with the more stringent requirements; either or both in accordance with the Architect's interpretation. The terms and provisions of this Section, however, shall not relieve the Contractor of any of the obligations set forth elsewhere Herein.

.1 On the Drawings, given dimensions shall take precedence over scaled measurements and large scale drawings over small scale Drawings.

.2 Before ordering any materials or doing any work, the Contractor and each Subcontractor shall verify measurements at the Project Site and shall be responsible for the correctness of such measurements. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the Work.

.3 If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change.

§ 1.2.7 Execution of the Contract by the Contractor is a representation that the Contractor has carefully examined the Contract Documents and the site, and represents that the Contractor is thoroughly familiar with the nature and location of the Work, the site, the specific conditions under which the Work is to be performed, and all matters which may in any way affect the Work or its performance. The Contractor further represents that as a result of such examinations and investigations, the Contractor thoroughly understands the Contract Documents and their intent and purpose, and is

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familiar with all applicable codes, ordinances, laws, regulations, and rules as they apply to the Work, and that the Contractor will abide by same. Claims for additional time or additional compensation as a result of the Contractor's failure to follow the foregoing procedure and to familiarize itself with all conditions and the Contract Documents will not be permitted.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects. Capitalized terms in other Contract Documents shall be defined as found herein.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party listed in Article 8 of the Agreement to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.2.1 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 1.9 Disclaimer

In no event shall the Owner or the Architect have any responsibility for the Contractor's construction means, methods,

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techniques, sequences, procedures or for safety or for safety precautions and programs in connection with the Work notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 Intentionally deleted.

§ 2.2 Intentionally deleted.

(Paragraphs deleted)

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, and Architect shall secure and pay for the building permit.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 Upon the request of the Architect, the Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner except to the extent that the Contractor knows or reasonably should know such information to be inaccurate or incomplete, but shall exercise proper precautions relating to the safe performance of the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of the Owner. Contractor shall report to the Architect whenever any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

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§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, as determined by the Architect, the Owner, or the Construction Manager, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

§ 2.5.1 If the Contractor defaults, fails, or neglects to carry out the Work in accordance with the Contract Documents and fails within a three (3) calendar day period after receipt of written notice from the Owner to commence and continue correction of such default, failure, or neglect with diligence and promptness, including the submission of an acceptable recovery schedule if required by the Construction Manager, the Owner may, without further notice (except to inform the Contractor its attempt to cure is inadequate) and without prejudice to other remedies the Owner may have, correct such deficiencies. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect. In such case an appropriate Change Order shall be issued (without the requirement for a signature by the Contractor) deducting from Payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect, the Construction Manager, Attorneys, and others, and expenses made necessary by such default, neglect or failure. The expenses incurred by the Owner in connection with retaining a replacement contractor (on a contingency basis or otherwise) are in addition to any other expenses incurred by Owner to remedy the deficiencies and shall be deducted from Payments then or thereafter due the Contractor. The Construction Manager and/or the Architect, pursuant to Section 9.5.1, may withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the cost of correcting such deficiencies, the cost of retaining a replacement contractor, and Owner's expenses and compensation for the Construction Manager and Architect and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs due to the Owner, the Contractor may file a Claim pursuant to Article 15. Such action by the Owner and amounts charged to the Contractor shall be equally binding upon the Contractor's Performance and Payment Bonds Surety.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 By executing the Contract, the Contractor represents and warrants to the Owner that:

.1 Contractor is and will be financially responsible and has and will have sufficient liquidity to meet its financial responsibilities under the Contract and for all other Projects in which Contractor is or may become involved;

.2 Contractor has carefully examined the Contract Documents and has visited and examined the site;

.3 from Contractor's investigation, Contractor has satisfied itself as to the nature and location of the proposed Work, general and local conditions, and all matters which may in any way affect the Work or its performance;

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.4 Contractor fully understands the intent and purpose of the Contract Documents; and

.5 The Contractor acknowledges that the Owner is a school district which is subject to various laws and regulations of the State of New York. The Contractor will, in each phase of the Contract, in accordance with applicable standards, comply with applicable laws and regulations as they pertain to the bidding and construction of the Project, including, without limitation, the requirements of Article 5-A of the General Municipal Law; Article 9 of the Education Law; and Sub-Chapter J, Part 155 of Title 8, Chapter II of the Codes, Rules and Regulations of the State of New York.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. The Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.2.1 The Contractor shall promptly notify the Architect, in writing, of any inconsistencies or errors to provide the Architect ample time for observation, investigation, detail drawings, etc.

§ 3.2.2.2 All Contractors submitting bid proposals shall be presumed to have examined the site to consider fully all conditions, which may have a bearing on the work, and to have accounted for these conditions in their bid proposals.

§ 3.2.2.3 When required, off-site storage is the responsibility of the Contractor.

§ 3.2.2.4 The exactness of grades, elevations, dimensions or locations indicated on the Drawings or of Work installed by others is not guaranteed by the Architect or the Owner.

§ 3.2.2.5 Except as to any reported errors, inconsistencies, nonconformities or omissions, and to concealed or unknown conditions referred to in Section 3.7.4, by executing the Agreement, the Contractor represents the following:

.1 The Contract Documents are sufficiently complete and detailed for the Contractor to (1) perform the Work required to produce the results intended by the Contract Documents and (2) comply with all the requirements of the Contract Documents.

.2 The Work required by the Contract Documents, including, without limitation, all construction details, construction means, methods, procedure and techniques necessary to perform the Work, use of materials, selection of equipment and requirements of product manufacturers are consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to Work; (3) requirements of any warranties applicable to the Work; and (4) all laws, ordinances, regulations, rules, and orders, and Owner's policies and procedures which bear upon the Contractor's performance of the Work.

§ 3.2.2.6 The Contractor shall satisfy itself as to the accuracy of all grades, elevations, dimensions and locations indicated on the Drawings. Where the Work of this Contract connects or interfaces with existing or other work Contractor shall verify at the site all conditions of such existing or other work. Any errors due to the Contractor's failure to verify such information shall be promptly remedied by the Contractor at no additional cost to the Owner.

§ 3.2.2.7 Before ordering any materials or doing any Work, the Contractor and each Subcontractor shall verify all existing conditions and measurements. Any differences, which may be found, between actual measurements and dimensions indicated on the Drawings shall be submitted to the Architect for resolution before proceeding with the Work. No extra compensation will be allowed for such discrepancies.

§ 3.2.2.8 If the Contractor performs any construction activity which involves a recognized error, inconsistency or omission in the Contract Documents without first providing notice to the Owner, Architect and Construction Manager of such condition and receiving authorization to proceed, the Contractor shall assume

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responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in writing in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims in writing as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Construction Manager and Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.6 Where existing conditions are obscured or concealed from the Owner or Architect's view prior to the start of this Project's construction activities, portrayal of such conditions in the documents is based on reasonable implications and assumptions. The Owner and Architect do not imply or guarantee to the Contractor in any way that such portrayals in the Documents are accurate or true.

§ 3.2.6.1 If the Contractor, during the progress of the work, discovers any discrepancies between the Drawings and the Specifications, errors and/or omissions on the Drawings, or any discrepancies between physical condition of the work and the Drawings, he shall immediately notify the Architect in writing who shall promptly adjust same. Whether or not an error is believed to exist, deviations from the Drawings and dimensions given thereon shall be made only after approval in writing is obtained from the Architect. Any work performed after such discovery without the approval of the Architect shall be at the Contractor's risk and expense.

§ 3.2.6.2 The Contractor may submit requests for information to the Architect to help facilitate the Contractor's performance of the contract. Prior to submitting each request for information, the Contractor shall first carefully study and compare the Contract Documents, field conditions, other Owner provided information, Contractor prepared Coordination Drawings, and prior Project correspondence and documentation to determine that the information to be requested is not reasonably obtainable from such sources.

§ 3.2.6.3 Each request for information shall be submitted to the Architect, in writing, with a copy to the Construction Manager. Each request for information shall identify the specific sources which were reviewed by the Contractor in an effort to determine the information requested, and a statement to the effect that the information being requested could not be determined from such sources.

§ 3.2.6.4 The Contractor shall submit each request for information sufficiently in advance of the date by which such information is requested in order to allow the Architect sufficient time, in the Architect's professional judgment, to permit adequate review and response and to permit Contractor compliance with the latest Construction Schedule.

§ 3.2.6.5 The Contractor shall reimburse the Owner amounts charged to the Owner by the Architect or Construction Manager for responding to Contractor requests for information where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information.

§ 3.2.7 Whenever the Drawings show existing or other construction not required as part of the Contract Work, it is understood that it is so shown as a matter of information and that the Owner, while believing such information to be

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substantially correct, assumes no responsibility thereof. The Contractor shall become familiar with all conditions affecting the nature and manner of conducting the Work.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract, subject to overall coordination of the Project by the Construction Manager. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. The Architect and Construction Manager shall advise Contractor in writing if Contractor's proposed alternative is acceptable as referenced above, in which case the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.1.1 The Contractor shall be responsible for and coordinate any and all inspections required by any governmental body having jurisdiction over the project. Failure to obtain any permits, licenses or other approvals because of the failure of the Contractor to conform to this requirement shall not extend the Contract time, and the Contractor shall not be entitled to any increase in the Contract Sum therefor. In addition, any additional costs and/or expenses of any nature incurred by the Owner as a result of the Contractor's failure to conform to this requirement shall constitute a charge against the Contractor's Contract.

§ 3.3.1.2 Coordination: Each Contractor shall be fully responsible for the coordination of the relationship of the Work of its Subcontractors and other Contractors and shall cross check all of its Instructions, Specifications, Drawings, Shop Drawings, Instruments of Service and installations with those of other Contractors and with existing conditions.

.1 The General Construction Contractor shall Furnish and erect all necessary batter boards, establish all lines and levels and connection therewith, and run all subsequent lines and levels as the work progresses in order to assure careful and accurate work true to the proper lines in accordance with the Contract Documents. Any batter boards, monuments, or marks of reference, which may for any reason become disturbed or destroyed, whether such displacement or destruction is caused by carelessness, accident, or by the elements, shall at all times, be promptly and accurately re-established by the General Construction Contractor.

.2 The General Construction Contractor shall establish finished floor elevations and finished grade lines for the building for all trades when requested to do so; and shall establish center lines of all interior partitions on floor forms before concrete is placed in order that Mechanical/Electrical Contractors will be able to place sleeves, etc., in proper locations.

.3 Each Contractor shall be required to establish centerlines, elevations and location of its Work when it is required for other Contractors to coordinate location of their work.

§ 3.3.1.3 The Contractor shall:

.1 Review all specified construction or installation procedures, including those recommended by manufacturers,

.2 Advise the Architect:
- If the specified procedure deviates from good construction practice,
- If following the procedure will affect any warranties, including the Contractor's general warranty,
- Or of any objections the Contractor may have to the procedure; and
- Propose any alternative procedure, which the Contractor will warrant.

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§ 3.3.1.4 Preconstruction Meetings: Prior to commencing the Work and before commencing certain portions of the Work, Contractors and their Subcontractors shall be required to participate in preconstruction meetings when deemed necessary by the Architect to coordinate Work between trades or to address concerns of the Owner.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. Contractor shall provide all on-site workers and the workers shall wear and prominently display a photo-identification badge at all times for identification and security purposes along with proof of their OSHA 10-hour training certification with their badge.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ **3.3.4** Shut Downs: Such Work as connections to existing sewers, plumbing, heating and electric systems, shall be done at a time agreeable to the Owner and the Architect, and shall be determined and agreed to well in advance of the actual doing of such Work so as to interfere as little as possible with the operation and use of existing facilities. Shut downs must be coordinated through the designated representative of the Owner. The continued uninterrupted operation of all facilities of the building is essential.

.1 If any existing facilities must be interrupted, the Contractor for the Work shall provide all necessary temporary facilities and connections necessary for maintaining these existing facilities at no increase in Contract price except as otherwise specified.

.2 No mechanical, heating, plumbing, sprinkler or electric services shall be interrupted at any time, except as approved in advance by the Owner. All communication systems must be maintained without interruption. As much related Work as possible shall be performed prior to shut-downs, so as to minimize the period of shut-down.

.3 All material and manpower to do the Work involved shall be at the job prior to interruption of services.

§ 3.3.5 The Contractor, its employees and subcontractors shall be subject to such rules and regulations for the conduct of the Work as the Owner may establish. The Contractor shall be responsible for the enforcement of same among his or her employees and those of its Subcontractors.

§ 3.3.6 Where equipment, lines of piping and/or conduit are shown diagrammatically, the Contractor shall be responsible for the coordination and orderly arrangement of the various lines of exposed piping and conduit included in the Work of the Contract. Contractor shall coordinate the Work of several Subcontractors and prevent all interferences between equipment, lines of piping, architectural features, and avoid any unsightly arrangements in the exposed Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 After Contract has been executed, the Architect in conjunction with the Construction Manager will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the Specifications. Substitutions shall satisfy the following conditions.

1. The materials, products and equipment described in the Contract Documents establish the standard of required quality, function, dimension and appearance expected.
2. Requests for substitutions must be submitted prior to, and acceptance provided by Architect prior to, time that bids are received (see below for post-bid substitution requests).
3. Substitution requests will be considered only if standards are met or exceeded as described above and are subsequently approved by the Architect and Owner.
4. Each such request shall include the name of the material, product or equipment item for which

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substitution is requested and a complete description of the proposed substitute, including drawings, cuts, performance and test data and any other information necessary for a complete evaluation.

5. Each such request shall include a statement setting forth any changes in other materials, product or equipment or other work that incorporation of the substitution would require.
6. The burden of proof of the merit of the proposed substitution is upon the proposer.
7. The Architect's decision of approval or disapproval of a proposed substitution shall be final and will be set forth in writing.
8. Additional substitution requests, during construction, will be considered only if substitution is caused by specific material, product or equipment's subsequent removal from, or unavailability in the market place and only if the substitution(s) complies with the requirements Herein and each is at "no change" or "credit" to Contract amount.
9. Contractor's Responsibilities: If any of the following conditions occur due to substitutions, the contractor making the substitution shall bear the cost of such conditions, including payment for services rendered by the Architect and/or Construction Manager:
    (a) Redesign required for any of the Work.
    (b) Material or quantity changes for any of the Work.
    (c) Delays in any of the Work.
    (d) Request for information generated due to substitutions.

In the event that Contractor wants to make a substitution and Architect requires additional compensation to evaluate same, Contractor agrees to have the cost of a reasonable Architect's fee (for this additional service) deducted from its Contract Sum. By proposing a substitution, the Contractor is deemed to represent and warrant to the Owner that the proposed substitution is appropriate for the purposes for which the Contractor proposes its use. Substitutions may be rejected by the Owner for any reason or for no reason, without explanation.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. There shall be no harassment of any kind by Contractor's employees or other persons carrying out the Work, including but not limited to sexual, ethnic, or religious harassment. If the Owner determines and notifies the Contractor that an employee or other person carrying out the Work is not acceptable within the meaning of this Article, Contractor shall remove the employee or other person from each project site within 24 hours.

§ 3.4.4 The Contractor shall comply with the most current Contract Requirements and Prevailing Wage Rate Schedules as published by the Bureau of Public Works, State of New York, Department of Labor established for this Project.

§ 3.4.4.1 The Contractor shall provide the labor necessary to install its work within the terms of this Contract. The Owner assumes no responsibility for any expense due to so-called "overtime."

§ 3.4.5 On receipt of signed Contract, the Prime Contractor will be expected to place firm orders with vendors for needed materials, including Subcontractors and major material suppliers. If deemed necessary to assure delivery of materials at times needed, Contractor may accept delivery of such materials at any time, and may include the cost of such materials in its next monthly application for payment, provided such materials have actually been delivered to Contractor and properly stored by him with approval or under direction of the Architect and Construction Manager either at the job site or in an approved storage shed or warehouse, as provided elsewhere in these General Conditions. No materials or supplies for the Work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that he has full title to all materials and supplies used by him in the Work, or resold to the Owner, Pursuant to this Contract Document, free from all liens, claims or encumbrances.

§ 3.4.6 All materials used permanently in the Work shall be new unless otherwise specified. The apparent silence of the Specifications as to any detail described concerning any Work to be done and materials to be Furnished shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the first quality are to be used, and all interpretations of the Specifications shall be made on this basis. All material incorporated in the Work shall be clean and exhibit no appearance of aging, exposure to weather, prior use, handling or damage of any kind.

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§ 3.4.6.1 All Work shall be executed in a thorough, substantial, workmanlike manner, in complete accordance with the manufacturer's most recent written recommendations unless otherwise specified or permitted by the Architect. A sufficient force of competent workmen, foremen, and superintendents shall be employed at all times to permit the Work to be pursued with diligence until completion.

§ 3.4.7 Manufacturer's identifications shall be inconspicuous, but where nameplates contain information relative to characteristics or maintenance, they shall be clearly visible and located for easy access.

§ 3.4.8 Equipment intended for permanent installation shall not be operated for temporary purposes without the written permission of the Architect.

§ 3.4.9 Materials shall be delivered in manufacturer's original sealed containers, with complete identification of contents and manufacturer, and kept sealed in original containers until used. Labels shall not be removed until materials have been installed and inspected.

§ 3.4.1 0 Whenever the Contract Documents require delivery by the Contractor of any materials, equipment or other items, the term delivery shall be deemed to include unloading and storing with proper protection where directed.

§ 3.4.11 Materials shall be applied or installed under proper climactic conditions, not when they may be affected by temperature, moisture, humidity or dust.

§ 3.4.12 As defined by Federal and State Laws, no materials incorporated into the Project Work shall contain asbestos. Material shall be "asbestos-free" containing zero percent (0%) asbestos. The Architect reserves the right to request certification from the material manufacturer through the Contractor for certification that materials installed contact zero percent (0%) asbestos.

§ 3.4.13 Equivalent Products: Except as otherwise specified, whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturer's or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers' or vendors which will perform adequately the duties imposed by the general design may be considered equally acceptable provided the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance, size, function and performance. Such proposed product shall not be purchased or installed until approved by the Architect.

.1 The Architect will be allowed a reasonable time within which to evaluate each proposed substitution. The Architect will be the sole judge of equivalence, and no substitution shall be ordered, installed or utilized without the Architect's review process having been completed and the product accepted by written notification.

.2 Owner may require Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any substitution.

.3 The Architect will record time required by the Architect and the Architect's Consultants in evaluating substitutions proposed by the Contractor and in making changes in the Contract Documents occasioned thereby. Whether or not the Architect accepts a proposed substitution, Contractor shall reimburse the Owner for the charges of the Architect, and the Architect's Consultants for evaluating each proposed substitution.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements including substitutions not properly approved and authorized, shall be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Contractor

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shall perform the Work in strict accordance with the Contract Documents and best industry practices. All materials are to be new, unless specified otherwise. Contractor, at its expense, shall remove and replace materials not meeting specifications or materials failing to perform as represented or warranted by the manufacturer, regardless of whether incorporated into the Work. Contractor shall promptly replace or correct any work or materials which Owner, Construction Manager or Architect shall reject as failing to conform to the requirements of the Contract Documents. The foregoing warranty obligations are not limited by the provisions of Article 12, and are in addition to and not in limitation of any other warranty set forth in the Contract Documents or otherwise prescribed by law.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.3 Neither final payment, nor provision in Contract Documents, nor partial or entire occupancy of premises by Owner shall constitute an acceptance of Work not done in accordance with Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

§ 3.5.4 The Contractor shall warrant all materials and operating systems to be free from any defects and faulty equipment for a period of one (1) year from the date the Architect recommends final payment, or where the performance of materials, system or equipment is documented, from the date that such materials, systems or equipment perform satisfactorily, whichever date is later. The Performance and Payment bonds shall remain in full force and effect through the guarantee period.

§ 3.5.5 In emergencies occurring during the guarantee period, the Owner may correct any defect immediately and charge the cost to the Contractor. The Owner shall at once notify the Contractor, who may take over the Work and make any corrections remaining after his or her forces arrive at the Work. Any repair work not started within seven days following notice to the Contractor of any defect shall be considered an emergency.

§ 3.5.6 The Contractor shall obtain and furnish to the Architect written Manufacturer's Warranties in the name of the Owner for all major materials and for all equipment. The terms of the warranty shall be as individually specified for the item. If no term is specified, the term shall be for a minimum of one year.

§ 3.6 Taxes

§ 3.6.1 Owner represents that it is an organization operated for purposes that make it exempt from New York Sales and Compensating Use Tax pursuant to Section 1115(a) (15) of the tax law, as amended by laws of New York 1974, CH. 513 and 514. The Contractor is advised that the Owner is exempt from payment of all State and Local sales and compensating use taxes of the State of New York, cities and counties on the purchase of all materials and supplies incorporated in and becoming an integral component part of the structures, buildings or real property, pursuant to the provisions of this Contract. Such taxes are not to be included in the Contract price, bid or costs to be reimbursed, as the case may be. This exemption does not, however, apply to tools, machinery, equipment or other property leased by or to the Contractor or a subcontractor or to supplies and materials which, even though they are consumed in the performance of the Contract, are not incorporated into the completed permanent work, and the Contractor and his or her subcontractors shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property upon all such unincorporated supplies and materials. Owner shall deliver to Contractor the appropriate exemption certificate required to be supplied by the Owner and Contractor and his or her subcontractors and material men shall be solely responsible for obtaining or delivering any and all exemption or other certificates and for furnishing a Contractor Exempt Purchase Certificate or other appropriate certificates to all persons, firms, or corporations from whom they purchase supplies, materials, and equipment for the performance of the Work.

§ 3.6.2 Except as otherwise specified, all Federal, State and Local taxes are to be included in the Contract price.

§ 3.6.3 Assessments and Taxes on Wages: Each Contractor shall pay and include in his or her proposal all costs and liabilities for the amounts assessed, or which may be assessed by the Federal, State and local governments under any and all Acts or Laws upon the wages and salaries paid or to be paid all employees of the Contractor and his or her subcontractors under this Contract.

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§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Architect and Construction Manager, shall secure and pay for the State Education Department building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work, including but not limited to all infectious disease exposure precautions.

§ 3.7.3 If the Contractor performs Work and knows or should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction, including applicable fines and/or penalties.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide written notice to the Owner, Construction Manager, and the Architect before conditions are disturbed or affected work is performed, and in no event later than 7 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor in writing, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15. No adjustment in the Contract Time or Contract Sum will be permitted, however, in connection with a concealed or unknown condition that does not differ materially from those conditions disclosed or that reasonably should have been disclosed by the Contractor's (1) prior inspections, test, and reviews, or (2) inspections, tests, and reviews the Contractor had the opportunity to make or should have performed in connection with the Project.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.

§ 3.8.2

(Paragraphs deleted)

Contract Sum Permitted Allowance costs shall include the direct cost to the Contractor and Subcontractor for labor, materials and equipment, including delivery, unloading, storage, handling and installation. Allowance costs do not include the Contractor's overhead and profit, including the costs of bonds, insurance, administration and supervision, which costs should be carried as part of the Contract Sum.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

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§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work, and shall attend all Project meetings, whether held prior to or after Substantial Completion of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor shall delegate to the Superintendent decision making authority to facilitate coordination of multiple contractors and coordination of the Work.

§ 3.9.2 Prior to starting the Work, the Contractor shall designate the Project Manager (non-working), Superintendent and other key individuals who shall be assigned to the Project through and including final completion. Such designations shall be in writing and provided to the Architect and Owner. The Superintendent shall be in attendance at the Project site throughout the Work, remain on the Project site not less than eight hours per day, five days per week, until termination of the Contract, unless the job is suspended, Work is stopped by the Owner, or no Work is scheduled. The Superintendent shall be approved by the Owner in its sole discretion. Said representatives shall be qualified in the type of work to be undertaken and shall not be changed during the course of construction without the prior written consent of the Owner. Should a representative leave the Contractor's employ, the Contractor shall promptly designate a new representative. The Owner shall have the right, at any time, to direct a change in the Contractor's representatives if their performance is unsatisfactory. In the event of such a demand, the Contractor shall within three days after notification thereof, replace said individual(s) with an individual(s) satisfactory to Owner, in Owner's sole discretion. If said replacement is disapproved, the Contractor may, at Owner's option, be terminated for cause. The Owner shall have no obligation to direct or monitor the Contractor's employees. All references Herein to the Superintendent shall be taken to mean the Contractor's superintending staff. Each Subcontractor shall designate the Project Manager, Superintendent and other key individuals who shall be assigned to the Project.

§ 3.9.3 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed Superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed Superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection. The Contractor shall not change the Superintendent without prior written notice to the Architect and Owner at least thirty (30) days prior to the proposed date of the change.

§ 3.9.4 The Contractor shall not employ a proposed Superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the Superintendent without the Owner's written consent.

§ 3.9.5 The Contractor shall not reduce or terminate supervision of the Work, nor change the Superintendent without the prior written approval of the Owner and Architect.

§ 3.9.6 If, for any reason, the Contractor takes an action resulting in any of the changes noted in Section 3.9.5, the Owner or their Agent may take remedial action to ensure continued progress of the Work, including the hiring of suitable supervisory personnel, and charge the Contractor all costs associated with these remedial actions including the costs of legal, and Architectural services.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work in electronic format with predecessor logic. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors. Failure by a Contractor to furnish any required schedule or schedule revision in a timely manner shall entitle the Construction Manager to prepare a schedule for that Contractor's Work, to which said Contractor shall be bound.

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§ 3.10.2 The Contractor, promptly after being awarded the Contract shall submit (as determined by Architect) long lead items for construction, and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.10.5 Procedure and Schedule of Work:

.1 Unless otherwise stated the Work on the entire project shall be performed continuously without interruption, so that all Work can be completed in the time set forth in the Contract Documents.

.2 The Contractor shall cooperate with the Owner, and the sequence of operation shall be scheduled with the Owner so as to interfere as little as possible with the Owner's use of existing site and existing structures and the Owner's approval shall be obtained prior to the starting of such operations.

.3 Time of Completion: All Work shall be completed on or before the date set forth in the Agreement, except as otherwise specified or modified by Change Order.

.4 Job Meetings: During the course of construction, job meetings will be held with representatives of the Owner, the Architect, the Construction Manager and the Contractors to discuss the progress of the Work, any problems of construction, timing or procedure, so as to expedite all phases of the Work to completion. Contractors and Subcontractors are to be represented at such meetings.

.5 Overtime Work: Each Contractor shall take into account the possible need for overtime work in order to meet the Contract Completion Date and shall include the costs associated with said overtime work in their Contract Sum.

§ 3.10.6 Project Scheduling

.1 After the Contractor has received from the Owner a notice to proceed or a letter of intent, a preconstruction conference will be held. The procedures and scheduling of the Work will be discussed.

.2 At the preconstruction conference, using the Project Schedule in Contract Documents, each Contractor shall submit a Construction Schedule to the Construction Manager of its own Work indicating starting dates and estimated completion dates of each phase of the Work and indicating information described in Contract (General, Supplementary and other conditions) "Submittals", using the time of completion set forth in the Contract Documents. The Project Schedule submitted by each Contractor shall be in electronic format with predecessor logic and durations specified for each of the Work activities set forth on the Schedule of Values.

.3 Procedures and requirements described in the Contract (General, Supplementary and other conditions) Section on "Submittals" shall be followed by all Contractors and the Architect to develop a Project Schedule.

.4 Once a Project Schedule is published by the Construction Manager and approved by the Owner, it shall

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be strictly enforced until the Project is completed, unless it becomes necessary to revise it by an appropriate modification. Upon issuance of the approved Project Schedule, each Contractor shall be responsible for interfacing and/or integrating its Work with that of other Contractors and the Owner and for completing its Work in the allotted time. In the event that the Contractors do not create and/or agree on an integrated Project Schedule, the Contractors will abide by the Project schedule previously developed by the Construction Manager and contained in the bid documents.

.5 NO PAYMENTS will be made on any of the Contracts until the scheduling procedures in this Section 3.10.6 have been completed.

§ 3.10.7 Continuing Performance and Schedule Adjustments

.1 In the event the Owner and Architect determine that performance of the Work has not progressed to the level of completion required by the Project Schedule the Owner shall have the right to order the Contractor to take corrective action necessary to expedite the progress of construction including without limitation overtime work, additional work shifts, supplying additional manpower or equipment as well as other extraordinary measures. Such extraordinary measures shall continue until the progress of the Work conforms to milestone dates set forth in the Project Schedule.

.2 The Contractor shall not be entitled to additional compensation in connection with such extraordinary measures required by the Owner except when Work progress has been delayed by events such as labor strikes or natural catastrophes.

.3 The Owner shall have the right to direct the Contractor to delay, postpone or reschedule any portion of the Work that may interfere with or disrupt the operations of the Owner.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. Each submittal shall bear written confirmation that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of the submittal. Reproducing Architect's construction drawing is not acceptable for shop drawing submittals.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, operating and maintenance procedures, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

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§ 3.12.4.1 The Contractor represents and warrants that all Shop drawings shall be prepared by a person or entity possessing expertise and experience in the trade for which the shop drawing has been prepared and, if required by the Contract Documents or law, by a licensed professional engineer.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, indicaate review and approval in writing, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors. No extension of time will be granted to the Contractor because of failure to have Shop Drawings, product data, and samples submitted in ample time to allow for review by the Architect or their Consultants.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 Work performed without approved Shop Drawings, product data, samples or similar submittals as required by the Specifications is subject to all comments and conditions of approval regardless of Work progress. Completed work must be in accordance with all comments and conditions of approval regardless of Work progress. Any portion of the Work performed prior to review and approval by the Architect of required Shop Drawings, Product Data, Samples, or other Submittals, is performed at Contractor's risk. No Contract adjustments will be made to correct or modify Work installed without approval.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must

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satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.12.10.3 If it is the position of the Contractor, or his or her licensed design professional, that the Owner and Architect have not provided all performance and design criteria, the Contractor shall request additional criteria in writing before proceeding with the professional services described in 3.12.10. Proceeding with the professional services shall be evidence that the Owner and Architect have provided all necessary performance and design criteria.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.1.1 Use of Buildings and Site:

.1 Each Contractor shall cooperate with the Owner in making available for the Owner's use, areas of the completed or partially completed building(s) or site as provided for in Article 9, Section 9.9. The Owner shall have the right to take possession of and to use any completed or partially completed portions of the building or site even though the time of completing the entire Work or such portion of the Work may not have expired. Such use shall not constitute acceptance thereof. Such occupancy shall in no way abrogate any specified warranties or guaranties for materials, workmanship or operation of equipment pertaining to the occupied portions.

.2 Each Contractor shall cooperate with the Owner in making available for the Owner's use such building services as heating, ventilating, cooling, water, lighting and telephone for the space or spaces to be occupied, and if the equipment required to furnish such services is not entirely completed at the time the Owner desires to occupy the aforesaid space or spaces, the Contractor shall make every reasonable effort to complete such part of its Work as soon as possible to the extent that the necessary equipment can be put into operation and use.

.3 Mutually acceptable arrangements shall be made as to the warranties or guaranties affecting all Work associated therewith.

.4 Such occupancy or use shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance have consented by endorsement to the policy or policies. Such occupancy shall be documented with an appropriately executed Certificate of Substantial Completion.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.1.1 The word "new" used Herein shall mean Work which has been or is to be installed under the terms of Contract for this project. The word "existing" used Herein shall mean existing conditions previous to the award of a Contract for this project.

§ 3.14.1.2 In order to eliminate cutting and patching as much as possible, each Contractor shall, during the progress of

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the Work Furnish to the General Construction Contractor who shall then install them, proper sleeves, inserts, etc. as required for his or her new Work and shall give proper and detailed instructions to others where Work may be affected by their Work, with adequate notice prior to the erection of new Work. Cutting and patching Work as required to install new work or remove existing Work shall be done carefully and neatly with as little damage as possible

§ 3.14.1.3 Unless otherwise specified in the Contract (General, Supplementary and other conditions, or the plans and specifications) each Contractor is responsible for their own cutting, removals and patching required for the proper installation or execution of their Work, as defined in the Specifications. Core drilling remains the responsibility of each Contractor.

§ 3.14.1.4 Any costs caused by defective or ill-timed Work shall be borne by the Contractor responsible, therefore. Any Contractor who is required to cut and patch his or her new Work to provide conditions for other Contractors to complete their new Work and who was not given adequate prior notice of the conditions required for completion of such Work before doing his or her work, shall charge the Contractor in default the documented cost of the cutting and patching Work plus 15% for overhead and profit unless otherwise specified.

§ 3.14.1.5 Cutting and patching of any Work shall be made in such a manner as to not breach any provisions of any guarantee or warranty on existing work left in place or guaranty or warranty required for his or her new Work. Patching of Work shall match existing adjacent surfaces and patchwork shall be disguised completely to hide any trace of patching.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

(Paragraph deleted)

§ 3.15.2 All debris required to be removed from the Project shall be removed in accordance with all applicable rules, regulations and statutes, which may pertain thereto & in accordance with the authority having jurisdiction. The Contractor shall warrant that all debris shall be disposed of in accordance with all rules, regulations and statutes applicable thereto and at a facility permitted and authorized to receive materials of the type and nature so removed from the premises. The Contractor shall hold the Owner free and harmless of, from or concerning any claimed liability resulting from the improper or unlawful removal and/or disposal of such debris. Contractors are encouraged to recycle as much material as is practical.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the

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Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Owner's consultants, Construction Manager, Architect, Construction Manager's and Architect's consultants, and each of their respective representatives employees, directors, officers, and agents from and against any and all claims, suits, actions, damages, losses, fines, penalties, costs, charges, and expenses, including but not limited to attorneys' fees and the costs of any proceeding, arising out of, relating to or resulting from performance of the Work, including, but not limited to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property to the extent caused in whole or in part by acts, actions, omissions, negligence, fault or breach of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18. The Contractor agrees to include the following indemnity provision in each and every contract it enters into with a subcontractor, and to require that subcontractor to include such provision in each contract it enters into with any lower tier subcontractor: "To the fullest extent permitted by law, Subcontractor shall indemnify and hold harmless the Contractor, Owner, Owner's consultant's, Construction Manager, Architect, Construction Manager's and Architect's consultants, and each of their respective representatives, employees, directors, officers, and agents, from and against any and all claims, suits, actions, debts, damages, fines, penalties, costs, charges and expenses, including but not limited to attorneys' fees and the costs of any proceeding, arising out of, relating to or resulting from the performance of this Subcontract, including, but not limited to, bodily injury and/or property damage, to the extent caused, in whole or in part, by acts, actions, omissions, negligence, fault or breach of the Subcontractor, its employees, agents, subcontractors, suppliers and/or materialmen, regardless of whether or not such claim is caused in part by a party indemnified hereunder."

§ 3.18.1.1 To the maximum extent permitted by law, the Contractor hereby assumes the entire responsibility and liability for any and all damage (liquidated, direct or consequential) and injury (including death), disease or sickness of any kind or nature whatsoever, to all persons, whether or not employees of the Contractor, and to all property and business or businesses, caused by, resulting from, arising out of, or occurring in connection with:

a. the Work;
b. the performance or intended performance of the Work;
c. the performance or failure to perform the Contract;
d. the failure to complete the Work by the date set for Substantial Completion;
e. any occurrence which happens in or about the area where the Work is being performed by the Contractor, either directly or through a Subcontractor, or while any of Contractor's property, equipment or personnel is in or about such area; or
f. New York State Labor Law, Article 10, including without limitation sections 240, 241, 241-a and 241-b, thereof, as amended, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

§ 3.18.1.2 Except to the extent, if any, expressly prohibited by law, should any such damage or injury referred to in Section 3.18.1.1 be sustained, suffered, or incurred by Owner, Architect, or Construction Manager, or should any claim for such damage or injury be made or asserted against any of them, whether or not such claim is based upon Owner's, Architect's, or Construction Manager's alleged active or passive negligence or participation in the wrong or upon any alleged breach of any statutory duty or obligation on the part of the Owner, Architect, or Construction Manager, Contractor shall indemnify and hold harmless Owner, Architect, and Construction Manager along with their Board of Education, Administration officers, agents, partners, and employees (hereinafter collectively referred to as "Indemnitees"), of, from and against any and all other loss, cost, expense, and liability, including without limitation, legal fees and disbursements, that Indemnitees may directly or indirectly sustain, suffer or incur as a result of such damages, injuries and claims; and Contractor agrees to assume, on behalf of any and all Indemnitees the defense (with counsel satisfactory to the party indemnified) of any action at law or in equity, or other legal proceeding, which may be brought against any Indemnitee upon or by reason of such damage, injury or claim and to pay on behalf of every Indemnitee, the amount of any judgment, decree, award, or order that may be entered against each said Indemnitee in any such action or proceeding. In the event that any such claim, loss, cost, expense, liability, damage or injury is sustained, suffered, or incurred by, or is made, asserted or threatened against any Indemnitee, Owner shall, in addition to all other rights and remedies, have the right to withhold from any payments due and to become due to Contractor an

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amount sufficient in Owner's judgment to protect and indemnify the Indemnitee(s) from and against any and all such claim, loss, cost, expense, liability, damage or injury, including legal fees and disbursements; or Owner, in its discretion, may require Contractor to furnish a surety bond satisfactory to Owner guaranteeing such protection which bond shall be furnished by Contractor within 5 days after written demand has been made therefore. In the event more than one Contractor is connected with an event or occurrence (or series of events or occurrences) covered by this indemnification, then all such Contractors shall be jointly and severally responsible to the Indemnitee, and the ultimate responsibility among such indemnifying Contractors shall be settled or otherwise determined by separate proceedings and without loss, expense or damage to any Indemnitee.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18 shall not be limited by a limitation on amount or type of damages, compensation, insurance proceeds, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.18.3 In any and all claims against the Owner, the Architect, the Construction Manager, or their agents or employees by third parties, the indemnification obligation under this § 3.18 shall apply and shall not be limited by limitation or amount of or type of damages, compensation, insurance proceeds, or benefits payable by or for the Contractor or Subcontractors.

§ 3.18.4 Contractor shall comply with, and cooperate with, Architect, Construction Manager, and Owner in complying with legal requirements. Among other things, Contractor shall be responsible for performing corrective work within any abatement periods prescribed by governmental entities including but not limited to OSHA, appealing from decisions or orders, requesting extensions on abatement periods, and furnishing such information or evidentiary material as may be necessary or as may be requested by Architect, Construction Manager, or Owner to fully protect the rights and interests of Owner, Architect, and Construction Manager with respect to possible, threatened or pending proceedings or orders.

§ 3.18.5 Natale Patent Rights. With respect to any Contractor performing asbestos abatement as part of its Scope of Work.

.1 Contractor shall hold a valid current license to perform Work using the negative pressure system covered by the Natale Patent or provide and Indemnity Agreement as follows:

.2 Indemnity Agreement: Contractor and Contractor's surety agree to protect, indemnify and hold harmless the Owner, the Architect, and the Board of Education, Administration directors, officers, agents, employees, and assigns of the Architect from any and all claims, judgments, liabilities, expenses, attorney fees, court costs, or losses of any nature, resulting from claims of patent right infringement including but not limited to U.S. Patent Number 4,604,111, commonly known as the Natale Patent, arising out of the performance of Work on the Project.

(a) The provisions of this Indemnity Agreement shall protect the Indemnitees against all claims arising out of the subject matter or performance of this Contract and Contract Documents, including, without limitation, allegations or findings that the Indemnitees, or any of them, were guilty of negligence in the issuance of such Contract.

(b) The provisions of this Indemnity Agreement shall be in addition to and shall in no way delete any provisions, including warranty and indemnity provisions of the Agreement.

§ 3.18.6 The Contractor accepts assignment of, and liability for, all purchase orders and other agreements for procurement of materials and equipment that are identified as part of the Contract Documents. The Contractor shall be responsible for such pre-purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation and testing of items covered in any assigned purchase orders or agreements. All warranty and correction of the Work obligations under the Contract Documents shall also apply to any pre-purchased items, unless the Contract Documents specifically provide otherwise.

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ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number. All changes in the work must be processed through the Architect.

§ 4.1.2 The Construction Manager is the firm set forth on page 1 hereof .

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment and during the Correction Period described in Article 12. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, or in progress, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work (1) known deviations from the Contract Documents and from the most recent Project schedule prepared by the Construction Manager, and (2) defects and deficiencies observed in the Work.

§ 4.2.2.1 The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor.

§ 4.2.2.2 On the basis of onsite observations and otherwise, the Architect shall keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

§ 4.2.2.3 The Architect will promptly report to the Owner any observed defects or deficiencies of the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed or as otherwise directed by the Owner. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, or charge of, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents except to the extent that any such failure shall be directly attributable to the negligent or wrongful act or omission of the Construction Manager or the Architect. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work. Nothing contained in this Section 4.2.5 shall limit the duties of the Architect or the Construction Manager to the Owner under any other provision of the Contract Documents. If the Architect or the

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Construction Manager believes that the Contractor is failing to perform the Work in accordance with the requirements of the Construction Documents, it shall promptly disclose such failure to the Owner in writing.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority and responsibility to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. The Construction Manager shall determine whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly, in such a manner as to cause no delay in the progress of the Work, review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are multiple Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other multiple Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.11.1 If the Architect is required to review more than two (2) submittals by a Contractor for the reason that the submittal and one (1) re-submittal failed to conform to the information given or the design concept expressed in the Contract Documents, the Contractor shall reimburse the Owner for the amount of compensation paid by the Owner to

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the Architect for such additional reviews. The Owner shall be entitled to withhold from any payment due the Contractor any such amount due from the Contractor.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Construction Manager and Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager and the Architect will prepare Change Orders and Construction Change Directives as set forth in the agreements between the Owner-Architect and Owner-Construction Manager.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by Contractor, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.19.1 If Work is described or indicated in a manner which makes it impossible to carry out the requirements of the Contract Documents, or should discrepancies appear among the Contract Documents, the Contractor shall request interpretation before proceeding with the Work. If Contractor fails to make such a request, no excuse will be entertained for failure to carry out the Work of the Contract Documents. Should a conflict occur in or between Contract Documents, the Contractor is deemed to have estimated on the more expensive way of doing the Work.

§ 4.2.20 The Architect's decisions, after consultation with the Owner, on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

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§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 The Contractor shall not award work to any one Subcontractor in excess of 50 percent of the Contract Sum, without prior written approval of the Owner. Unless otherwise stated in the Contract Documents, the Contractor, within ten (10) calendar days after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time or information for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.1.1 Unless otherwise expressly set forth in the Contract Documents, a Subcontractor proposed by a Contractor shall not be acceptable unless the Contractor submits evidence to the Construction Manager with its proposal of the Subcontractor that the proposed Subcontractor has satisfactorily completed similar contracts or subcontracts and has the necessary experience, personnel, equipment, licensing, and financial ability to complete the subcontract in accordance with the Project Schedule. The substitution of a different proposed Subcontractor shall not entitle the Contractor to any upward adjustment in the Contract Sum or the Contract Time.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection. Contractor shall provide proposed substitute within five (5) days of notice of such reasonable objection.

§ 5.2.3 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

(Paragraph deleted)

§ 5.2.4 Maintenance of the Project Schedule is critical. Contractors shall award subcontracts to entities capable of performing in a manner that will maintain the Project Schedule and require its subcontractors to complete their work in accordance with the Project Schedule.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents including but not limited to all deadlines and substantial completion dates, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents

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with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity.

(Paragraph deleted)

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

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§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.2.6 Claims and other disputes and matters in question between the Contractor and a Separate Contractor shall be subject to the provisions of Article 15 as amended provided the separate contractor has reciprocal obligations.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Allowance Use Authorization, Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.2.1 See other subsections for Allowance Use provisions and permitted costs for the Allowance Uses.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 Unit Prices

§ 7.1.4.1 Unit prices shall be submitted in the Bid Form for various items set forth therein.

§ 7.1.4.2 Unit prices set forth shall be used to determine equitable adjustment of the Contract price in connection with additional Work or Work omitted or reduced by the Architect. The Unit Prices quoted shall include all labor, materials, equipment, applicable taxes and shall apply to all Work added or Work deducted.

§ 7.1.4.3 If any one of the unit prices quoted by a Contractor is excessively high in the opinion of the Architect, the Owner and Architect will have the right to adjust such unit prices to a fair and reasonable amount.

§ 7.1.5 Changes in the Work involving additional Work or deletion of Work whether or not resulting in an addition to or subtraction from the Contract Sum shall not be made until the Contractor submits to the Architect the cost of the added or deleted Work with a complete and detailed listing of all Subcontractors involved, all materials, labor and equipment.

§ 7.1.5.1 Overhead and profit as described in 7.1.7.1 and 7.1.7.2-a may be added to the cost of a claim for additional Work *only* when the source of monies for such additional work is not a Contingency Allowance included in the Contract Sum or any other monies for Work included in the Contract Sum.

§ 7.1.5.2 Changes in the Work whether or not involving additions or deductions from the Contract Sum shall not be

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made until an appropriate Change Order or Change Directive has been issued.

§ 7.1.5.3 Where quoted unit prices are not applicable as set forth in Section 7.1.4 and the extra cost is to be determined under clause 7.3.3.3, the mark-ups (above actual cost) for overhead and profit shall be as specified in Section 7.1.7 and as qualified in 7.1.5.1 above.

§ 7.1.6 Labor costs shall include items incidental to labor such as workmen's compensation insurance, social security, fringe benefits (exclusive of transportation) and all mandatory costs paid in connection with labor.

§ 7.1.7 Overhead shall include insurance other than those incidental to labor mentioned above, premiums on bonds required by the Contract, Contractor's Supervisory employees, home and field office expenses, transportation costs and both manual and power small tools and manual and power small equipment. Material and equipment costs shall be as described in 7.3.4.

§ 7.1.7.1 For Work done by the Contractor's own forces, mark-up for combined overhead and profit on materials and on cost of labor shall not exceed 15%.

§ 7.1.7.2 For Work done by the subcontractors, mark-up of costs as defined Herein by subcontractors for combined overhead and profit on materials and on cost of labor shall not exceed 10%.

a. To this amount, 5% may be added for the Contractor's combined overhead and profit, except as otherwise specified for allowances and unit prices (See 7.1.5.1 above.)

§ 7.1.8 Material costs shall be as described in 7.3.4.

§ 7.1.9 To facilitate reviewing quotations for either extra charges or deductions, all proposals shall be accompanied by a complete itemization of costs including labor, materials, subcontracts, and if allowed, mark-ups for overhead and profit. Subcontracts shall be similarly itemized.

§ 7.1.10.1 If requested, the Contractor shall submit detailed quotations from material suppliers.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.1 All Change Orders must have the approval of the Owner, Architect, and Construction Manager in writing.

§ 7.2.2 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work which is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any all adjustments to the Contract Sum and the contract time.

§ 7.2.3 Methods used in determining adjustments to the Contract Sum may include these, those listed in Section 7.3 with its subsections and Section 7.5 with its subsections.

§ 7.2.4 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without

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invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.5. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, social security, unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance directly related to the work of the change, and other employee costs approved by the Construction Manager and Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation directly related to the work of the change, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others directly related to the work of the change;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.3.11 Lump sum adjustment described in clause 7.3.3.1 shall be substantiated by submitting evidence of actual costs to the Architect for evaluation for the following:

.1 Costs described in Section 7.3.4, including labor and other costs of subcontractors, itemized by trades.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.5 OVERHEAD AND PROFIT

§ 7.5.1 The combined overhead and profit included in the total cost of a Change Order to the Owner shall be based on the following schedule:

§ 7.5.1.a Contractor: For Work performed by the Contractor's own forces, markup shall not exceed a total of fifteen percent (15%), of the value of labor and materials (L+M).

. 1 Example: Total Contractor Amount= (L+M) + 15% O&P

§ 7.5.1.b Contractor's Subcontractor(s): For Work performed by the Subcontractor's own forces, markup shall not exceed a total often percent (10%) of their value of labor and material (L+M). For the Contractor, for work performed by that Contractor's Subcontractor, markup shall not exceed five percent (5%) for the value of the Subcontractor amount.

.1 Example: Total Subcontractor Amount= (L+M) + 10% O&P
.2 Example: Total Contractor Amount= Total Subcontract Amount+ 5% O&P

§ 7.5.1.c Contractor's Subcontractor's Sub-subcontractor(s): For Work performed by the Sub-subcontractor's own forces, markup shall not exceed a total of five percent (5%) of their value of labor and materials (L+M). For the Subcontractor, for work performed by the Sub-subcontractor, markup shall not exceed a total of five percent (5%) of their value of labor and materials (L+M) for work performed by the Sub-subcontractor. For the Subcontractor, markup shall not exceed a total of five percent (5%) of the Sub-subcontractor amount. For the Contractor, markup shall not exceed 5% of the Subcontractor Amount.

.1 Example: Total Sub-subcontractor Amount= (L+M) + 5% O&P
.2 Example: Total Subcontractor Amount= Sub-subcontractor Amount+ 5% O&P
.3 Example: Total Contractor Amount= Subcontractor Amount+ 5% O&P

§ 7.5.2 Performance and Payment Bond Adjustments: Do not itemize increases for bond premiums for each individual Change Order per General Conditions of the Contract, Section 11.1.1.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

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§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 TIME IS OF THE ESSENCE IN THE COMMENCEMENT, PROSECUTION AND COMPLETION OF THE WORK. Contractor shall be responsible for all direct and consequential damages to Owner and Architect arising from the delay of Contractor, its Subcontractors and suppliers, in performing or completing the Work in accordance with the time requirements of paragraph 8.2. The indemnity provisions of Articles 3 and 11 are applicable to such damages and to claims arising in respect thereto. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.1.1 Contractor shall cooperate with Owner, Construction Manager, Architect and other Contractors on the Project, making every reasonable effort to reduce the contract time.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, permanently commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.2.1 Contractor shall not commence Work on the site until evidence of insurance and original performance and payment bonds as required in Article 11, have been accepted by the Owner.

§ 8.2.3 Contractor shall do all things necessary to ensure the prosecution of the Work in accordance with any one or more of the following as determined by the Architect and the Owner, in their discretion:

.1 Project schedules and revisions thereof, given from time to time to Contractor;
.2 The time requirements for various portions of Work;
.3 The requirements of the Project including, but not limited to, coordination requirements as may from time to time be known to Contractor; and
.4 Schedules of the Work provided by Contractor to Architect upon the Owner's request.

§ 8.2.4 Should the progress of the Work and/or other Work be delayed by any fault, neglect, act or failure to act of Contractor or any of its Subcontractors or suppliers so as to cause any additional cost, expense, liability or damage to Owner, Architect, or Construction Manager, or for which Owner, Architect, or Construction Manager may become liable, Contractor shall hold them harmless from and indemnify them against all such additional cost, expense, liability or damage.

§ 8.2.5 If the Contractor does not achieve Substantial Completion within the Contract Time established in the Agreement between the Owner and the Contractor, or in a subsequent Change Order, the Contractor shall be liable to the Owner for any liquidated, direct and/or consequential damages; for the costs of fees and reimbursements to the Owner's Agents including, but not limited to, the Architect and the Construction Manager for their services attributable to the Contractor's delay or abandonment. Except as may be prohibited by applicable law, all of Owner's rights and remedies in connection with the Contractor's failure to achieve Substantial Completion within the Contract Time established in the Agreement between the Owner and the Contractor, shall be cumulative and may be exercised singularly or concurrently. Election by Owner to pursue any remedy shall not exclude pursuit of any other remedy.

§ 8.2.6 The Work shall be performed during designated working hours, except that in the event of emergency or when necessary to perform the Work in accordance with the requirements of Section 8.2, Work shall be performed at Contractor's cost and expense on other shifts, overtime, Saturdays, Sundays, Holidays and at other times, if permission to do so has been obtained in writing from Owner. Without limiting the requirements of the preceding sentence, if the progress of the Work or of the Project has been delayed by any fault, neglect, act or failure to act of Contractor or any of its Subcontractors or suppliers, Contractor shall work such overtime, at Contractor's cost and expense as aforesaid, as Architect shall deem necessary or desirable to make up for all time lost and to avoid delay in the completion of the Work and of the Project. The failure by Architect to direct Contractor to engage in such

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overtime shall not relieve Contractor of the consequences of its delay.

§ 8.2.7 Unless otherwise noted, the date of commencement of the Work is the date established in a notice to proceed. The notice to proceed will be issued immediately upon return of signed documents by the Contractor and the presentation of acceptable insurance certificates. Contractor shall organize construction schedules as specified in Section 3.10, Contractor's Construction Schedules. The commencement date shall not be postponed by the failure to act of the Contractor or of persons or entities for which the Contractor is responsible.

§ 8.2.8 The Architect may direct acceleration of the Work so that it may be performed in advance of the schedules, time requirements and Project requirements described in Section 8.2. If so directed, Contractor shall increase its staff and/or work overtime. Contractor will not be entitled to additional compensation for work performed outside of designated working hours, except as approved by Owner in writing in advance. Provided that Contractor is not in default under the Contract, is meeting the Project Schedule, and Owner has issued the aforesaid authorization, there shall be added to the Contract Sum as actual out-of-pocket amount equal to:

.1 Additional premiums on wages actually paid, at rates that have been accepted by Architect;
.2 Taxes imposed by law on such additional wages; and
.3 Premiums for worker's compensation and liability insurance if required to be paid on such additional wages.

Written authorization for overtime work that exceeds $500.00 for which Contractor intends to charge the Owner in any one week shall be invalid unless confirmed in writing by the Owner, it being understood that Owner's Site Representative shall not have authority to authorize such overtime which exceeds $500.00 in any one week.

§ 8.2.9 In no case shall the Contractor delay the progress of the Work or any part thereof on account of changes in the Work or disputes caused by proposed or ordered changes in the Work or any disputes or disagreements as to the equitable value of such changes.

§ 8.2.10 Contractor and Contractor's Surety shall be strictly accountable for completion of the Work in accordance with the Project Schedule as a condition to satisfactory contractual performance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 Should Contractor be obstructed or delayed in the commencement, prosecution or completion of the Work, without fault on its part, by reason of failure to act, direction, order, neglect, delay or default of the Owner or the Architect; by changes in the Work; fire, lightning, earthquake, enemy action, act of God or similar catastrophe; by Government restrictions with respect to materials or labor, or by an industry-wide strike beyond Contractor's reasonable control, then Contractor shall be entitled to an extension of time lost by reason of any and all causes aforesaid, but no claim for extension of time on account of delay shall be allowed unless a claim in writing therefore is presented to Architect with reasonable diligence but in any event not later than fifteen (15) days after the commencement of such claimed delay. Except for the causes specifically listed above in this Section, no other cause or causes of delays shall give rise to an extension of time to perform the Work. The granting of an extension of time is conditioned upon Contractor's timely submission of the aforesaid written notice. Except to the extent, if any, expressly prohibited by law, Contractor expressly agrees not to make, and hereby waives, any claim for damages, including those resulting from increased labor or material cost, on account of any delay, obstruction or hindrance for any cause whatsoever, whether or not foreseeable and whether or not anticipated including but not limited to the causes set forth in this Section, and agrees that the sole right and remedy therefore shall be an extension of time not to exceed the duration of the time lost, provided the Contractor has met the pre-condition of a notice of claim to the Architect as set forth in this Section.

§ 8.3.2 If Contractor claims an increase in the Contract Sum or an extension in the completion time required by reason of a change in the Work, Contractor shall give Architect written notice within fifteen (15) days after Contractor's knowledge of the occurrence of the matter giving rise to such claim. This notice shall be given by Contractor before proceeding to execute the changed Work, except in an emergency endangering life or property in which case Contractor shall proceed in accordance with Article 10. No such claim will be valid unless notice is given as required

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in this Section. Contractor shall proceed to execute the Work, even though the increase or time extension has not been agreed upon.

§ 8.3.2.1 Extension of time, if requested by the Contractor, shall only be considered after the Contractor has made reasonable effort to recover the lost time.

§ 8.3.2.2 An extension, or extensions, of time may be granted subject to the provisions of this article, but only after written application therefore by the Contractor.

§ 8.3.2.3 An extension of time shall be only for the number of days of delay that the Architect may determine to be due solely to the causes set forth in the application for extension of time. The Contractor shall not be entitled to receive a separate extension of time for each one of several causes of delay operating concurrently; but, if at all, only the actual period of delay as determined by the Architect.

§ 8.3.3 Contractor shall not be allowed an extension of time unless Contractor has established to the satisfaction of the Owner and Architect that the delay claimed by Contractor is to a portion of the Work on the critical path of the Work schedule.

§ 8.3.4 No monetary recovery may be obtained by Contractor for delay. Time extensions for delay are limited to the specific causes set forth in Section 8.3.1 and then, only upon compliance with the notice and proof requirements of Section 8.3.1 and 8.3.2.

§ 8.3.5 Contractor waives any claim against Owner, Architect, or Construction Manager for the consequences of any delay resulting from directions given or not given by Architect or Construction Manager including scheduling and coordination of the Work or resulting from Architect's preparation of Drawings and Specifications or review of Shop Drawings.

§ 8.3.6 When the Contract Time has been extended, as provided under this Section 8.3, such extension of time shall not be considered as justification for extra compensation to the Contractor for administrative costs or other similar reasons.

§ 8.3.7 The intent of the Contracts is for the Work to follow a logical sequence; however, the Contractor may be required by Architect to temporarily omit or leave out any section of Work, or perform Work out of sequence. All such out-of-sequence Work and come back time to these areas shall be performed at no additional cost to the Owner.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner, the applicable unit prices shall be equitably adjusted as set forth in Section 7.1.4.3.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, at least sixty (60) days before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and upon written approval to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

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§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, releases of waivers of lien from Subcontractors and suppliers, certified payroll information in accordance with NYS law, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Until Substantial Completion, the Owner shall pay ninety-five percent (95%) of the amount due to the Contractor on account of progress payments.

§ 9.3.1.4 The Contractor shall supply with each of its applications for payment any information requested by the Architect, Owner, or Construction Manager such as lien waivers for work performed to date by subcontractors and suppliers.

§ 9.3.1.5 When the work or major portions thereof as contemplated by the terms of the Contract are substantially complete, the Contractor shall submit to the Construction Manager and Architect a requisition for payment of the remaining amount of the Contract balance for that major portion of the Work. Upon receipt of such requisition, the Owner shall approve and promptly pay the remaining amount of the Contract less two times the value of any remaining items to be completed, including close-out documentation/items and work, and an amount necessary to satisfy any claims, liens or judgments against the Contractor, which have not been suitably discharged, as determined by the Architect in conjunction with the Construction Manager. Any claims, liens or judgments referred to in this clause shall pertain to the Project and shall be filed in accordance with the terms of the Contract, and applicable laws.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner free and clear of all liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work, no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall be free and clear of all liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.3.4 The Contractor further expressly undertakes to defend the Owner, at the Contractor's sole expense, against any actions, lawsuits or proceedings brought against Owner as a result of liens filed against the Work, the site of any of the Work, the project site and any improvements thereon, payments due the Contractor or any portion of the property of the Owner, including but not limited to the public fund in connection with the Work (referred to collectively as liens in Section 9.3.3). The Contractor hereby agrees to indemnify and hold Owner harmless against any such liens or claims of lien and agrees to pay any judgment or lien resulting from any such actions, lawsuits or proceedings and reimburse

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Owner for all legal fees and costs incurred by Owner in connection with any such actual or threatened action, lawsuit or proceeding.

§ 9.3.5 The Owner shall release any payments withheld due to a lien or a claim of lien if the Contractor obtains security acceptable to the Owner or a lien bond which is: (1) issued by a surety acceptable to the Owner, (2) in form and substance satisfactory to the Owner, and (3) in an amount not less than One Hundred Ten percent (110%) of such lien claim. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of any responsibilities or obligations under this Section 9.3, including, without limitation, the duty to defend and indemnify the Owner. The cost of any premiums incurred in connection with such bonds and security shall be the responsibility of the Contractor and shall not be part of, or cause any adjustment to, the Contract Sum.

§ 9.3.6 The Contractor agrees to waive any right which it may have to assert a mechanic's or other lien against the Project site and any improvements thereon or the public fund created in connection with the Project, including, without limit, the Work itself. Furthermore, the Contractor will cause a similar provision, waiving any right to a mechanic's or other lien against the property, to be included in all of its subcontracts, any subcontracts and all contracts with material suppliers. Upon execution of the Agreement, the Contractor shall also execute the waiver of lien attached to the Agreement and made a part thereof as an Exhibit.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

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§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor or other Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents; or

.8 failure to comply with applicable federal, state or local law or regulations, including but not limited to laws requiring the delivery of certified payrolls to the Owner.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment. Payments made by the Owner to any Subcontractor of the Contractor under this Article 9 shall be deemed to be payments made to the Contractor for the purposes of this Contract.

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§ 9.5.5 Notwithstanding anything above to the contrary, the Owner has the right to withhold payment to protect itself against damages incurred or which may be incurred as the result of the Contractor's breach of Contract or negligence, including, but not limited to, the items set forth in Section 9.5.1.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid and charge any costs or expenses, including but not limited to attorneys' fees and disbursements, incurred by the Owner as a result of the Contractor's failure to furnish such evidence. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents. This Section 9.7 shall not

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apply to the extent that the Contractor owes the Owner any amount pursuant to the indemnification or other provisions of the Contract Documents, or the Owner is required to incur any cost or expense to purchase additional insurance or pay premiums for the Contractor's insurance as a result of a failure of the Contractor to obtain or maintain insurance meeting the requirements set forth in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 The Date of Substantial Completion of the Project or a designated portion thereof is the date when construction is sufficiently complete in accordance with the Drawings and Specifications so the Owner can occupy or utilize the entire Project (or such portion thereof as Owner earlier elects to occupy or utilize) for the uses for which it is intended. Substantial Completion shall not be deemed to exist until the Owner receives a Certificate of Occupancy for the Project (or such portion as elected by Owner) if such Certificate of Occupancy is required, and any other permits, approvals, licenses and any other documents from governmental authorities having jurisdiction therefore necessary for the beneficial occupancy of the project and the Contractor, Architect and Owner have agreed upon a schedule to provide the Owner with all as built drawings, operating manuals and warranties. Warranties called for by the Agreement or by the Drawings and Specifications shall commence on the date of Substantial Completion of the Project or designated portion thereof, or any later date that the parties agree. This date shall be established by a Certificate of Substantial Completion signed by the Owner, Architect and Contractor and shall state their respective responsibilities for security, maintenance, heat utilities, damage to the Work and insurance. This Certificate shall also list the items to be completed or corrected together with a price for each item and a time for their completion and correction.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive written list of items to be completed or corrected which shall identify all non-conforming, defective and incomplete Work and establish the date of commencement of warranties in connection with any such Work prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.3.1 Except with the consent of the Owner, the Architect in conjunction with the Construction Manager will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The two (2) inspections will include not only determining if the area is substantially complete, but will also include any follow-up inspection to confirm all open punch list items have been completed for that specific item. The Owner may deduct from the Contract Sum amounts paid to the Architect for any additional inspections necessitated by the Contractor's misrepresentation of conditions.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance, and upon the Owner's receipt of the consent of surety with respect to any bond furnished by the Contractor pursuant to the Agreement,, the Owner shall promptly pay that portion of the Contract Sum not yet paid less an amount equal to two (2) times the value

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of any items of Work remaining to be completed and two (2) times the amount necessary to satisfy any claims, liens, or judgments against the Contractor that have not been discharged.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents and shall not constitute substantial completion.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or the Contractor's Subcontractors or Sub-subcontractors, or any other person for whom the Contractor shall be responsible, or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 audits performed by the Owner, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.10.6 In the event the Contractor does not achieve final completion within thirty (30) days after the date of substantial completion, allowing for any approved extensions of the contract time, Contractor shall not be entitled to any further payment and Contractor hereby agrees that such failure to complete the work within the time set forth above shall constitute a waiver of all claims by the Contractor to any money that may be due. This provision shall not operate as a waiver by the Owner of any claims or remedies of any nature against the Contractor arising out of the Contract.

§9.11 Retainage

§9.11.1 Applications for Payment shall include a retainage amount of not less than five percent (5%) of the value of the completed work. Reduction of retainage shall only be approved upon completion of the Work and when authorized by the Owner in writing.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, the Contractor's Subcontractors or Sub-subcontractors, when appropriate using coverings and other protective measures sufficient to insure the integrity and security of the Work and such materials and equipment;

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and

.4 construction or operations by the Owner, Separate Contractors, or other Contractors.

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§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss, including but not limited to all infectious disease exposure precautions. The Contractor represents and warrants to the Owner that its services and compensation set forth herein contemplate compliance with all of the Owner's policies and procedures and all current and reasonably foreseeable federal, state and local orders, regulations, and guidance related to limiting the spread of the COVID-19 virus, including but not limited to regulations and guidance from the NYS Education Department and the NYS Department of Health. Accordingly, the Contractor hereby waives any claim for an increase in compensation or a change to the Substantial Completion date due to said compliance.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly replaced by the Contractor.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If the Contractor suffers injury or damage to person or property because of an act or omission of the Owner, written, notice of the injury or damage, whether or not insured, shall be given to the Owner within a reasonable time not exceeding seven (7) calendar days after discovery. The notice shall provide sufficient detail to enable the Owner to investigate the matter.

§ 10.2.9 The Contractor shall promptly report in writing to the Owner, Architect, and Construction Manager, all accidents arising out of or in connection with the Work which cause death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect.

§ 10.2.10 The Contractor shall be solely responsible for the conditions which develop during construction and in the event any structure is dislocated, over strained, or damaged so as to affect is usefulness, the Contractor shall be solely responsible. The Contractor shall take whatever steps necessary to strengthen, relocate or rebuild the structure to meet requirements.

§ 10.2.11 The Contractor is responsible for restoration and/or repair of utilities, private property, buildings, pavement, walkways, roads, etc. damaged by its activities, or by its Subcontractors or Sub-subcontractors under this Agreement.

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§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner, Construction Manager and Architect n writing. The Contractor shall take all reasonable precautions and measures to prevent any further contamination of the Project site or the Work by hazardous materials or substances it encounters and to prevent the further spread or disturbance of such materials or substances.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity. Exception is made for the Contractor expressly retained for the removal of lead, asbestos or polychlorinated (PCB) from the site. In this condition, all Contract Specifications and Drawings shall govern the handling of this material.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

(Paragraph deleted)

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located and one to which the Owner has no reasonable objection,

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such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations;

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18;

.9 Where the Contract or Subcontract involves asbestos, the insurance required by Section 11.1 shall specifically include the words asbestos abatement work and shall specify any limitations on completed operation time period and if there is a limitation, it will be at the Owner's discretion to accept or reject the limitation;

.10 Insurance must remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work; and

.11 Contractor agrees to indemnify the Owner for all applicable deductibles and self-insurance retentions.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. All liability insurance shall be written on an occurrence basis with the Contractor's insurance as primary and the Owner's policies as excess and noncontributory. Coverages shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.2.1 If there is a lapse in the Contractor's required insurance through cancellation, expiration, failure to renew, or any other cause, the Contractor shall stop performing Work until it is once again in compliance with this Article. The Contractor shall have no claim against the Owner and shall not be entitled to any adjustment in the Contract Time or the Contract Sum as a result of any resulting delays. At its sole option, the Owner shall be permitted to pay the amount of any premium due for a policy of insurance required to be maintained by the Contractor under the Contract Documents or take such other action as may be necessary to prevent a lapse of coverage under any such policy and deduct the amount paid by the Owner from any amounts to be paid or to become payable to Contractor under the Contract Documents.

§ 11.1.2.2 The Contractor shall include coverage for its Subcontractors in its liability insurance policies or submit evidence that each of its Subcontractors has obtained and is maintaining insurance coverage in the amount and of the types required of the Contractor by this Article before such Subcontractor commences any portion of the Work or enters onto the Project site. The Contractor shall not permit any Subcontractor to enter upon or continue the performance of the Work unless such Subcontractor maintains insurance coverage of the types and in the amounts described intis Article.

§ 11.1.3 Each certificate of insurance must describe the services to be provided by Contractor, be acceptable to the Owner, and shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work; and thereafter upon renewal or replacement of each required policy of insurance. The certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for

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completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness. The Contractor shall provide written notification to the Owner of the cancellation or expiration of any insurance required by Section 11.1. The Contractor shall provide such written notice within five (5) business days of the date the Contractor is first aware of the cancellation or expiration or is first aware that the cancellation or expiration is threatened or otherwise may occur, whichever comes first.

§ 11.1.3.1 Along with the submission of certificates of insurance, the Contractor shall include written disclosure of any prior and/or pending claims against the submitted policies. In addition, the Contractor shall immediately disclose to Owner in writing, any subsequent claims against the policies.

§ 11.1.3.2 A fully competed New York Construction Certificate of Liability Insurance Addendum (ACORD 855 NY 2014/05) must be included with the certificates of insurance. For any "Yes" answers on Items G through L on this Form – additional details must be provided in writing.

§ 11.1.4 Each Contractor shall maintain the following insurance for the duration of this Agreement and shall maintain Products and Completed Operations insurance coverage in effect for a period of two (2) years after Final Completion of the Work to be performed under the Contract Documents.

§ 11.1.4.1 Comprehensive General Liability Insurance naming the Owner, Architect and Construction Manager as an Additional Insured, containing an Additional Insured Endorsement, and a Waiver of Subrogation Endorsement. The additional insured coverage shall be primary and a non-contributory on a follow form basis to any of the Owner's, Architect's and Construction Manager's insurance policies and shall apply to both ongoing and completed operations on a per project and per location basis:

General Aggregate	$2,000,000
Products Completed Operations Aggregate	$2,000,000
Personal and Advertising Injury	$1,000,000
Each Occurrence	$1,000,000
Fire Damage	$100,000
Medical Expense	$10,000

Including Bodily Injury and Property Damage, Damage for Premises/Operations, Products and Completed Operations and coverage provided by the General Liability coverage form CG00010 1/96 in connection with work to be completed by the Contractor and all subcontractors and consultants, with the Owner, Architect and Construction Manager named as an Additional Insured. Coverage must be provided on a per project, per location basis.

All property damage insurance shall include coverage for explosion, collapse and underground operations.

§ 11.1.4.2 Commercial Automobile Liability Insurance covering owned and rented vehicles operated by the Contractor with policy limits of not less than one million ($1,000,000) combined single limit and aggregate for bodily injury and property damage. Including Bodily Injury and Property Damage for the operation of Any Auto (Symbol 1) used in connection with Work to be completed by the Contractor and all subcontractors and consultants, with the Owner, Architect, and Construction Manager named as an Additional Insureds with Endorsement attached.

§ 11.1.4.3 Umbrella Liability Insurance:

Each Occurrence Limit	$5,000,000
Aggregate	$5,000,000

The Umbrella Liability Insurance coverage shall provide additional limits of liability coverage over and above the General Liability and Automobile Liability coverages required by this Agreement on a follow-form basis with the Owner, Architect, and Construction Manager named as an Additional Insured with Endorsement attached.

§ 11.1.4.4 Worker's Compensation Insurance covering the obligations of the Contractor in accordance with applicable law at statutory limits and Employer's Liability Insurance with a policy limit of not less than required by applicable

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law, covering all operations under this Agreement, whether performed by the Contractor, its subcontractors or consultants, containing a Blanket Waiver of Subrogation Endorsement.

§ 11.1.4.5 Owner's and Contractor's Protective Liability Insurance **with the Owner listed as the Named Insured**:

Each Occurrence	$1,000,000
Aggregate	$2,000,000

In addition, the Owner shall provide property damage insurance on a builder's risk "all risk" or equivalent policy form in the amount of the initial contract sum plus the value of subsequent contract modifications and the cost of materials supplied or installed by others, comprising the total value for the entire project at the site on a replacement cost basis without optional deductibles. The form of the policy shall be Completed Value. The policy deductible must be no greater than $5,000 per occurrence.

§ 11.1.4.6 The Contractor shall provide to the Owner for each of the insurance coverages required herein one original or one certified copy of the original policy of insurance, including all endorsements, plus one certificate of insurance on ACCORD Form 25S accompanied by AIA Form G715, with a brief description of the project or service. The policies and certificates shall show the Owner, the Architect, and the Construction Manager as an additional insured on the Comprehensive General Liability, Automobile Liability, umbrella or excess policies, and the Owner as the Named Insured on the Owner's Protective Liability Insurance policy. All such insurance shall be written without expense to the Owner by an insurance company authorized to provide insurance in the State of New York with an AM Best rating of A- or better, shall be drawn on standard forms approved by the New York State Insurance Department and shall protect the Contractor, its subcontractors and consultants, and the Owner, the Architect and the Construction Manager from liability for claims for personal injury, death and property damage which may arise from performance under the Contract Documents.

§ 11.1.4.7.1 At the request of the Owner, the issuing insurance company, agents and/or authorized representatives shall set forth in writing that there are no pending claims against the insured and/or that there is ample coverage remaining to cover the insured in the event of a claim.

§ 11.1.4.7.2 At the request of the Owner, the issuing insurance company, agents and/or authorized representatives shall set forth in writing that the insurance: (1) applies to all operations of the Contractor in connection with the Work to be performed under this Agreement; (2) applies on the effective dates stated, whether or not the Agreement between the Contractor and the Owner has been executed; and (3) is written in accordance with the company's regular policies and endorsements.

§ 11.1.4.7.3 Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner and its bonding company, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Waivers of Subrogation

§ 11.2.1 The Contractor waives all rights against (1) Owner and any of its agents, and employees; (2) the Construction Manager and Construction Manager's consultants; and (3) the Architect and Architect's consultants, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.2.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

(Paragraphs deleted)

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§ 11.3 Owner's Insurance

§ 11.3.1 The Owner may purchase and maintain insurance in its discretion.

(Paragraph deleted)

§ 11.4

(Paragraphs deleted)

Performance Bond and Payment Bond

(Paragraphs deleted)

§ 11.4.1 The Contractor must furnish two (2) executed Surety bonds, each in the amount equal to one hundred (100%) percent of the Contract Sum.

§ 11.4.1.1 The Performance Bond shall be furnished as security for the faithful performance by the Contractor of all terms and conditions of the Contract Documents.

§ 11.4.1.2 The Payment Bond shall be furnished as security for the claims of laborers and materials suppliers.

§ 11.4.1.3 Both bonds shall be made out to the Owner, prepared on AIA Form A311-1970 and submitted by the Contractor to the Owner within ten (10) days of notification that its Bid was accepted.

§ 11.4.1.4 The Surety thereon must be such Surety company or companies as are authorized and licensed to transact business in the State of New York and included on the Department of the Treasury's Listing of Approved Sureties with an underwriting limit of at least $2,000,000 or the amount of the bond, whichever is higher. Each bond must be properly signed with acknowledgment of the signatures. Attorneys-in-fact who sign bonds must file with each bond a certified copy of their power of attorney to sign said bonds. Every bond must display the Surety's Bond Number.

§ 11.4.1.5 All Bonds shall be maintained in full force for a period of twelve (12) months after the date of the Contractor's acceptance of final payment as guarantee that the Contractor will make good any faults or defects in the Work arising from improper or defective workmanship or materials which may appear during the period.

§ 11.4.1.6 The Contractor shall keep the surety informed of the progress of the Work, and, where necessary, obtain the surety's consent to, or waiver of: (1) notice of changes in the Work; (2) request for reduction or release of retention; (3) request for final payment; and (4) any other material required by the surety. The Owner shall be notified by the Contractor, in writing, of all communications with the surety. The Owner may, in the owner's sole discretion, inform surety of the progress of the Work and obtain consents as necessary to protect the Owner's rights, interest, privileges and benefits under any bond issued in connection with the Work.

§ 11.4.1.7 Additional performance and payment bonds may be required by the Owner, in the Owner's discretion, from any Subcontractor whose Subcontract exceeds One Hundred Thousand Dollars ($100,000.00). The Owner shall pay for any premiums charged for obtaining required Subcontractor bonds by executing a Change Order which shall increase the Contract Sum in an amount equal to such premiums. All such bonds shall be in form and substance satisfactory to the Owner in the Owner's sole judgment.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract or performance under the Contract Documents, the Contractor shall promptly furnish a copy of the bonds and hereby authorizes the Owner to furnish a copy of the bonds.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate.

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If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense and may be deducted pursuant to a change directive.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 The Contractor unconditionally warrants the Work and its performance to the Owner. The Contractor shall perform all warranty obligations and responsibilities with respect to the Work. The Contractor, at is sole expense, shall remedy defects due to improper and/or defective workmanship or materials appearing within one (1) year of Final Completion or for such longer period as may be set forth elsewhere in the Contract Documents (the "Correction Period"). Upon Substantial Completion of the Work, the Contractor shall submit to the Owner all written warranties and guaranties from Subcontractors, suppliers, and manufacturers. If a warrant or guaranty delivered to the Owner by a supplier, vendor, or manufacturer shall be available, the Owner will first diligently pursue remedies under such warranty or guaranty before pursuing any remedy against the Contractor pursuant to any such warranty or guaranty, and the Contractor shall fully cooperate with such efforts. The Contractor acknowledges that its obligations to the Owner under this Section are joint and several during the Correction Period with Subcontractors, suppliers, vendors, and manufacturers for all warranties and guaranties supplied with respect to the Work or any portion thereof. Any notice given to the Contractor by the Owner pertaining to any deficiency in the Work covered by a warranty or guaranty described in this Section shall toll the Correction Period until the deficiency has been corrected, and the Correction Period for all corrected Work shall recommence on the date of correction. The obligations of the Contractor pursuant to this Section shall continue notwithstanding the termination of the Contract or of the Contractor for any reason. The rights and remedies of the Owner pursuant to this Section are in addition to and not in lieu of any rights and remedies that may be available to the Owner under the Contract Documents, including but not limited to Section 2.4 of this Agreement, or applicable law. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense and may be deducted pursuant to a change directive..

§ 12.2.2.1.1 Any replacement made under any guarantee required by or included in the Contract Documents, or within one (1) year after the date of substantial completion of the Contract, shall likewise be guaranteed as stipulated above from the date such replacement is accepted by the Owner.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 Upon completion of any Work under or pursuant to this Section 12.2, the one-year Correction Period in connection with the Work requiring correction shall be renewed and recommence.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.3.1 Upon request by the Owner and prior to expiration of one year from the date of Substantial Completion, the Construction Manager and the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction whether completed or partially completed, of the Owner or separate contractors or other Multiple Contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents. The

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obligations shall cover any repair and replacement to any part of the Work or other property caused by the defective Work.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the Correction Period as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules.

§ 13.1.2 The Contractor shall at all times observe and comply with all Federal and State Laws, and all Laws, Ordinances and Regulations of the Owner, in any manner affecting the work, and all such orders decreed as exist at present and those which may be enacted later, by bodies or tribunals having jurisdiction or authority over the Work, and the Contractor shall indemnify and save harmless the Owner and all its officers, agents or servants against any claim or liability arising from, or based on, a violation of any such law, ordinances, regulation or order, whether by its employee or agents.

§ 13.1.3 During the performance of this Contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, marital status, or domestic violence victim status;
2. If directed to do so by the Owner or the State Commissioner of Human Rights, the Contractor will send to each labor union or representative of workers which with the Contractor has or is bound by a collective bargaining or other agreement or understanding, a notice, to be provided by the State Commissioner of Human Rights, advising such labor union or representative of the Contractor's agreement under clauses (I) through (6) (hereinafter called "non-discrimination clauses"). If the Contractor was directed to do so by the Owner as part of the bid or negation of this Contract, the Contractor shall request such labor union or representative to furnish a written statement that such labor union or representative will not discriminate because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, or marital status, and that such labor union or representative will cooperate, within the limits of its legal contractual authority, in the implementation of the policy and provisions of these non-discrimination clauses and that it consents and agrees that the recruitment, employment and the terms and conditions of employment under this Contract shall be in accordance with the purposes and provision of these non-discrimination clauses. If such labor union or representative fails or refuses to comply with such a request that it furnish such a statement, the Contractor shall promptly notify the Owner and the State Commissioner of Human Rights of such failure or refusal;
3. If directed to do so by the Owner or the Commissioner of Human Rights, the Contractor will post and keep posted in conspicuous places, available to employees and applicants for employment, notices to be provided by the State Commissioner of Human Rights setting forth the substance of provisions of clauses (1) and (2) and such provision of the State's law against discrimination as the State Commissioner of Human Rights shall determine;
4. The Contractor will state in all solicitations or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of age, race, creed, color, national origin, sexual orientation, military status, sex, disability, predisposing genetic characteristics, marital status, or domestic violence victim status;

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5. The Contractor will comply with the provisions of Sections 290-299 of the Executive Law, and with the Civil Rights Law, will furnish all information and reports deemed necessary by the State Commissioner of Human Rights under these non-discrimination clauses and such section of the Executive Law, and will permit access to the Contractor's books, records, and accounts by the Owner, the State Commissioner of Human Rights, the Attorney General and the Industrial Commissioner for the purposes of investigation to ascertain compliance with the non-discrimination clauses and such sections of the Executive Law Civil Rights Law;
6. This Contract may be forthwith cancelled, terminated or suspended, in whole or in part, by the Owner upon the basis of a finding made by the State Commissioner of Human Rights that the Contractor has not complied with the non-discrimination clauses, and that the Contractor may be declared ineligible for future contracts made by or on behalf of the Owner, the State or a public authority or agency of the State, until the Contractor satisfies the State Commissioner of Human Rights that the Contractor has established and is carrying out a program in conformity with the provisions of these non-discrimination clauses. Such findings may be made by the State Commissioner of the Human Rights after conciliation efforts by the Commissioner have failed to achieve compliance with these non-discrimination clauses and after a verified complaint has been filed with the Commissioner, notice thereof has been given to the Contractor to be heard publicly in accordance with the Executive Law. Such sanctions may be imposed and remedies invoked independently of or in addition to sanctions and remedies otherwise provided by law; and
7. The Contractor will include the provisions of clauses .1 through .6 in every subcontract or purchase order in such a manner that such provisions will be binding upon each subcontractor or vendor as to operations to be performed within the State of New York. The Contractor will take action in enforcing such provisions of such subcontract or purchase order as the State Commissioner of Human Rights or the Owner may direct, including sanctions or remedies for non-compliance. If the Contractor becomes involved or is threatened with litigation with a subcontractor or vendor as a result of such directions by the State Commissioner of Human Rights or the Owner, the Contractor shall promptly so notify the Owner and the Attorney General requesting the Attorney General to intervene and protect the interests of the State of New York.

§ 13.1.4 The parties expressly agree that any claim, dispute, or other controversy of any nature arising out of the Contract or performance of the Work shall be commenced and maintained in the New York State Supreme Court in the County where the Project is located.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. The Contractor shall not assign the Contract as a whole without written consent of the Owner. Any assignment or attempted assignment by the Contractor in violation of the provisions of this Section 13.2.1 shall be void and unenforceable and shall be deemed a material breach of this Agreement.

(Paragraph deleted)

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The

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Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, or inspections where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due in accordance with New York State Laws.

§ 13.6 Any material to be furnished shall be subject to inspections and tests in the shop and field by the Architect. Shop inspection shall not relieve the Contractor of the responsibility to furnish satisfactory materials and the right is reserved to reject any material at any time before final acceptance of the work, when in the opinion of the Architect the materials and workmanship do not conform to the Specification requirements.

§ 13.7 General Provisions

§ 13.7.1 Any specific requirement in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and are also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped; or

.2 An act of government, such as a declaration of national emergency, that requires all Work to be

(Paragraphs deleted)

stopped.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work,

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repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner, Construction Manager and Architect, and upon the failure of the Owner to cure the alleged grounds for termination within that seven days, terminate the Contract and recover from the Owner payment for Work properly and acceptably executed.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1

(Paragraphs deleted)

If, in the opinion of the Owner, the Contractor at any time refuses or fails to provide sufficient skilled workers or materials, timely prosecute the Work, is substantially behind schedule, fails to furnish the Owner with satisfactory assurance evidencing the Contractor's ability to complete the Work in compliance with the requirements of the Contract Documents, make payment to Subcontractors as required by the Contract, by the Contractor's contracts with such third parties, or by applicable law, or comply with any provisions of the Contract Documents, or makes any general assignment for the benefit of creditors, becomes insolvent, makes any filing in any proceeding in bankruptcy, has any involuntary proceeding in bankruptcy commenced for it, or disregards applicable laws, rules, and regulations or Project-specific instructions of the Owner, the Owner may, without prejudice to any other rights or remedies it may have: (a) take reasonable steps to remedy the condition, in which case the Contractor shall be liable to the Owner for the direct and indirect costs. The costs incurred by the Owner in connection with retaining a replacement contractor (on a contingency basis or otherwise) are in addition to any other costs incurred by Owner to remedy the condition (including, without limitation, reasonable legal fees and disbursements) incurred by the Owner in taking such steps; or (b) terminate the Contract. In either event, the Owner may enter the Project site, take possession of all Work and all materials and equipment of the Contractor, require the Contractor to assign to the Owner any or all of its subcontracts and contracts or purchase orders pertaining to the Project or the Work, and complete the Work by itself, through others, or by whatever method or methods the Owner may deem appropriate. In the case of termination for default, the Contractor shall not be entitled to receive any further payment until the Work is fully completed and accepted by the Owner. Any payment then made shall be limited to Work fully performed by the Contractor in accordance with the Contract Documents up to the date of termination, less any charges or other amounts owed by the Contractor to the Owner. If the amount paid by the Owner for completing the Work exceeds the unpaid balance of the Contract Sum, then the Contractor shall pay the Owner the difference within five (5) business days following demand therefor by the Owner. The Contractor shall, in addition, pay all of the Owner's costs of collection, including, without limitation, reasonable legal fees and disbursements. The Contractor's obligations hereunder shall survive the termination of the Contract for any reason.

§ 14.2.2

(Paragraphs deleted)

If the Owner is subsequently determined in any binding dispute resolution proceeding to have improperly or wrongfully exercised its rights under Section 14.2, the Contractor shall be deemed to have been terminated at the Owner's convenience and shall be compensated accordingly.

§ 14.2.3 The Contractor hereby constitutes and appoints the Owner its true and lawful attorney in fact to execute and deliver all instruments and documents and take all such other actions on behalf of the Contractor as the Owner may deem necessary or convenient to the effectuation of the purposes and transactions described in this Article 14 from and after the Owner's termination of the Contract as permitted by this Article 14. Nothing in this Section 14.2.3 and no exercise or assertion by the Owner of any of the authority granted hereunder shall be deemed to relieve the Contractor of any liability or obligation to the Owner under the Contract Documents or otherwise.

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(Paragraph deleted)

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. No adjustment shall be made to the extent:

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.3.3 In the event the Owner terminates the contract pursuant to this provision, the Contractor shall be paid for Work performed in accordance with this Contract as certified by the Architect and Owner's Consultant, and Contractor shall be entitled to no other payment and shall make no claim for damages.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 Notwithstanding any other provision to the contrary in this Agreement, the Owner reserves the right at any time and in its absolute discretion to terminate the services of the Contractor and/or the Work for the Owner's convenience and without cause by giving written notice to the Contractor. This termination for the convenience of the Owner provision allows and authorizes the Owner to terminate this Agreement at any time and for any reason whatsoever. This right may be exercised by the Owner in its complete discretion.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to, and the Owner shall reimburse the Contractor for an equitable pro rata portion of the Contractor's fee based on the portion of the Work properly completed before the effective date of termination and for any other reasonable costs incurred before the effective date of termination. Contractor's entitlement to payment for all such work shall be predicated on its performance of such work in accordance with the Contract Documents as certified by the Architect and Construction Manager. Contractor shall be entitled to no other payment and waives any claim for damages.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. The Owner may, but is not required to, refer a claim to the Construction Manager and or the Architect for their review and assistance.

§ 15.1.2 Notice of Claims

Claims by the Contractor must be initiated by written notice to the Owner and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect. Claims by the Contractor must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the Contractor should have been aware of the condition giving rise to the Claim, whichever is later. The notice requirements set forth in this Agreement dealing with Claims and Disputes are in addition to and not a substitution or replacement of any and all notice requirements contained in applicable law.

§ 15.1.2.1 Claims by the Contractor must be made by written notice in accordance with the following procedures.

.1 The Contractor may submit a Claim concerning a matter properly noticed in accordance with the time requirements of this Contract set forth in Section 15.1.2 and elsewhere;

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.2 Failure by the Contractor to furnish the required Claim documentation within the time set forth above shall constitute waiver of the Contractor's right to compensation for such Claim.

.3 Contractor shall furnish three (3) certified copies of the required Claim documentation, with a copy submitted to the Owner, Architect, and Construction Manager. The Claim documentation shall be complete when furnished. The evaluation of the Contractor's Claim will be based, among other things, upon the Owner's Project Records and the Contractor's furnished Claim documentation.

.4 Claim documentation shall conform to Generally Accepted Accounting Principles and shall be in the following format:

a. general introduction;
b. general background discussion
c. issues
    i. index of issues (listed numerically);
    ii. for each issue:
        (1) background
        (2) chronology
        (3) Contractor's position (reason for Owner's potential liability)
        (4) supporting documentation of merit or entitlement
        (5) supporting documentation of damages
        (6) begin each issue on a new page
d. all critical path method schedules (as-planned, monthly updates, schedule revisions and as-built), along with computer disks of all schedules related to the Claim;
e. productivity exhibits (if appropriate); and
f. summary of issues and damages.

.5 Supporting documentation of merit for each issue shall be cited by reference, photocopies or explanation. Supporting documentation may include, but shall not be limited to General Conditions, General Requirements, technical specifications, drawings, correspondence, conference notes, Shop Drawings and submittals, shop drawing logs, survey books, inspection reports, delivery schedules, test reports, daily reports, subcontracts, fragmentary CPM schedules or time impact analyses, photographs, technical reports, requests for information, field instructions and all other related records necessary to support the Contractor's claim.

.6 Supporting documentation of damages for each issue shall be cited, photocopied or explained. Supporting documentation may include, but shall not be limited to, any or all documents related to the preparation and submission of the bid; certified, detailed labor records including labor distribution reports; material and equipment procurement records; construction equipment ownership, cost records or rental records; subcontractor or vendor files and cost records; service cost records; purchase orders; invoices; Project as-planned and as-built cost records; general ledger records; variance reports; accounting adjustment records, and any other accounting material necessary to support the Contractor's Claims.

.7 Each copy of the Claim documentation shall be certified by a responsible officer of the Contractor in accordance with the requirements of these Contract Documents..

§ 15.1.3 Continuing Contract Performance

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Construction Manager will prepare Change Orders and the Architect will issue a Certificate for Payment or Project Certificate for Payment in accordance with the decisions of the Initial Decision Maker.

(Paragraphs deleted)

§ 15.1.4 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3. Claims for additional compensation relating to Contractor's non-compliance with its representations and warranties in this Contract will not be allowed.

(Paragraphs deleted)

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§ 15.1.5 Claims for Additional Time

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary. Claims for an extension of time relating to Contractor's non-compliance with its representations and warranties in this Contract will not be allowed.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 Waiver of Claims for Consequential Damages. The Contractor waives all Claims for consequential damages arising out of or relating to this Contract. This waiver includes, but is not limited to:

.1 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit; and

.2 all consequential damages incurred by the Contractor as a result of Owner's termination in accordance with Article 14.

(Paragraphs deleted)

§ 15.2 Initial Decision

§ 15.2.1 Claims, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response to the requested supporting data, or (2) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect and Construction Manager, if the Architect or Construction Manager is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate with respect to the initial decision.

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§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 are subject to mediation upon mutual agreement of the parties.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered in accordance with the Construction Industry Mediation Procedures of the American Arbitration Association in effect on the date of this Agreement. However, the American Arbitration Association will not be involved in the mediation unless the parties mutually agree. A request for mediation shall be made in writing, delivered to the other party to the Contract. The parties shall select a mutually acceptable mediator. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

(Paragraph deleted)

§ 15.4 Litigation

If for any reason the Claim or dispute is not resolved by the mediation or the parties fail to agree on mediation as a dispute resolution process, then the Claim or dispute shall be resolved in New York State Supreme Court in the County where the Project is located. The Owner shall be entitled to recover its reasonable attorney's fees and costs if it prevails in the litigation. The Owner and the Contractor consent to exclusive jurisdiction of the New York State Supreme Court with jurisdiction over the County in which the Project is located and waive any and all objections to the jurisdiction of such court.

(Paragraphs deleted)

§ 15.5 SAVING CLAUSE

If, during the term of this Contract, it is found that a specific clause of the Contract is illegal under Federal or State law, the remainder of the Contract not affected by such a ruling shall remain in full force and effect.

ARTICLE 16 PROVISIONS REQUIRED BY LAW

§ 16.1 PROVISIONS DEEMED INSERTED

Each and every provision or obligation required by law and/or required to be inserted in the Contract shall be deemed to be inserted Herein and the Contract shall be read and enforced as though it were included Herein and in the event any such provision is not inserted or is not correctly inserted then, upon the application of either party, this Contract shall forthwith be physically amended to make such insertion or correction.

§ 16.2 MINIMUM RATE OF WAGE AND SUPPLEMENT

§ 16.2.1 The minimum hourly wage rates (including supplements) to be paid shall not be less than that designated by the New York State Department of Labor, Bureau of Public Works and any redetermination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated Herein by reference as of the effective date of redetermination and shall form a part of these Contract Documents.

§ 16.2.2 The minimum hourly supplement to be paid shall be in accordance with the prevailing practices in the locality where the work is located and shall be not less than that designated by the Industrial Commissioner. Supplements as defined in Section 220 of the Labor Law, as amended, means all remuneration for employees paid in any medium other than cash or reimbursements for expenses or any payments which are not wages within the meaning of the law, including, but not limited to, health, welfare, non-occupational disability, retirement, vacation benefits, holiday pay

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and life insurance.

§ 16.2.3 The Contract shall be forfeited by a Contractor and he shall not be entitled to receive any sum of money for any work performed hereunder on his or her second conviction for willfully paying less than the stipulated wage scale (including supplements) as provided in the Labor Law, Section 220, as amended, or the stipulated minimum hourly wage scale (including supplements) as provided in the Labor Law, Section 220-d, as amended.

§ 16.3 APPRENTICES

Where required by law apprentices must be registered, individually, under a bona fide program registered with the New York State Department of Labor. The allowable ratio of apprentices to journeymen in any craft classification shall not be greater than the ratio permitted to the contractor as to his or her work force on any job under the registered program. Any employee, who is not registered as above, shall be paid the prevailing wage rate for the classification of work he actually performed. The contractor or subcontractor will be required to furnish written evidence of the registration of his or her program and apprentices as well as of the appropriate ratios and wage rates for the area of construction, prior to using any apprentices on the contract work. (See Section 220.3-e).

§ 16.4 ASSIGNMENT OF PUBLIC CONTRACTS

As provided in Section 109 of the General Municipal Law, the Contractor is prohibited from assigning, transferring, conveying, subletting or otherwise disposing of this Contract, or of his or her right title, or interest therein, or his or her power to execute such contract or any other person or corporation without the previous consent in writing of the officer, board or agency awarding the Contract. If any Contractor, to whom any contract is let, granted and awarded, as required by law, by any officer, board or agency in a political subdivision, or of any district therein, shall without the previous written consent specified in subdivision one of this section, assign, transfer, convey, sublet or otherwise dispose of such contract, or his or her right, title or interest therein, or his or her power to execute such contract, to any other person or corporation, the officer, board or agency which let, made, granted, or awarded such contract shall revoke and annul such contract, and the political subdivision or district therein, as the case may be, and such officer, board or agency shall be relieved and discharged form any and all liability and obligations growing out of such contract to such contractor, and to the person or corporation to which such contract shall have been assigned, transferred, conveyed, sublet or otherwise disposed of, and such contractor, and his or her assignees, transferees or sublessees shall forfeit and lose all moneys, theretofore earned under such contract, except so much as may be required to pay his or her employees. The provisions of this section shall not hinder, prevent, or affect an assignment by any such contractor for the benefit of his or her creditors made pursuant to the laws of this state."

§ 16.5 FINGERPRINTING

Pursuant to the Safe Schools Against Violence in Education Act ("SAVE" legislation) and Part 87 of the Regulations of the Commissioner of Education, any individual who, as a result of their work on this capital project, will move (or migrate) in and out of student occupied areas for more than five (5) days a year, must be fingerprinted. All contractors shall be responsible to ensure that they (and their employees) are in full compliance with the fingerprinting provisions of New York's SAVE Legislation and Part 87 of the Regulations of the Commissioner of Education at their sole cost and expense.

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AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the day of in the year
(Paragraphs deleted)
BETWEEN the Owner:

and the Contractor:

for the following Project:

King + King Project #

The Construction Manager:

The Architect:

King + King Architects, LLP
358 West Jefferson Street
Syracuse, New York 13202
Telephone Number: 315-671-2400

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

[X] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Paragraph deleted)

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§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:

(Paragraph deleted)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:

[X] Stipulated Sum, in accordance with Section 4.2

(Paragraphs deleted)

below

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:

(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:

(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

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Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Intentionally deleted.

(Paragraph deleted)
(Table deleted)
(Paragraphs deleted)
§ 4.4 Intentionally deleted.

(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
(Table deleted)
(Paragraphs deleted)
§ 4.5 Liquidated damages, if any:

None.

§ 4.6 Other:

None.

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the last day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the thirtieth (30) day of the following month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than thirty (30) days after the Construction Manager receives the Application for Payment.

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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§ 5.1.4.3.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Intentionally deleted

(Paragraphs deleted)

§ 5.1.6 Intentionally deleted

(Paragraphs deleted)

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Paragraph deleted)

1. Five percent (5%); and

2. Less two hundred percent (200%) of the amount required to complete the Work plus the amount necessary to satisfy any claims, liens, or judgments against the Contractor which have not been resolved, settled, or discharged.

(Paragraphs deleted)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(Paragraph deleted)

Only as agreed to in writing by the Owner.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7.

(Paragraphs deleted)

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect, and Contractor has submitted acceptable original, signed and where required notarized Closeout Documents, including but not limited to: AIA Document G706-1994 Contractor's Affidavit of Payment of Debts and Claims; AIA Document G706A-1994 Contractor's Affidavit of Release of Liens; AIA Document G707-1994 Consent of Surety to Final Payment, if applicable; and Contractor's or Subcontractor's Final Release of Lien Waiver for the Contractor and each Subcontractor and material supplier.

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§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment AND the receipt by the Owner of all Closeout Documents required by this Contract.

(Paragraphs deleted)
§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due
(Paragraphs deleted)
in accordance with New York State General Municipal Law §106-b and Tax Law §1096(e).

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(Paragraphs deleted)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Paragraphs deleted)

[X] Litigation in New York State Supreme Court with jurisdiction over the Project Location..

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Paragraph deleted)
The Owner shall pay the Contractor a termination fee to be determined by the Architect, in its capacity as Initial Decision Maker. The Architect shall establish the termination fee based exclusively on a reasonable estimate of the Contractor's anticipated profit for the portion of the work that is not completed by the Contractor as a result of the Owner's termination for convenience.

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Intentionally deleted

(Paragraphs deleted)

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Paragraph deleted)

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§ 8.3 The Contractor's representative:
(Paragraph deleted)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A232–2019, General Conditions of the Contract for Construction, Supplementary Conditions to General Conditions of the Contract for Construction, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A232–2019, General Conditions of the Contract for Construction, Supplementary Conditions to General Conditions of the Contract for Construction.

§ 8.6 Notice in electronic format may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if
(Paragraphs deleted)
completed.

§ 8.7 Other provisions:

(Paragraphs deleted)
§ 8.7.1 The Architect's review of the Contractor's submittals is limited to an initial submittal and one (1) resubmittal. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of additional resubmittals.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, as modified

.2 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified

(Paragraph deleted)

.3 upplementary General Conditions of the Contract for Construction

(Paragraph deleted)

.5 Drawings – Listed in Exhibit B, Index under Drawing List

(Table deleted)

.6 Specifications – Listed in Exhibit B, Index under Project Manual List

(Table deleted)

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Paragraph deleted)

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[ ] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[ ] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:

Exhibit A – Contractor's Executed Bid Form
Exhibit B – Prevailing Wage Rate

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

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SELECTED AIA DOCUMENTS

Contractors are required to obtain and use the following AIA documents, which can be ordered directly from the American Institute of Architects, at https://shop.aiacontracts.com/search/role/Contractor?curpage=3

CONTRACTOR'S QUALIFICATION STATEMENT - AIA Document A305 (1986)

An owner preparing to request bids or to award a contract for a construction project often requires a means of verifying the background, references, and financial stability of any contactor being considered. These factors, along with the time frame for construction, are important for an owner to investigate. Using AIA Document A305-1986, the contractor may provide a sworn, notarized statement and appropriate attachments to elaborate on important aspects of the contractor's qualifications.

BID BOND - AIA Document A310 (2010)

AIA Document A310-2010, a simple, one-page form, establishes the maximum penal amount that may be due to the owner if the selected bidder fails to execute the contract or fails to provide any required performance and payment bonds. Note: A310-2010 replaces AIA Document A310-1970 (expired December 31, 2010)

PERFORMANCE BOND AND PAYMENT BOND - AIA Document A312 (1970)

AIA Document A312 incorporates two bonds – one covering the contractor's performance, and the other covering the contractor's obligations to pay subcontractors and others for material and labor. In addition, AIA A312 obligates the surety to act responsively to the owner's requests for discussions aimed at anticipating or preventing a contractor's default.

APPLICATION AND CERTIFICATION FOR PAYMENT - AIA Document G732 (1992)

AIA Document G732-2009 serves as both the contractor's application and the architect's certification. Its use can expedite payment and reduce the possibility of error. If the application is properly completed and acceptable to the architect, the architect's signature certifies to the owner that a payment in the amount indicated is due to the contractor. The form also allows the architect to certify an amount different than the amount applied for, with explanation provided by the architect. The standard AIA Document G703-1992, Continuation Sheet, is appropriate for use with G732-2009. Note: G732-2009 replaces AIA Document G702 CMa-1992 (expired December 31, 2010).

CONTINUATION SHEET – AIA Document G703 (1992)

AIA Document G703-1992, Continuation Sheet, and G702-1992 (or G732-2009 if there is a Construction Manager), provide convenient and complete forms on which the contractor can apply for payment and the architect can certify that payment is due. The forms require the contractor to show the staus of the contract sum to date, including the total dollar amount of the work completed and stored to date, the amount of retainage (if any), the total of previous payments, a summary of change orders, and the amount of current payment requested. AIA Document G703-1992 breaks the contract sum into portions of the work in accordance with the schedule of values prepared by the contractor as require by the general conditions. Note: The AIA does not publish a standard schedule of values form.

CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS – AIA Document G706 (1994)

The contractor submits this affidavit with the final request for payment, stating that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the owner might be responsible has been paid or otherwise satisfied. AIA Document G706-1994 requires the contractor to list any indebtedness or known claims in connection with the construction contract that have not been paid or otherwise satisfied. The contractor may also be required to furnish a lien bond or indemnity bond to protect the owner with respect to each exception.

CONTRACTOR'S AFFIDAVIT OR RELEASE OF LIENS – AIA Document G706A (1994)

AIA Document G706A-1994 supports AIA Document G706-1994 in the event that the owner requires a sworn statement of the contractor stating that all releases or waivers of liens have been received. In such event, it is normal for the contractor to submit AIA Documents G706-1994 and G706A-1994 along with attached releases or waivers of liens for the contractor, all subcontractors, and others who may have lien rights against the owner's property. The contractor is required to list any exceptions to the sworn statement provided in G706A-1994 and may be required to furnish to the owner a lien bond or indemnity bond to protect the owner with respect to such exceptions.

CONSENT OF SURETY TO FINAL PAYMENT – AIA Document G707 (1994)

AIA Document G707-1994 is intended for use as a companion to AIA G706-1994, Contractor's Affidavit of Payment of Debts and Claims, on construction projects where the contractor is required to furnish a bond. By obtaining the surety's approval of final payment to the contractor and its agreement that final payment will not relieve the surety of any of its obligations, the owner may preserve its rights under the bond.

CONSENT OF SURETY TO FINAL REDUCTION IN OR PARTIAL RELEASE OF RETAINAGE – AIA Document G707A (1994)

This is a standard form for use when a surety company is involved and the owner/contractor agreement contains a clause whereby retainage is reduced during the course of the construction project. When duly executed, AIA Document G707A-1994 assures the owner that such reduction or partial release of retainage does not relieve the surety of its obligations.

ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS - AIA Document G710 (1992)

AIA Document G710-1992 is used by the architect to issue additional instructions or interpretations or to order minor changes in the work. It is intended to assist the architect in performing its obligations as interpreter of the contract documents in accordance with the owner/architect agreement and the general conditions of the contractor for construction. AIA Document G710-1992 should not be used to change the contract sum or contract time. It is intended to help the architect perform its services with respect to minor changes not involving adjustment in the contract sum or contract time.

REQUEST FOR INFORMATION (RFI) – AIA Document G716 (2004)

AIA Document G716-2004 provides a standard form for an owner, architect and contractor to requires further information from each other during construction. The form asks the requesting party to list the relevant drawing, specification or submittal reviewed in attempting to find the information. Neither the request nor the response received provides authorization for work that increases the cost or time of the project.

INFORMATION AVAILABLE TO BIDDERS

LIMITED PRE-RENOVATION ASBESTOS SURVEY REPORT
MAINE ENDWELL CENTRAL SCHOOL DISTRICT – HIGH SCHOOL
PHASE 4 – 2022 CAPITAL PROJECT
(Number of Pages - 65)
Prepared by:
DELTA Engineers
January 2025

EXTERIOR BUILDING CAULK PCB SAMPLING REPORT
MAINE-ENDWELL CENTRAL SCHOOL DISTRCIT – HIGH SCHOOL
PHASE 4 – 2022 CAPITAL PROJECT
(Number of Pages – 10)
Prepared by:
DELTA Engineers
January 2025

LIMITED LEAD-BASED PAINT SURVEY REPORT
MAINE-ENDWELL CENTRAL SCHOOL DISTRICT – HIGH SCHOOL
PHASE 4 -2022 CAPITAL PROJECT
(Number of Pages – 30)
Prepared by:
DELTA Engineers
April 2025

The materials and conditions indicated in these reports are offered as supplementary only. The reports are not inserted as part of the Contract Documents for this project, nor shall they be considered as instructions or specifications for execution of Work.

There is no guarantee, either expressed or implied, that the conditions indicated are representative of those actually existing throughout the area or in any part of it, or that unforeseen developments may not occur. Interpretation or extrapolation of the reports presented is the responsibility of the Contractor.

Limited Pre-Renovation Asbestos Survey Report

Performed at the

Maine-Endwell Central School District
Maine Endwell Senior High School

750 Farm to Market Road, Endwell, New York 13760

For the

Maine-Endwell CSD 2022 Capital Improvement Project - Phase 4
Senior High School
SED PROJECT NO. 03-11-01-06-0-010-030



Prepared for:

Mr. Jeff L'Amoreaux, Assistant Superintendent for Business & Personnel
Maine-Endwell Central School District
712 Farm to Market Road
Endwell, NY 13760

Prepared by:

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS
860 Hooper Road, Endwell, NY 13760
Tel: 607-231-6600 Fax: 607-231-6640
www.delta-eas.com
Delta Project No. 2016.424.015

Field work performed by: Robert Cherevko, Shawn May & William Johnson
January 14th & 20th, 2025

Report prepared by: Robert Cherevko

Report reviewed by: Stephen Prislupsky

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860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

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1.0 INTRODUCTION:

Delta Engineers, Architects, Land Surveyors, & Landscape Architects, DPC (Delta EAS) was contracted by the Maine-Endwell Central School District to perform a Pre-Renovation Asbestos Survey at the Maine Endwell High School located at 750 Farm to Market Road in Endwell, New York. The survey is being performed in support of the upcoming Maine-Endwell CSD 2022 CIP - Phase 4 Maine Endwell Senior High Project and addressed accessible suspect building materials in the renovation areas with the potential to be impacted by the proposed Renovation Scope as delineated in the project's 100% Construction Documents Drawing Set dated 01/08/2025.

The initial stage of the survey included a review of existing bulk sample information for the building. Bulk sample results through previous Delta / "other" Consultant sampling efforts and information in the School's the AHERA Report / AHERA Triennial Reports have been incorporated into this Survey and associated Survey Report where applicable.

On January 14th and January 20th, 2025, Delta NYS DOL Certified Asbestos Inspectors Robert Cherevko, Shan May and William Johnson conducted a walkthrough of the school to identify the various accessible suspect materials present in the renovation areas with the potential to be impacted by the anticipated project scope. Based on a visual inspection of the affected renovation areas along with a review of the project scope and existing sample information for the building, a total of thirty-seven (37) bulk samples were collected representing eighteen (18) separate suspect homogenous building materials. All thirty-seven (37) samples collected were non-friable organically bound (NOB).

In addition to the samples collected above, other suspect homogenous materials with the potential to be impacted by the project were observed but not sampled as they were addressed through previous sampling efforts. For these previously sampled materials, results are available through the Maine-Endwell District Offices. The suspect homogenous building materials identified and/or sampled in the affected project renovation areas included the following:

Homogenous Area (HA)	Suspect Building Material
01	Ground Floor 1'x1' White Fissured Ceiling Tile
02	Brown Mastic "Puck" from HA 01 Ceiling Tile
03	1st Floor 1'x1' White Fissured Ceiling Tile
04	Brown Mastic "Puck" from HA 03 Ceiling Tile
05	2nd Floor 1'x1' White Fissured Ceiling Tile
06	Brown Mastic "Puck" from HA 05 Ceiling Tile
07	12"x12" Gray/White Mottled Floor Tile
08	Yellow Mastic from HA 07 Floor Tile
09	12"x12" Light/Dark Orange Mottled Floor Tile
10	Brown Mastic from HA 09 Floor Tile
11	12"x12" Light/Dark Yellow Mottled Floor Tile
12	12"x12" Navy Blue Mottled Floor Tile
13	12"x12" Light/Dark Blue Mottled Floor Tile
14	12"x12" Light/Dark Gray Mottled Floor Tile
15	Yellow /White Mastic from HA's 11, 12, 13 & 14 Floor Tiles

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Homogenous Area (HA)	Suspect Building Material (Continued)
16	12"x12" Off-White w/Brown, Tan & Gray Flecks Floor Tile
17	Yellow Mastic from HA 16 Floor Tile
18	Tan Exterior Louver Caulk
19*	**All Colors / Patterns of 9”x9" Floor Tile**
20*	**Black Mastic from All Colors / Patterns of 9”x9" Floor Tile**
21*	Sheetrock
22*	Joint Compound
23*	All Patterns of 2’ x 2’ Ceiling Tiles
24*	All Patterns of 2’ x 4’ Ceiling Tiles
25*	Top-Coat Plaster
26*	Base-Coat Plaster
27*	Carpet Mastics / Adhesives
28*	All sizes / colors of Vinyl Cove Base
29*	Brown, Tan, and Yellow Cove Base Mastics
30*	White Floor Leveler
31*	Gray Floor Leveler
32*	Terrazzo Flooring
33*	Ceramic Floor Tile Grout & Mud Bed
34*	Ceramic Wall Tile Grout & Mud Bed
35*	Wrap / Covering from non-suspect in-line fiberglass pipe insulation
36*	**Hard-Packed Pipe Fitting Insulation on fiberglass in-line**
37*	**All Non-Foam / Non-Fiberglass Hard-Packed In-line Pipe Insulation**
38**	Roofing System Materials
39***	**Mastics from wall-mounted Chalkboards, Bulletin Boards & Whiteboards**

* - *Materials previously sampled as a part of the AHERA Program or by Delta /”other” Consultants as a part of previous Capital Improvement Projects (results are available through the Maine-Endwell CSD District Offices).*

** - *All asbestos containing roofing system materials associated with the original roof were removed as a part of the Summer 2011 Capital Improvement Project. The existing roof is a non-suspect EPDM membrane over foam insulation board.*

*** - *Suspect Mastic(s) from wall-mounted Chalkboards, Bulletin Boards and White Boards were inaccessible at the time of this survey and are therefore assumed to be Asbestos Containing until they can be accessed / sampled / analyzed.*

Specific information required by 12 NYCRR Part 56-5.1, (f) – “Building/Structure Asbestos Survey Information” to be included in this pre-renovation report is as follows:

1) Building Name/Address: Maine Endwell High School
750 Farm to Market Road
Endwell, NY 13760

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Fax: 607.231.6650
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2) Owner's Name/Address:	Maine-Endwell Central School District 712 Farm to Market Road Endwell, NY 13760
3) Owner's Agent:	Mr. Jeff L'Amoreaux Assistant Superintendent for Business & Personnel
4) Survey Performed By:	Delta Engineers, Architects, & Surveyors 860 Hooper Road Endwell, NY 13760
5) Certified Inspectors:	Robert Cherevko, Certificate No. 24-6L7O3-SHAB
6) Date of Survey:	January 14th & 20th, 2025
7) Laboratory:	America Science Team New York, Inc. 117 East 30th Street, New York, NY 10016

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Tel: 607.231.6600
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2.0 ASBESTOS SURVEY AND SAMPLING PROCEDURES AND METHODS:

2.1 Survey requirements

Requirements to perform Pre-Demolition/Pre-Renovation Asbestos Surveys are based on the following State and Federal Regulations.

Occupational Safety and Health Administration (OSHA): OSHA survey requirements and sampling protocols are included in 29 CFR Part 1910.1001(j)(2) & (j)(8) and 29 CFR Part 1926.1101(k),(5):

29 CFR Part 1910.1001(j)(2), Installed Asbestos Containing Material: Employers and building owners are required to treat installed TSI and sprayed on and troweled-on surfacing materials as ACM in buildings constructed no later than 1980 for purposes of this standard. These materials are designated "presumed ACM or PACM", and are defined in paragraph (b) of this section. Asphalt and vinyl flooring material installed no later than 1980 also must be treated as asbestos-containing. The employer or building owner may demonstrate that PACM and flooring material do not contain asbestos by complying with paragraph (j)(8)(iii) of this section.

29 CFR Part 1910.1001(j)(8), Criteria to rebut the designation of installed material as PACM:
1910.1001(j)(8)(i) - At any time, an employer and/or building owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of paragraph (j)(8)(ii) of this section has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, shall be retained pursuant to paragraph (m) of this section.

1910.1001(j)(8)(ii) - An employer or owner may demonstrate that PACM does not contain asbestos by the following:

1910.1001(j)(8)(ii)(A) - Having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR 763, Subpart E) which demonstrates that no ACM is present in the material; or

1910.1001(j)(8)(ii)(B) - Performing tests of the material containing PACM which demonstrate that no ACM is present in the material. Such tests shall include analysis of bulk samples collected in the manner described in 40 CFR 763.86. The tests, evaluation and sample collection shall be conducted by an accredited inspector or by a CIH. Analysis of samples shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.

1910.1001(j)(8)(iii) -The employer and/or building owner may demonstrate that flooring material including associated mastic and backing does not contain asbestos, by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.

29 CFR Part 1926.1101(k)(5), Criteria to rebut the designation of installed material as PACM:
1926.1101(k)(5)(i) - At any time, an employer and/or building owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration pursuant to the requirements of paragraph (k)(5)(ii) of this section has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, shall be retained pursuant to paragraph (n) of this section.

1926.1101(k)(5)(ii) – An employer or owner may demonstrate that PACM does not contain more than 1 percent asbestos by the following:

1926.1101(k)(5)(ii)(A) - Having a completed inspection conducted pursuant to the requirements of AHERA (40 CFR Part 763, Subpart E) which demonstrates that the material is not ACM; or

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Fax: 607.231.6650
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1926.1101(k)(5)(ii)(B) - Performing tests of the material containing PACM which demonstrate that no ACM is present in the material. Such tests shall include analysis of bulk samples collected in the manner described in 40 CFR 763.86. The tests, evaluation and sample collection shall be conducted by an accredited inspector or by a CIH. Analysis of samples shall be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) or the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA) or an equivalent nationally-recognized round robin testing program.

1926.1101(k)(5)(iii) - The employer and/or building owner may demonstrate that flooring material including associated mastic and backing does not contain asbestos, by a determination of an industrial hygienist based upon recognized analytical techniques showing that the material is not ACM.

EPA National Emissions Standard for Hazardous Air Pollutants (NESHAPs): (NESHAPs) regulates asbestos under "40 CFR Part 61, Subpart M - National Emission Standard for Asbestos". Subpart M regulates demolition and/or renovation of "facilities" that may contain asbestos-containing materials (ACMs). "Facilities," as defined by NESHAPs, includes any institutional, commercial, public, industrial, or residential structure or building, *except* residential buildings having four or fewer units. ACMs are defined in NESHAPs as materials containing more than 1 percent asbestos. Section 61.145 states:

61.145 Standard for demolition and renovation.
(a) Applicability. To determine which requirements of paragraphs (a), (b), and (c) of this section apply to the owner or operator of a demolition or renovation activity and prior to the commencement of the demolition or renovation, thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos, including Category I and Category II nonfriable ACM.

It should be noted that 40 CFR Part 1 Subpart M, NESHAPS has no cut-off date exempting survey requirements.

New York State Department of Labor (NYS DOL): Guidelines followed for the inspection are those established by the NYS DOL's Industrial Code Rule 56 (Cited as 12 NYCRR Part 56, as amended, adopted January 11, 2006; effective September 5, 2006). The specific survey, sampling and reporting requirements included in 12 NYCRR Part 56-5.1(e) – "Building/Structure Asbestos Survey Requirements" include:

56-5.1 Asbestos Survey Requirements for Building/Structure Demolition, Renovation, Remodeling and Repair

(a) **Asbestos Survey Required.** An owner or an owner's agent, except the owner of one and two-family dwellings who contracts for, but does not direct or control the work, shall cause to be conducted, an asbestos survey completed by a licensed asbestos contractor using inspectors certified in compliance with Section 56-3.2(d), to determine whether or not the building or structure, or portion(s) thereof to be demolished, renovated, remodeled, or have repair work, contains ACM, PACM or asbestos material. This asbestos survey shall be completed and submitted as indicated in Subdivision (g) of this Section, prior to commencing work. All such asbestos surveys shall be conducted in conformance with the requirements of Subdivision (e) of this Section.

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(b) **Exemptions to Asbestos Survey Requirements**: The asbestos survey required by this Subdivision (a) of this Section shall not be required for the following classes of buildings or structures:

(1) An agricultural building;

(2) Buildings or structures for which original construction commenced on or after January 1, 1974;

(3) A structure certified in writing to be structurally unsound by a licensed Professional Engineer, Registered Architect, Building Inspector, Fire Inspector or other official of competent jurisdiction. (See Section 56-11.5)

(c) **Building/Structure Demolition**. If a building/structure asbestos survey is not required or performed per Subdivision (b) of this Section, and the building/structure is certified to be unsound or slated for contracted demolition, the building/structure shall be assumed to contain asbestos, and shall be demolished per this Part, unless the building/structure is adequately certified to be free of asbestos containing material. Acceptable documentation for certification shall be a previous thorough building/structure asbestos survey, abatement records or other documentation acceptable to the Commissioner or his or her representative.

(d) **Responsibility to Comply.** No exemption to the requirement to conduct an asbestos survey shall exempt any person, asbestos contractor, property owner or business entity from the inspection or asbestos survey requirements of EPA, OSHA, and any other applicable section of this Part.

(e) **Building/Structure Asbestos Survey Requirements.** The asbestos survey shall include a thorough inspection for and identification of all PACM, suspect miscellaneous ACM, or asbestos material throughout the building/structure or portion thereof to be demolished, renovated, remodeled, or to have repair work. The required inspection shall be performed by a certified asbestos inspector, and, at a minimum, shall include identification of PACM, suspect miscellaneous ACM or asbestos material by all of the following methods:

(1) The review of building/structure plans and records, if available, for references to asbestos, ACM, PACM, suspect miscellaneous ACM or asbestos material used in construction, renovation or repair; and

(2) A visual inspection for PACM and suspect miscellaneous ACM throughout the building/structure or portion thereof to be demolished, renovated, remodeled, or repaired. For the purpose of this Part, all PACM and suspect miscellaneous ACM visually assessed shall be treated and handled as ACM and shall be assumed to be ACM, unless bulk sampling is conducted as per this Section, standard EPA and OSHA accepted methods, including multi-layered systems sampling protocols; the subsequent analyses are performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

(f) **Building/Structure Asbestos Survey Information.**

(1) The asbestos survey shall, at a minimum, identify and assess with due diligence, the locations, quantities, friability and conditions of all types of installations at the affected portion of the building/structure relative to the ACM, suspect miscellaneous ACM, PACM or asbestos material contained therein. The following list is not inclusive of all types of ACMs, it only summarizes typical

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ACMs. The certified asbestos inspector is responsible for identification and assessment of all types ACM, PACM, suspect miscellaneous ACM and asbestos material within the affected portion of the building/structure:

PACM

(i) **Surfacing Treatments:**

(a) Fireproofing;
(b) Acoustical Plaster;
(c) Finish Plasters; and
(d) Skim Coats of Joint Compound.

(ii) **Thermal System Insulation:**

(a) Equipment Insulation;
(b) Boiler, Breeching, Boiler Rope, Duct, or Tank Insulation, Cement or Mortar Used for Boilers and Refractory Brick;
(c) Piping and Fitting Insulations including but not limited to, Wrapped Paper, Aircell, Millboard, Rope, Cork, Preformed Plaster, Job Molded Plaster and coverings over fibrous glass insulation.

SUSPECT MISCELLANEOUS ACM

(i) **Roofing and Siding Miscellaneous Materials:**

(a) Insulation Board;
(b) Vapor Barriers;
(c) Coatings;
(d) Non-Metallic or Non-Wood Roof Decking
(e) Felts;
(f) Cementitious Board (Transite);
(g) Flashing;
(h) Shingles; and
(i) Galbestos.

(ii) **Other Miscellaneous Materials:**

(a) Dust and Debris;
(b) Floor Tile;
(c) Cove Base;
(d) Floor Leveler Compound;
(e) Ceiling Tile;
(f) Vermiculite Insulation
(g) Gaskets, Seals, Sealants (including for condensate control);
(h) Vibration Isolators;
(i) Laboratory Tables and Hoods;
(j) Chalkboards;
(k) Pipe Penetration Packing or Other Firestopping Materials
(l) Cementitious Board;
(m) Electrical Wire Insulation;
(n) Fire Curtains;
(o) Fire Blankets;
(p) Fire Doors;
(q) Brakes and Clutches;
(r) Mastics, Adhesives and Glues;

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(s) Caulks;
(t) Sheet Flooring (Linoleum);
(u) Wallpaper;
(v) Drywall;
(w) Plasterboard
(x) Spackling/Joint Compound;
(y) Textured Paint;
(z) Grout;
(aa) Glazing Compound; and
(ab) Terrazzo.

(2) All ACM, PACM, suspect miscellaneous ACM, or asbestos material reported under Paragraph (1) of this Subdivision shall include the location of the materials, an estimate of the quantities, types, friability and condition of the identified materials to be treated and handled as ACM. For the purpose of this Part, all PACM and suspect miscellaneous ACM visually assessed shall be treated and handled as ACM and shall be assumed to be ACM, unless bulk sampling is conducted as per this Section, standard EPA and OSHA accepted methods, including multilayered systems sampling protocols; the subsequent analyses are performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

(3) The building/structure asbestos survey shall also include the building/structure name, address, the building/structure owner's name and address, the name and address of the owner's agent, the name of the firm performing the asbestos survey and a copy of the firm's current asbestos handling license, the names of the certified inspector(s) performing the survey and a copy of the current asbestos handling certificate for each inspector utilized, the dates of the asbestos survey, a listing of homogeneous areas identifying which ones are ACM, all laboratory analyses reports for bulk samples collected, and copies of the appropriate certifications for the laboratory used for analysis of samples taken during the asbestos survey.

(g) **Transmittal of Building/Structure Asbestos Survey Information.** One (1) copy of the results of the building/structure asbestos survey shall be immediately transmitted by the building/structure owner as follows:

(1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws.
(2) The completed asbestos survey for controlled demolition (as per Subpart 56-11.5) or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office.
(3) The completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, throughout the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

(h) **Removal Required.** If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM,

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PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part. For multi-phased work, the access restriction for uncertified trades or personnel applies to each intermediate portion of the entire project. Upon completion of the intermediate portion of the asbestos project, other trades or personnel may access that portion of the work site.

For demolition projects that are exempt from asbestos survey requirements due to being structurally unsound, the demolition is considered an asbestos project and shall proceed as per Section 56-11.5.

(1) All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this Part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM assumed to be ACM at the work site.

(i) **Bidding.** Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part.

(j) **Unidentified and Unassessed Asbestos.** When any construction activity, such as demolition**,** remodeling, renovation or repair work, reveals PACM or suspect miscellaneous ACM that has not been identified by the asbestos survey per this Part, or has not been identified by other inspections as per current OSHA or EPA requirements, all activities shall cease in the area where the PACM or suspect miscellaneous ACM is found and the Asbestos Control Bureau shall be notified by telephone by the building/structure owner or their representative, followed with a written notice in accordance with the notification requirements of this Part. Unassessed PACM or suspect miscellaneous ACM shall be treated and handled as ACM and assumed to be ACM, unless proven otherwise by standard EPA and OSHA accepted methods, including multi-layered systems sampling protocols; subsequent analyses performed by a laboratory that meets the requirements of Section 56-4.2 of this Part; and the analyses satisfies both NYS ELAP and federal requirements, including multi-layered sample analyses, to document non-asbestos containing material.

2.2 Sample Analysis

Bulk sample analysis was performed by American Science Team New York Inc., an independent laboratory approved/accredited by the NYS Department of Health (ELAP), the American Industrial Hygiene Association (AIHA), and the National Voluntary Laboratory Accreditation Program (NVLAP).

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Samples collected during the course of this survey fell into one of two categories. The first category includes non-friable organically bound (NOB) materials. These materials are those which have an organic binder in their matrix and include items such as floor tiles, sheet flooring, mastics, glazings, caulks and roofing materials. The second category includes non-NOB "friable" materials including parging, sheetrock, joint compound, wall insulations, and wallboard.

Analysis of all "NOB" materials was initially performed by Polarized Light Microscopy (PLM) following the New York State Department of Health ELAP 198.6 Gravimetric Reduction Methodology. If a given sample was reported as non-asbestos following this analysis, it was then analyzed by Transmission Electron Microscopy (TEM) following the NYS DOH ELAP 198.4 Methodology.

Analysis of all "non-NOB" materials was performed by Polarized Light Microscopy (PLM) following the EPA 600/M4/82/020 and the NYS DOH ELAP 198.1 Methodologies.

2.3 Materials not sampled

There were several materials present at the site which were not considered "suspect" by the inspector and were not sampled. These included various fiberglass, foam, vinyl, silicone, wood/cellulose products and concrete/cinder block/brick components. Backsplash mastic observed for the non-suspect Trespa countertop was observed to be non-suspect silicone. No mastics were observed on the remaining countertops. All shelving and wall standards were observed to be mechanical fastened. All fume hood duct work seams were observed to be welded. All wiring was observed to be non-suspect vinyl wire wrap.

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3.0 Survey Findings and Conclusions

3.1) Maine-Endwell CSD 2022 Capital Improvement Project (CIP) – Phase 4 Maine Endwell High School Project Pre-Renovation Asbestos Survey, Non-Asbestos Materials – Based on previous sample results and results reported for samples collected during this Survey of accessible suspect materials present at the Maine Endwell High School with the potential to be impacted by the 2022 CIP Phase 4 Project, the following were identified as non-asbestos:

Homogenous Area (HA)	Non-Asbestos Material
01	Ground Floor 1'x1' White Fissured Ceiling Tile
02	Brown Mastic “Puck” from HA 01 Ceiling Tile
03	1st Floor 1'x1' White Fissured Ceiling Tile
04	Brown Mastic “Puck” from HA 03 Ceiling Tile
05	2nd Floor 1'x1' White Fissured Ceiling Tile
06	Brown Mastic “Puck” from HA 05 Ceiling Tile
07	12"x12" Gray/White Mottled Floor Tile
08	Yellow Mastic from HA 07 Floor Tile
09	12"x12" Light/Dark Orange Mottled Floor Tile
10	Brown Mastic from HA 09 Floor Tile
11	12"x12" Light/Dark Yellow Mottled Floor Tile
12	12"x12" Navy Blue Mottled Floor Tile
13	12"x12" Light/Dark Blue Mottled Floor Tile
14	12"x12" Light/Dark Gray Mottled Floor Tile
15	Yellow /White Mastic from HA’s 11, 12, 13 & 14 Floor Tiles
16	12"x12" Off-White w/Brown, Tan & Gray Flecks Floor Tile
17	Yellow Mastic from HA 16 Floor Tile
18	Tan Exterior Louver Caulk
21*	Sheetrock
22*	Joint Compound
23*	All Patterns of 2’ x 2’ Ceiling Tiles
24*	All Patterns of 2’ x 4’ Ceiling Tiles
25*	Top-Coat Plaster
26*	Base-Coat Plaster
27*	Carpet Mastics / Adhesives
28*	All sizes / colors of Vinyl Cove Base
29*	Brown, Tan, and Yellow Cove Base Mastics
30*	White Floor Leveler
31*	Gray Floor Leveler
32*	Terrazzo Flooring
33*	Ceramic Floor Tile Grout & Mud Bed
34*	Ceramic Wall Tile Grout & Mud Bed
35*	Wrap / Covering from non-suspect in-line fiberglass pipe insulation
38**	Roofing System Materials

* - *Materials previously sampled as a part of the AHERA Program or by Delta /”other” Consultants as a part of previous Capital Improvement Projects (results are available through the Maine-Endwell CSD District Offices).*

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** - *All asbestos containing roofing system materials associated with the original roof were removed as a part of the Summer 2011 Capital Improvement Project. The existing roof is a non-suspect EPDM membrane over foam insulation board.*

It should be noted that No Suspect Materials with the potential to be impacted by the project were observed to be present in the Ground Floor or 1st Floor of "Area A".

3.2) Maine-Endwell CSD 2022 Capital Improvement Project (CIP) – Phase 4 Maine Endwell High School Project Pre-Renovation Asbestos Survey, Asbestos Containing Materials –

Based on previous sample results and results reported for samples collected during this Survey of accessible suspect materials present at the Maine Endwell High School with the potential to be impacted by the 2022 CIP Phase 4 Project, the following were identified as being ***asbestos-containing***:

Homogenous Area (HA)	Asbestos-Containing Material
19*	**All Colors / Patterns of 9"x9" Floor Tile**
20*	**Black Mastic from All Colors / Patterns of 9"x9" Floor Tile**
36*	**Hard-Packed Pipe Fitting Insulation on fiberglass in-line**
37*	**All Non-Foam / Non-Fiberglass Hard-Packed In-line Pipe Insulation**
39***	**Mastics from wall-mounted Chalkboards, Bulletin Boards & Whiteboards**

* - *Materials previously sampled as a part of the AHERA Program or by Delta / "other" Consultants as a part of previous Capital Improvement Projects (results are available through the Maine-Endwell CSD District Offices).*

*** - *Suspect Mastic(s) from wall-mounted Chalkboards, Bulletin Boards and White Boards were inaccessible at the time of this survey and are therefore assumed to be Asbestos Containing until they can be accessed / sampled / analyzed.*

A breakdown of asbestos-containing materials by Homogeneous Area is as follows:

A) 9" x 9" Asbestos Floor Tile and associated Asbestos Containing Mastic, HA's 19* & 20*:

Asbestos containing 9" x 9" floor tile (VAT) and its associated asbestos containing mastic was observed to be present:

- As the finished flooring system and beneath carpeting / vinyl plank flooring throughout the Ground Floor District Office Area E.
- In the 2nd Floor Area E Study Hall 215 Closet and Room 218.1.
- In the 1st Floor Area B Auditorium Control Room.

Reference the Appendix F Drawings for Asbestos Floor Tile / Mastic locations. The locations of ACM floor tile / mastic to be impacted as a part of the current 2022 CIP Phase 4 Project is assumed to be at all locations where it is present and where the existing flooring is to be removed / replaced.

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B) Hard Packed In-Line Pipe and Pipe Fitting Insulation, HA's 36* & 37*: The previously identified asbestos containing hard-packed fitting insulation and hard-packed in-line pipe insulation is present on the HW Heating System Piping, Domestic Water System Piping and Roof Drain Leaders. Although the majority of ACM piping Insulation present on the Domestic Water Lines and HW Heating System lines were removed as a part of previous Capital Improvement Projects, it was observed to still be present in various rooms in ceiling plenum spaces / wet-walls / pipe chases and is assumed to still be present above all hard-plaster ceiling systems, hard-sheetrock ceiling systems and all 1' x 1' adhered ceiling tile systems. Reference the Appendix G Drawings for "Confirmed" and "Assumed" Asbestos In-line Pipe and Pipe Fitting Insulation. The locations of ACM Pipe Insulation to be impacted as a part of the current 2022 CIP Phase 4 Project is assumed to be at all locations where it is present and where existing piping is scheduled to be removed.

C) Mastics from wall-mounted Chalkboards, Bulletin Boards & Whiteboards, HA 39***: Suspect Mastics associated with wall-mounted Chalkboards, Bulletin Boards and White Boards were inaccessible at the time of this survey and are therefore assumed to be Asbestos Containing until they can be accessed / sampled / analyzed.

4.0 INACCESSIBLE AREAS

This Survey was performed in accordance with 12 NYCRR Part 56, which references the application of "due diligence" during the identification and assessment of materials, i.e., a reasonable standard of care will be applied based upon training and experience. Performing this Survey in full compliance with the applicable statutory code does not guarantee that every asbestos-containing material will be identified.

Renovation spaces and areas which were visible and accessible were inspected and sampled as a part of this survey. Inaccessible areas such as wall chases/interstitial wall space, hard ceiling plenum spaces, and enclosed pipe chases could not be inspected without select demolition. Based on the fact that the school was partially occupied by staff at the time of the survey, the inaccessible areas were not included as a part of this survey. Any materials encountered in those areas not accessible shall be assumed ACM until tested.

As stated above, this survey was limited to only those accessible spaces / areas and associated accessible suspect materials anticipated to be impacted during the upcoming Maine-Endwell CSD 2022 CIP – Phase 4 Maine Endwell Senior High School Project.

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Fax: 607.231.6650
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APPENDIX A

Asbestos Bulk Sample Report Form

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Client: Maine-Endwell Central School District	**SED Project:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.013
Project: Maine-Endwell CSD 2022 Capital Improvement Project - Phase 4, Senior High School	**Date Sampling Performed:** 01/14/2025 & 01/20/2025	**Asbestos Inspector(s):** Robert Cherevko
	Date of Report: 01/30/2025	**Number of Samples Collected:** 37
	Laboratory: AmeriSci, New York	**Number of Samples Analyzed:** PLM - 37 / TEM - 37

Asbestos Bulk Sample Report Form

Sample Number		HA*	Floor	Bulk Sample Description / Details	Material Type	Asbestos Type	PLM Result % Asbestos	TEM Result % Asbestos
2016.424.015-	01A	01	G	1'x1' White Fissured, Splined Ceiling Tile - Room G40, Northwest	Miscellaneous	ND	ND	ND
2016.424.015-	01B	01	G	1'x1' White Fissured, Splined Ceiling Tile - Room G44, Southwest	Miscellaneous	ND	ND	ND
2016.424.015-	02A	02	G	Brown Glue Puck to HA 01-Room G40, Northwest	Miscellaneous	ND	ND	ND
2016.424.015-	02B	02	G	Brown Glue Puck to HA 01-Room G44, Southwest	Miscellaneous	ND	ND	ND
2016.424.015-	03A	03	1	1'x1' White Fissured, Splined Ceiling Tile - Room 147, Southeast corner	Miscellaneous	ND	ND	ND
2016.424.015-	03B	03	1	1'x1' White Fissured, Splined Ceiling Tile - Room 149, Southeast corner	Miscellaneous	ND	ND	ND
2016.424.015-	04A	04	1	Brown Glue Puck to HA 03-Room 147, Southeast corner	Miscellaneous	ND	ND	ND
2016.424.015-	04B	04	1	Brown Glue Puck to HA 03-Room 149, Southeast corner	Miscellaneous	ND	ND	ND
2016.424.015-	05A	05	2	1'x1' White Fissured, Splined Ceiling Tile - Room 216, Southwest	Miscellaneous	ND	ND	ND
2016.424.015-	05B	05	2	1'x1' White Fissured, Splined Ceiling Tile - Room 218, Northwest	Miscellaneous	ND	ND	ND
2016.424.015-	06A	06	2	Brown Glue Puck to HA 05-Room 216, Southwest	Miscellaneous	Non-Asbestos	Trace	< 1.0%
2016.424.015-	06B	06	2	Brown Glue Puck to HA 05-Room 218, Northwest	Miscellaneous	Non-Asbestos	Trace	< 1.0%
2016.424.015-	07A	07	G	12"x12" Gray/White Mottled Floor Tile (FT-1)-Area E-Room A14 (Mailroom)	Miscellaneous	ND	ND	ND

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Client: Maine-Endwell Central School District	**SED Project:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.013
Project: Maine-Endwell CSD 2022 Capital Improvement Project - Phase 4, Senior High School	**Date Sampling Performed:** 01/14/2025 & 01/20/2025	**Asbestos Inspector(s):** Robert Cherevko
	Date of Report: 01/30/2025	**Number of Samples Collected:** 37
	Laboratory: AmeriSci, New York	**Number of Samples Analyzed:** PLM - 37 / TEM - 37

Asbestos Bulk Sample Report Form

Sample Number		HA*	Floor	Bulk Sample Description / Details	Material Type	Asbestos Type	PLM Result % Asbestos	TEM Result % Asbestos
2016.424.015-	07B	07	G	12"x12" Gray/White Mottled Floor Tile (FT-1)-Area E-Room A14 (Mailroom)	Miscellaneous	ND	ND	ND
2016.424.015-	08A	08	G	Yellow Floor Tile Mastic to HA 07-Area E-Room A14 (Mailroom)	Miscellaneous	ND	ND	ND
2016.424.015-	08B	08	G	Yellow Floor Tile Mastic to HA 07-Area E-Room A14 (Mailroom)	Miscellaneous	ND	ND	ND
2016.424.015-	09A	09	G	12"x12" Light/Dark Orange Mottled Floor Tile (FT-2)-Area E-Room A15 (Breakroom)	Miscellaneous	ND	ND	ND
2016.424.015-	09B	09	G	12"x12" Light/Dark Orange Mottled Floor Tile (FT-2)-Area E-Room A15 (Breakroom)	Miscellaneous	ND	ND	ND
2016.424.015-	10A	10	G	Brown Floor Tile Mastic to HA 09-Area E-Room A15 (Breakroom)	Miscellaneous	ND	ND	ND
2016.424.015-	10B	10	G	Brown Floor Tile Mastic to HA 09-Area E-Room A15 (Breakroom)	Miscellaneous	ND	ND	ND
2016.424.015-	11A	11	1	12"x12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 151 @ uni-ventilator	Miscellaneous	ND	ND	ND
2016.424.015-	11B	11	1	12"x12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 107 (Band Room)	Miscellaneous	ND	ND	ND
2016.424.015-	12A	12	1	12"x12" Navy Blue Mottled Floor Tile (FT-4) - Room 130 @ uni-ventilator	Miscellaneous	ND	ND	ND
2016.424.015-	12B	12	1	12"x12" Navy Blue Mottled Floor Tile (FT-4) - Room 107 (Band Room)	Miscellaneous	ND	ND	ND
2016.424.015-	13A	13	2	12"x12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 208 (Science Prep Room)	Miscellaneous	ND	ND	ND
2016.424.015-	13B	13	1	12"x12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 107 (Band Room)	Miscellaneous	ND	ND	ND

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Client: Maine-Endwell Central School District	**SED Project:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.013
Project: Maine-Endwell CSD 2022 Capital Improvement Project - Phase 4, Senior High School	**Date Sampling Performed:** 01/14/2025 & 01/20/2025	**Asbestos Inspector(s):** Robert Cherevko
	Date of Report: 01/30/2025	**Number of Samples Collected:** 37
	Laboratory: AmeriSci, New York	**Number of Samples Analyzed:** PLM - 37 / TEM - 37

Asbestos Bulk Sample Report Form

Sample Number		HA*	Floor	Bulk Sample Description / Details	Material Type	Asbestos Type	PLM Result % Asbestos	TEM Result % Asbestos
2016.424.015-	14A	14	1	12"x12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room)	Miscellaneous	ND	ND	ND
2016.424.015-	14B	14	1	12"x12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room)	Miscellaneous	ND	ND	ND
2016.424.015-	15A	15	G	Yellow /White Floor Tile Mastic to HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room G-40	Miscellaneous	ND	ND	ND
2016.424.015-	15B	15	1	Yellow /White Floor Tile Mastic to HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 151	Miscellaneous	ND	ND	ND
2016.424.015-	15C	15	2	Yellow /White Floor Tile Mastic to HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 208	Miscellaneous	ND	ND	ND
2016.424.015-	16A	16	G	12"x12" Off-White w/Brown, Tan & Gray Flecks Floor Tile (FT-6)-Room G40, north platform	Miscellaneous	ND	ND	ND
2016.424.015-	16B	16	G	12"x12" Off-White w/Brown, Tan & Gray Flecks Floor Tile (FT-6)-Room G40, SW corner	Miscellaneous	ND	ND	ND
2016.424.015-	17A	17	G	Yellow Floor Tile Mastic to HA 16; Room G40, north platform	Miscellaneous	ND	ND	ND
2016.424.015-	17B	17	G	Yellow Floor Tile Mastic to HA 16; Room G40, SW corner	Miscellaneous	ND	ND	ND
2016.424.015-	18A	18	Ext	1/4" Tan Exterior Louver Caulk - Area D-East Side (football field)	Miscellaneous	ND	ND	ND
2016.424.015-	18B	18	Ext	1/4" Tan Exterior Louver Caulk - Area D-East Side (football field)	Miscellaneous	ND	ND	ND

HA - Homogenous Area **ND** - No Asbestos Detected **NA** - Not Analyzed by Methodology **NA/PS** - Not Analyzed, Positive Stop
TSI - Thermal System Insulation **Misc** - Miscellaneous Material **Trace / < 1%** - Non-asbestos by definition

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APPENDIX B

Laboratory Analytical Results

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Delta Engineers
Attn: Stephen Prislupsky
860 Hooper Road

Endwell, NY 13760

Date Received 1/22/2025 **AmeriSci Job #** 225012454
Date Examined 01/23/25 **P.O. #**
ELAP # 11480 **Page** 1 **of** 7
RE: 2016.424.015; Maine-Endwell CSD; Maine-Endwell High School; 2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-01A 1	225012454-01	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 1' x 1' White Fissured, Splined Ceiling Tile - Room G40, Northwest **Analyst Description:** White/Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14%				
2016.424.015-01B 1	225012454-02	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 1' x 1' White Fissured, Splined Ceiling Tile - Room G44, Southwest **Analyst Description:** White/Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16%				
2016.424.015-02A 2	225012454-03	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Brown Glue Puck To HA-01 Room G40, Northwest **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 46%				
2016.424.015-02B 2	225012454-04	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Brown Glue Puck To HA-01 Room G44, Southwest **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 39%				
2016.424.015-03A 3	225012454-05	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 147, Southeast Corner **Analyst Description:** White/Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11%				

See Reporting notes on last page

PLM Bulk Asbestos Report

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School;
2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-03B 3	225012454-06	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 149, Southeast Corner **Analyst Description:** White/Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19%				
2016.424.015-04A 4	225012454-07	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - Brown Glue Puck To HA 03-Room 147, Southeast Corner **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 45%				
2016.424.015-04B 4	225012454-08	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - Brown Glue Puck To HA 03-Room 149, Southeast Corner **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 44%				
2016.424.015-05A 5	225012454-09	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 2 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 216, Southwest **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16%				
2016.424.015-05B 5	225012454-10	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 2 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 218, Northwest **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19%				
2016.424.015-06A 6	225012454-11	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 01/23/25	*2*
Location: Floor 2 - Brown Glue Puck To HA-05 Room 216, Southwest **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 41%				
2016.424.015-06B 6	225012454-12	***Yes***	Inconclusive - Trace Chrysotile detected at 1% or less (NOB by EPA 600/M4-82-020) by Valeriu Voicu on 01/23/25	*2*
Location: Floor 2 - Brown Glue Puck To HA-05 Room 218, Northwest **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.3 % pc **Other Material:** Non-fibrous 45%				

See Reporting notes on last page

PLM Bulk Asbestos Report

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School;
2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-07A 7	225012454-13	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 12" x 12" Gray/White Mottled Floor Tile (FT-1) Area E-Room A14 (Mailroom) **Analyst Description:** Lt. Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14%				
2016.424.015-07B 7	225012454-14	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 12" x 12" Gray/White Mottled Floor Tile (FT-1) Area E-Room A14 (Mailroom) **Analyst Description:** Lt. Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11%				
2016.424.015-08A 8	225012454-15	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Yellow Floor Tile Mastic To HA 07-Area E-Room A14 (Mailroom) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.3%				
2016.424.015-08B 8	225012454-16	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Yellow Floor Tile Mastic To HA 07-Area E-Room A14 (Mailroom) **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.6%				
2016.424.015-09A 9	225012454-17	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 12" x 12" Light/Dark Orange Mottled Floor Tile (FT-2) Area E-Room A15 (Breakroom) **Analyst Description:** Orange, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19%				
2016.424.015-09B 9	225012454-18	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 12" x 12" Light/Dark Orange Mottled Floor Tile (FT-2) Area E-Room A15 (Breakroom) **Analyst Description:** Orange, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 36%				

See Reporting notes on last page

PLM Bulk Asbestos Report

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School;
2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-10A 10	225012454-19	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Brown Floor Tile Mastic To HA 09-Area E-Room A15 (Breakroom) **Analyst Description:** Tan/Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17%				
2016.424.015-10B 10	225012454-20	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Brown Floor Tile Mastic To HA 09-Area E-Room A15 (Breakroom) **Analyst Description:** Tan/Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13%				
2016.424.015-11A 11	225012454-21	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 151 @ Uni-Ventilator **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 35%				
2016.424.015-11B 11	225012454-22	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 107 (Band Room) **Analyst Description:** Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30%				
2016.424.015-12A 12	225012454-23	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Navy Blue Mottled Floor Tile (FT-4) - Room 130 @ Uni-Ventilator **Analyst Description:** Dark Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 35%				
2016.424.015-12B 12	225012454-24	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Navy Blue Mottled Floor Tile (FT-4) - Room 107 (Band Room) **Analyst Description:** Dark Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 31%				

See Reporting notes on last page

PLM Bulk Asbestos Report

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School;
2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-13A 13	225012454-25	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 2 - 12" x 12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 208 (Science Prep Room) **Analyst Description:** Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25%				
2016.424.015-13B 13	225012454-26	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 107 (Band Room) **Analyst Description:** Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 28%				
2016.424.015-14A 14	225012454-27	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room) **Analyst Description:** Dark Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 28%				
2016.424.015-14B 14	225012454-28	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - 12" x 12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room) **Analyst Description:** Dark Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30%				
2016.424.015-15A 15	225012454-29	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Yellow/White Floor Tile Mastic To HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room G-40 **Analyst Description:** Tan/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25%				
2016.424.015-15B 15	225012454-30	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 1 - Yellow/White Floor Tile Mastic To HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 151 **Analyst Description:** Tan/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13%				

See Reporting notes on last page

PLM Bulk Asbestos Report

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School;
2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-15C 15	225012454-31	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor 2 - Yellow/White Floor Tile Mastic To HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 208 **Analyst Description:** Tan/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14%				
2016.424.015-16A 16	225012454-32	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 12" x 12" Off-White W/Brown, Tan & Gray Flecks Floor Tile (FT-6) Room G40, North Platform **Analyst Description:** Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.8%				
2016.424.015-16B 16	225012454-33	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - 12" x 12" Off-White W/Brown, Tan & Gray Flecks Floor Tile (FT-6) Room G40, SW Corner **Analyst Description:** Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.3%				
2016.424.015-17A 17	225012454-34	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Yellow Floor Tile Mastic To HA 16; Room G40, North Platform **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.0%				
2016.424.015-17B 17	225012454-35	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Floor G - Yellow Floor Tile Mastic To HA 16; Room G40, SW Corner **Analyst Description:** Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.1%				
2016.424.015-18A 18	225012454-36	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*
Location: Ext - 1/4" Tan Exterior Louver Caulk - Area D-East Side (Football Field) **Analyst Description:** Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.5%				

See Reporting notes on last page

PLM Bulk Asbestos Report

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School;
2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos	Notes
2016.424.015-18B 18	225012454-37	***No***	Inconclusive - NAD (NOB by NYS ELAP 198.6) by Valeriu Voicu on 01/23/25	*1*

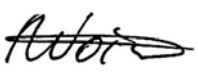
Location: Ext - 1/4" Tan Exterior Louver Caulk - Area D-East Side (Football Field)
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 0.9%

Reporting Notes:

(1) NAD results by NYS 198.6 are inconclusive and are not considered non-ACM

(2) Trace <1% results by NYS 198.6 are inconclusive and are not considered non-ACM

Analyzed by: Valeriu Voicu
Date: 1/23/2025



Reviewed by: Hongyan Ran



*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School; 2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	2016.424.015-01A	1	0.221	14.2	71.0	14.8	NAD	NAD
Location:	Floor G - 1' x 1' White Fissured, Splined Ceiling Tile - Room G40, Northwest							
02	2016.424.015-01B	1	0.252	13.4	70.3	16.3	NAD	NAD
Location:	Floor G - 1' x 1' White Fissured, Splined Ceiling Tile - Room G44, Southwest							
03	2016.424.015-02A	2	0.288	51.9	2.1	46.1	NAD	NAD
Location:	Floor G - Brown Glue Puck To HA-01 Room G40, Northwest							
04	2016.424.015-02B	2	0.274	51.8	8.8	39.4	NAD	NAD
Location:	Floor G - Brown Glue Puck To HA-01 Room G44, Southwest							
05	2016.424.015-03A	3	0.344	8.7	80.0	11.2	NAD	NAD
Location:	Floor 1 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 147, Southeast Corner							
06	2016.424.015-03B	3	0.318	12.1	68.6	19.3	NAD	NAD
Location:	Floor 1 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 149, Southeast Corner							
07	2016.424.015-04A	4	0.232	52.4	2.5	45.1	NAD	NAD
Location:	Floor 1 - Brown Glue Puck To HA 03-Room 147, Southeast Corner							
08	2016.424.015-04B	4	0.337	50.6	4.5	44.9	NAD	NAD
Location:	Floor 1 - Brown Glue Puck To HA 03-Room 149, Southeast Corner							
09	2016.424.015-05A	5	0.277	13.1	70.2	16.8	NAD	NAD
Location:	Floor 2 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 216, Southwest							
10	2016.424.015-05B	5	0.317	10.5	70.3	19.2	NAD	NAD
Location:	Floor 2 - 1' x 1' White Fissured, Splined Ceiling Tile - Room 218, Northwest							
11	2016.424.015-06A	6	0.275	50.9	7.7	41.2	Chrysotile <0.3	Chrysotile <1.0
Location:	Floor 2 - Brown Glue Puck To HA-05 Room 216, Southwest							
12	2016.424.015-06B	6	0.218	51.8	3.0	45.0	Chrysotile <0.3	Chrysotile <1.0
Location:	Floor 2 - Brown Glue Puck To HA-05 Room 218, Northwest							
13	2016.424.015-07A	7	0.240	17.0	69.0	14.0	NAD	NAD
Location:	Floor G - 12" x 12" Gray/White Mottled Floor Tile (FT-1) Area E-Room A14 (Mailroom)							
14	2016.424.015-07B	7	0.284	15.8	72.4	11.8	NAD	NAD
Location:	Floor G - 12" x 12" Gray/White Mottled Floor Tile (FT-1) Area E-Room A14 (Mailroom)							
15	2016.424.015-08A	8	0.083	96.4	2.3	1.3	NAD	NAD
Location:	Floor G - Yellow Floor Tile Mastic To HA 07-Area E-Room A14 (Mailroom)							
16	2016.424.015-08B	8	0.064	96.1	2.3	1.6	NAD	NAD
Location:	Floor G - Yellow Floor Tile Mastic To HA 07-Area E-Room A14 (Mailroom)							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School; 2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	2016.424.015-09A	9	0.280	17.0	63.5	19.5	NAD	NAD
Location:	Floor G - 12" x 12" Light/Dark Orange Mottled Floor Tile (FT-2) Area E-Room A15 (Breakroom)							
18	2016.424.015-09B	9	0.262	17.4	46.2	36.4	NAD	NAD
Location:	Floor G - 12" x 12" Light/Dark Orange Mottled Floor Tile (FT-2) Area E-Room A15 (Breakroom)							
19	2016.424.015-10A	10	0.160	44.1	38.0	17.9	NAD	NAD
Location:	Floor G - Brown Floor Tile Mastic To HA 09-Area E-Room A15 (Breakroom)							
20	2016.424.015-10B	10	0.054	51.4	35.0	13.6	NAD	NAD
Location:	Floor G - Brown Floor Tile Mastic To HA 09-Area E-Room A15 (Breakroom)							
21	2016.424.015-11A	11	0.262	20.2	44.6	35.2	NAD	NAD
Location:	Floor 1 - 12" x 12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 151 @ Uni-Ventilator							
22	2016.424.015-11B	11	0.248	22.0	47.3	30.7	NAD	NAD
Location:	Floor 1 - 12" x 12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 107 (Band Room)							
23	2016.424.015-12A	12	0.219	20.3	44.2	35.5	NAD	NAD
Location:	Floor 1 - 12" x 12" Navy Blue Mottled Floor Tile (FT-4) - Room 130 @ Uni-Ventilator							
24	2016.424.015-12B	12	0.294	20.4	48.4	31.2	NAD	NAD
Location:	Floor 1 - 12" x 12" Navy Blue Mottled Floor Tile (FT-4) - Room 107 (Band Room)							
25	2016.424.015-13A	13	0.233	20.2	54.8	25.1	NAD	NAD
Location:	Floor 2 - 12" x 12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 208 (Science Prep Room)							
26	2016.424.015-13B	13	0.293	18.9	52.8	28.2	NAD	NAD
Location:	Floor 1 - 12" x 12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 107 (Band Room)							
27	2016.424.015-14A	14	0.279	20.3	51.4	28.3	NAD	NAD
Location:	Floor 1 - 12" x 12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room)							
28	2016.424.015-14B	14	0.262	20.8	48.8	30.4	NAD	NAD
Location:	Floor 1 - 12" x 12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room)							
29	2016.424.015-15A	15	0.241	41.2	33.2	25.6	NAD	NAD
Location:	Floor G - Yellow/White Floor Tile Mastic To HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room G-40							
30	2016.424.015-15B	15	0.310	42.1	44.1	13.8	NAD	NAD
Location:	Floor 1 - Yellow/White Floor Tile Mastic To HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 151							
31	2016.424.015-15C	15	0.285	34.9	50.4	14.8	NAD	NAD
Location:	Floor 2 - Yellow/White Floor Tile Mastic To HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 208							
32	2016.424.015-16A	16	0.249	15.6	80.6	3.8	NAD	NAD
Location:	Floor G - 12" x 12" Off-White W/Brown, Tan & Gray Flecks Floor Tile (FT-6) Room G40, North Platform							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results by NYS ELAP 198.4

2016.424.015; Maine-Endwell CSD; Maine-Endwell High School; 2022 CIP, Phase 4; Limited Pre-Renovation Asbestos Survey

AmeriSci Sample #	Client Sample#	HG Area	NOB Sample Weight (gram)	NOB Heat Sensitive Organic %	NOB Acid Soluble Inorganic %	NOB Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	2016.424.015-16B	16	0.290	14.8	80.9	4.3	NAD	NAD
Location:	Floor G - 12" x 12" Off-White W/Brown, Tan & Gray Flecks Floor Tile (FT-6) Room G40, SW Corner							
34	2016.424.015-17A	17	0.050	96.6	1.4	2.0	NAD	NAD
Location:	Floor G - Yellow Floor Tile Mastic To HA 16; Room G40, North Platform							
35	2016.424.015-17B	17	0.140	93.0	5.9	1.1	NAD	NAD
Location:	Floor G - Yellow Floor Tile Mastic To HA 16; Room G40, SW Corner							
36	2016.424.015-18A	18	0.180	55.7	37.9	6.5	NAD	NAD
Location:	Ext - 1/4" Tan Exterior Louver Caulk - Area D-East Side (Football Field)							
37	2016.424.015-18B	18	0.116	62.4	36.8	0.9	NAD	NAD
Location:	Ext - 1/4" Tan Exterior Louver Caulk - Area D-East Side (Football Field)							

Analyzed by: Hongyan Ran
Date: 1/24/2025



Reviewed by: Hongyan Ran



**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

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#2250124454

Bulk Sample Data Sheet / COC

Client:	Maine-Endwell CSD	**Delta Project No.:**	2016.424.015	**Date:**	1/20/2025
Project:	Maine-Endwell High School; 2022 CIP Phase 4; Limited Pre-Renovation Asbestos Survey	**Client Project No.:**		**Turnaround Time:**	**48 Hours**
		Collected By:	R. Cherevko		

Sample Number		Material Type	Material Condition	Floor	Description / Sample Location
2016.424.015-	01A	Miscellaneous	Intact	G	1'x1' White Fissured, Splined Ceiling Tile - Room G40, Northwest
2016.424.015-	01B	Miscellaneous	Intact	G	1'x1' White Fissured, Splined Ceiling Tile - Room G44, Southwest
2016.424.015-	02A	Miscellaneous	Intact	G	Brown Glue Puck to HA 01-Room G40, Northwest
2016.424.015-	02B	Miscellaneous	Intact	G	Brown Glue Puck to HA 01-Room G44, Southwest
2016.424.015-	03A	Miscellaneous	Intact	1	1'x1' White Fissured, Splined Ceiling Tile - Room 147, Southeast corner
2016.424.015-	03B	Miscellaneous	Intact	1	1'x1' White Fissured, Splined Ceiling Tile - Room 149, Southeast corner
2016.424.015-	04A	Miscellaneous	Intact	1	Brown Glue Puck to HA 03-Room 147, Southeast corner
2016.424.015-	04B	Miscellaneous	Intact	1	Brown Glue Puck to HA 03-Room 149, Southeast corner
2016.424.015-	05A	Miscellaneous	Intact	2	1'x1' White Fissured, Splined Ceiling Tile - Room 216, Southwest

Instructions: Analyze all non-NOB samples by NYS ELAP 198.1 PLM methodology. Analyze all NOB samples initially by NYS ELAP 198.6 PLM methodology. If all samples from a given sample set are reported as non-asbestos by 198.6, analyze by NYS ELAP 198.4 TEM methodology. Stop analysis after 1st positive for a given sample set.

Email results to wjohnson@delta-eas.com, sprislupsky@delta-eas.com, rcherevko@delta-eas.com

Notes: _____

Submitted By: Robert M. Cherevko (Printed) / Robert M Cherevko (Signature) **Date:** 1/21/2025

Received By: Alexa Cano (Printed) / Alexa Cano (Signature) **Date:** 1/21/25 1020

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#225012454

Bulk Sample Data Sheet / COC

Client:	Maine-Endwell CSD	**Delta Project No.:**	2016.424.015	**Date:**	1/20/2025
Project:	Maine-Endwell High School; 2022 CIP Phase 4; Limited Pre-Renovation Asbestos Survey	**Client Project No.:**		**Turnaround Time:**	**48 Hours**
		Collected By:	R. Cherevko		

Sample Number		Material Type	Material Condition	Floor	Description / Sample Location
2016.424.015-	05B	Miscellaneous	Intact	2	1'x1' White Fissured, Splined Ceiling Tile - Room 218, Northwest
2016.424.015-	06A	Miscellaneous	Intact	2	Brown Glue Puck to HA 05-Room 216, Southwest
2016.424.015-	06B	Miscellaneous	Intact	2	Brown Glue Puck to HA 05-Room 218, Northwest
2016.424.015-	07A	Miscellaneous	Intact	G	12"x12" Gray/White Mottled Floor Tile (FT-1)-Area E-Room A14 (Mailroom)
2016.424.015-	07B	Miscellaneous	Intact	G	12"x12" Gray/White Mottled Floor Tile (FT-1)-Area E-Room A14 (Mailroom)
2016.424.015-	08A	Miscellaneous	Intact	G	Yellow Floor Tile Mastic to HA 07-Area E-Room A14 (Mailroom)
2016.424.015-	08B	Miscellaneous	Intact	G	Yellow Floor Tile Mastic to HA 07-Area E-Room A14 (Mailroom)
2016.424.015-	09A	Miscellaneous	Intact	G	12"x12" Light/Dark Orange Mottled Floor Tile (FT-2)-Area E-Room A15 (Breakroom)
2016.424.015-	09B	Miscellaneous	Intact	G	12"x12" Light/Dark Orange Mottled Floor Tile (FT-2)-Area E-Room A15 (Breakroom)
2016.424.015-	10A	Miscellaneous	Intact	G	Brown Floor Tile Mastic to HA 09-Area E-Room A15 (Breakroom)
2016.424.015-	10B	Miscellaneous	Intact	G	Brown Floor Tile Mastic to HA 09-Area E-Room A15 (Breakroom)
2016.424.015-	11A	Miscellaneous	Intact	1	12"x12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 151 @ uni-ventilator
2016.424.015-	11B	Miscellaneous	Intact	1	12"x12" Light/Dark Yellow Mottled Floor Tile (FT-3) - Room 107 (Band Room)
2016.424.015-	12A	Miscellaneous	Intact	1	12"x12" Navy Blue Mottled Floor Tile (FT-4) - Room 130 @ uni-ventilator
2016.424.015-	12B	Miscellaneous	Intact	1	12"x12" Navy Blue Mottled Floor Tile (FT-4) - Room 107 (Band Room)

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Bulk Sample Data Sheet / COC

#25012454

Client:	Maine-Endwell CSD	**Delta Project No.:**	2016.424.015	**Date:**	1/20/2025
Project:	Maine-Endwell High School; 2022 CIP Phase 4; Limited Pre-Renovation Asbestos Survey	**Client Project No.:**		**Turnaround Time:**	**48 Hours**
		Collected By:	R. Cherevko		

Sample Number		Material Type	Material Condition	Floor	Description / Sample Location
2016.424.015-	13A	Miscellaneous	Intact	2	12"x12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 208 (Science Prep Room)
2016.424.015-	13B	Miscellaneous	Intact	1	12"x12" Light/Dark Blue Mottled Floor Tile (FT-5) - Room 107 (Band Room)
2016.424.015-	14A	Miscellaneous	Intact	1	12"x12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room)
2016.424.015-	14B	Miscellaneous	Intact	1	12"x12" Light/Dark Gray Mottled Floor Tile (FT-7) - Room 107 (Band Room)
2016.424.015-	15A	Miscellaneous	Intact	G	Yellow /White Floor Tile Mastic to HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room G-40
2016.424.015-	15B	Miscellaneous	Intact	1	Yellow /White Floor Tile Mastic to HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 151
2016.424.015-	15C	Miscellaneous	Intact	2	Yellow /White Floor Tile Mastic to HA's 11, 12, 13, & 14; (FT's 3, 4, 5, & 7); Room 208
2016.424.015-	16A	Miscellaneous	Intact	G	12"x12" Off-White w/Brown, Tan & Gray Flecks Floor Tile (FT-6)-Room G40, north platform
2016.424.015-	16B	Miscellaneous	Intact	G	12"x12" Off-White w/Brown, Tan & Gray Flecks Floor Tile (FT-6)-Room G40, SW corner
2016.424.015-	17A	Miscellaneous	Intact	G	Yellow Floor Tile Mastic to HA 16; Room G40, north platform
2016.424.015-	17B	Miscellaneous	Intact	G	Yellow Floor Tile Mastic to HA 16; Room G40, SW corner
2016.424.015-	18A	Miscellaneous	Intact	Ext	1/4" Tan Exterior Louver Caulk - Area D-East Side (football field)
2016.424.015-	18B	Miscellaneous	Intact	Ext	1/4" Tan Exterior Louver Caulk - Area D-East Side (football field)

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APPENDIX C

Delta Engineers, Architects, & Land Surveyors
Company and Personnel Certifications

WE ARE YOUR DOL

NEW YORK STATE | Department of Labor

DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

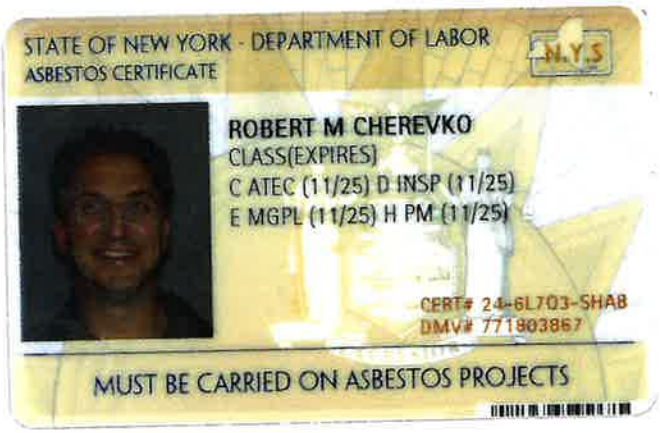
Delta Engineers, Architects, Land Surveyors, & Landscape, Architects, D.P.C.
860 Hooper Road, Endwell, NY, 13760

License Number: 29322
License Class: RESTRICTED
Date of Issue: 10/22/2024
Expiration Date: 10/31/2025
Duly Authorized Representative: Stephen Prislupsky

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor



01213 007423505 21

IF FOUND, RETURN TO:

NYSDOL - L&C UNIT

ROOM 161A BUILDING 12

STATE OFFICE CAMPUS

ALBANY NY 12226

IF FOUND, RETURN TO:

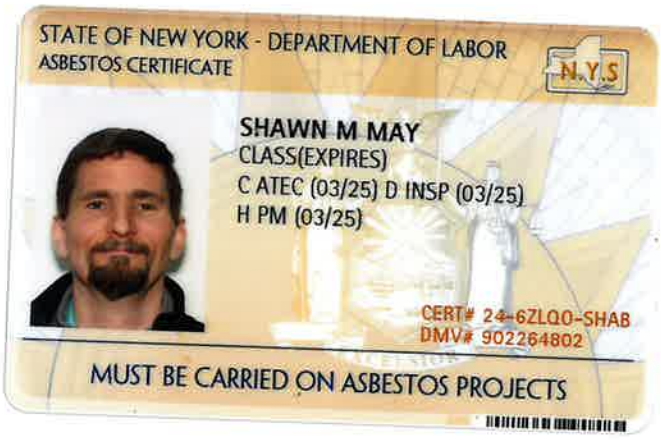
NYSDOL - L&C UNIT

ROOM 161A BUILDING 12

STATE OFFICE CAMPUS

ALBANY NY 12226

01213 0072000356 98



STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S



WILLIAM T JOHNSON
CLASS(EXPIRES)
C ATEC (11/25) D INSP (11/25)
H PM (11/25) I PD (11/25)

CERT# 24-6L5BB-SHAB
DMV# 183706373

MUST BE CARRIED ON ASBESTOS PROJECTS

ENGINEERS, ARCHITECTS, & SURVEYORS

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Endwell, NY 13760
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Fax: 607.231.6650
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APPENDIX D

Laboratory Certifications

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2025
Issued April 01, 2024

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. KAROL H. LU
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 68795

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200546-0

AmeriSci New York

New York, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique on ISO/IEC 17025).

2024-07-01 through 2025-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AmeriSci New York
117 E. 30th Street
New York, NY 10016
Mr. Andrew Lee
Phone: 212-679-8600
Email: alee@amerisci.com
http://www.amerisci.com

ASBESTOS FIBER ANALYSIS **NVLAP LAB CODE 200546-0**

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

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APPENDIX E

Bulk Sample Location Drawings

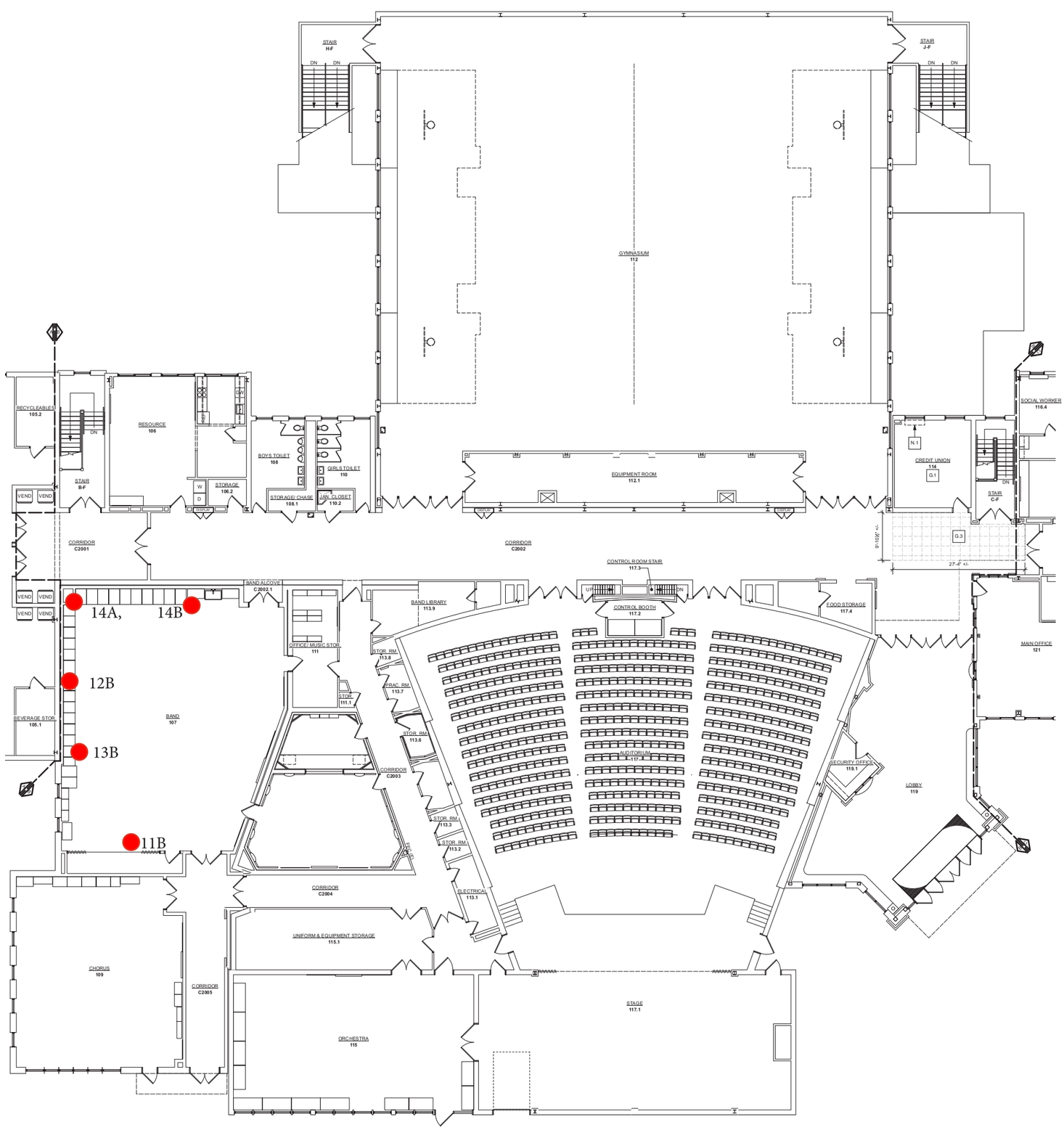


PROJECT NORTH

B1 / D A0.04

DEMOLITION PLAN - GROUND FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"

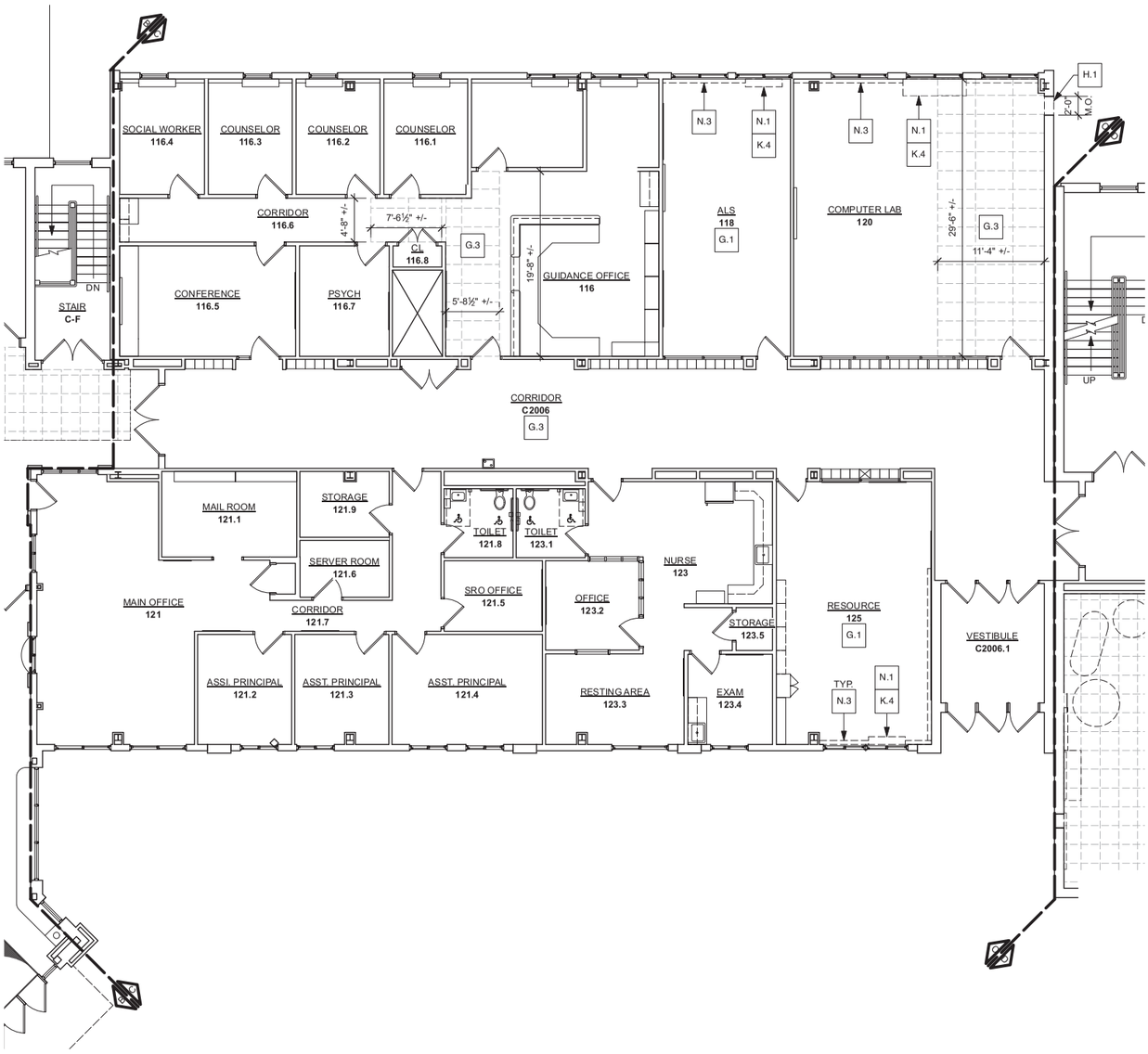


PROJECT NORTH

A1 / A0.00

DEMOLITION PLAN - FIRST FLOOR - AREA 'B'

Scale: 1/8" = 1'-0"

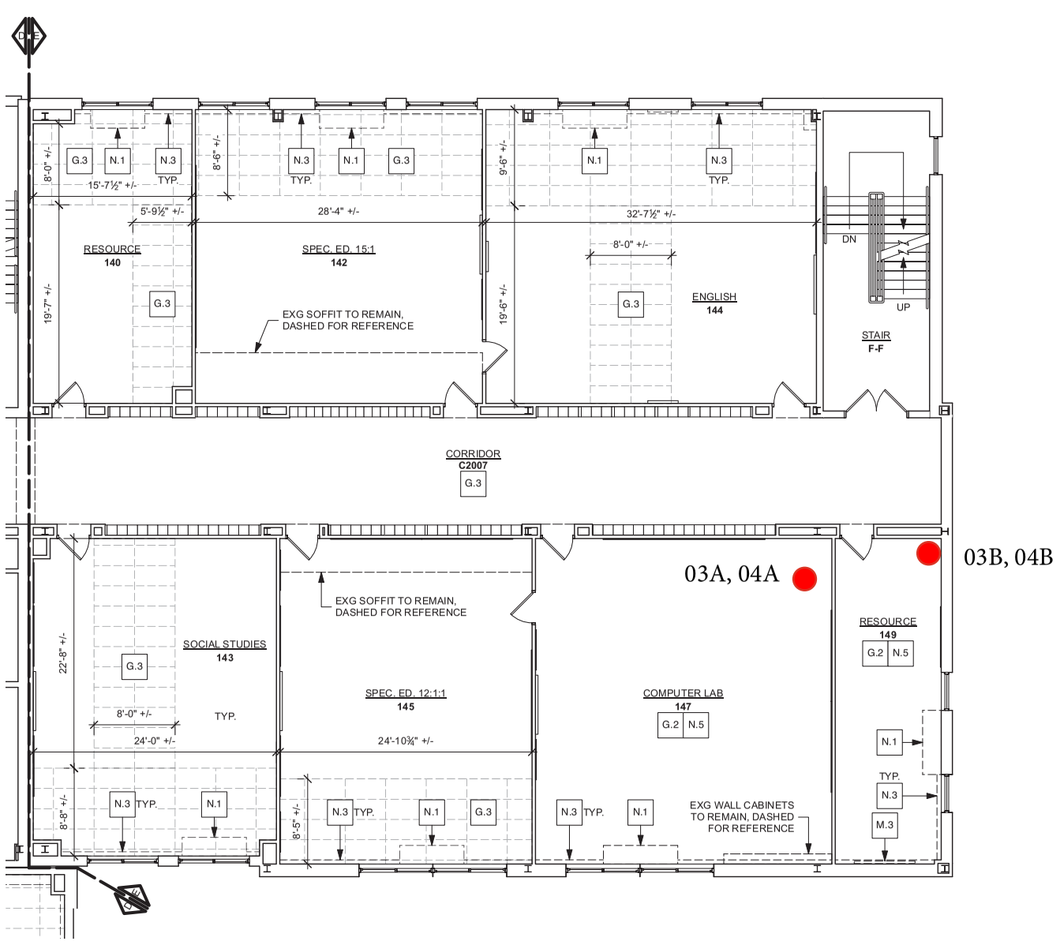


PROJECT NORTH

C3 / D A0.07

DEMOLITION PLAN - FIRST FLOOR - AREA 'C'

Scale: 1/8" = 1'-0"

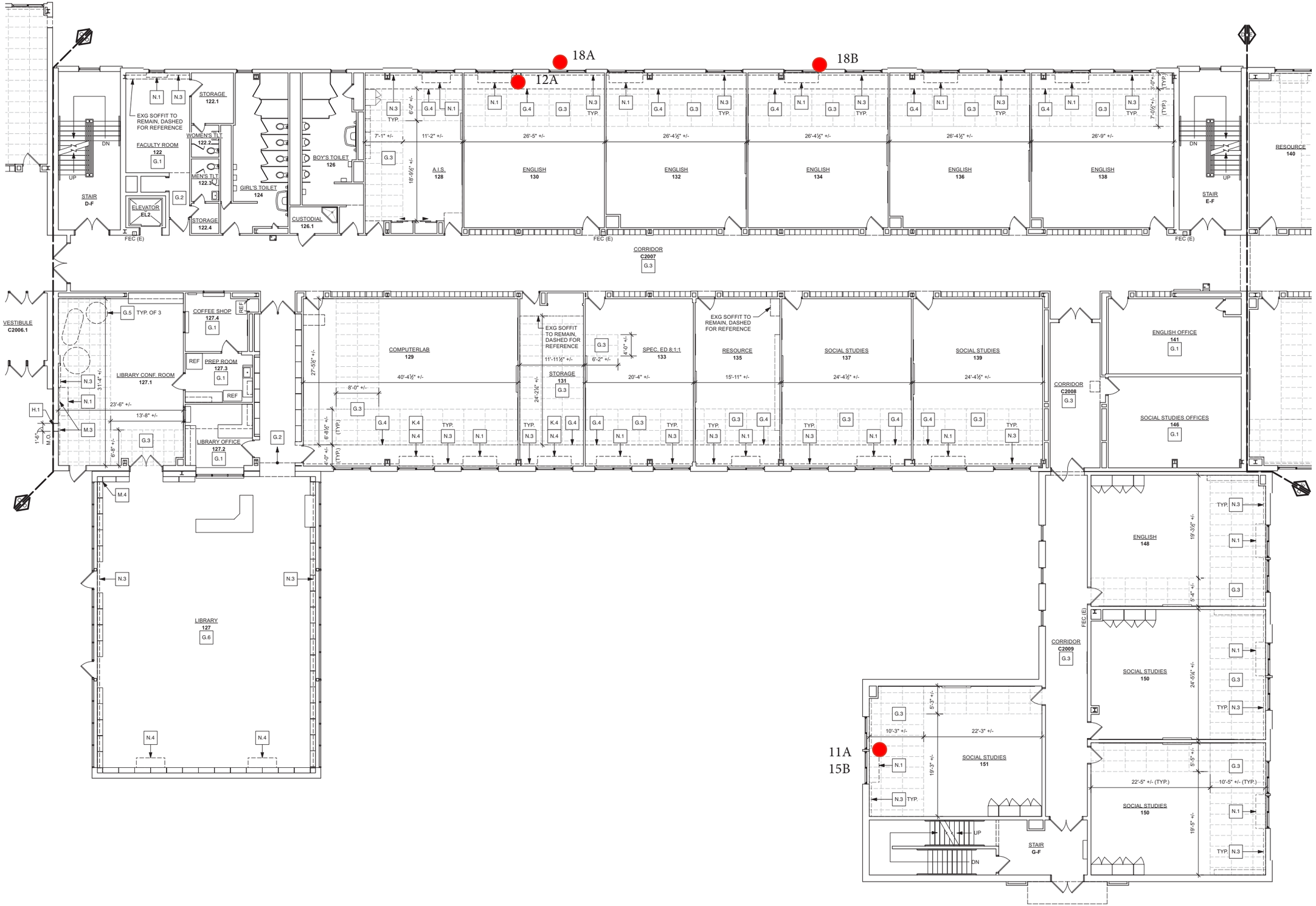


PROJECT NORTH

A3 / D A0.07

DEMOLITION PLAN - FIRST FLOOR - AREA 'E'

Scale: 1/8" = 1'-0"

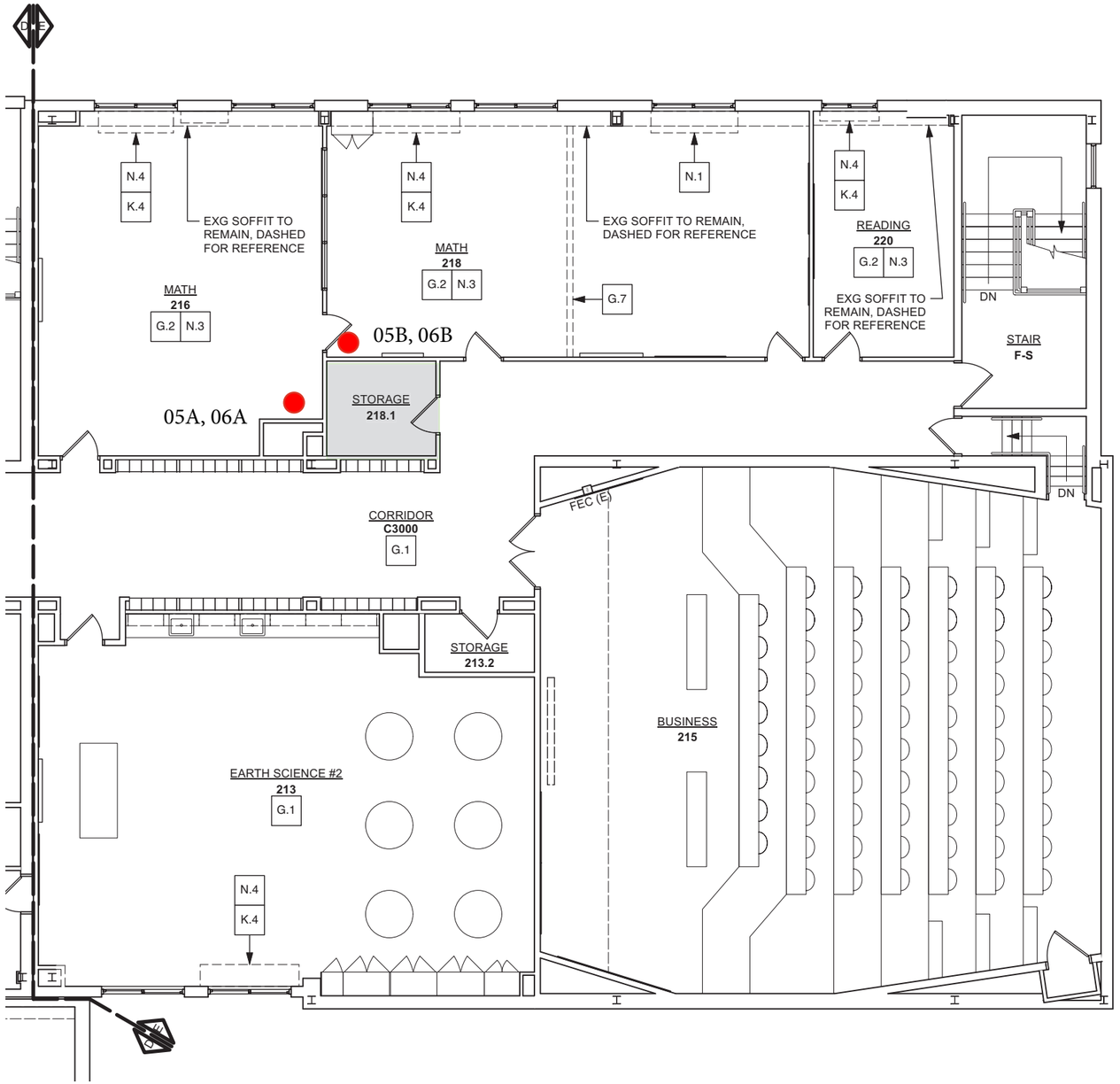


PROJECT NORTH

B1 / D A0.08

DEMOLITION PLAN - FIRST FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"



PROJECT NORTH

A3
D A0.09

DEMOLITION PLAN - SECOND FLOOR - AREA 'E'

Scale: 1/8" = 1'-0"

13A, 15C

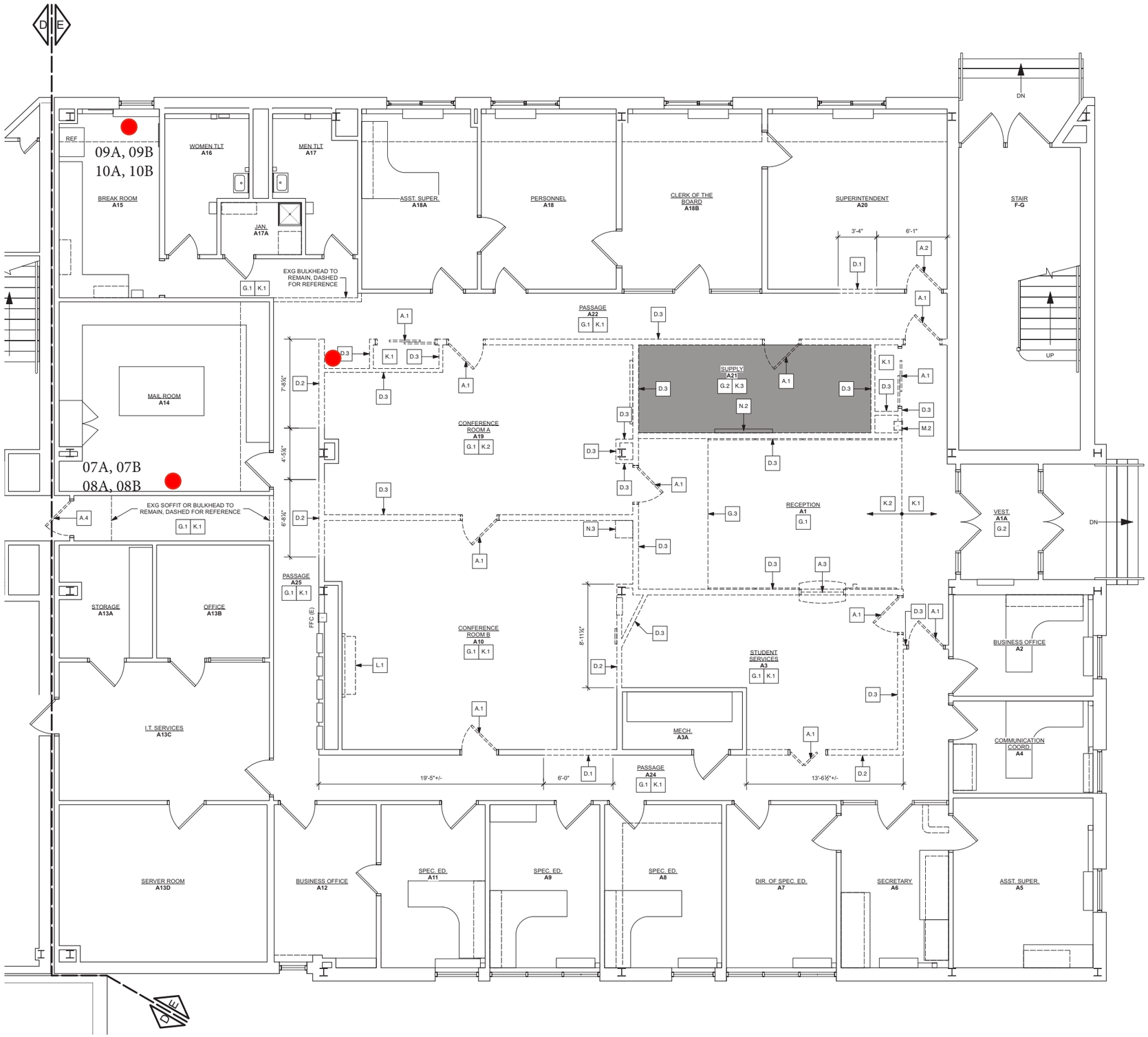


PROJECT NORTH

B1 / D A0.10

DEMOLITION PLAN - SECOND FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"



PROJECT NORTH

B1
D A4.01

PARTIAL ENLARGED DEMOLITION PLAN - DISTRICT OFFICE

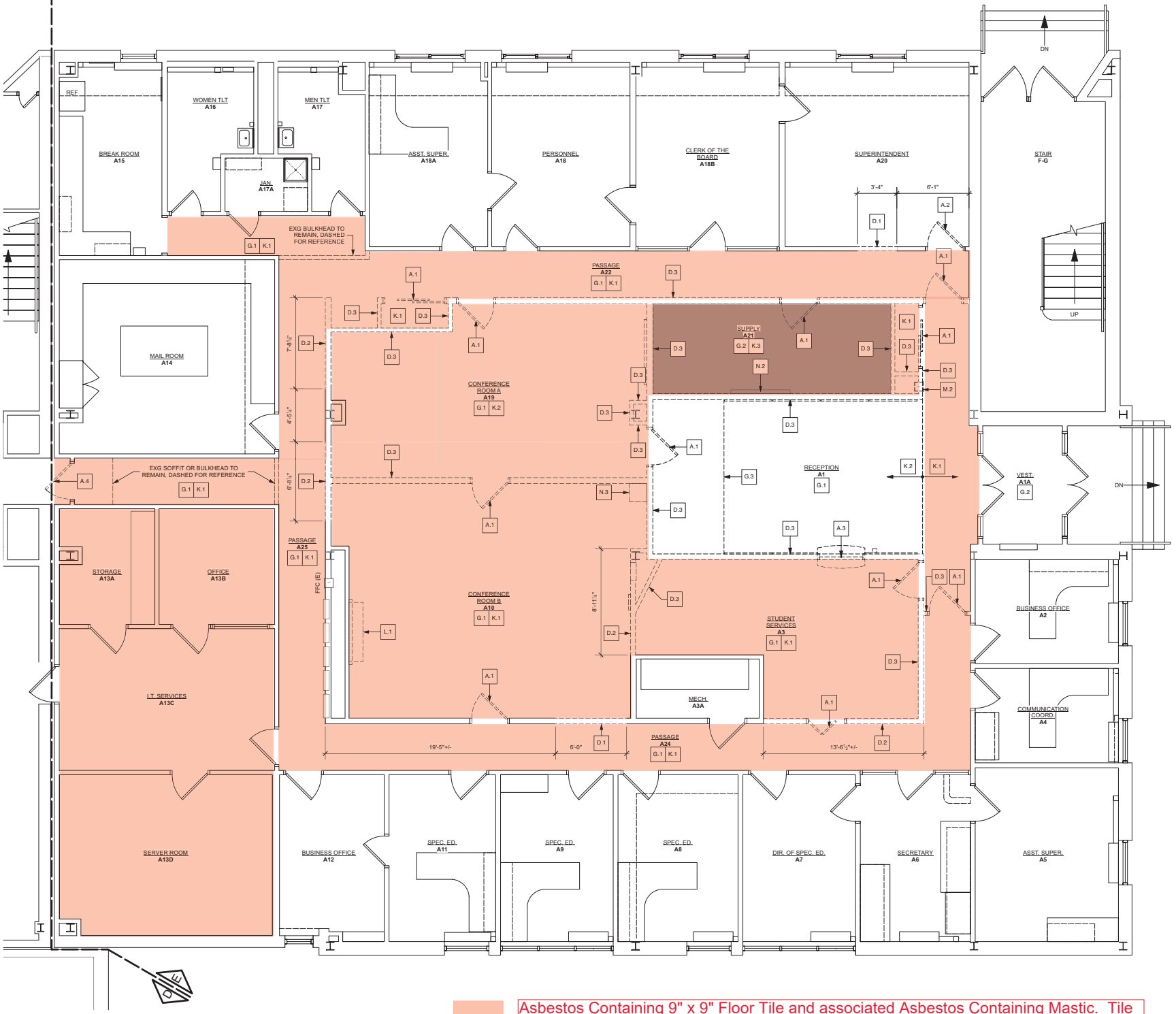
Scale: 1/4" = 1'-0"

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APPENDIX F

Asbestos Containing Floor Tile / Mastic Location Drawings



Asbestos Containing 9" x 9" Floor Tile and associated Asbestos Containing Mastic. Tile is present as finished floor, beneath carapeting, and beneath vinyl plank flooring

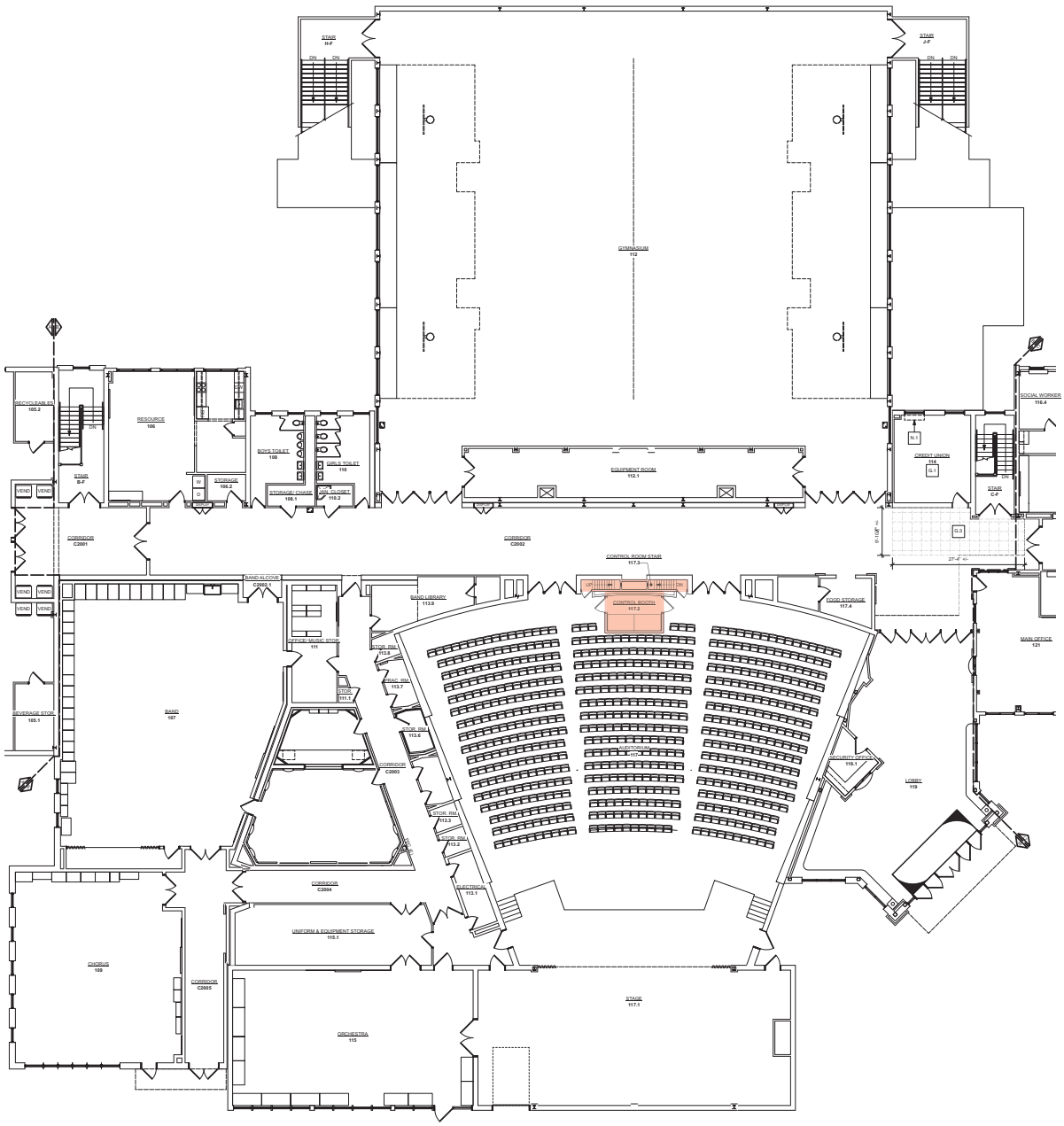
PROJECT NORTH

B1 / D A4.01

PARTIAL ENLARGED DEMOLITION PLAN - DISTRICT OFFICE

Scale: 1/4" = 1'-0"

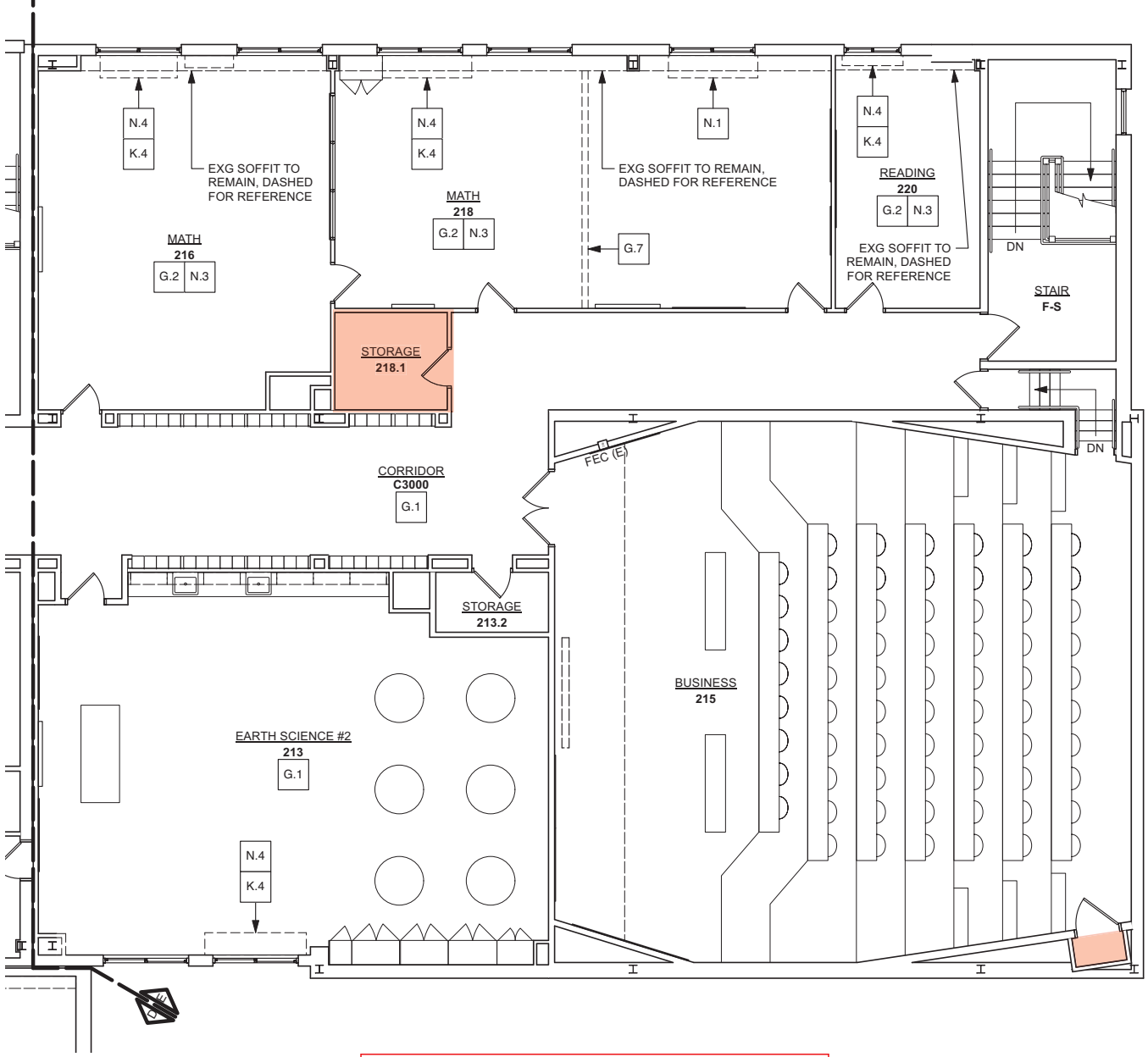
Asbestos Containing 9" x 9" Floor Tile and associated Asbestos Containing Mastic.



PROJECT NORTH

DEMOLITION PLAN - FIRST FLOOR - AREA 'B'

Scale: 1/8" = 1'-0"



Asbestos Containing 9" x 9" Floor Tile and associated Asbestos Containing Mastic

PROJECT NORTH

A3
D A0.09

DEMOLITION PLAN - SECOND FLOOR - AREA 'E'

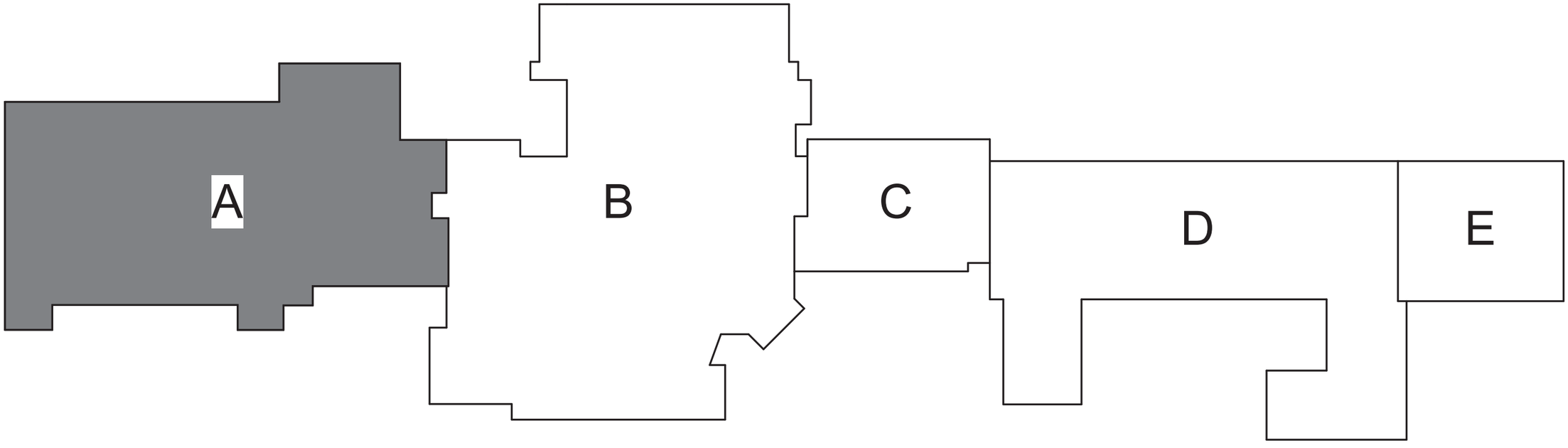
Scale: 1/8" = 1'-0"

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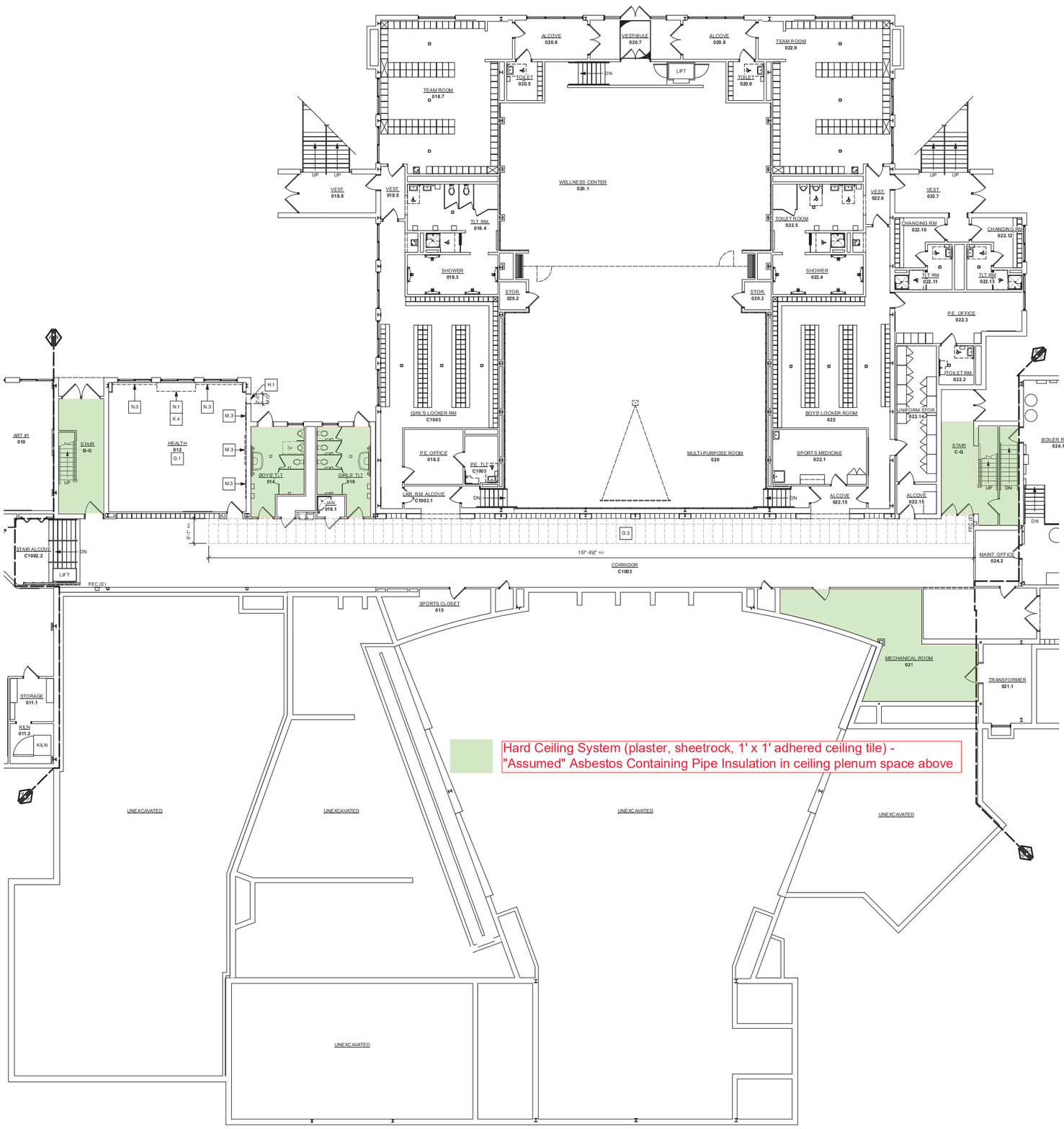
APPENDIX G

"Hard Ceiling" Location Drawings for "Assumed" Asbestos Pipe Insulation Locations and "Confirmed" Asbestos Containing Pipe Insulation



PROJECT
NORTH

KEY PLAN

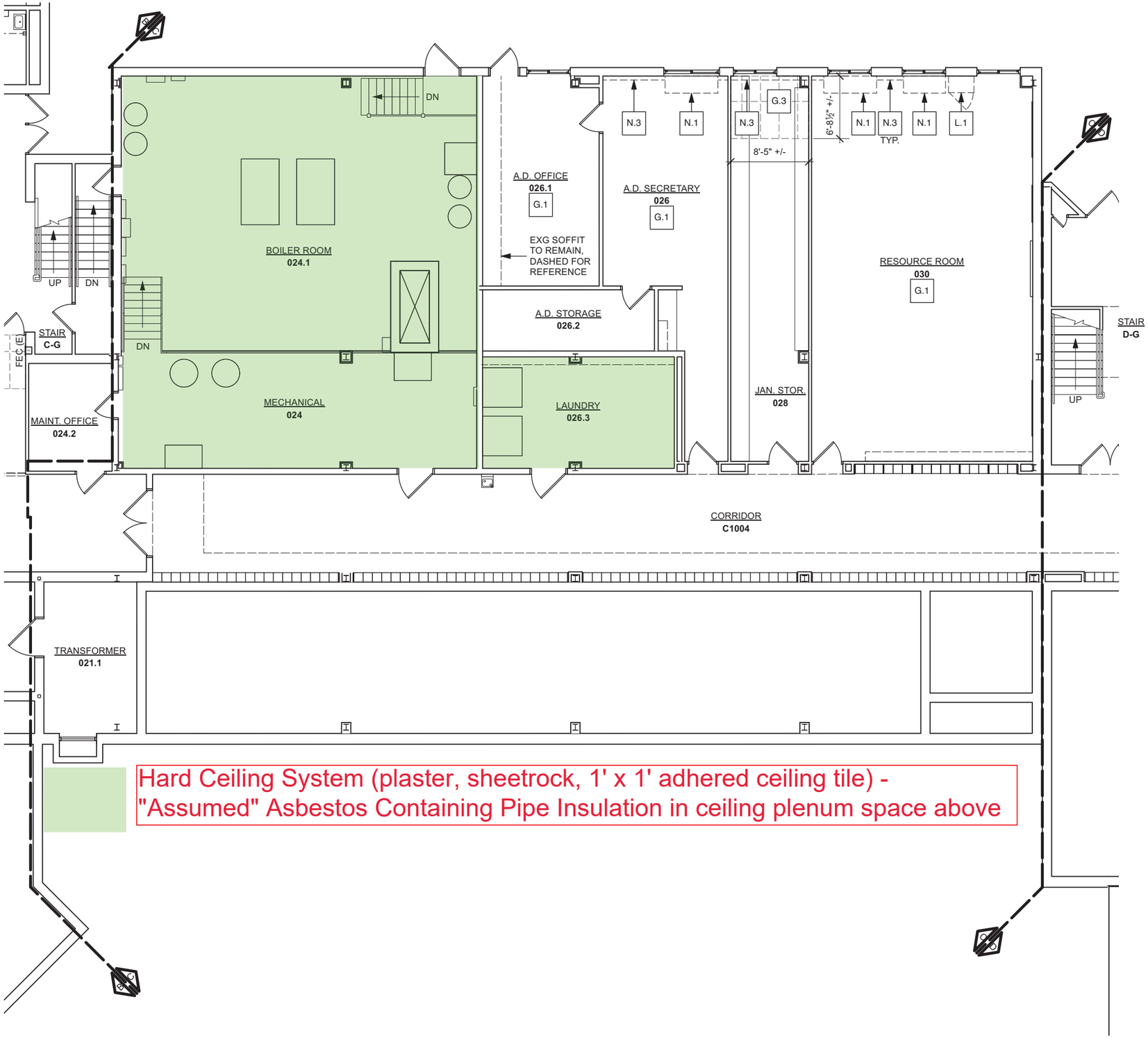


PROJECT NORTH

A1 (D A0.02)

DEMOLITION PLAN - GROUND FLOOR - AREA 'B'

Scale: 1/8" = 1'-0"

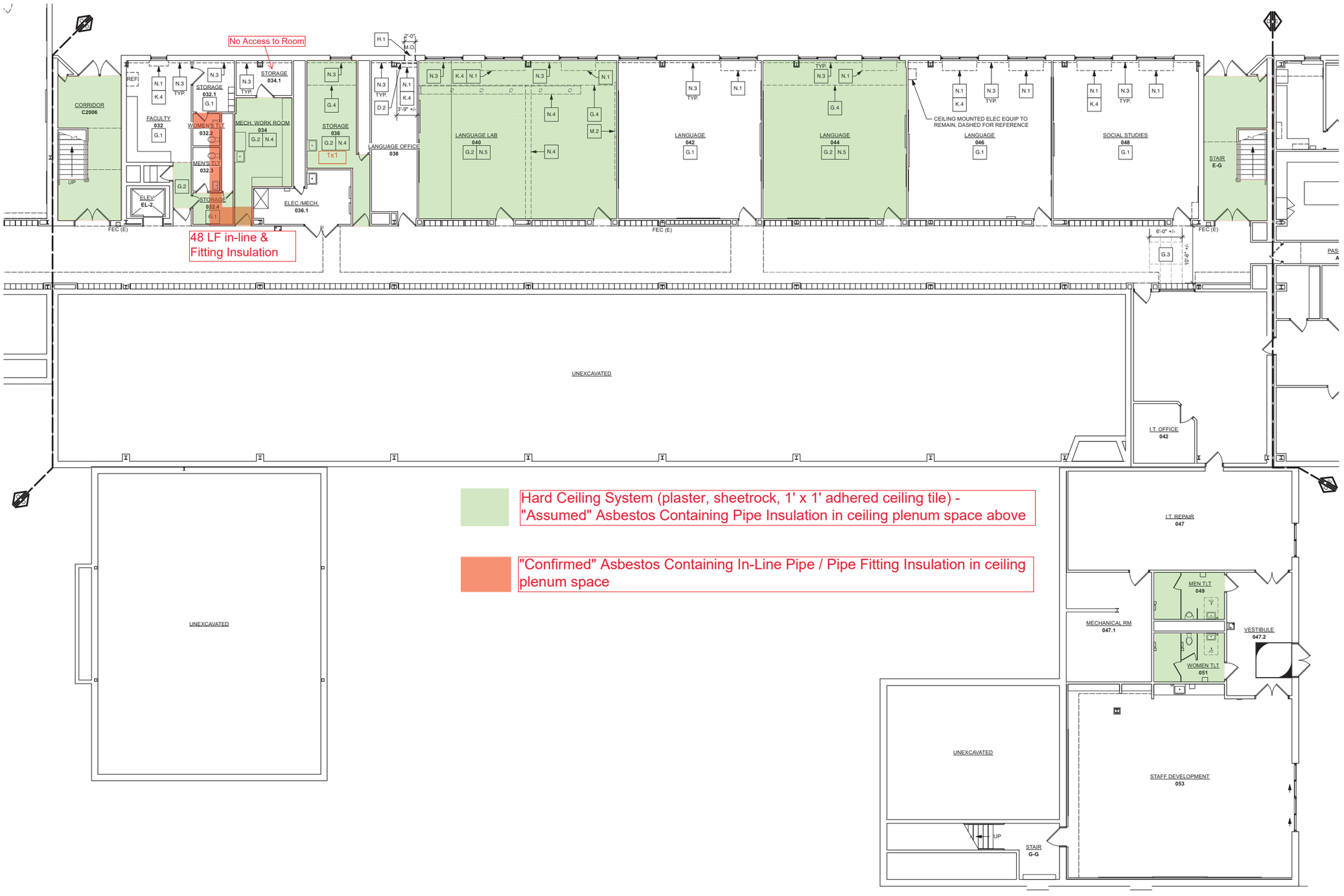


PROJECT NORTH

4
D A0.03

DEMOLITION PLAN - GROUND FLOOR - AREA 'C'

Scale: 1/8" = 1'-0"

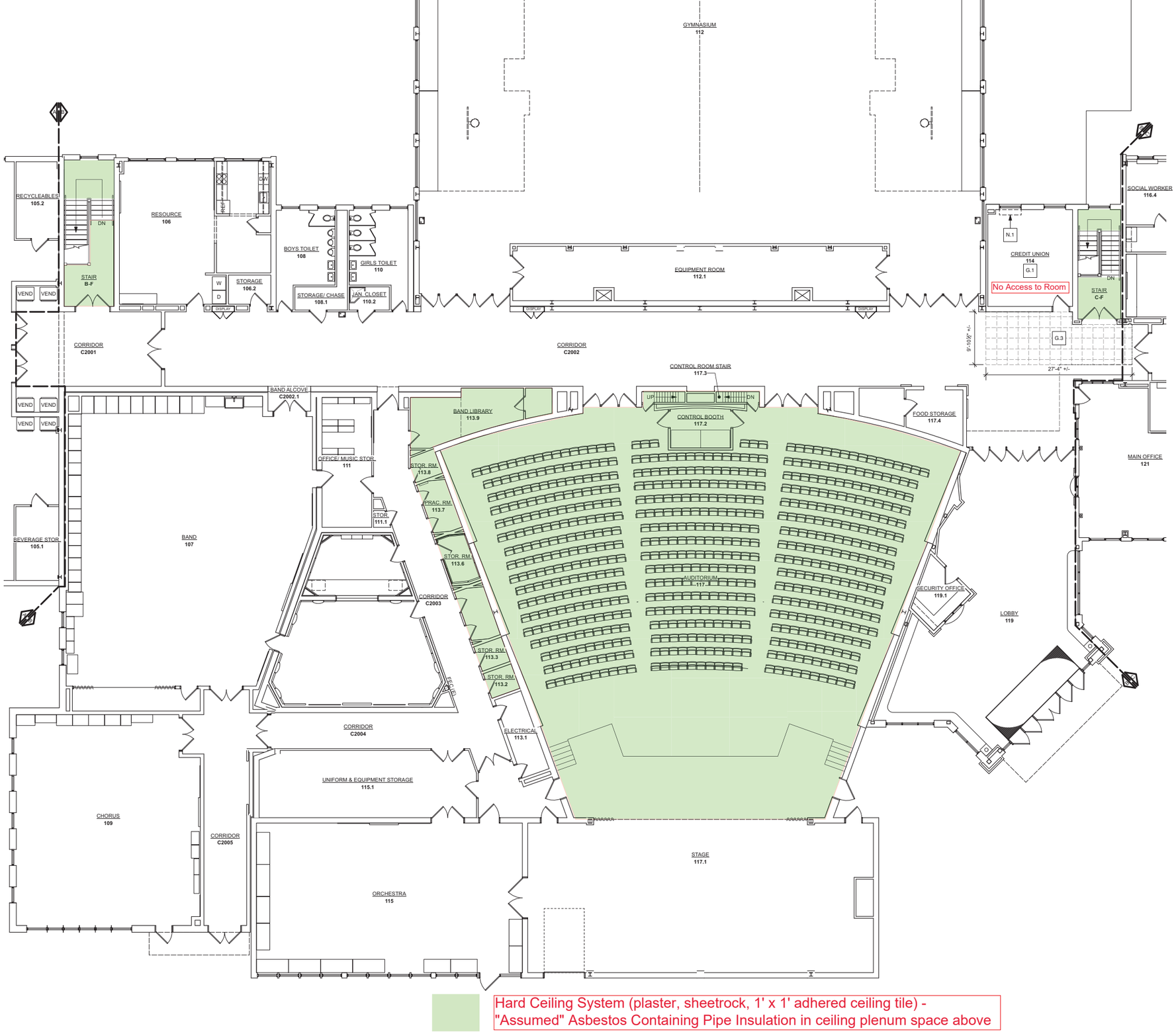


PROJECT NORTH

B1 / D A0.04

DEMOLITION PLAN - GROUND FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"



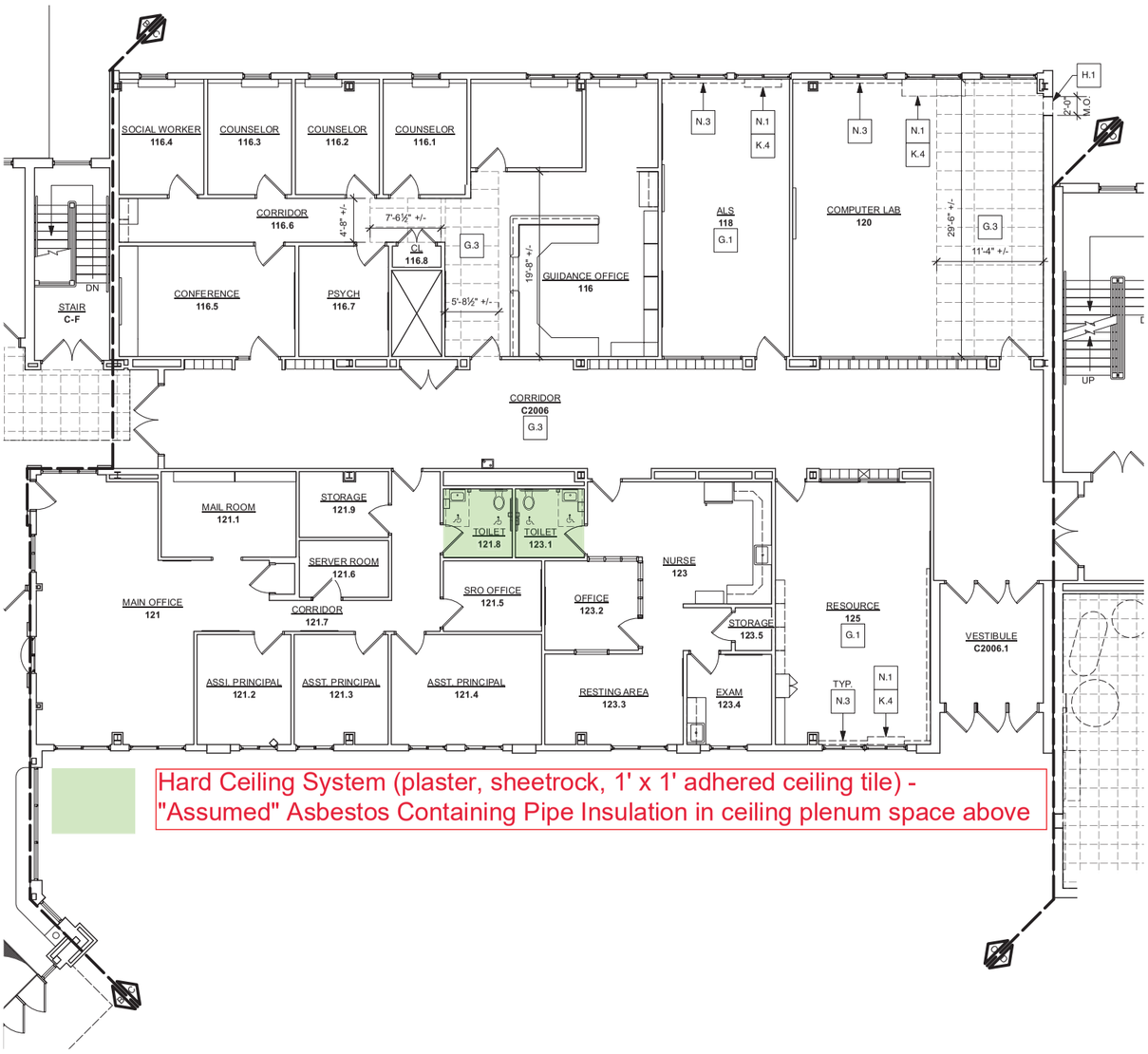
Hard Ceiling System (plaster, sheetrock, 1' x 1' adhered ceiling tile) - "Assumed" Asbestos Containing Pipe Insulation in ceiling plenum space above

PROJECT NORTH

A1
D A0.06

DEMOLITION PLAN - FIRST FLOOR - AREA 'B'

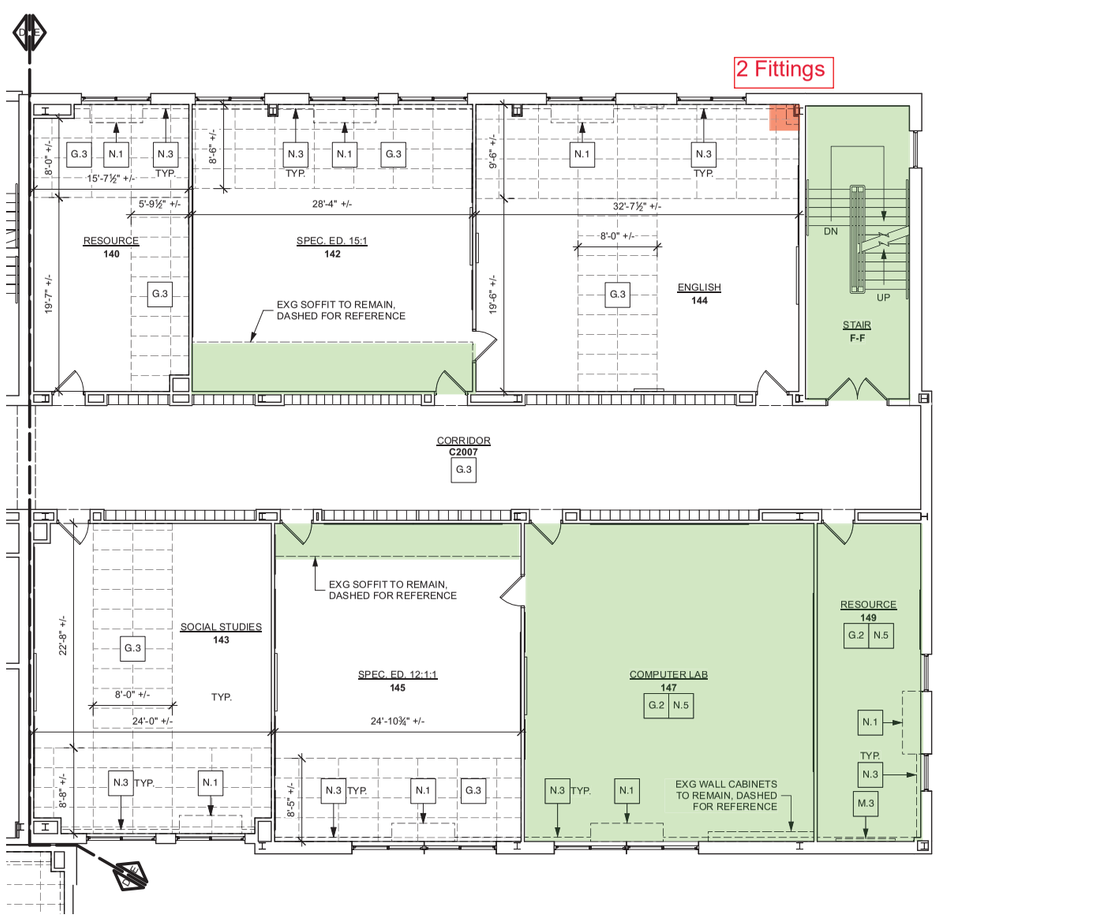
Scale: 1/8" = 1'-0"



PROJECT NORTH C3 / D A0.07

DEMOLITION PLAN - FIRST FLOOR - AREA 'C'

Scale: 1/8" = 1'-0"



PROJECT NORTH A3 / D A0.07

DEMOLITION PLAN - FIRST FLOOR - AREA 'E'

Scale: 1/8" = 1'-0"



Hard Ceiling System (plaster, sheetrock, 1' x 1' adhered ceiling tile) - "Assumed" Asbestos Containing Pipe Insulation in ceiling plenum space above

PROJECT NORTH

B1 / D A0.08

DEMOLITION PLAN - FIRST FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"



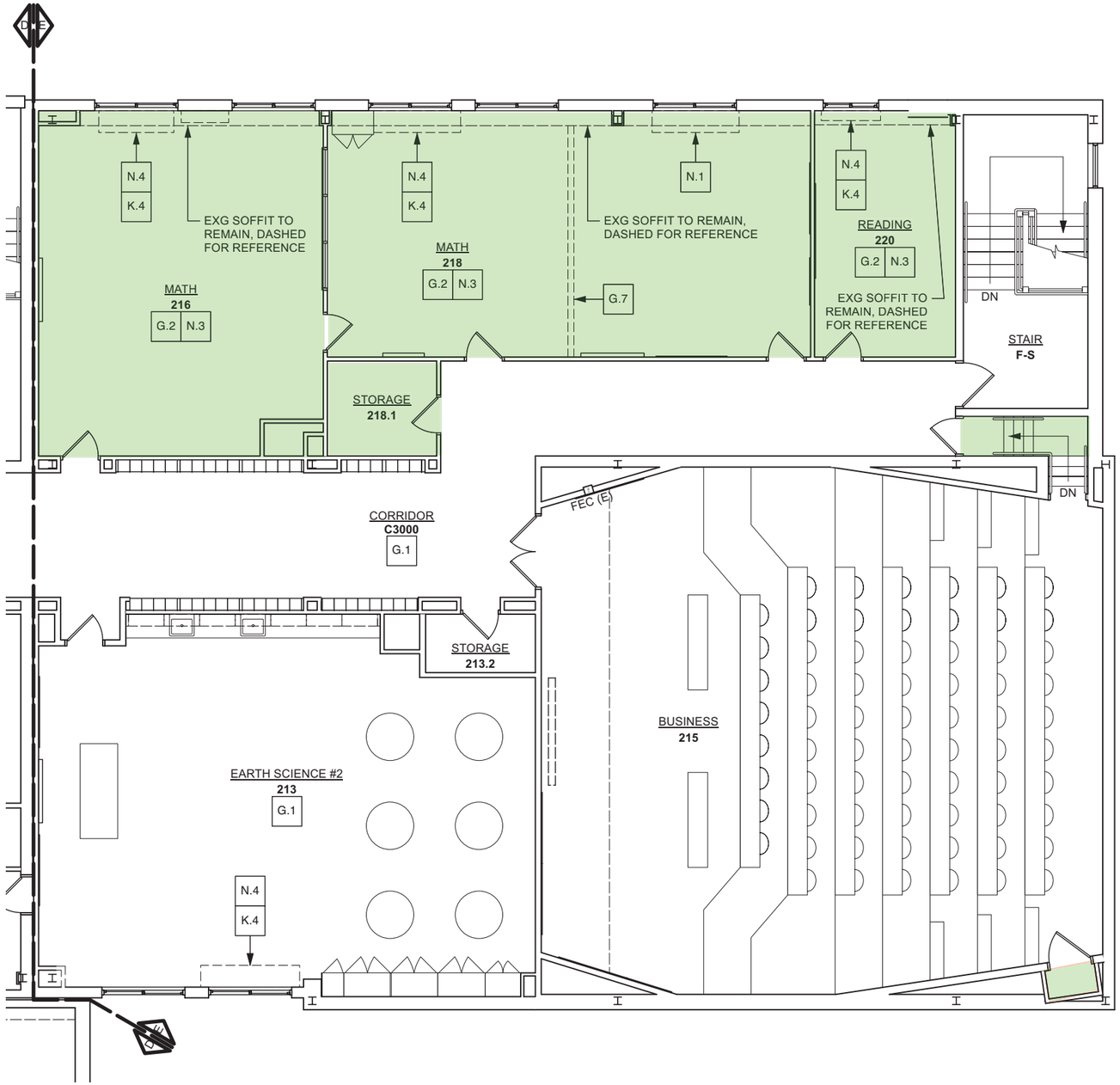
Hard Ceiling System (plaster, sheetrock, 1' x 1' adhered ceiling tile) - "Assumed" Asbestos Containing Pipe Insulation in ceiling plenum space above

PROJECT NORTH

B1 / D A0.10

DEMOLITION PLAN - SECOND FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"



Hard Ceiling System (plaster, sheetrock, 1' x 1' adhered ceiling tile) - "Assumed" Asbestos Containing Pipe Insulation in ceiling plenum space above

PROJECT NORTH

A3
D A0.09

DEMOLITION PLAN - SECOND FLOOR - AREA 'E'

Scale: 1/8" = 1'-0"

Exterior Building Caulk PCB Sampling Report

Performed at the

Maine-Endwell Central School District
Maine Endwell Senior High School

750 Farm to Market Road, Endwell, New York 13760

For the

Maine-Endwell CSD 2022 Capital Improvement Project - Phase 4
Senior High School
SED PROJECT NO. 03-11-01-06-0-010-030



Prepared for:

Mr. Jeff L'Amoreaux, Assistant Superintendent for Business & Personnel
Maine-Endwell Central School District
712 Farm to Market Road
Endwell, NY 13760

Prepared by:

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS
860 Hooper Road, Endwell, NY 13760
Tel: 607-231-6600 Fax: 607-231-6640
www.delta-eas.com
Delta Project No. 2016.424.015

Field work performed by: Robert Cherevko – January 20th, 2025

Report prepared by: Robert Cherevko

Report reviewed by: Stephen Prislupsky

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

EXECUTIVE SUMMARY:

Delta Engineers, Architects, Land Surveyors, & Landscape Architects, DPC (Delta EAS) was contracted by the Maine-Endwell Central School District to perform sampling of exterior building caulks for PCB content at the Maine Endwell High School located at 750 Farm to Market Road in Endwell, New York. The sampling is being performed in support of the upcoming Maine-Endwell CSD 2022 CIP - Phase 4 Maine Endwell Senior High Project and addressed exterior building caulks with the potential to be impacted by the proposed Renovation Scope as delineated in the project's 100% Construction Documents Drawing Set dated 01/08/2025.

A total of one (1) caulk sample was collected from the exterior of the building and submitted to York Analytical Laboratories, Inc. for analysis. The caulk sampled, along with the reported Analytical Results for each, are as follows:

Sample Number	Location / Description	Result
01-PCB	Exterior Tan Caulk from 1st Floor UV Intake Louver	None Detected

Exterior Louvers were observed to either have a homogenous caulk or non-suspect masonry material applied along their perimeter.

York Analytical Laboratories analyzed the sample utilizing the SW846-3550B/8082A Methodology and reported the results in mg/kg (ppm). Results for the sample was reported as "No PCB Detected". Industry standard as well as EPA regulations, consider solid materials with concentrations under 50 ppm or 50 mg/Kg to be a Non-PCB Product. It should be noted that EPA protocol includes the **total** or cumulative PCB content for each sample (i.e. the total PCB count for all tested matrices) should be used in determining the regulated level (i.e. "PCB Free", "non-PCB", "PCB-contaminated" or "PCB").

Results and particulars from York Analytical Laboratories, Inc. are included in Appendix A.

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

APPENDIX A

York Analytical Laboratories, Inc. Analysis Report

Technical Report

prepared for:

Delta Engineers
860 Hooper Road
Endwell NY, 13760
Attention: Robert Cherevko

Report Date: 01/27/2025
Client Project ID: 2016.424.015
York Project (SDG) No.: 25A1233

Stratford, CT Laboratory IDs:
NY:10854, NJ: CT005, PA: 68-0440, CT: PH-0723

Richmond Hill, NY Laboratory IDs:
NY:12058, NJ: NY037, CT: PH-0721, NH: 2097,
EPA: NY01600

120 RESEARCH DRIVE STRATFORD, CT 06615 ■ 132-02 89th AVENUE RICHMOND HILL, NY 11418
www.YORKLAB.com (203) 325-1371 FAX (203) 357-0166 ClientServices@yorklab.com

Report Date: 01/27/2025
Client Project ID: 2016.424.015
York Project (SDG) No.: 25A1233

Delta Engineers
860 Hooper Road
Endwell NY, 13760
Attention: Robert Cherevko

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on January 22, 2025 and listed below. The project was identified as your project: **2016.424.015**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
25A1233-01	Tan Caulk-perimeter of Uni-Ventilator (1st Fl. Ea	Caulk	01/20/2025	01/22/2025

General Notes for York Project (SDG) No.: 25A1233

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854, NJ Cert No. CT005, PA Cert No. 68-04440, CT Cert No. PH-0723; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058, NJ Cert No. NY037, CT Cert No. PH-0721, NH Cert No. 2097, EPA Cert No. NY01600.

Approved By: Cassie L. Mosher
Laboratory Manager

Date: 01/27/2025

Sample Information

Client Sample ID: 01-PCB: 1/4" Tan Caulk-perimeter of Uni-Ventilator (1st Fl. East Classroom) **York Sample ID:** 25A1233-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
25A1233	2016.424.015	Caulk	January 20, 2025 5:15 pm	01/22/2025

PCB, 8082 MASTER

Log-in Notes:

Sample Notes:

Sample Prepared by Method: EPA 3550C

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
12674-11-2	Aroclor 1016	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
11104-28-2	Aroclor 1221	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
11141-16-5	Aroclor 1232	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
53469-21-9	Aroclor 1242	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
12672-29-6	Aroclor 1248	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
11097-69-1	Aroclor 1254	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
11096-82-5	Aroclor 1260	ND		mg/kg	2.00	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH-PH-0723,NJDEP-CT005	01/24/2025 08:35	01/25/2025 04:25	NF
1336-36-3	* Total PCBs	ND		mg/kg	2.00	1	EPA 8082A Certifications:	01/24/2025 08:35	01/25/2025 04:25	NF

	Surrogate Recoveries	Result	Acceptance Range
877-09-8	*Surrogate: Tetrachloro-m-xylene*	*78.0 %*	*30-120*
2051-24-3	*Surrogate: Decachlorobiphenyl*	*63.5 %*	*30-120*

Total Solids

Log-in Notes:

Sample Notes:

Sample Prepared by Method: % Solids Prep

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
solids	*** % Solids**	**99.5**		%	0.100	1	SM 2540G Certifications: CTDOH-PH-0723	01/23/2025 06:28	01/23/2025 11:07	BF

Sample and Data Qualifiers Relating to This Work Order

S-08 The recovery of this surrogate was outside of QC limits.

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon current NELAC/TNI Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

Field Chain-of-Custody Record

YORK ANALYTICAL LABORATORIES INC

York Analytical Laboratories, Inc. (YORK)'s Standard Terms & Conditions are listed on the back side of this document.
This document serves as your written authorization for YORK to proceed with the analyses requested below.
Your signature binds you to YORK's Standard Terms & Conditions.

YORK Project No. 25A1233

120 Research Drive Stratford, CT 06615 132-02 89th Ave Queens, NY 11418 56 Church Hill Rd. #2 Newtown, CT 06470 clientservices@yorklab.com www.yorklab.com 800-306-YORK

YOUR Information	Report To:	Invoice To:	YOUR Project Number	Turn-Around Time
Company: Delta Engineers	Company: SAME	Company: Delta Payables	2016.424.015	RUSH - Next Day:
Address: 860 Hooper Road, Endwell, NY 13760	Address:	Address:		RUSH - Two Day:
Phone: 607-231-6676	Phone:	Phone:		RUSH - Three Day:
Contact: Robert Cherevko	Contact:	Contact:		RUSH - Four Day:
E-mail: rcherevko@delta-eas.com	E-mail:	E-mail: payables@delta-eas.com	YOUR PO#:	RUSH - Five Day:
				Standard (6-9 Day): X
				PFAS Standard is 7-10 Days

Please print clearly and legibly. All information must be complete. Samples will not be logged in and the turn-around-time clock will not begin until any questions by YORK are resolved.

Samples Collected by: (print AND sign your name)

Matrix Codes		Samples From		Report / EDD Type (circle selections)			YORK Reg. Comp.
S - soil / solid		New York	X	Summary Report	CT RCP	EQuIS (Standard)	Compared to the following Regulation(s): (please fill in)
GW - groundwater		New Jersey		QA Report	CT RCP DQA/DUE	NYSDEC EQuIS	
DW - drinking water		Connecticut		CMDP	NJDEP Reduced Deliverables	NJDKQP	
WW - wastewater		Pennsylvania		Standard Excel EDD		NJDEP SRP HazSite	
O - Oil	Other	Other:		NY ASP B Package	Other:		

Sample Identification	Sample Matrix	Date/Time Sampled	Analyses Requested	Container Type	No.
01-PCB: 1/4" Tan Caulk-perimeter of Uni-Ventilator (1st Fl. East Classroom)	Solid	1/20/2025-1715	PCB's 8082	Bag	1

Comments:
Please Report Results in PPM

Samples iced/chilled at time of lab pickup? circle Yes or No

Preservation: (check all that apply)
HCl ___ MeOH ___ HNO3 ___ H2SO4 ___ NaOH ___
ZnAc ___ Ascorbic Acid ___ Other: ___

Special Instruction
Field Filtered
Lab to Filter

1. Samples Relinquished by / Company	Date/Time	1. Samples Received by / Company	Date/Time	2. Samples Relinquished by / Company	Date/Time
Robert M. Cherevko	1/21/2025 @1530				
2. Samples Received by / Company	Date/Time	3. Samples Relinquished by / Company	Date/Time	3. Samples Received by / Company	Date/Time
					09:55
4. Samples Relinquished by / Company	Date/Time	4. Samples Received by / Company	Date/Time	Samples Received in LAB by	Date/Time / Temperature
				Nancy C	01/22/25 ~~10:55~~ 10:52 / 20.8 Degrees C

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

APPENDIX B

Laboratory Certifications

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2025
Issued April 01, 2024

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CATHERINE L. MOSHER
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625.1
	EPA 8270D
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270D
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270D
	EPA 8270E
Benzo(a)anthracene	EPA 625.1

Serial No.: 68593

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

Limited Lead-Based Paint Survey Report

Performed at the

Maine-Endwell Central School District
Maine Endwell Senior High School

750 Farm to Market Road, Endwell, New York 13760

For the

Maine-Endwell CSD 2022 Capital Improvement Project - Phase 4
Senior High School
SED PROJECT NO. 03-11-01-06-0-010-030



Prepared for:

Mr. Jeff L'Amoreaux, Assistant Superintendent for Business & Personnel
Maine-Endwell Central School District
712 Farm to Market Road
Endwell, NY 13760

Prepared by:

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607-231-6600 Fax: 607-231-6640
www.delta-eas.com
Delta Project No. 2016.424.015

Field work performed by: Michael J. Staudt; April 23rd, 2025

Report prepared by: Michael J. Staudt

Report reviewed by: Stephen Prislupsky

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

EXECUTIVE SUMMARY

Delta Engineers, Architects, & Surveyors (Delta) was contracted by the Maine-Endwell Central School District to perform a “limited” lead based paint sampling at the at the Maine Endwell High School located at 750 Farm to Market Road in Endwell, New York. The sampling was performed in support of the upcoming Maine-Endwell CSD 2022 CIP - Phase 4 Maine Endwell High School Project and addressed ceiling plenum space I-beams and bar joists in Wings B, C, D & E. Delta EPA/NYS Certified Lead Paint Inspector, Michael Staudt, conducted the limited XRF Lead Based Paint Sampling on April 23rd 2025 addressing the interior painted roof/ceiling deck bar joist & I-beams. No other surfaces / components were included as a part of the sampling.

Representative XRF sampling following modified HUD Protocol was performed on roof/ceiling deck bar joist & I-beam support system surfaces only. Delta took forty-one (41) assays (including 6 “pre” and 6 “post” calibration assays) of these painted components utilizing the XRF analyzer to determine the presence of lead-based paint at the building.

APPLICABLE STANDARDS/GUIDELINES:

The standards used to identify lead-based paint for this survey were taken from the OSHA 1926.62 (Lead) Standard, modification of the guidelines established by the U.S. Department of Housing and Urban Development (HUD) as well as New York State regulations.

Occupational Safety and Health Administration (OSHA)

On May 4, 1993, OSHA promulgated the Lead Exposure in Construction Rule and codified the regulation in Title 29, CFR, Part 1926.62. This particular regulation applies to all construction activities involving potential lead exposures. This regulation defines construction work as “work for construction, alteration, and/or repair including painting and decorating”. It further states “the standard for the construction industry applies to all occupational exposure to lead in all construction work in which lead, in any **amount,** is present in an occupationally related context where the source of the lead is employment related, all exposure to lead is covered by the standard.”

U.S. Department of Housing and Urban Development (HUD)

The U.S. Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface ($\geq$ 1.0 mg Pb/cm^2) when measured with an XRF analyzer, or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990."

New York State

The State of New York's definition of the action level for lead-based paint is consistent with the level established by HUD. The State is in the process of adopting LBP regulations which are based on the HUD guidelines and currently enforces only licensing/certification requirements.

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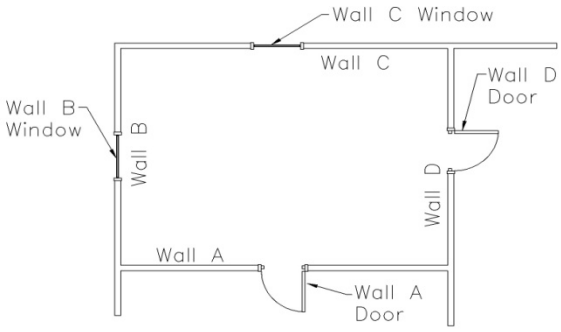
860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

SAMPLING METHODS/PROCEDURES:

Delta performed sampling utilizing a HEURESIS Pb200i XRF Lead Paint Analyzer. The Lead Paint Analyzer is a state-of-the-art XRF spectrum analyzing system for the quantitative measurement of lead in paint on any surface. The HEURESIS Pb200i XRF Lead Paint Analyzer uses a Co-57 radioactive source and an advanced, solid-state, room temperature, radiation detector to generate and detect the x-ray fluorescence spectrum of a painted surface. The x-ray fluorescence properties are determined through calibration process and are used for automatic substrate correction and calculation of the lead content of a painted surface. The HEURESIS Pb200i XRF Lead Paint Analyzer is operated with guidance from the Performance Characteristic Sheet[1] developed by *QuanTech, Inc.* under a contract from the U.S. Department of Housing and Urban Development (HUD). The instrument has an action level of 1.0 mg/cm^2 with results at or above this value classified as Lead-Based Paint as per the applicable HUD and NYS regulations referenced above. *Results reported as greater than 0.0 mg/cm^2 are considered Lead-Containing Paint as per the OSHA standards.*

RESULTS

Delta took 29 individual assays of interior ceiling plenum space I-beams and bar joists in Wings B, C, D & E at the High School; of which **ten (10), all taken from the I-Beams,** were positive for the presence of lead as per the NYS and HUD >/= 1.0 mg/cm^2 Criteria referenced above for Lead Based Paint. The remaining **nineteen (19) assays, all taken from Bar Joists,** were reported as being less than 1.0 mg/cm^2. As defined by Industry guidelines, for purposes of identifying/locating the various surfaces and components included in this survey, the wall in which one enters a room is referenced as “Wall A”, with Wall B immediately to the left of “A” and Walls C and D continuing clockwise around the room.



Appendix A includes the Overall XRF Lead Paint Report Form listing all individual assay results, sampling locations and details. Appendix B includes the XRF Lead Paint Report Form listing all individual assay results reported as falling within the NYS/HUD Lead-Based Paint Criteria. Appendix C includes Drawings for the Building. Appendix D includes a Photo typical of the I-Beams and Bar Joists Sampled. Appendix E includes Company / Personnel license and certification paperwork. Appendix F includes the Heuresis Pb200i Performance Characteristic Sheet.

1-HUD has determined that the PCS information is acceptable when used in conjunction with Chapter 7, Lead Based Paint Inspection of HUD’s *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

APPENDIX A

Maine-Endwell High School
750 Farm To Market Road, Endwell, NY 13760

Overall XRF Lead Paint Report Form

DELTA
ENGINEERS, ARCHITECTS, & SURVEYORS

860 Hooper Road
Endwell, NY 13760
Tel: 607.231.6600
Fax: 607.231.6650
www.delta-eas.com

Client: Maine Endwell CSD	**SED Project No.:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.015
Project: Maine Endwell CSD 2022 CIP - Phase 4 High School: Wings B/C/D/E Bar Joists / I-Beams Limited Pre-Renovation XRF Lead Paint Sampling	**Date Sampling Performed:** 04/23/2025	**Inspector(s):** Michael J. Staudt
	Date of Report: 05/01/2025	**Number of XRF Readings:** 41

Overall XRF Lead-Based Paint Sample Report Form

Sample ID No.	Building	Room	Floor	Wall	Test Location	Color	Substrate	XRF Reading
1	04-23-2025				Calibration			0.1
2	04-23-2025				Calibration			0.0
3	04-23-2025				Calibration			0.1
4	04-23-2025				Calibration			1.0
5	04-23-2025				Calibration			1.0
6	04-23-2025				Calibration			0.9
7	High School - B Wing	Room 012	GR		Ceiling Bar Joist	Red	Metal	0.3
8	High School - B Wing	Room 106	1		Ceiling Bar Joist	Red	Metal	0.2
9	**High School - B Wing**	**Room 106**	**1**		**Ceiling I-Beam**	**Red**	**Metal**	**3.4**
10	High School - B Wing	Corridor 2002	1		Ceiling Bar Joist	Red	Metal	0.5
11	High School - C Wing	Room 030	Gr		Ceiling Bar Joist	Red	Metal	0.6
12	**High School - C Wing**	**Room 030**	**Gr**		**Ceiling I-Beam**	**Red**	**Metal**	**2.3**
13	High School - C Wing	Room 120	1		Ceiling Bar Joist	Red	Metal	0.4
14	**High School - C Wing**	**Room 125**	**1**		**Ceiling I-Beam**	**Red**	**Metal**	**3.2**

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Client: Maine Endwell CSD	**SED Project No.:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.015
Project: Maine Endwell CSD 2022 CIP - Phase 4 High School: Wings B/C/D/E Bar Joists / I-Beams Limited Pre-Renovation XRF Lead Paint Sampling	**Date Sampling Performed:** 04/23/2025	**Inspector(s):** Michael J. Staudt
	Date of Report: 05/01/2025	**Number of XRF Readings:** 41

Overall XRF Lead-Based Paint Sample Report Form

Sample ID No.	Building	Room	Floor	Wall	Test Location	Color	Substrate	XRF Reading
15	High School - C Wing	Room 125	1		Ceiling Bar Joist	Red	Metal	0.3
16	High School - D Wing	Room 032	Gr		Ceiling Bar Joist	Red	Metal	0.6
17	**High School - D Wing**	**Room 032**	**Gr**		**Ceiling I-Beam**	**Red**	**Metal**	**3.5**
18	High School - D Wing	Room 048	Gr		Ceiling Bar Joist	Red	Metal	0.5
19	High School - D Wing	Room 122	1		Ceiling Bar Joist	Red	Metal	0.6
20	**High School - D Wing**	**Room 122**	**1**		**Ceiling I-Beam**	**Red**	**Metal**	**2.8**
21	High School - D Wing	Room 133	1		Ceiling Bar Joist	Red	Metal	0.2
22	High School - D Wing	Room 138	1		Ceiling Bar Joist	Red	Metal	0.4
23	High School - D Wing	Room 203	2		Ceiling Bar Joist	Red	Metal	0.6
24	**High School - D Wing**	**Room 203**	**2**		**Ceiling I-Beam**	**Red**	**Metal**	**4.5**
25	High School - D Wing	Room 210	2		Ceiling Bar Joist	Red	Metal	0.5
26	**High School - D Wing**	**Room 210**	**2**		**Ceiling I-Beam**	**Red**	**Metal**	**6.5**
27	High School - E Wing	Passage A-25	Gr		Ceiling Bar Joist	Red	Metal	0.3
28	High School - E Wing	Passage A-25	Gr		Ceiling Bar Joist	Red	Metal	0.1

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Client: Maine Endwell CSD	**SED Project No.:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.015
Project: Maine Endwell CSD 2022 CIP - Phase 4 High School: Wings B/C/D/E Bar Joists / I-Beams Limited Pre-Renovation XRF Lead Paint Sampling	**Date Sampling Performed:** 04/23/2025	**Inspector(s):** Michael J. Staudt
	Date of Report: 05/01/2025	**Number of XRF Readings:** 41

Overall XRF Lead-Based Paint Sample Report Form

Sample ID No.	Building	Room	Floor	Wall	Test Location	Color	Substrate	XRF Reading
29	High School - E Wing	Room 140	1		Ceiling Bar Joist	Red	Metal	0.1
30	High School - E Wing	Room 145	1		Ceiling Bar Joist	Red	Metal	0.2
31	**High School - E Wing**	**Room 145**	**1**		**Ceiling I-Beam**	**Gray**	**Metal**	**1.2**
32	High School - E Wing	Corridor C3000	2		Ceiling Bar Joist	Red	Metal	0.5
33	**High School - E Wing**	**Corridor C3000**	**2**		**Ceiling I-Beam**	**Gray**	**Metal**	**6.5**
34	High School - E Wing	Room 203	2		Ceiling Bar Joist	Red	Metal	0.7
35	**High School - E Wing**	**Room 203**	**2**		**Ceiling I-Beam**	**Red**	**Metal**	**4.5**
36					Calibration			0.1
37					Calibration			0.0
38					Calibration			0.0
39					Calibration			1.1
40					Calibration			1.0
41					Calibration			1.0

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APPENDIX B

Maine-Endwell High School
750 Farm To Market Road, Endwell, NY 13760

Lead-Based Paint Report Form
As per NYS/HUD >/= 1.0 mg/cm^2 Criteria

Of the total 29 individual assays collected from interior painted Bar Joists & I-Beams present in ceiling plenum spaces at the Maine Endwell High School, ***ten (10) were positive for the presence of lead as per the NYS and HUD (>/= 1.0 mg/cm^2) criteria, with all 10 being from I-Beams.***

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Client: Maine Endwell CSD	**SED Project No.:** 03-11-01-06-0-010-030	**Delta Proj. No.:** 2016.424.015
Project: Maine Endwell CSD 2022 CIP - Phase 4 High School: Wings B/C/D/E Bar Joists / I-Beams Limited Pre-Renovation XRF Lead Paint Sampling	**Date Sampling Performed:** 04/23/2025	**Inspector(s):** Michael J. Staudt
	Date of Report: 05/01/2025	**Number of >/= 1.0 XRF Readings:** 10

Surfaces and Components coated with Lead-Based Paint as per NYS/HUD >/= 1.0 mg/cm^2 Criteria

Sample ID No.	Building	Room	Floor	Wall	Test Location	Color	Substrate	XRF Reading
9	High School - B Wing	Room 106	1		Ceiling I-Beam	Red	Metal	3.4
12	High School - C Wing	Room 030	Gr		Ceiling I-Beam	Red	Metal	2.3
14	High School - C Wing	Room 125	1		Ceiling I-Beam	Red	Metal	3.2
17	High School - D Wing	Room 032	Gr		Ceiling I-Beam	Red	Metal	3.5
20	High School - D Wing	Room 122	1		Ceiling I-Beam	Red	Metal	2.8
24	High School - D Wing	Room 203	2		Ceiling I-Beam	Red	Metal	4.5
26	High School - D Wing	Room 210	2		Ceiling I-Beam	Red	Metal	6.5
31	High School - E Wing	Room 145	1		Ceiling I-Beam	Gray	Metal	1.2
33	High School - E Wing	Corridor C3000	2		Ceiling I-Beam	Gray	Metal	6.5
35	High School - E Wing	Room 203	2		Ceiling I-Beam	Red	Metal	4.5

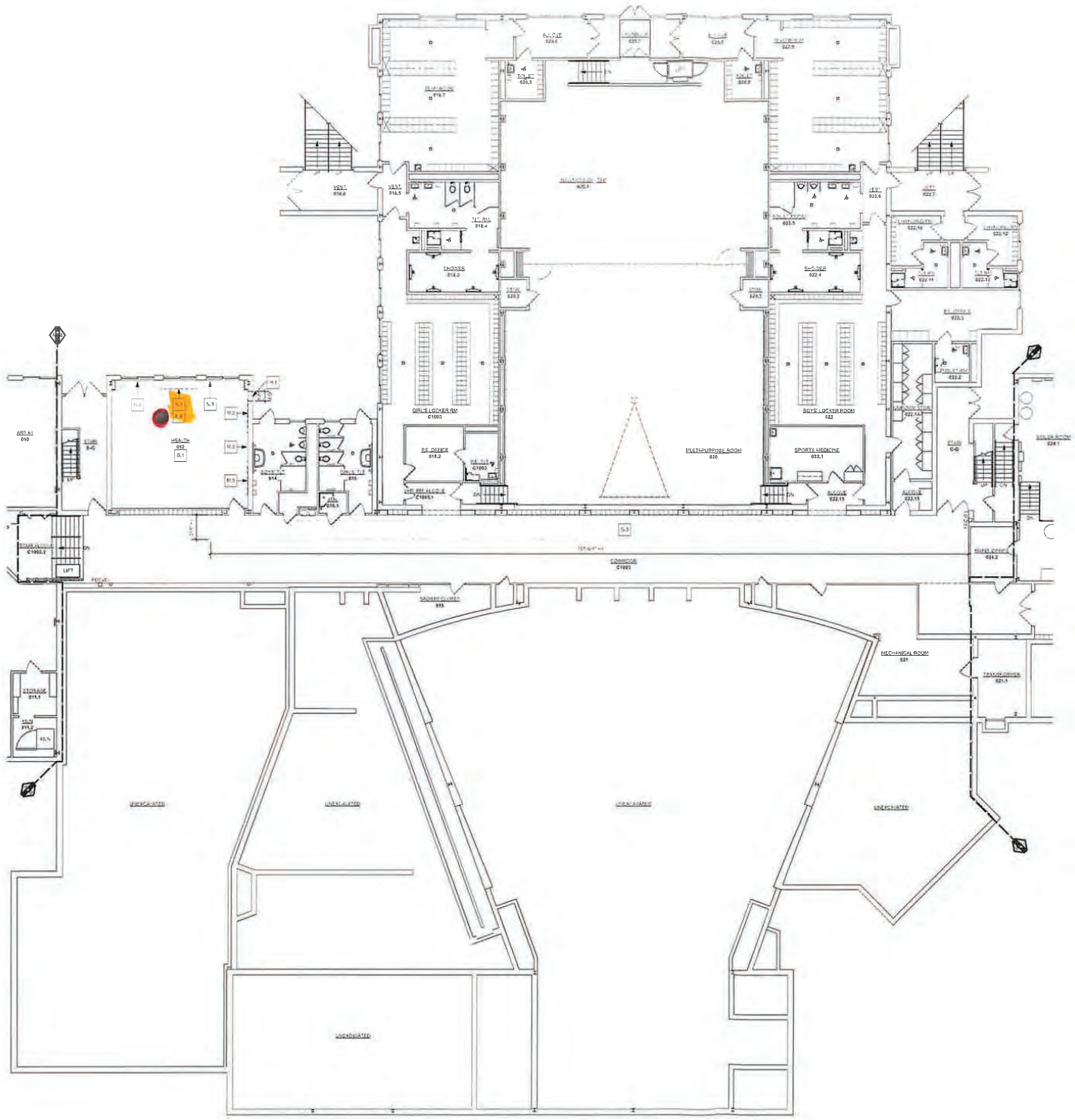
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APPENDIX C

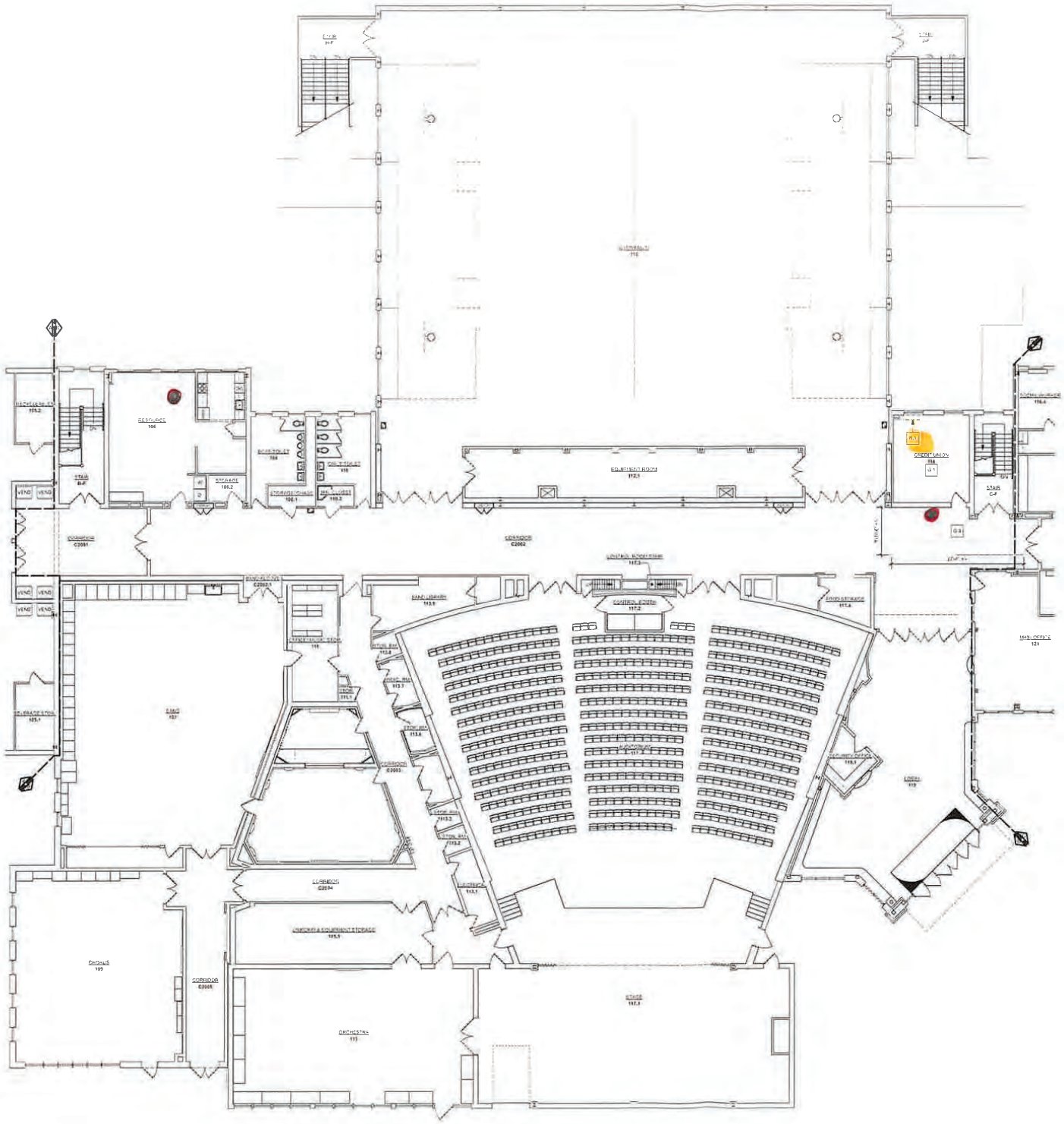
Maine-Endwell High School
750 Farm To Market Road, Endwell, NY 13760

Drawings

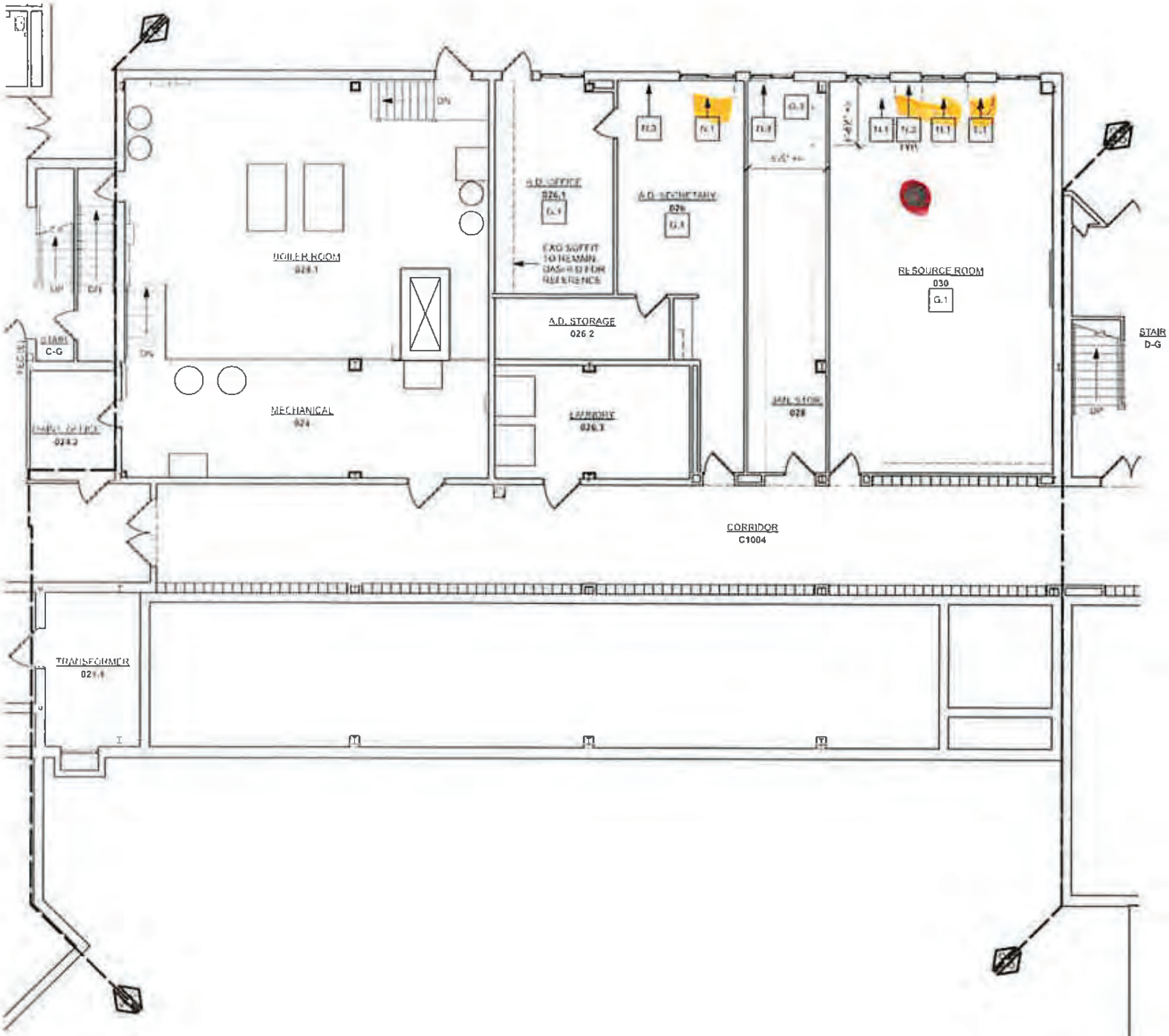


PROJECT NORTH

DEMOLITION PLAN - GROUND FLOOR - AREA 'B'



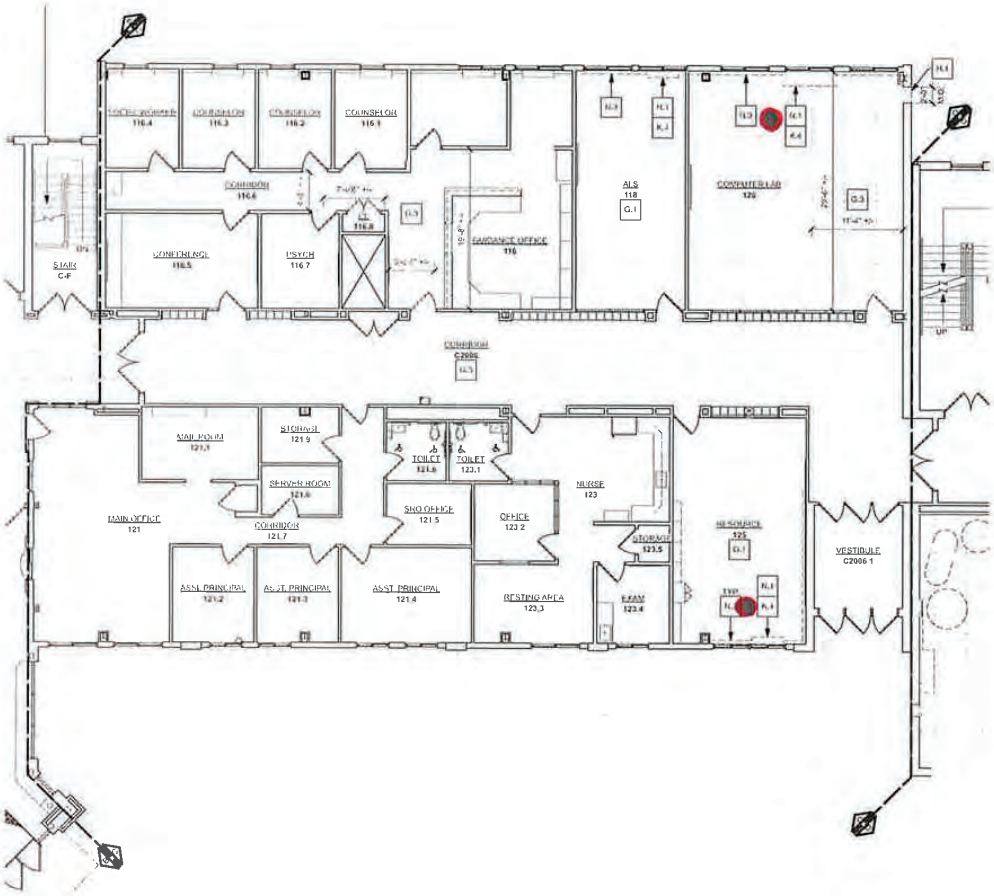
DEMOLITION PLAN - FIRST FLOOR - AREA 'B'



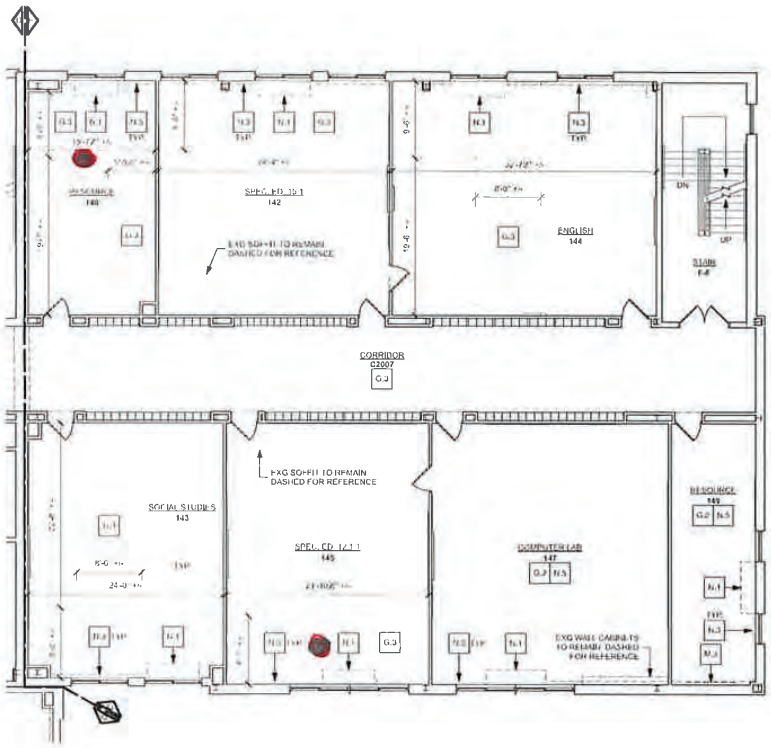
NORTH

DEMOLITION PLAN - GROUND FLOOR - AREA 'C'

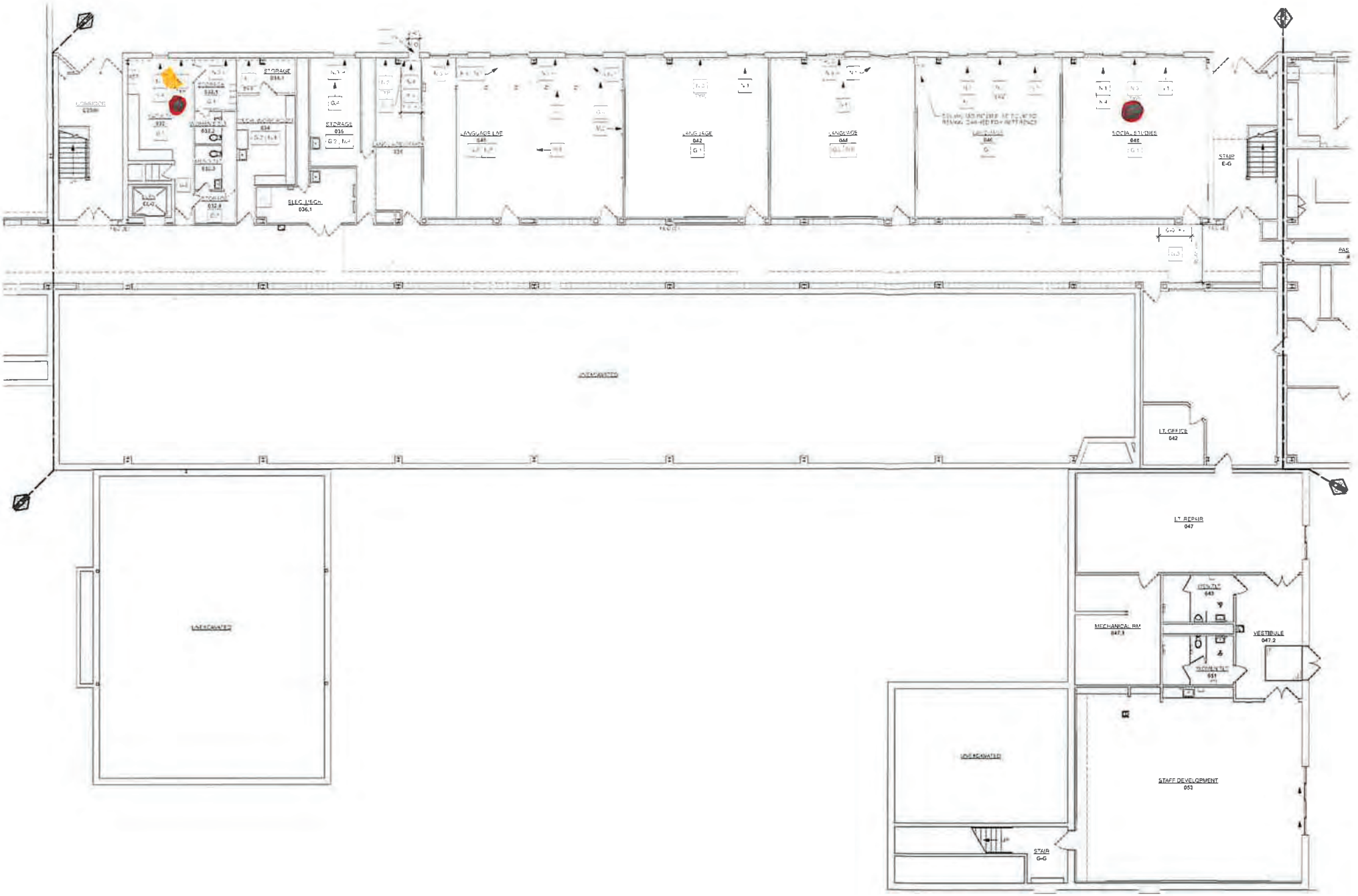
Scale: 1/8" = 1'-0"



DEMOLITION PLAN - FIRST FLOOR - AREA 'C'



DEMOLITION PLAN - FIRST FLOOR - AREA 'E'



PROJECT NORTH

B1 AD 40.01

DEMOLITION PLAN - GROUND FLOOR - AREA 'D'

Scale: 1/8" = 1'-0"

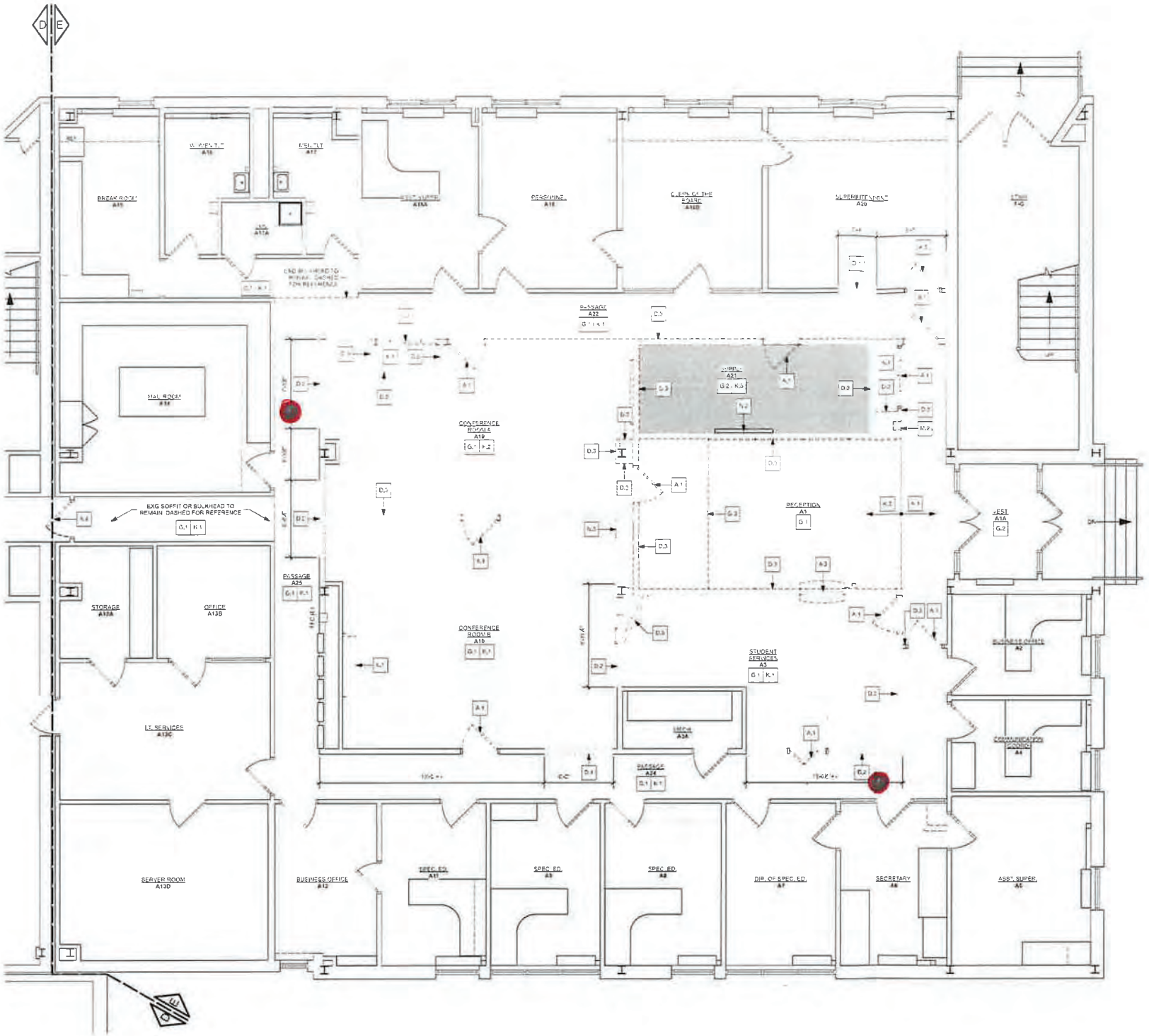


DEMOLITION PLAN - FIRST FLOOR - AREA 'D'

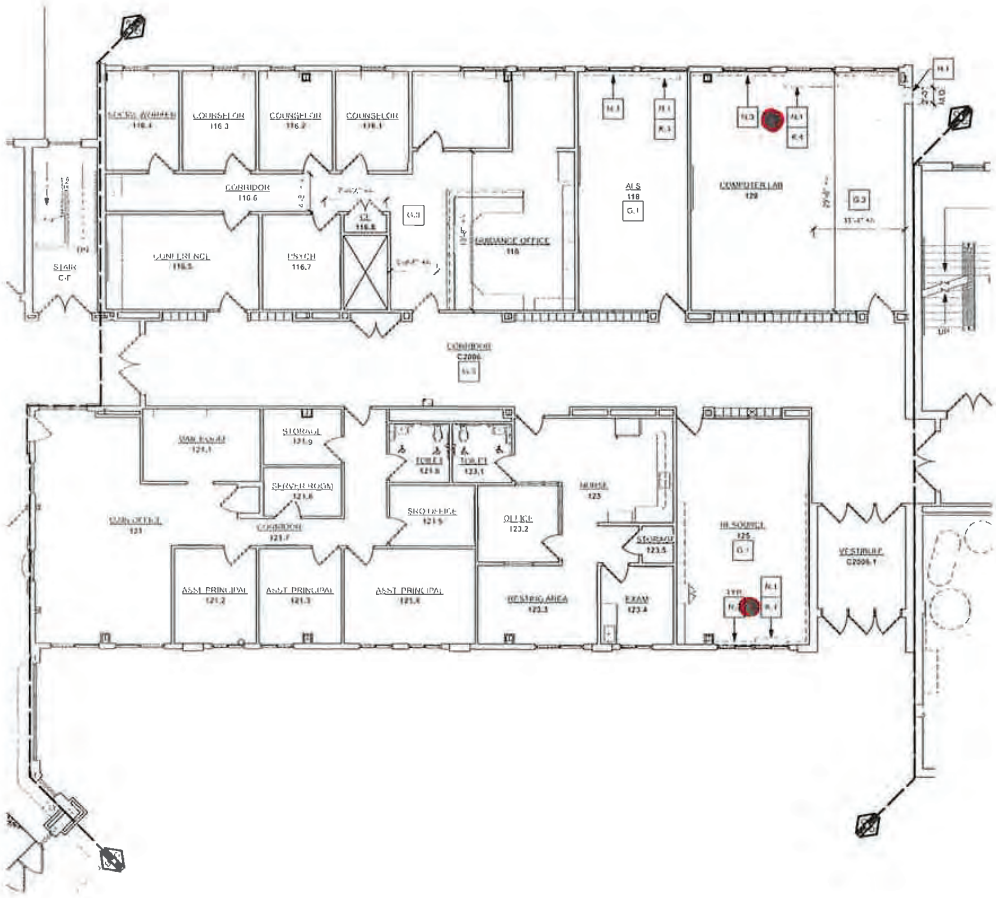
Scale 1/8" = 1'-0"



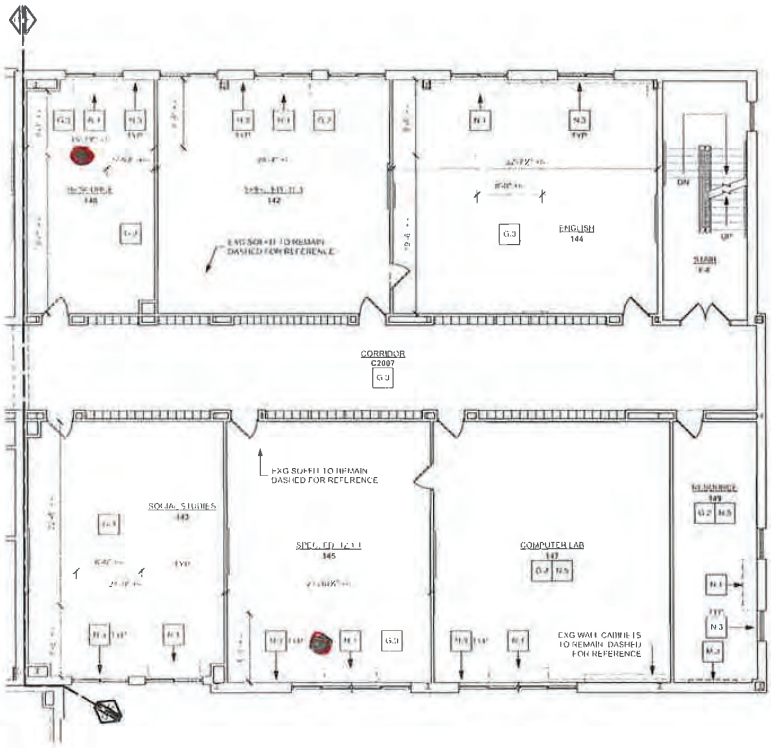
E1 DEMOLITION PLAN - SECOND FLOOR - AREA 'D'



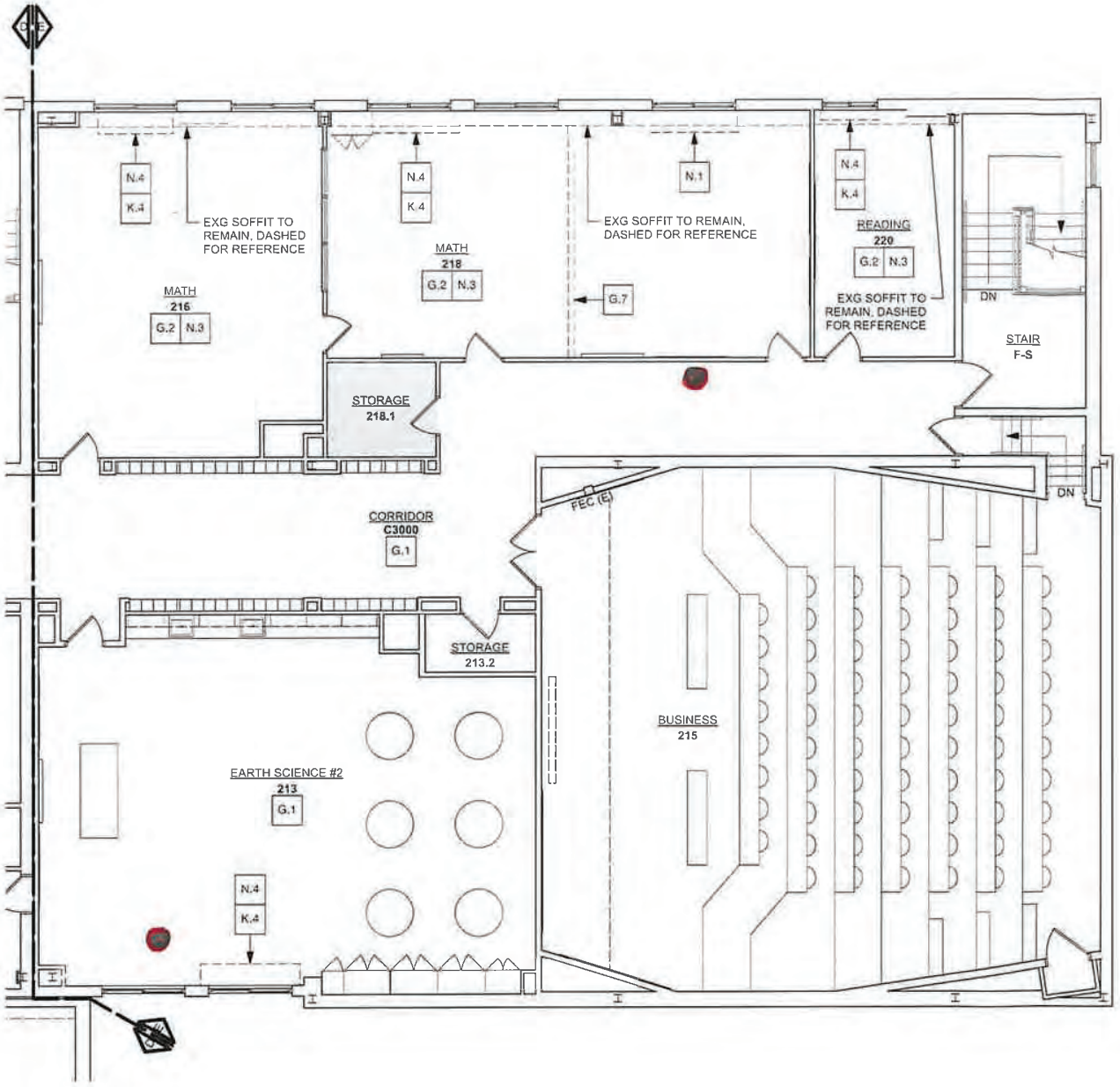
GED DEMOLITION PLAN - DISTRICT OFFICE



DEMOLITION PLAN - FIRST FLOOR - AREA 'C'



DEMOLITION PLAN - FIRST FLOOR - AREA 'E'



PROJECT NORTH

A3
D A0.09

DEMOLITION PLAN - SECOND FLOOR - AREA 'E'

Scale: 1/8" = 1'-0"

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APPENDIX D

Maine-Endwell High School
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Photo



Results for all I-Beam Paints reported as being Lead Based

Results for all Bar Joist Paints reported as being Non-Lead Based

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APPENDIX E

Maine-Endwell High School
750 Farm To Market Road, Endwell, NY 13760

License and Certification Paperwork

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

June 21, 2022

William Johnson
Delta Engineers, Architects & Land Surveyors, P.C.
860 Hooper Road
Endwell, NY 13760

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

Dear William Johnson:

Thank you for applying to the U.S. Environmental Protection Agency (EPA) for certification to conduct Lead-based Paint Activities in target housing and child-occupied facilities. I am pleased to inform you that, pursuant to 40 CFR Part 745, Subpart L, your lead-based paint activities firm is certified. Your certificate is enclosed.

This certification **expires on August 10, 2025 and is valid in All EPA Administered States, Tribes, and Territories**. However, if a State in which you are certified obtains program authorization during the term of this certification, the scope of your certification will be diminished to exclude the affected area.

Your EPA firm certification is subject to the following restrictions:

1) Individual states and Indian tribes, whether authorized or not, are not required to accept EPA certification and may accept or reject it under its own authority. Please be aware that your EPA certification does not relieve you of any obligations you may have to any State or Indian tribe regarding lead-based paint activities.

2) EPA certification is specific and limited as described above. If you wish to obtain certification in other lead-based paint disciplines, you must apply separately.

3) In advertising the EPA certification, firms must indicate clearly that the firm is certified only for purposes of Section 402 of TSCA. Failure to accurately state EPA certification conditions could result in EPA suspending or withdrawing certification.

4) EPA may conduct audits and/or inspections to ensure continued compliance with regulatory standards, and may revoke or suspend its certification if subsequent alterations or deviations result with the firm no longer meeting the standards found at 40 CFR Part 745, Subpart L.

If you have questions about the lead-based paint activities rule or need assistance, please contact the Regional Lead Coordinator, Tracy Truesdale, of the EPA Region 2 staff at 732-906-6855. If you have any questions about your firm certification, please contact the National Lead Information Center at 1-800-424-LEAD and refer to **Application ID number A806350**. Congratulations, and thank you for your interest in being a certified abatement firm.

Sincerely,

Michelle Price

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

Enclosures

United States Environmental Protection Agency

This is to certify that

Delta Engineers, Architects & Land Surveyors, P. C.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires August 10, 2025

LBP-68796-3

Certification #

June 16, 2022

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Michael John Staudt

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 18, 2025

LBP-R-17652-3

Certification #

August 19, 2022

Issued On

Ben Conetta

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

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Fax: 607.231.6650
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APPENDIX F

Maine-Endwell High School
750 Farm To Market Road, Endwell, NY 13760

Heuresis Pb200i Performance Characteristic Sheet

Performance Characteristic Sheet

EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: ***Heuresis***
Models: ***Model Pb200i***
Source: ***^{57}Co, 5 mCi (nominal – new source)***

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm^2 for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm^2 at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

> Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm^2. Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.
>
> Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.
>
> <u>For each substrate type</u> (the 1.02 mg/cm^2 NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):
>
> Correction value = (1st + 2nd + 3rd + 4th + 5th + 6th *Reading*)/6 - 1.02 mg/cm^2
>
> Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm^2. The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm^2)	**Mean Reading Time (seconds)**	**Standard Deviation (seconds)**
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
$\geq$ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm^2), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

SECTION 010000 – LABOR RATES

1.0 PART 1 – GENERAL

1.1 WAGE RATE SCHEDULES

A. The following New York State, Broome County schedule of prevailing wage rates and supplements have been provided by the New York State Department of Labor.

B. This prevailing wage rate schedule is listed on the New York State Department of Labor's web site (https://apps.labor.ny.gov/wpp/showFindProject.do?method=showIt) using PRC# 2025001133.

1. It is each Contractor's responsibility to determine and pay the current wage rates and supplements, at the time of payment, throughout the term of the project.

2.0 PART 2 – PRODUCTS (Not Applicable)

3.0 PART 3 – EXECUTION (Not Applicable)

END OF SECTION 010000

SECTION 011000 – SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: 2022 Capital Improvement Project – Phase 3
1. High School: SED # 03-11-01-06-0-010-030

B. Owner: Maine Endwell Central School District
1. Owner's Representative: Jeffrey L'Amoreaux (Assistant Superintendent).

C. Architect: King & King, Architects LLP, 358 West Jefferson Street, Syracuse, New York 13202.

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
a. Environmental: Delta Engineers, Architects & Land Surveyor 860 Hooper Road, Endwell, NY 13760
b) M/E/P: IBC Engineering PC 3445 Winton Place, Suite 219, Rochester, NY 14623
c) Civil: Appel Osborne Landscape Architecture, 102W Division ST Ste 100, Syracuse, NY 13204
d) Structural: St Germain & Aupperle, PLLC, 5711 West Genesse Street, Camillus, NY 13031

D. Construction Manager: LeChase, 31 Lewis Street, Suite 303 | Binghamton NY 13901

E. The work of this Project is separated into five (5) Prime Contracts.

F. The Prime Contracts for this project are listed as follows:

1. 01 10 10 GENERAL CONSTRUCTION (GC)
a. The General Trade Contractor shall furnish all labor, Equipment, Subcontractors, Supervision, Management and Administration required for the total performance of work on this contract as listed in the following specification sections and as shown on the following drawings including, but not limited to:
b. All work for the project as shown on drawings C/G-series, C/X-series(asbestos), C/S-series, C/L-series and C/A-series unless noted otherwise.
c. Provide the complete work for all sections of Specification Division 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 12, 31, 32 and 33 unless noted otherwise.
d. Provide as applicable for all other Specification Divisions 22, 23, 26 & 28.

2. 01 10 20 MECHANICAL CONSTRUCTION (MC)

a. The Mechanical Trade Contractor shall furnish all labor, Equipment, Subcontractors, Supervision, Management and Administration required for the total performance of work on this contract as listed in the following specification sections and as shown on the following drawings including, but not limited to:
b. All work for the project as shown on drawings C/G-series, C/L-series and C/H-series unless noted otherwise.
c. Provide the complete work for all sections of Specification Division 00, 01 and 23 unless noted otherwise.
d. Provide as applicable for all other Specification Divisions 2, 7, 22, 23, 31 & 33.

3. 01 10 30 PLUMBING CONSTRUCTION (PC)
   a. The Plumbing Trade Contractor shall furnish all labor, Equipment, Subcontractors, Supervision, Management and Administration required for the total performance of work on this contract as listed in the following specification sections and as shown on the following drawings including, but not limited to:
   b. All work for the project as shown on drawings C/G-series, C/L-series and C/P-series unless noted otherwise.
   c. Provide the complete work for all sections of Specification Division 00, 01, and 22 unless noted otherwise.
   d. Provide as applicable for all other Specification Divisions 2, 7, 23, 31 & 33.

4. 01 10 40 ELECTRICAL CONSTRUCTION (EC)
   a. The Electrical Trade Contractor shall furnish all labor, Equipment, Subcontractors, Supervision, Management and Administration required for the total performance of work on this contract as listed in the following specification sections and as shown on the following drawings including, but not limited to:
   b. All work for the project as shown on drawings C/G-series C/L-series and H-series unless noted otherwise.
   c. Provide the complete work for all sections of Specification Division 00, 01, 26 and 28 unless noted otherwise.
   d. Provide as applicable for all other Specification Divisions 2, 7, 22, 23, 31 & 33.
   e. EC too temporarily suspend all electrical devices (i.e. Lighting, Fire Alarm, Speakers. Motion Detectors, Camera's and WAPS) as ceiling grid comes down. Relocate electrical devices as required for other primes to manage their work and re-install at end of project as the GC is installing the new ceiling. NOTE: separate fire alarm project will be in progress during this project and monitored separately

5. 01 10 50 STADIUM CONSTRUCTION (SC)
   a. The Stadium Trade Contractor shall furnish all labor, Equipment, Subcontractors, Supervision, Management and Administration required for the total performance of work on this contract as listed in the following specification sections and as shown on the following drawings including, but not limited to:
   b. All work for the stadium field and track as shown on drawings G-series, L-series and A-series unless noted otherwise.
   c. Provide the complete work for all sections of Specification Division 00, 01, 31 and 32 unless noted otherwise.
   d. Provide as applicable for all other Specification Divisions 2, 7, 22, 23 & 26.

G. The work described within this Bid Package takes place at the following locations:

Maine Endwell High School

750 Farm to Market Road
Endwell, New York 13790

It is encouraged that all Prime Contractors apply for Labor Dispensation with NYS DOL prior to man-powering the site.

1.3 WORK UNDER SEPARATE CONTRACTS

A. One set of documents is issued covering all multiple Prime Contracts. Each Prime Contractor is to review all drawings and specifications for complete understanding and knowledge of the work.

B. Prime Contracts, in the context used in this Section, are separate contracts that represent significant elements of work that are performed concurrently with and in close coordination with work performed on the project under other prime contracts with the Owner.

1.4 INTENT OF DOCUMENTS

A. Plans and Specifications supplement each other and require the contractor to provide in their bid:

1. All labor, material, tools, equipment, supervision, layout, delivery, shop drawings, submittals, appurtenances, transportation, related items, safety monitoring, etc., necessary to complete the work described in the trade contract summary of work for each Contract.
2. All systems complete and left in good and/or specified operating condition.
3. Any apparatus, appliance, material or work not shown on Drawings but mentioned in Specifications, or vice versa.
4. Any accessories, reasonably inferable from Drawings and Specifications and as may be required by the manufacturer of such materials or equipment necessary to make the work complete.
5. Any item, labeled in one location but not another, is typical, reasonably inferable from Drawings and specifications and as may be required.

B. All sections of these Specifications as outlined in the trade contract summary of work shall apply in full to the contractor and their respective subcontractors.

C. Notes or instructions shown on anyone Drawing apply where applicable, to all other Drawings.

D. Install all work in compliance with Plans and Specifications in excess of requirements of codes and regulations and not contrary to it.

E. The Contract Documents contemplate a finished piece of work of such character and quality as is reasonably inferable from them. The contractor shall provide full cooperation in coordinating the installation of its work with the work of others and to make its work complete and operational and in compliance with good practice. The contractor further acknowledges that inadvertent minor discrepancies or omissions or the failure to show details or to repeat on any part of the contract documents the figures or notes given on another shall not be the cause for additional charges or claims. In the event of such conflict between and among the parts of the Contract Documents, the more expensive way of doing the work, the better the quality or the greater the quantity of material shall govern unless the Construction Manager otherwise directs.

F. The Drawings are schematic in nature and are not intended to show every offset and detail. The Contractor shall make adequate provisions in their bid to accommodate the actual conditions without additional cost to the Owner.

1.5 GENERAL REQUIREMENTS

A. All Prime Contractors are responsible for all work under their contract no matter what drawing on which that work appears, including drawings of other trade disciplines. For example, the HVAC Contractor will be responsible for HVAC work shown on Architectural, Roofing and Electrical Drawings etc.

B. All Trade Contractors are responsible to provide complete all Permits and Inspections, including any associated fees, which may be required by any local and state code agency relative to the work of their contract. Coordination of Owner provide Testing is by the contractor performing the work.

C. All work must conform to any applicable codes including but not limited to OSHA, Federal, State, Local, Governmental Agencies having jurisdiction and / or Owner requirements.

D. Contractor shall comply with all applicable federal, state, county and municipal laws concerning pollution of surrounding public waters. All work shall be performed in such a manner that objectionable conditions will not be created in public waters through or adjacent to the project areas.

E. Local custom and trade union jurisdictional settlements do not control the scope of work included in each prime contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, the affected prime contracts shall promptly negotiate a reasonable settlement to avoid or minimize the pending interruption and delays. Prime Contractors affected by such disputes shall be responsible for any related schedule and / or cost impact.

F. Union business shall not be conducted on site. Any Union Representative that visits the site must declare what Contractor's personnel they represent and must be escorted by that Contractor's Union Steward at all times. No visitors, sales representative or non-working personnel shall be permitted onsite without prior consent of the Construction Manager. No photographs shall be taken without the Construction Manager's prior approval.

G. Indoor Air Quality as a result of construction activity must be controlled. The transmission, movement or infiltration of construction dust, odors, vapors and/or other particulates is prohibited. Each Contractor is responsible for this and must take appropriate measures to control all dust, odors, vapors and/or other particulates cause by that contractor’s activity through the use of fans, negative air machines and/or off shift work. Any degradation of IAQ in spaces will necessitate the shutdown of such operations until the IAQ in the spaces can be rectified. Failure to control the IAQ due to construction activities shall require the completion of the work during off hours.

1. Construction operations such as demolition, sanding, painting, the use of mastics, and other construction operations, which may produce an odor or a dust condition, shall be scheduled with the Construction Manager 72 hours in advance of when such operation might occur. The Construction Manager and the Owner will review the request to proceed with said construction operation and decide if the operation can be done at that time, have to be rescheduled, or if additional precautions need to be implemented by the Contractor to carry out the operation that may produce an odor or a dust condition. Any rescheduling or additional precautions required by the Construction Manager, or the Owner shall be

conducted by the Contractor at no additional cost to the project. Refer to NYS Standards of School Construction Specification 01 60 00.

H. Decisions required from the Construction Manager, Architect and/or Engineer shall be anticipated by the Contractor to provide ample time for inspection, investigation or detailed drawings. A "Request for Information" form will be provided by the Construction Manager to the contractor. This form is to be filled out completely by the Contractor and sent to the Construction Manager for further processing. Verbal request for information will not be acted upon. Any verbal responses are not binding.

I. Repair for any damage to existing or new structure, finishes, ceilings, walls, flooring, equipment, fixtures etc. caused by defective or ill-timed work shall be borne by the responsible Contractor.

J. Provide complete all surface preparation, prime and seal substrates in accordance with the Manufacturer's recommendations for the type of substrate involved. Apply sizing to all gypsum drywall prior to installation of wall covering. Each Contractor shall verify compatibility of substrates as supplied by others. Starting of work shall constitute acceptance of substrates. Do not proceed with surface preparation or painting application until conditions are suitable.

K. The Construction Manager is responsible for assigning the work to the various Prime Contracts. The "Summary of Work" sections prepared for each Prime Contractor by the Construction Manager take precedence over the Architect's drawings and specifications.

L. Each Contractor is responsible for providing material to the jobsite in a manner consistent with the Milestone Construction Schedule and Sequencing Plans.

M. Equipment furnished by all Contractors shall be factory painted and field protected until acceptance by the Owner. If proper protection has not been provided or maintained, the material will be refinished, repaired, or replaced at the discretion of the Construction Manager at no cost to the Owner.

N. Contractor's personnel will not be permitted to use Owner's Food Service Facilities or sanitation facilities. Contractor's using school facilities will be back charged for cleaning services via. deduct change order.

1.6 WORK SEQUENCE

A. The Work will be conducted to provide the least possible interference to the activities of the Owner's operation.

B. Work is to be performed as follows: SUMMER HOURS - weekdays (Monday through Saturday) from 7:00 AM to 3:30 PM unless otherwise noted. SCHOOL YEAR - weekdays (Monday through Friday) from 4:00 PM to 01:30 AM unless otherwise noted. Work cannot be performed in occupied spaces and shall be scheduled during off-hours, vacations and weekends for occupied spaces as coordinated and approved with the Construction Manager/Owner. A Prime Contractor Supervision shall be on site at all times that work is being performed and Construction manager will be available as required. If a Contractor fails to maintain the progress as indicated by the milestone schedule by no other fault but its own and requires overtime to complete the work; the Contractor shall make arrangements with the Construction Manager 48 hours in advance and pay for a Construction Manager's superintendent and an Owner's representative on an overtime rate. In the event that the cause for delay is multi-contract, then the costs shall be distributed proportionately across affected Contracts.

C. The intention of the work is to follow a logical sequence; however, the Contractor may be required by Construction Manager to temporarily omit or leave out any section of his work or perform his work out of sequence. All such out of sequence work and returning to these areas shall be at no additional cost to the Owner.

D. Coordination of any utility and/or power interruption must be done with the Construction Manager and shall be scheduled 72 hours in advance. Shutdowns must occur during off hours and non-occupied days only. Each Contractor shall provide complete all terminations, removals and tie-ins as required by their Contract. Shift work must be approved in advance by the Construction Manager.

E. Any and all shutdowns are to be coordinated with the Construction Manager and Owner and shall be scheduled 72 hours in advance of any proposed shut down. Obtain permits and pay all fees associated with required shutdowns, disconnections, or relocations. All existing life safety type systems are to remain operational during installation of new system. All temporary work required to keep existing systems operational is the responsibility of the Contractor installing the work. At no time while the building is occupied are heating, ventilation or domestic waters to be shut down.

F. Any Prime Contractors who install their work out of sequence according to the Milestone Schedule shall protect their work from fireproofing overspray. No work shall be performed that prohibits fireproofing from being professionally installed.

1.7 MANPOWER / SUPERVISION

A. Contractor understands that time is of the essence and will adequately man the job to successfully complete the Contract Work in accordance with the Construction Manager's Milestone Schedule. The option to work extended hours and weekends at the Contractor's expense under prior agreement with the Construction Manager may be made available. Bidders are not to include any overtime.

B. In the event a Contractor falls behind scheduling the Construction Manager shall have the authority to direct the contractors and subcontractors to work overtime including weekends to maintain the schedule at no additional cost to the Owner. Contractors warrant that the work shall be physically complete, including punch list, startup and commissioning, within the early start and late finish schedule milestones.

C. Each Prime Contractor shall provide multiple crews to maintain the project schedule. Each crew is to be furnished with its own supervision, cranes, scaffold and other means necessary to maintain the Project Schedule.

D. The General Construction, HVAC and Electrical Contractor shall provide full time, non-working, onsite supervision from project commencement until such time as determined by the Construction Manager. This is to include supervision for all Subcontractors. If supervision is reduced or terminated without the consent of the Construction Manager, the Construction Manager will appoint an individual to manage work under this Contract with all cost borne by the Contractor and continues to assume all responsibilities for the appointed individual and the work of this Contract. The contractor’s on-site superintendent shall be on a Full-Time basis in a managerial capacity to continuously expedite, direct, supervise and coordinate the

work and shall not engage in performing actual work. A working Forman shall not be designated by the contractor as a superintendent.

1. All other Contractors are required to provide a working Supervisor for the duration of the project. This working Supervisor will be required to perform all duties of an on-site Supervisor per the Contract including but not limited to responsible for safety, attend meetings, coordinate and expedite the work and work of subcontractors.

E. The proposed Contractors' Project Manager and Field Superintendent for the project are to have sufficient experience and be successful in the proposed position. Each successful bidder shall submit resumes to the Construction Manager for the proposed Project Manager and Field Superintendent for the project. This information will be reviewed with the Owner, Architect and Construction Manager for approval. Should the Project Manager and/or Superintendent prove unqualified for the position at any point in the project, the Construction Manager shall issue a letter stating that the person is to be removed from involvement in the project. Contractor shall replace with a qualified individual promptly. Such full time Field Superintendent shall be required on site until such time as all Contract Work, including punch list work, is completed and accepted.

F. Each Contractor shall employ the appropriate trades people for their work as required. These people shall be experienced in their trades. A shortage of labor in the industry shall not be accepted as an excuse for not properly staffing each project.

1.8 SITE LOGISTICS / ACCESS

A. Each Contractor shall limit their operations, including storage of materials and prefabrication to areas designated by the Construction Manager. Contractor shall move at their own expense any stored products under Contractor's control, including excavated material, which interfere with operations of the Owner or other Contractors.

B. The Construction Manager will determine when a construction operation can be conducted in Owner occupied areas. The Construction Manager's decision of when the work can take place shall not constitute that the Contractor is entitled to additional compensation.

C. All Contractors shall try to minimize their presence in areas that are occupied by the Owner. Construction work in these areas will generally be performed when the public is not present.

D. The Construction Manager shall indicate to the Contractors entry points to the construction areas and routes through Owner occupied areas. The Contractor will ensure that their employees use only these entry points and routes through Owner occupied areas. A specific stairwell should be assigned for construction worker use during work hours. In general, workers may not use corridors or stairs designated for the Owner.

E. There will be no contact between the Contractor or their personnel and the Owner. The Contractor is not to take direction from anyone but the Construction Manager.

F. No visitors, sales representative or non-working personnel shall be permitted onsite without prior consent of the Construction Manager.

G. Badges and Signing In: The primary goal is for construction operations only during times of no staff & students in the building, or, in a designated, well defined and separated area of the

building that has no staff or students. All personnel are required to have a badge at all times on school property. The badge is to provided by the contractor. The information on each badge must include person's name, photo, company name and expiration date.

H. Sign In: All personnel must complete the Owner's sign in and license scanning requirement as follows:
a.) Field Personnel - one time sign in and license scanning; place resulting sticker on company provided badge.
b.) Non-field Personnel - sign in and scanning required for every site visit.
c.) Each contractor to submit list of accredited personnel and periodically update.
d.) An OSHA 10 card is required for each tradesperson. Cards to be submitted to Construction Manager prior to working on site. Do not submit OSHA 10 cards with certified payroll.

I. GC Contractor must plan, provide and maintain access, ramping, and egress as required into and out of the site, staging of trailers, materials machinery, and equipment in agreement with the Construction Manager's Superintendent. Each Contractor shall provide complete all planking and protection for walks, pavements, and curbs, etc. which are to be crossed by equipment. Trucking and delivery operation should be coordinated with Construction Manager's Superintendent and all other trades.

J. During excavation and backfill operations that interfere with other Prime Contractors means of access and egress to the site, the Prime Contractor performing the work must provide an alternate means of access and egress. Any damage to finished grades shall be repaired by the Contractor responsible for the damage.

1.9 COORDINATION

A. Each Prime Contractor shall coordinate scheduling and installation of work with the work of other Contractors, sub-contractors and other trades. Each Contractor is also required to coordinate all work of their Contract with Owner-supplied materials, direct contacts and normal building operations.

B. Each Prime Contractor shall supply and coordinate exact locations of embedded items in concrete or masonry work with the General Construction Contractor. Each Prime Contractor shall monitor such items throughout concrete/masonry activities to ensure proper placement.

C. HVAC & Electrical Prime Contractors shall be responsible for providing any rough opening or masonry opening dimensions to the General Construction Contractor. HVAC & Electrical Prime Contractors shall be responsible for any rework or additional work required due to their failure to provide this information prior to the schedule start of wall construction.

D. The HVAC & Electrical Prime Contractors shall coordinate all device and rough-in locations required with the casework shop drawings.

E. Each Contractor shall take special care in verifying that his equipment matches the characteristic of the power being supplied. All Contractors shall coordinate with the Electrical Contractor and provide them with a copy of the approved submittal for all equipment that require electrical power.

1.10 TEMPORARY FACILITIES

A. Refer to Specification Section 01 50 00 for detailed information related to Temporary Facilities.

1.11 SURVEY & LAYOUT

A. All Prime Contractors shall work from the Benchmark identified in the Contract Documents and verified by a licensed surveyor employed by the General Construction Contractor.

1. The General Construction Contractor shall furnish and erect all necessary batter boards, establish all lines and levels and connection therewith, and run all subsequent lines and levels as the work progresses in order to assure careful and accurate work true to the proper lines in accordance with the Contract Documents. Any batter boards, monuments, or marks of reference, which may for any reason become disturbed or destroyed, whether such displacement or destruction is caused by carelessness, accident, or by the elements, shall at all times, be promptly and accurately re-established by the Contractor.
2. The General Construction Contractor shall establish finished floor elevations and finished grade lines for the building for all trades when requested to do so; and shall establish center lines of all interior partitions on floor forms before concrete is placed in order that HVAC & Electrical Contractors will be able to place sleeves, etc., in proper locations.

B. The General Construction Contractor shall provide services of a licensed surveyor for site layout, elevation and as-built foundation location.

1.12 CUTTING AND PATCHING

A. Refer to Specification Section 01 73 10 for detailed information related to Cutting and Patching.

B. General Contractor is responsible to cut the existing and new roof areas for the HVAC and Electrical contractors for their respective penetrations and ensure the roof is watertight at all times. Each contractor shall lay out their penetrations and coordinate with the General Contractor to cut and patch in a manner to maintain existing roofing manufacturer's warranty. (See 1.15,K,5). Cuts through existing decking are to be performed by the contractor requiring the penetration.

1.13 CLEAN UP REQUIREMENTS

A. Refer to Specification Section 01 74 00 for detailed information related to Clean Up Requirements.

B. All Contractors are responsible for daily clean-up of all debris caused by their work. Contractors will provide sufficient cleanup personnel and sweeping compound as directed by the Construction Manager. Any Contractor not providing personnel will be charged for labor provided by the Owner.and back charged via change order.

1.14 TESTING & LABORATORY SERVICES

A. Refer to Specification Section 01 45 33 for detailed information related to Testing Laboratory Services.

1.15 PRIME CONTRACTOR RESPONSIBILTIES

A. Each prime contractor shall be responsible for de-watering all excavations pertaining to their scope of work for the duration that the excavations must remain open and to maintain the project schedule.

B. Unless specifically indicated in the Contract Documents that a ceiling system is being removed, re-installed or replaced, the GC Contractor shall be responsible for the removal and re-installation of all existing ceilings systems. Any damage to these existing ceiling systems due to the removal and re-installation process shall be each Contractor's responsibility to repair or replace the ceiling as directed by the Construction Manager at no additional cost to the Owner.

C. Each Prime Contractor is to survey existing work and submit to the Construction Manager a list of damaged areas (i.e. ceiling tiles, concrete sidewalks… etc.) prior to commencing work. Any damaged areas not identified prior to the work shall be the responsibility of the contractor(s) working in that area.

D. Each Prime Contractor is to provide sufficient protection of their work throughout the construction period by use of Kraft paper, plastic, plywood or other means acceptable to Construction Manager.

E. Each Prime Contractor is responsible for locating (via Instrument) all existing below-grade utilities; including but not limited to telephone, cable, data, water, sewer, gas, storm drains, etc. prior to any excavation work. Contact Dig Safe NY 48 hours prior to excavations.

F. The General (GC) Prime Contractor is responsible for excavation (saw cutting if required), backfill and restoration as required for installation of all U/G work. The responsibility for bedding materials and installing the utility is the trade contractor (example: GC trenches and MC provides bedding and chilled water lines, The GC backfills, compacts and restores)

G. The General Construction Contractor is responsible for all site trenching outside the building perimeter wall. Final connections of site work related piping and conduits are by the applicable Contractor, (MC or PC or EC). Each trade is to provide utility detection tape to GC. The General Contractor is to coordinate elevations of all utilities with the Construction Manager.

H. The General Construction Contractor shall be responsible for proof rolling the building pads and parking lots so that the Testing Agency can be scheduled to inspect and approve subgrade.

I. The General Construction Contractor shall review and accept the subgrade prior to the start of foundations.

J. Each HVAC, Plumbing & Electrical Prime Contractor shall be responsible for all interior and exterior mechanical / housekeeping pads required for their equipment.

K. Roof penetration work is defined as follows:

1. Within 15 days of Notice to Proceed the HVAC, Plumbing and Electrical Contractors shall provide the General Construction Contractor and Construction Manager a complete list (quantity, size, location and coordinated sketch or drawing) of structural support required for all roof penetrations per Contract Documents.
2. All blocking, flashing and cutting of roofing material and installation is by the General Construction Contractor.
3. Support framing for roof penetrations and equipment suspended from steel structure is provided by the General Construction Contractor. Coordinate work with Prime Contractor requiring such support.
4. Cutting of all existing decking regardless of type is by the Prime Contractor requiring the penetration.
5. Roof curbs are furnished and laid out by the HVAC Contractor and then installed, flashed in and tied into the roofing system by the General Construction Contractor.
6. The General Contractor's - Roofing Contractor shall provide all required boot, pitch pocket, flashing materials for making roofing penetrations by other trades watertight. Layout of roof penetrations shall be performed by the Prime Contractor requiring the penetration.
7. Each Contractor shall provide all temporary weather protection and safety coverings associated with the equipment openings required under their scope of work.

L. Through wall penetrations at <u>existing wall</u> locations are defined as follows:

1. Each HVAC, Plumbing & Electrical Prime Contractor shall provide cored penetrations patching, UL listed fire sealant smoke sealant at existing wall locations associated with openings required under their scope of work. Jack Hammering or demo hammering of masonry walls for penetrations is not allowed.

2. All pipe and conduit penetrations through existing rated construction shall be sealed fire safe by a UL listed approved method by the Prime Contractor requiring the penetration. All piping, ductwork and conduit penetrations in existing walls partitions shall be cored and sleeved. These sleeves shall be furnished and installed by the Trade responsible for the penetration.

3. All duct penetrations through existing rated construction shall be sealed fire safe by a UL listed approved method by the HVAC Contractor. HVAC Contractor shall provide layout at the location of the duct penetration. The HVAC Contractor shall cut the opening, provide required lintels and patching for the duct penetration layout provided by the HVAC Contractor.

1.16 <u>PROJECT CORRESPONDENCE / REPORTING REQUIREMENTS</u>

A. Each Contractor shall provide its management personnel assigned to this Project with access to personal computers and access to the Internet on a daily basis.

B. Each Contractor shall report on a regular basis, and as necessary to be kept fully appraised of Project developments, for correspondence, assigned tasks and other matters that transpire on the site. These may include but are not limited to: RFI's, action items, meeting minutes,

discussion threads, revisions to contract drawings and/or specifications, submittals, punch list items, and daily reports. Minimum requirement is via email on a weekly basis.

C. Fire Alarm Service
   a. As directed by the CM, the electrical contractor shall be responsible to remove, relocate and reprogram smoke, heat detectors and A/V devices, etc. as needed to facilitate work of the other trades. The electrical contractor shall be compensated for this work if not called for on the drawings.
   b. As directed by the CM, the electrical contractor shall clean all smoke and heat detectors in the area where major demolition work was performed prior to final turnover.

END OF SECTION

SECTION 012100 - ALLOWANCES

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Attention is directed to Paragraph 3.8 (as amended in the SGC) of the General Conditions for further description.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Contingency allowances.

C. Related Sections include the following:

1. Division 01 Section "Unit Prices" for procedures for using unit prices.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by the Architect to the Construction Manager for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

1. All overhead and profit associated with the contingency allowance shall be included in the base bid. The contingency allowance shall be used for construction cost only (See Item B).

B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are as follows:

1. Cost of Product(s) to Contractor less any trade discounts.
2. Cost of delivery to site, on-site handling, unloading, uncrating, and storage.
3. Cost of applicable taxes.
4. Protection from the elements or from damage.
5. Labor costs for installation, finishing, and testing; except where labor is specified not to be included in the allowance.
6. Subcontractor’s overhead and profit (only) at the stipulated rate of 15%. Prime contractors are entitled to one markup per subcontractor per change event. Subcontractors that contract out work are not entitled to additional overhead and profit beyond that noted above.

C. Change Orders or Change Directives authorizing use of funds from the contingency allowance will include only Contractor's related costs as described above.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.7 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

2.0 PART 2 - PRODUCTS (Not Used)

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. General Construction Work

1. Allowance No. GC-01 (Contingency Cash Allowance): Include a lump sum allowance of **$48,000** for use upon the Owner's instructions. This allowance is to be included in the General Construction Contractor's Base Bid sum.

B. Electrical Work

1. Allowance No. EC-01 (Contingency Cash Allowance): Include a lump sum allowance of **$20,000** for use upon the Owner's instructions. This allowance is to be included in the Electrical Contractor's Base Bid sum.

C. HVAC Work

1. Allowance No. MC-01 (Contingency Cash Allowance): Include a lump sum allowance of **$180,000** for use upon the Owner's instructions. This allowance is to be included in the HVAC Contractor's Base Bid sum.

D. Plumbing Work

1. Allowance No. PC-01 (Contingency Cash Allowance): Include a lump sum allowance of **$10,000** for use upon the Owner's instructions. This allowance is to be included in the Plumbing Contractor's Base Bid sum.

E. Site Work

1. Allowance No. SC-01 (Contingency Cash Allowance): Include a lump sum allowance of **$40,000** for use upon the Owner's instructions. This allowance is to be included in the Plumbing Contractor's Base Bid sum.

END OF SECTION 012100

SECTION 012200 – UNIT PRICES

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary materials, plus costs for delivery, installation, and taxes (when applicable).

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

2.0 PART 2 – PRODUCTS (Not Used)

3.0 PART 3 – EXECUTION

3.1 LIST OF UNIT PRICES

A. Site Construction Work (SC):

1. UNIT PRICE NO. SC-01: UNDERCUTTING

a. Description: Undercutting where unsatisfactory soils are discovered. This includes excavation, removal and haul away of unsuitable material, backfill and compaction with imported granular material as specified in Section 311201. Note: 25 cubic yards to be included in Base Bid.

b. Unit of Measurement: Cubic yard, installed.

2. UNIT PRICE NO. L-2: SOIL STABILIZATION FABRIC:

a. Description: Woven soil stabilization fabric furnished and installed as described in Section 321201.

b. Unit of Measurement: Square yard, installed.

3. UNIT PRICE NO. L-3: MEDIUM DUTY ASPHALT:

a. Description: Medium duty asphalt, stabilization fabric and stone subbase as described in Section 321201. This includes excavation and removals for placement of medium duty asphalt.

b. Unit of Measurement: Square yard, installed.

4. UNIT PRICE NO. L-4: SELF-ADHERING WATERPROOF MEMBRANE:

a. Description: Surface preparation/priming, furnishing and installation of 12" wide self-adhering waterproof membrane as specified in Section 321201. Note: 1,500 linear feet to be included in Base Bid.

b. Unit of Measurement: Linear feet, installed.

5. UNIT PRICE NO. L-5: MILLING, TACK COAT, AND TOP COURSE ASPHALT:

a. Description: One and a half inch (1-1/2") Asphalt milling and removal off site of existing top course asphalt and installation of new top course asphalt. This includes milling, removal, sweeping, crack repairs, tack coating, and new one and half inch (1-1/2") minimum top course asphalt as specified in Section 321201.

b. Unit of Measurement: Square yard, installed.

6. UNIT PRICE NO. L-6: 4' HEIGHT VINYL CLAD CHAIN LINK FENCE:

a. Description: 4' height vinyl clad chain link fence as described in Section 323101. This includes excavation and removals to sub-grade for placement

of 4’ height vinyl clad chain link fence.

b. Unit of Measurement: Linear foot, installed.

7. UNIT PRICE NO. L-7: 4" STORM WATER MANAGEMENT TRENCH (SMT):

a. Description: 4" storm water management trench (SMT) piping, filter fabric and drainage stone, furnished and placed as described in Section 334001. This includes trenching and removals.

b. Unit of Measurement: Linear foot, installed.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

2.0 PART 2 - PRODUCTS (Not Used)

3.0 PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. General Construction Contract: None.

B. Mechanical Construction Contract: None.

C. Plumbing Construction Contract: None.

D. Electrical Construction Contract: None.

E. Site Construction Contract:

1. ALT SC-01 – LONG JUMP PIT REPLACEMENT

a. The Bidder shall state the amount to be ADDED to the Base Bid for all site construction work associated with providing and installing the sand-catcher style long jump pits and all associated removals, drainage, restoration and other sitework shown on the plans and as specified.

b. Note: If this Alternate is NOT accepted by the Owner, no work other than track resurfacing (and asphalt milling/topping, if alternate SC-04 is accepted) shall occur at the long jump pit areas.

2. ALT SC-02 – CHAIN LINK FENCE AND GATE IMPROVEMENTS

a. The Bidder shall state the amount to be ADDED to the Base Bid for all site construction work associated with providing and installing chain link fence and gate improvements at the track perimeter fence and all associated removals and other sitework as sown on the plans and as specified.

b. Note: If this Alternate is NOT accepted by the Owner, no chain link fence and gate improvements shall be made other than what is required to resurface the track and gain construction access to the athletic complex.

3. ALT SC-03 – MILLING/TOPPING OF ASPHALT AT PEDESTRIAN AREAS OUTSIDE OF TRACK

a. The Bidder shall state the amount to be ADDED to the Base Bid for all site construction work associated with milling and topping of asphalt at pedestrian areas outside of the athletic track including associated removals and other sitework as shown on the plans and as specified.

b. Note: If this Alternate is NOT accepted by the Owner, no milling and topping of asphalt outside of the athletic track shall occur.

4. ALT SC-04 – MILLING/TOPPING OF ASPHALT AT ATHLETIC TRACK

a. The Bidder shall state the amount to be ADDED to the Base Bid for all site construction work associated with milling and topping of asphalt at the athletic track.

b. Note: If this Alternate is NOT accepted by the Owner, no milling and topping of asphalt at the athletic track shall occur. Removal of existing track surfacing shall be included in Base Bid.

5. ALT SC-05 – SYNTHETIC TURF

a. The Bidder shall state the amount to be ADDED to or DEDUCTED from the Base Bid to furnish the Basis of Design FieldTurf Vertex Prime Synthetic Turf in accordance with the drawings and specifications.

6. ALT SC-06 – RESILIENT TRACK SURFACING

a. The Bidder shall state the amount to be ADDED to or DEDUCTED from the Base Bid to furnish the Basis of Design Beynon BSS 300 Resilient Track Surface in the color Hertha Blue in accordance with the drawings and specifications.

END OF SECTION 012300

SECTION 012500 – EQUIVALENCY

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. “APPROVED EQUIVALENTS” refers to manufacturers, materials, products, systems or equipment approved by the Architect for use in place of those specified, prior to contract award.

B. "APPROVED SUBSTITUTIONS" refer to manufacturers, materials, products, systems or equipment approved by the Architect for use in place of those specified, after contract award.

C. Standard of Quality: Specified materials, products and equipment establish the standard of function, dimension, appearance and quality.

D. Burden of Proof of equivalency rests with the entity submitting the proposed equivalent.

E. Acceptance: The Owner and the Architect shall determine a product's acceptability.

1.3 RELATED SECTIONS

A. Instructions to Bidders.

B. Supplementary Instructions to Bidders.

C. Supplementary General Conditions.

D. Division 01 Section “Submittals.”

1.4 PRODUCT OPTIONS

A. Where products are specified by reference standards or by description only; select any product meeting those standards or description.

B. Where products are specified by “or equal”, or by naming one or more products or manufacturers:

1. Select one of the products or manufacturers named which complies with the requirements of the Specifications; or

2. Submit an equivalent product that has been approved by addenda. Bidders shall follow procedures as described in Article "EQUIVALENTS PROPOSED OR CONSIDERED DURING THE BIDDING PHASE".

3. Submit a product which, in the Bidder's opinion, is equal in all respects, which product shall be subject to post award approval by the Architect. Bidder shall follow procedures for approval of substitutions as described in Article "SUBSTITUTIONS PROPOSED AS "OR EQUALS" AFTER CONTRACT AWARD".

1.5 CONTRACTOR'S CERTIFICATION

A. The Contractor shall provide certification as follows for all proposed equivalents and substitutions made under any of the procedures specified herein.

1. The Contractor has investigated the proposed product and determined that it is equal to or superior in all respects to the product specified, and that it will perform adequately in the application indicated.

2. The Contractor will provide the same warranties or bonds for the equivalent/substitute as for the product specified.

3. For equivalents, the Contractor certifies that it waives all claims for additional costs related to the substitution which subsequently become apparent, or become necessary because of the failure of the substitution to perform adequately.

4. For substitutions, the Contractor certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent, or become necessary because of the failure of the substitution to performance adequately.

5. The Contractor will coordinate the installation of an accepted substitution in the work, and make such other changes in the work as may be required for installation to make the work complete in all respects, at no additional cost to the Owner.

6. The Contractor agrees to reimburse the Owner for additional costs from claims by other Prime Contractors resulting from incorporation of requested equivalents and substitutions.

7. The Contractor agrees to reimburse the Owner for all additional costs billed by the Architect or his consultants for the review of the substitution request(s), any redesign of the Work of this Contractor or associated Contractors, additional site visits related to the substitution request and for the work to prepare Change Directives or Change Orders."

1.6 EQUIVALENTS PROPOSED OR CONSIDERED DURING THE BIDDING PHASE

A. If a Bidder desires to obtain pre-bid approval of a product it deems equivalent to a specified product rather than bidding "at risk", the Bidder may do so during the bidding process by the procedure described herein by the procedure as follows:

1. Form of Request: Use enclosed "Equivalency Request" form.

2. Request Submitted To: Architect.

3. Request Made By: **Prime** Contract Bidders of Record **only**; in writing.

4. Deadline: Requests received fourteen (14) days prior to date of receipt of Bids.

5. Notification of Approved Products: By Addendum.

6. Specifics: Incomplete information will be rejected and not reviewed. The burden of proof is on the submitter. Provide complete information.

7. Separate Requests: Use separate request form for each product request.

B. Product Equivalency: Answers to the following questions, prefaced by "(How) does (the use of) the proposed equivalent product or its manufacturer," shall be addressed by the submitter:

1. Serve the same function?

2. Affect other products and the Project as a whole? If so, what?

3. Have the same dimensions?

4. Have the same appearance?

5. Comply with the same codes and conform to the same standards?

6. Have same life expectancy?

7. How long has the product been produced as currently manufactured?

8. Where has the product been used locally? List Projects and Architects.

9. Have a history of past problems, and if so what was the remedy?

10. Affect other aspects of the construction?

11. Affect any details? What needs to be changed?

12. Require license fee or royalties.

13. Affect construction time?

14. Have a product warranty equal to the specified warranty?

15. Have a track record of standing behind the product and the warranty?

16. Vary or differ from specified product?

17. Benefit the Owner?

C. Any "equivalent" not approved by addendum (which action shall be at the contractor's risk) must be submitted to the Architect no later than 48 hours after receipt of bids.

1. The Bidder shall use the Equivalency Request form and shall respond in writing to all the concerns noted above.

2. After the 48 hour limit described above, similar submittals shall be deemed to be substitution requests.

1.7 SUBSTITUTIONS PROPOSED AS "OR EQUALS" AFTER CONTRACT AWARD

A. The following procedures apply after contract award.

B. For a period **not to exceed fourteen (14) calendar days** following the date of Contract Award, the Architect will consider written requests from the Prime Contractor (**only**) for product substitutions. The date of Contract Award shall establish the start of the fourteen (14) day period.

C. The materials, products and equipment described in the Contract Documents establish a standard of function, dimension, appearance and quality to be met by any proposed substitution.

D. Submit separate request for substitution on the "Substitution Request" form for each product which is proposed, supported with complete data, drawings and/or samples as appropriate, including written responses to the following concerns:

1. Justification of need for substitution.

2. Complete data substantiating compliance of proposed substitution with Contract Documents (five copies).

3. Comparison of the qualities of the proposed substitution with that specified, including size, weight, durability, performance and visual effect.

4. Changes and coordination required in other elements of work because of the substitution.

5. Effect on the construction schedule, including other Contracts.

6. Cost data comparing the proposed substitution with the product specified.

7. Any required license fees or royalties.

8. Availability of maintenance service and source of replacement materials.

9. Samples when requested.

10. Statement explaining how use of product is beneficial to Owner.

E. Provide Contractor's Certification as specified above.

F. The Architect will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution.

1. When substitution is not accepted, provide specified product.

1.8 PRODUCT LIST

A. After the substitution period has ended and the Architect has reviewed requests and responded in writing, the Contractor shall develop the Approved Product List.

1.9 SUBSTITUTIONS PROPOSED DURING THE CONSTRUCTION PHASE

A. The following procedures apply beyond fourteen (14) calendar days after Contract Award.

B. Requests for substitutions made during the construction period shall be considered only if needed to replace unavailable products.

C. Substitutions not properly approved and not authorized shall be considered defective and shall be replaced by specified products.

D. All costs for review, research and modification of details on the part of the Architect or any consultants shall be borne by the Contractor.

E. If substitute products are used, any and all associated costs shall be paid by the Contractor, including additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Prime Contractors, and similar considerations.

F. Submittal process described in this Section of the Specifications shall be followed. Submit the following:

1. Substitution Request Form. See the form included at the end of this section.

2. Written response to Architect’s questions / concerns.

3. All data requested.

4. Samples requested.

1.10 ARCHITECT’S REVIEW

A. Conditions: The Architect will receive and consider the Contractor's equivalent/substitution request when all or most of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

11. Where a proposed substitution involves more than one prime Contractor, each Contractor shall cooperate with the other Contractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.

B. Architect’s Action: After receipt of the request for equivalent/substitution, the Architect will request additional information or documentation if necessary for evaluation of the request. Within two weeks of receipt of the request, or one week of receipt of the additional information or documentation, which ever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution.

1. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.

2. If a substitution changes the cost and/or schedule of the project, acceptance will be in the form of a Change Order.

2.0 PART 2 – PRODUCTS (Not Applicable).

3.0 PART 3 – EXECUTION (Not Applicable).

END OF SECTION 012500

☐ **Equivalency Request** ☐ **Substitutions Request** ***(check one)***

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section Page Paragraph Description

The undersigned requests consideration of the following:

PROPOSED EQUIVALENT/SUBSTITUTION: _____

_____

_____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. Attach data in compliance with Division 01 Section "Equivalency."

Attached data also includes a description of changes to the Contract Documents that the proposed equivalent/substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

The proposed equivalent/substitution does not affect dimensions shown on Drawings.

The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested equivalent/substitution.

The proposed equivalent/substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

Maintenance and service parts will be locally available for the proposed equivalent/substitution.

The undersigned further states that the function, appearance, and quality of the proposed equivalent/substitution are equal or superior to the specified item.

Submitted by:

Signature: _____ For use by the A/E

Firm: _____ O Approved O Approved as noted

Address: _____ O Not Approved O Received too late

_____ By: _____

Date: _____ Date: _____

Telephone: _____ Remarks: _____

Attachments

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than fourteen days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Name of Architect.
c. Architect's Project number.

d. Contractor's name and address.
e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.

3. Arrange schedule of values broken down by SED Building number.
4. Arrange the schedule of values in tabular form, to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Change Orders (numbers) that affect value; separate line item for each change order
d. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

1) Labor.
2) Materials.
3) Equipment; where applicable

5. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for subcontract amounts
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site.

7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
9. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
10. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout and Project Record Document requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.

B. Payment Application Times: Submit draft copy of Application for Payment to Architect and Construction Manager by the last day of month. The period covered by each Application for Payment is one month, ending on the last day of the month.

C. Application for Payment Forms: Use AIA Document G732 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect and Construction Manager will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and pictures for Off Site stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

F. Transmittal: Submit one digital signed and notarized original copy of each Application for Payment to Construction Manager.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

2. Transmit one digital copy of certified payroll records for the payment period.

G. Waivers of Mechanic's Lien: With each Application for Payment, for construction period covered.

1. Submit partial waivers

2. Not Used

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.

5. AIA Document G706A.
6. AIA Document G707. (if applicable)
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT COORDINATION

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific trade contractor.

1.3 GENERAL PROJECT COORDINATION

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other prime contractors for proper installation, connection, and operation.

1. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
2. Make provisions to accommodate items scheduled for later installation.
3. Each Prime Contractor shall provide a layout drawing of all wall, floor, ceiling and roof penetrations that they require to the General Construction Contractor and Construction Manager. The General Construction Contractor will be responsible to provide layout and wall penetrations based on the penetration drawing provided by Each Prime Contractor requiring a penetration.
4. Each Prime Contractor is responsible for providing fire caulk or sound caulk from their penetrating device to the adjacent construction.
5. If is there is a required sleeve for the penetration, it is the Prime Contractors' responsibility requiring the penetration to provide the sleeve as well as the fire caulk or sound caulk of the sleeve to the penetrating device.
6. Schedule work and cooperate with others to avoid delays, interferences, and unnecessary work, conforming to the construction schedule.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work.

D. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

E. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

F. In the event that penetration drawings are not received prior to wall, floor, ceiling, or roof construction, the Prime Contractor requiring the penetration will bear all responsibility for layout, sleeves, cutting, patching, and fire / sound caulking the required penetration.

1.4 SURVEY AND RECORDS

A. General: Working from lines and levels established from existing conditions and by the property survey, the General Construction or Sitework Contractor shall establish and maintain benchmarks and other dependable markers. These benchmarks and markers are established to set lines and levels for Work at each story of construction and elsewhere as needed to properly locate each element for Project. Each Prime Contractor shall calculate, and measure required dimensions, and locate its Work in coordination with such benchmarks. Drawings shall not be scaled to determine dimensions.

B. Procedure: Before proceeding with the layout of actual Work, each Prime Contractor shall verify the layout information indicated, in relation to the property survey, existing benchmarks, and existing conditions. As work proceeds, check every major element for line, level and plumb. Record deviations for required lines and levels and upon detection, promptly advise the Construction Manager of deviations exceeding indicated or recognized tolerances. Each Prime Contractor shall record deviations on the Project Record Drawing.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings: Prepare Coordination Drawings for all areas, by building, floor, area and/or phase, of the project. Close attention should be implemented where limited space availability necessitates maximum utilization of space for efficient installation of different components, in the following manner:

1. Mechanical, Electrical and Plumbing Prime Contractors are responsible to prepare coordination drawings to a Scale of 1/4” = 1’-0” or larger, detailing major elements, components, and systems of mechanical and electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including but not limited to the following:

    a. Proposed locations of ductwork, piping, conduit, equipment, and materials.
    b. Clearances for installing and maintaining insulation.
    c. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
    d. Equipment connection and support details.
    e. Exterior wall and foundation penetrations.
    f. Fire rated wall, floor, ceiling, and roof penetrations.

g. Sizes and location of required concrete pads and bases.
h. Valve stem movement.
i. Sleeves.

2. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations. Clearly define relationships between sleeves, piping, ductwork, conduit, ceiling grid, lighting, fire sprinkler, HVAC equipment and other mechanical, plumbing, and electrical equipment with other components of the building such as beams, columns, ceilings, and walls.

3. Prepare reflected ceiling plans to coordinate and integrate installations of air outlets and inlets, light fixtures, communication systems components, sprinkler, and other ceiling mounted items.

4. Resolve conflicts between trades, prepare composite coordination drawings and obtain signatures from all affected Prime Contractors on original composite drawings. Submit coordination drawings to the Architect/Engineer and Construction Manager.

5. Mechanical, Electrical and Plumbing Prime Contractors are to first submit their respective shop drawings for approval, to the Architect / Engineer, in order to make any necessary changes prior to going through the coordination process.

6. Coordination drawings to be signed off by affected Contractors within 45 days of Notice to Proceed. A Coordination drawing timeline schedule shall be developed and tracked.

7. The coordination drawings shall be coordinated with the construction & phasing schedule.

8. The routing process will begin with the HVAC Contractor who shall take the lead in the coordination of their work with all affected trades.

9. The HVAC Contractor shall prepare background drawings to be used as the basis for coordination drawings in all areas or as determined by the Construction Manager (Scale: 1/4” = 1’-0” or larger). These drawings shall be completed by a qualified HVAC draftsperson. All Architectural features shall be accounted for in preparation of this drawing, i.e., permanent, casework, interior columns, partitions, finish ceiling and height, lighting and roof elevations, etc. The HVAC Contractor will provide a black line drawing showing all of the approved ductwork. HVAC Contractor is to locate all piping with orange lines. Forward drawings to the Plumbing Contractor.

10. The Plumbing Contractor is to locate the plumbing lines with blue lines, and resolve all conflicts and determine locations and elevations, and forward drawing to the Fire Protection or Electrical Contractor.

11. The Electrical Contractor to indicate all lighting fixtures, panels with associated clearances, duct banks, bus duct, conduit racks and all individual conduits 1 1/2” and larger in with green lines and resolve all conflicts and determine locations and elevations and forward to the General Construction Contractor.

12. The General Construction will have the last coordination review. Provide overlaid coordination drawings for all General Construction work and resolve all conflicts. All

Architectural features shall be detailed clearly, i.e. permanent casework, interior columns, partitions, finish ceiling and roof elevations, etc. Provide a ceiling lay out detailed coordination drawing showing ceilings, lights, diffusers, etc.

13. Contractors to provide underground coordination drawings for all underground utilities; show exact location of piping stub ups, floor drains, etc. as required.

14. All Prime Contractors shall have the option to provide coordination drawings using a computer aided design (CAD) or similar software at no additional cost to the Owner. Prime Contractors shall be responsible for all costs associated with obtaining backgrounds from the Architect/Engineer.

15. All coordination meetings will be held in the Construction Managers field office. As each coordination drawing is completed, Contractors are to meet with the Construction Manager to review and resolve all conflicts on the coordination drawings. Contractors are required to distribute shop drawings, cut sheets & submittals to other Prime Contractors where appropriate. Approved coordination drawings will also be available for reviewing at the Construction Managers field office.

16. All Contractors shall provide a hard copy of the coordination drawings for review by the Architect/Engineer.

17. Once complete and signed off, the HVAC, Plumbing and Electrical Contractors will submit dimensioned wall and slab penetration drawings and housekeeping pad drawings to the appropriate parties.

18. If the coordination drawing process is not complete, Mechanical, Electrical and Plumbing Contractors will provide wall penetration drawings to the General Construction no later than five (5) days prior to wall erection.

19. All Prime Contractors must install the work in accordance with the coordinated drawings at no additional cost to the Owner. No additional compensation will be made for extra ductwork offsets, piping and/or conduit or retrofit work due to improper component location, or lack of Contractor(s) coordination.

20. All Prime Contractors shall take special care in verifying with the Electrical Contractor that the equipment matches the characteristics of the power being supplied. The Electrical Contractor is similarly bound.

21. The Mechanical, Electrical and Plumbing Drawings are schematic in nature and are not intended to show every offset and detail. The Mechanical, Electrical and Plumbing Contractors will make adequate provisions in their bid to accommodate the actual conditions, provide all required ductwork, piping and conduit offsets per the coordination drawings, without additional cost to the Owner.

1.6 LOCATION STREAMERS

A. The Mechanical, Electrical and Plumbing Contractors shall hang streamers from all above ceiling equipment that will require access. This is in addition to any specification requirements for tags, labels, etc. Shop drawings should also highlight these areas for Architect/Engineer's

review. In addition, the Contractors shall notify the Construction Manager and Architect/Engineer of all areas where equipment maintenance access is difficult. Coordinate architecturally placed access doors with points of mechanical / electrical systems requiring that access.

END OF SECTION 013100

SECTION 013120 - PROJECT MEETINGS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Each Contractor shall participate in all project meetings in order to facilitate coordination between trades.

1.3 DESCRIPTION

A. Construction Manager shall schedule and administer project meetings.

B. Architect/Engineer and Owner may attend meetings.

1.4 PRE-CONSTRUCTION MEETING

A. Schedule within fifteen (15) days after notice of award of Contracts.

B. Attendance:
   1. Construction Manager
   2. Architect/Engineer
   3. Contractor and pertinent Subcontractors (Contractors Representatives to minimally include Project Managers and Superintendent).
   4. Owner's Representative

C. Minimum Agenda:
   1. Introduction and sign in of attendees.
   2. Contractor to submit:
      a. List of major Subcontractors and Suppliers.
      b. Tentative procurement and construction schedule.
      c. Staff names.
      d. Preliminary Submittal Schedule.
      e. Labor Rate Sheet: Provide for each trade classification of Prime Contract workforce on form per Section 00 85 20 “Project Forms and Documents.”
   3. Construction Manager to provide overview of projected construction milestones and schedules.
   4. Designation of responsible personnel for coordination of work between Contractors.
   5. Safety and job rules.
   6. Change Orders: Overhead and profit markups.
   7. Distribution of Contract Documents.
   8. Shop drawing, product data, and samples.
   9. Record Documents.
   10. Use of premises:
      a. Field office and storage area.

b. Owner's requirements.
c. Identification badges.
d. Working hours.
e. Telephone use.

11. Project Orientation.
12. Project Safety requirements and training.
13. Distribution of Contract Documents.
14. Major equipment deliveries and priorities.
15. Coordination Drawings.
16. Clean-up procedures.
17. Location and time for progress meetings.

1.5 PREINSTALLATION CONFERENCES

A. Construction Manager shall conduct pre-installation conferences at Project site before each construction activity that requires coordination with other construction and as identified in individual specification Sections as follows:

B. Attendees: Prime Contractor, Installer, Testing & Inspection Rep., Architect / Consultant Rep. and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Construction Manager shall advise Architect of scheduled meeting dates.

C. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

1. Deliveries.
2. Possible conflicts including compatibility problems.
3. Conformance with Construction Manager’s Project construction schedule.
4. Projected weather limitations.
5. Manufacturer’s written recommendations.
6. Warranty requirements and manufacturers inspection notification.
7. Acceptability of substrates.
8. Testing and inspecting requirements, if any.

D. Construction Manager: Record significant conference discussions, agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five (5) days of the meeting.

1. Do not proceed with installation if Conference is not successfully concluded. Construction Manager shall initiate required actions to resolve impediments to performance of Work and reconvene the Conference at the earliest date feasible.

1.6 PROGRESS MEETINGS

A. Schedule for regular weekly Contractor Meetings will be set up at the Pre-Construction Meeting.

B. Schedule for regular weekly / biweekly Project Manager and Architect Meetings will be set up at the Pre-Construction Meeting.

C. Attendance:

1. Construction Manager
2. Contractors' Project Superintendent
3. Contractors' Project Manager
4. Subcontractors pertinent to agenda
5. Architect and Engineer
6. Owner's Representative

D. Minimum Agenda:

1. Review of Safety issues.
2. Review minutes of previous meeting.
3. Review and note field observations, problems, and decisions.
4. Identify present problems and necessary resolutions.
5. Contractors shall provide two / three week look ahead schedules to be reviewed in conjunction with the project master schedule.
6. Review status of shop drawings and submittals.
7. Product procurement & deliveries.
8. Status of RFI's.
9. Coordinate occupancy arrangements and access requirements with Owner as required.
10. Status of Change Events.
11. Owner issues.
12. Architect & Engineers issues.
13. Open Discussion.
14. Location and time for next meeting.

E. Contractors are required to attend Progress Meetings. Unexcused absences from Progress Meetings will result in a deduct Change Order in the amount of $150.00 for each absence. Meeting attendees shall have the authority to make decisions on behalf of the firm they represent.

1.7 OTHER MEETINGS

A. Pre-demolition Conference.

B. Coordination Drawing Meetings – Refer to Specification 01 31 00 for additional information.

C. Special meetings to resolve particular situations as they arise.

1.8 PERSONNEL

A. Supervision: Each Prime Contractor's project manager and field superintendent throughout project duration shall have five years experience minimum in the proposed position.

1. Two (2) years minimum of the five (5) years experience for position shall be with Prime Contractor's firm.

B. Should in the opinion of the Construction Manager, Architect or Owner, the project manager, superintendent or other Contractor's employees or subcontractor personnel prove unqualified for their position at any point in the project, the Construction manager shall issue a letter stating that the person is to be removed from involvement in the project.

1. Action must be made by Prime Contractor within seven working days of receipt of such letter.

C. Staff Names: At Preconstruction conference each Prime Contractor shall submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities. List business addresses and telephone numbers, including business office, field office, cellular, and facsimile. Each prime contractor shall submit a list of emergency contact names and phone numbers.

1. Post copies in Project meeting room, each temporary field office and at each temporary telephone.

Provide corresponding identification badge number for each staff listed.

END OF SECTION 013120

SECTION 013200 - CONSTRUCTION SCHEDULES

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Construction Schedule for Bidding Purposes. Bids are to be submitted conforming to the attached Construction Schedules- Milestone Schedule, Swing Space Schedule and Swing Space Identification Plan with Milestone Dates.

1.2 SUMMARY

A. This section addresses the requirements of construction schedules.

1.3 DESCRIPTION

A. All Prime Contractors, and the Construction Manager, are required to own and utilize the software Microsoft Project. All schedules shall be developed and/or modified and distributed as Microsoft Project files.

B. The General Contractor shall submit to the Construction Manager a preliminary schedule based on the Milestone Schedule found at the end of 013200. This preliminary schedule shall include place holder activities for all the other prime contractors. The preliminary schedule shall be submitted no later than forty five (45) days after Notice to Proceed is issued. The Construction Manager shall then distribute a copy to each of the other primes

C. Each Prime Contractor shall then review the preliminary schedule and add or delete it's applicable place holder activities and supply durations for it's applicable activities. Within twenty one (21) days each Prime shall then return a copy to the Construction Manager who shall forward to the General Contractor. The General Contractor shall then revise the schedule to reflect the activities and durations indicated by the other Primes and return the schedule to the Construction Manager for review. Schedules are subject to the review and acceptance of Construction Manager.

D. Construction Manager shall approve or request modification of schedule submittals and work with the Contractor to achieve overall project goals. Construction Manager will establish and update a master project schedule based upon approved schedule submittals.

E. Each Prime Contractor is to review the approved schedule throughout the project and attempt to resolve any conflicts. Unresolved conflicts, or any problem that may affect overall project goals, shall be immediately brought to the attention of the Construction Manager.

F. Three-week look ahead schedules shall be prepared biweekly by each Prime Contractor and shall correlate with the overall Project Schedule. These look aheads are to be submitted to the Construction Manager two (2) working days prior to the scheduled site progress meetings. Three-week look ahead schedules shall be submitted on contractor's own forms subject to Construction

Manager's review and approval. Construction Manager will review these look aheads and publish same, as approved, to other Prime Contractors.

G. Contractors shall provide a Recovery Schedule as requested by the Construction Manager and provide all labor force necessary, including overtime, to recover any lost time in the Schedule.

1.4 PROJECT SCHEDULE DESCRIPTIONS

A. Each Prime Contractor's initial Overall Project Schedule shall be based upon and respond to overall project objectives and information available to the Contractor through direct observation, research and examination of project documents, and discussions with Construction Manager. Schedules shall be submitted as outlined in 1.3. Each Prime Contractor shall indicate significant events such as submittals, shop drawings, material ordering, fabrication, delivery, coordination precedents, installation, testing, and turnover by area or system as agreed with Construction Manager. Points of interface between Subcontractors and other Prime Contractors, prerequisite work, durations, milestones and overall project objectives shall be detailed. Once approved by Construction Manager, the schedule shall be considered the Master Project Schedule, signed off by all trades, and will be updated bi-weekly by the Construction Manager.

B. Construction Manager's Master Project Schedule will be based upon project objectives and each Prime Contractors' approved schedules as described above. Weekly reviews of the Master Schedule will be held with the Prime Contractor's throughout the duration of the project. Each Prime Contractor shall participate in developing, implementing, updating and maintaining the master schedule. In addition, each Prime Contractor is to review the approved Project Schedule and attempt to identify conflicts with other trades. Conflicts, or any problem that may affect overall project goals, shall be immediately brought to the attention of Construction Manager.

C. Integrate delivery dates of critical items of materials and equipment into the schedule. Each Prime Contractor shall keep the Construction Manager apprised of the status of shipping dates, shipments and deliveries throughout the project. Each Prime Contractor shall communicate with suppliers as necessary to assure compliance and shall be responsible for notifying the Construction Manager of changes in delivery dates, which affect the progress of the project. Contractors must take all steps to ensure that materials are delivered to the project when required by the schedule. All costs associated with material delays shall be borne by the Contractor responsible for the delay.

D. All Contractors shall cooperate with each other in the installation and construction of each Contractor's work and in such manner as the Owner or Construction Manager may direct. All Contractors shall control and coordinate the work of their subcontractors. The Owner or Construction Manager may request the modification of the work schedules of individual contractors so the whole project progresses as one unit. The award of more than one Contract for the Project requires sequential or otherwise interrelated contractor operations and may involve delays in the progress of any individual Contractor's work. In such event it is the Contractor's responsibility to immediately notify the Construction Manager. Accordingly, the Owner and/or the Construction Manager cannot guarantee the unimpeded operations of any Contractor.

E. Contractor understands that time is of the essence and will provide sufficient manpower to successfully complete the contract work in accordance with the Project Schedule. A shortage of labor in the industry shall not be accepted as an excuse for not properly manning the project.

F. The Milestone Schedule that follows is to be used as the baseline for developing the Prime Contractors Schedule as noted in item “1.3 B” above.

END OF SECTION 013200

013200 Construction Schedules- Milestone Schedule

Dates	Scope of Work
3/30/2026 – 4/06/2025	Completion of the **Logistics Area GC-01 Contract**, all work described in Section 015100 -Temporary Facilities, 3.4 Site Logistics including Attachments "A". **GC-01 Contract.**
4/6/2026 – 8/14/2026	**Track & Field SC-01 Contract**. All work associated with Drawings D L0.01, D L0.02, D L1.01, D L1.02, D L9.01, D L9.02 & D K9.03.
4/3/2026 – 4/10/2026	Removal ceiling tiles for Salvage (only), in Corridors C1003 (Ground Floor Area B), Corridor C2007 (First Floor Area D & E) and Corridor C3000 (Second Floor Area D & E). **GC-01 & EC-01 Contracts.**
7/1/2026 – 7/31/2026	All associated ACM removals completed. **GC-01 Contract.**
7/1/2026 – 7/16/2026	Replacement of exterior transformer and associated I-Line Panel work. Provide temporary power for Construction, Server Rooms and Alarms. **EC-01 Contract.**
7/1/2026 – 8/26/2026	All work associated with the reconstruction and improvements to the **Library #127.** (First Floor Area D). **GC-01, PC-01, MC-01 & EC-01 Contracts.**
7/7/2026 – 7/27/2026	All work associated with the replacement of RTU-21H, including but not limited to point of connection removals of ductwork, removal of existing RTU, structural steel improvements, new curb and roof flashing, rigging and complete installation of RTU-21H and point of connection for new ductwork in the **Music Lab #113** & Corridor C2204 (First Floor Area B). **GC-01, PC-01, MC-01 & EC-01 Contracts.**
7/1/2026 – 8/26/2025	All work associated with the installation of EVPA 102A, 102B & 102C in the **Kitchen #102 . PC-01, MC-01 & EC-01.**
7/1/2026 – 8/24/2027	Complete renovation of **"Swing Space Rooms",** balance of contract documents. **GC-01, PC-01, MC-01 & EC-01 Contracts.**
3/1/2027 – 8/31/2027	Complete renovation of the **District Office GC-01, PC-01, MC-01 & EC-01 Contracts**, all work shown for Ground Floor Area E including the **Temporary Office Trailers** as described in Section 015100- Temporary Facilities, 3.7 Temporary Office Trailers for Owner Use including Attachment "B". ACM Abatement is to be performed on 2nd Shift hours.
7/1/2027 – 8/10/2027	All work associated within the **Pool Area,** including Pool #001 & Mechanical Room #100. **MC-01 Contract.**

Maine Endwell Capital Improvement Project
Phase 4 - High School Interior Renovations
Swing Space Schedule

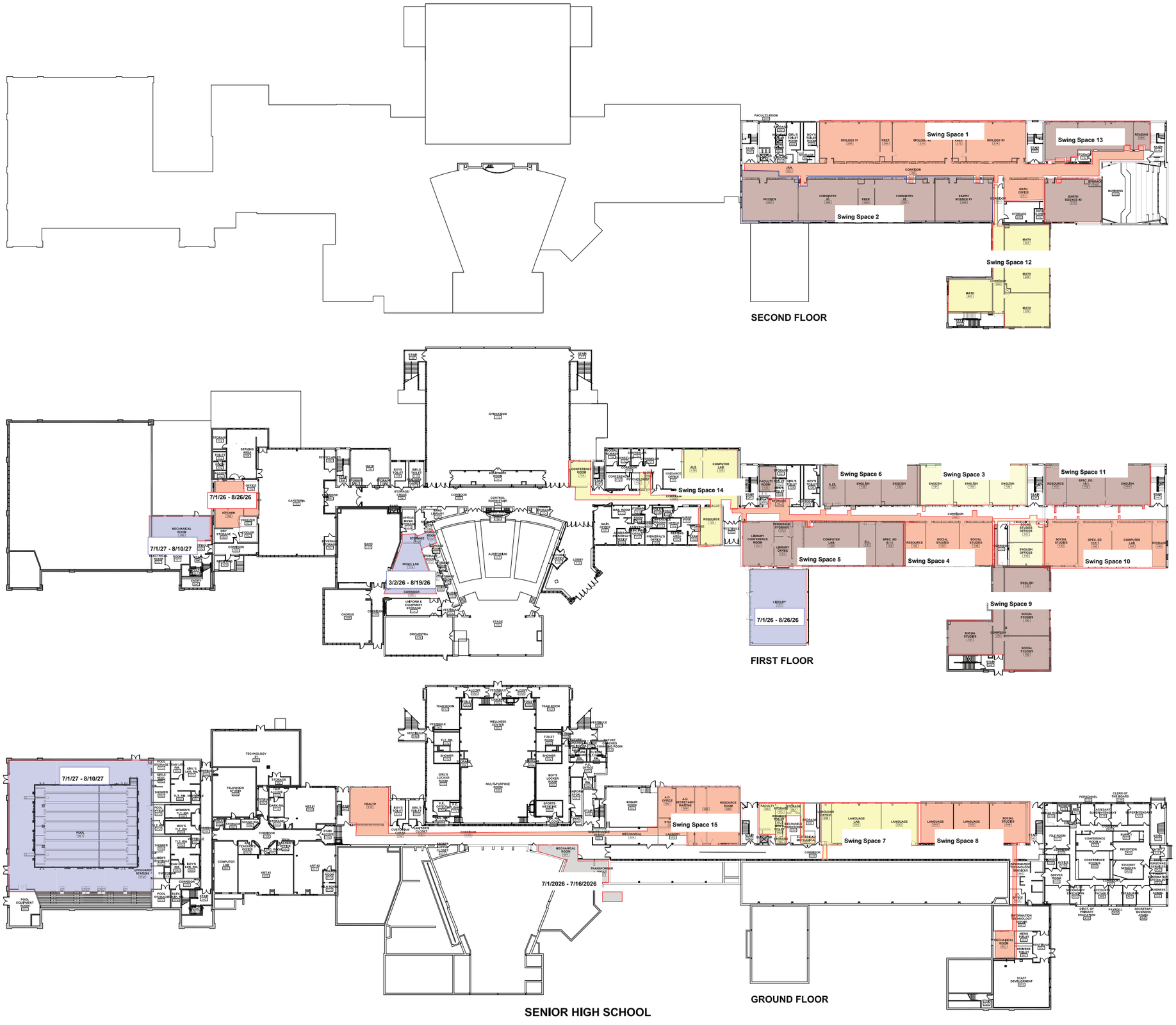
SED Project No. 03-11-01-06-0-010-030

Swing Space No.	Location	Associated Swing Space Room Nos.	Duration
1	2nd Flr Area D	Corridor C3000, 206, 210, 211 & 214	7/1/26 - 7/25/26
2	2nd Flr Area D	201, 203, 207 & 209	7/29/26 - 8/25/26
3	1st Flr Area D	134, 136, 138, 141 & 146	8/26/26 - 9/22/26
4	1st Flr Area D	Corridor C2007, 135, 137 & 139	9/23/26 - 10/20/26
5	1st Flr Area D	127.1, 127.2, 127.3, 129, 131 & 133.	10/21/26 - 11/17/26
6	1st Flr Area D	122, 128, 120 & 132	11/18/26 - 12/15/26
7	Grnd Flr Area D	032, 038, 040 & 042.	12/16/26 - 1/12/27
8	Grnd Flr Area D	044, 046, 048 & 047.1	1/13/27 - 2/9/27
9	1st Flr Area D	148, 150, 151 & 152	2/10/27 - 3/9/27
10	1st Flr Area E	143, 145, 147 & 149	3/10/27 - 4/6/27
11	1st Flr Area E	140, 142 & 144	4/7/27 - 5/4/27
12	2nd Flr Area D	224, 226, 227 & 228	5/5/27 - 6/1/27
13	2nd Flr Area E	213, 216, 218 & 220	6/2/27 - 6/29/27
14	1st Flr Area C	114, 118, 120 & 125	6/30/27 - 7/27/27
15	Grnd Flr Area B	012, 026, 026.1, 028 & 030	7/28/27 - 8/24/27

Maine Endwell Capital Improvement Project

Ph4 High School

Swing Space Identification Plan and Milestone dates



SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the requirements for the submittals procedures.

1.3 SUBMITTAL REQUIREMENTS

A. Each Prime Contractor shall provide a Submittal register indicating submittals required for each section of the Specifications.

B. An electronic copy of the Submittal register shall be provided to the Construction Manager with submittal date column filled in, indicating anticipated dates for submission of each submittal. Establish anticipated submittal dates after coordinating delivery lead times with the current Project Master Schedule. This register shall be completed and submitted before first Application for Payment will be approved. This register is required within fifteen (15) days of contract award.

C. Schedule all submittals to be completed within sixty (60) days after Contract execution unless otherwise specified. Indicate items requiring more than sixty (60) days with an explanation for the additional time and on what dates they will be submitted. The dates indicated for each submittal shall take into account the lead-time required for ordering and fabricating of the various items. It is the Contractor's responsibility to expedite submittals / product data as required to maintain the Construction Master Schedule.

D. All submittals shall be electronic, pdf files. Required file names and the submission process will be explained by the Construction Manager shortly after Notice of Award.

1.4 PROCUREMENT LOG REQUIREMENTS

A. All Prime Contractors shall submit to the Construction Manager an "Equipment / Fixture Procurement Report" (Critical List) two (2) weeks after the Contractor is notified of award. The Contractor shall list all equipment items, which are being purchased, drawing submittals, samples, etc., for a complete composite report.

B. The report shall be resubmitted to the Construction Manager with updated information weekly until such time as the Construction Manager notifies the Contractor that only bi-monthly or monthly reports are required.

1.5 SHOP DRAWINGS

A. Original drawings, prepared by Contractor, Subcontractor, supplier or distributor, which illustrate some portion of the work showing fabrication, layout, setting or erection details.

1. Identify details by reference to sheet and detail numbers shown on shop drawings.
2. Sheet size, multiple of 8 1/2 X 11 inches, not to exceed size of contract drawings when unfolded.
3. Photographic reproductions of contract drawings will not be accepted as shop drawings and will be rejected.
4. Submittals traced or copied from Contract Drawings are not acceptable and will be returned without review.

1.6 PRODUCT DATA

A. Manufacturers catalog sheets, brochures, diagrams, schedules, performance charts and other standard descriptive data.

1. Modify product data to delete information that is not applicable to project.
2. Supplement standard to provide additional information applicable to project.
3. Clearly mark each copy to identify applicable materials, products or models.
4. Show dimensions and clearances required.
5. Show performance characteristics and capacities.
6. Show wiring or piping diagrams and controls.

1.7 SAMPLES

A. Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.

1. Office samples to be of sufficient size and quantity to clearly illustrate:
    a. Functional characteristics of product or material, with related parts and method of attachment.
    b. Full range of color samples.

B. Field samples and mock-ups:
1. Erect at project site at location acceptable to the Construction Manager and Architect/Engineer.
2. Construct samples or mock-up complete, including work of all trades required in finish work.

1.8 CONTRACTOR RESPONSIBILITIES

A. Do not start, fabricate or install work requiring submittals until submittals meeting Contract Requirements have been returned to the Contractor.

B. In the event material and/ or equipment is installed prior to obtaining approval of shop drawings, and in the sole opinion of the Owner’s Agent, this material and/ or equipment does not meet the specifications, the Contractor shall be liable for the removal and the replacement at no additional cost to the contract.

C. Review, stamp and sign shop drawings, product data and samples prior to submission to Architect through the Construction Manager.

D. Before release of fabrication or purchase, Contractor must verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and other data.

E. Coordinate each submittal with requirements of Work and Contract Documents.

F. Contractor's responsibility for mistakes and oversights in submittals is not relieved by the Construction Manager or Architect/Engineer's review of submittals.

G. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect/Engineer's review of submittals unless Architect/Engineer gives written acceptance of the specific deviations.

H. Notify the Construction Manager and Architect/Engineer in writing, at time of submission, of deviations in submittals from requirements of Contract Documents.

E. This Project shall utilize an FTP site. All submittals shall be electronic, pdf files. Required file names and the submission process will be explained by the Construction Manager shortly after Notice of Award.

1.9 SUBMISSION REQUIREMENTS

A. Schedule submissions to allow at least fifteen (15) working days for review. Large submissions may take longer.

B. For product data and shop drawings, submit ten (10) copies.

C. Submit at least the number of samples specified in each technical section and no less than two (2) each, plus the number that Contractor needs returned.

D. Submittal Cover Sheet:

1. Submittal cover sheets must be filled out completely and attached to each copy of all submissions. Submissions without the Submittal Cover Sheet will be returned without review. Refer to Section 00 85 20 Forms.

E. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the work so processing will not be delayed by the need to review submittals concurrently for coordination.
    a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

F. Submittals shall be bound adequately so as to remain in tact during use in jobsite environment, and shall be indexed with labeled dividers if they include more than one product or material.

G. Submissions shall include:

1. Date and revision dates.
2. Relationship to all adjacent structure or materials.
3. Field dimensions, clearly identified as such.
4. Applicable standards.
5. Notification and identification of deviations from Contract Documents via cover letter and clear markings on the submission.
6. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.
7. Submittals without Contractor's stamp will be returned without being reviewed.
8. Additional pertinent data.
9. Work or item represented by submittal.

H. Should additional copies be required, Contractor shall make required copies for distribution of shop drawings and product data that have been stamped and signed by the Architect/Engineer.

I. Submittals shall be identified by reference to drawing numbers, detail numbers, schedule numbers, room numbers, and identification systems used in the Contract Documents.

J. All items that require color selection shall be submitted as soon as possible. The Architects' review and coordination of color selections cannot be completed until all items are submitted.

K. Submissions that are incomplete due to lack of Contractor's approval, lack of proper identification, incorrect number or type of submittal items or similar reasons shall be returned without action for correct submission.

1.10 RESUBMISSION REQUIREMENTS

A. Shop Drawings

1. Revise initial drawings as required and resubmit as specified for initial submittal.
2. Indicate on drawings changes that have been made other than those requested by the Architect/Engineer.

B. Product Data and Samples: Submit new data and samples as required for approval.

1.11 CONTRACTOR'S DISTRIBUTION OF SUBMITTALS

A. Distribute full size copies of shop drawings and any product data which carry an Architect/Engineer stamp to:

1. Contractor's Subcontractors and Suppliers, as required for coordination.
2. Other Contractors for coordination purposes.
3. Construction Manager.

1.12 ARCHITECT/ENGINEER

A. Review by the Architect will be for conformance to design intent, materials, and general dimensions, but shall not relieve any Contractor of their responsibility for furnishing proper equipment or materials nor for undetected errors in the drawings, unless attention to same is

noted in writing at the time of submission of Drawings. Review of shop drawings does not relieve Contractor of responsibility for proper fit, not detail design of connections nor for supplying all necessary material or quantities.

B. Review of separate items does not constitute review of an assembly in which item functions.

C. Stamp and initial or sign to indicate review of submittal.

D. Route submittal to the FTP site and notify pertinent parties via email.

E. Do not permit submittals marked "Revise and Resubmit" to be used at the Project site, or elsewhere where work is in progress.

1.13 ADDITIONAL INSTRUCTIONS

A. The Construction Manager may from time-to-time issue additional instructions to the Contractor as may be necessary to amplify, augment, modify or clarify the Contractor Documents. These may be in the form of drawings, Specifications, interpretations, orders and supplemental agreement, Change Order or minor change. Submittals shall be resubmitted and otherwise kept up to date as required by additional instructions.

END OF SECTION 013300

SECTION 013400 - NYSED REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. NYSED REGULATIONS / SCHOOL DISTRICT REGULATIONS

1. The occupied portion of any school building shall always comply with minimum requirements necessary to maintain a certificate of occupancy.

2. General safety and security standards for construction projects per NY State Education Department code Rule 155 shall be met by all Contractors.

    a. All construction materials shall be stored in a safe and secure manner.

    b. Fences around construction supplies or debris shall be maintained.

    c. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

    d. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.

    e. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

3. Separation of construction areas from occupied spaces: Construction areas which are under the control of a Contractor and, therefore, not occupied by staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.

    a. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students, staff or public.

    b. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

    c. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. Buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

4. Prior to beginning construction or demolition, contractors shall submit a plan detailing how exiting required by the applicable building code will be maintained.

5. Prior to beginning construction or demolition, contractors shall submit a plan detailing how adequate ventilation will be maintained during construction.

6. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken. Noise level measurements (dba) shall be taken with a type 2 sound level meter in the occupied space in a location closest to the source of the noise.

7. All Contractors shall be responsible for the control of chemical fumes, gases, and other contaminants produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.

8. All Contractors shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied. Contractor schedules are to include sufficient time for "off-gassing" of volatile organic compounds introduced during construction before occupancy is allowed, as part of meeting project schedule milestones.

9. All areas to be disturbed by renovation and demolition will be tested for Lead & Asbestos prior to the start of the project.

10. Lead:

    a. Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Any construction or maintenance operations which will disturb surfaces that contain lead will require abatement of those areas pursuant to protocols detailed in the "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing" (June 1995; U.S. Department of Housing and Urban Development, Washington, D.C. 20410; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). All areas scheduled for construction as well as areas of flaking and peeling paint shall be tested for the presence of lead and abated or encapsulated in accordance with the above noted guidelines.

11. Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied. Whenever air clearance is required for an asbestos project, T.E.M. will be used for final air clearance.

    a. Asbestos: Asbestos abatement protocols. All asbestos abatement projects shall comply with all applicable Federal and State laws including but not limited to the New York State Department of Labor industrial code rule 56 (12 NYCRR 56), and the Federal Asbestos Hazard Emergency Response Act (AHERA), 40 CFR part 763 (Code of Federal Regulations, 1998 Edition, Superintendent of Public Documents, U.S. Government Printing Office, Washington, DC 20402; 1998; available at the Office of Facilities Planning, Education Building Annex, Room 1060, State Education Department, Albany, NY 12234). Minor asbestos projects defined by 12 NYCRR 56 as

an asbestos project involving the removal, disturbance, repair, encapsulation, enclosure or handling of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos material may be performed in unoccupied areas of an occupied building in accordance with the above referenced regulations.

i. Asbestos Industrial Code Rule 56: Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied except as determined by AICR56 with proper isolation.
ii. Labor Rule 56 and AHERA both must be followed for asbestos projects in schools. Whenever air clearance is required by Labor Rule 56 or AHERA, TEM must be used for the final air clearance test.
iii. Labor Rule 56 addresses final air clearance for tall asbestos work including minor glove bag projects when there is a breaching containment. AHERA requires that TEM be used for final air clearance for work in schools, but does not speak to minor project air clearance.
iv. NOTE: It is NYS State Education Department's interpretation that the term "building" as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with a sealed non-combustible construction. The isolated portion of the building must contain exits, which do not pass through the occupied portion, and ventilation systems must be physically separated and sealed at the isolation barrier.

12. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

13. Use of shipping containers as material storage facilities shall be readily operable from the egress side of the door without the use of a key or special knowledge or effort. Every container shall have a louver incorporated into one side. The louver shall be large enough to aid ventilation according to the materials stored inside.

14. Occupied spaces shall be protected against visual distraction due to construction activities.

15. All holes in floors and walls shall be sealed with a fire-resistive material. All contractors shall provide fire-resistive materials throughout the project in association with the work of their contract. All Contractors shall maintain proper operation of fire extinguishers, fire alarm, and smoke/fire detection systems and all items shall be maintained throughout the project.

16. During construction, daily inspections of occupied areas shall be conducted by each Contractor's Superintendent to assure that construction materials, equipment or debris do not block fire exits or emergency egress windows.

17. All personnel involved with the construction project will be required to wear a Photo Identification Badge, when on the project jobsite. Any person related to the project, who does not have one of these photo identification badges, will not be allowed on site. The Owner will supply these badges at no cost to the Contractor. The badges will be made up at a designated location at the project site. All new personnel will report to this designated location upon arriving on site to be issued a badge. The loss or theft of these badges shall be reported immediately to the Construction Manager. There will be a $10.00 charge to the Contractor for the replacement of any lost or stolen badges. These badges will remain the

property of the School District and shall be returned to the Construction Manager once the personnel that the badge was issued to are no longer on site.

END OF SECTION 013400

SECTION 013410 - CONTRACTOR USE OF PREMISES

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Contractor shall comply with Owner occupancy, public use, and phasing requirements.

B. Contractor shall limit his use of the premises for work and for storage, to allow for:
   1. Work by other Contractors
   2. Owner occupancy
   3. Public use

C. Contractor shall limit their operations including storage of materials and prefabrication to areas within the Contract Limit Lines unless otherwise permitted by the Construction Manager at the Owner's option. Refer to Logistics Lay Down Area.

D. Contractor shall coordinate the use of premises with the Owner and Construction Manager and shall move, at his own expense, any stored products under Contractor's control, including excavated material, which interfere with operations of the Owner or separate contractors.

E. Contractor shall obtain and pay for the use of additional storage or work areas needed for operations.

F. Contractor shall assume full responsibility for the protection and safekeeping of Products under this Contract stored on the site and shall cooperate with the Construction Manager to ensure security for the Owner's property.

G. The contractors shall take all measures necessary to protect the existing landscaping in and around the construction site. No alterations of any kind to trees scheduled to remain will be permitted.

H. In the utilization of ground area, each Contractor shall protect pavement, curbs, walks, structures, and other permanent components that are designated to remain and shall maintain such protection. Any damage to the area used shall be repaired and/or restored to previous condition by the responsible contractor.

I. Each Contractor and their Subcontractors, material suppliers and fabricators shall provide full and free access for the Owner's Representative, Consultants and/or other designated representatives of the Owner to inspect job materials, equipment, fabrication facilities and storage locations, both at and away from the job site.

J. Work in Owner occupied spaces shall be restricted to essential activities. Such activities shall be scheduled in advance with the Construction Manager and Owner.

K. Exterior doors: to be latched and locked at all times that building has student occupants; as coordinated with Construction Manager, doors may be unlocked when building is not student occupied. (See 013430, 1.3 Maintenance of Building Exits)

1.2 AREA AVAILABLE FOR CONTRACTOR'S USE

A. The Contractor shall confine its operations to those portions of the Owner's property, and to the right-of-ways or easements, temporary or permanent, acquired or designated for the work of the Contract as shown on the Drawings.

B. Private property adjacent the site shall not be entered upon or used by the Contractor for any purpose without the written consent of the Owner thereof. A copy of such consent shall be filed with the Construction Manager prior to the start of work.

C. All construction personnel are to park within the construction fence. No parking in the school's parking lot is allowed.

D. Vehicles or equipment of any kind are not allowed in the Bus Loop without prior approval.

END OF SECTION 013410

SECTION 013420 - SITE CONDITIONS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the site condition requirements without limiting the generality implied by the Specifications and Drawings. Refer to Section 01 10 00 for summary / scope of work.

1.3 PRE-BID INSPECTION & EXAMINATION

A. The Contractor warrants and represents that prior to submitting his Bid, that they are satisfied as to the location and nature of the work and the quantity, quality, type and nature of both surface and subsurface structures and materials likely to be encountered.

1.4 BORINGS

A. Any data on subsurface conditions that may have been obtained by the Owner prior to the advertisement for bids, through test borings, test pits, seismic explorations, or other means, was obtained by the Owner for its sole use and purpose. Any such data, known or recalled as of the date of Advertisement or Notice for Bids, are shown on separate drawings or in separate schedules and reports which are not any part of the Contract Documents. All such data are made available to Bidders, the Contractor, and other interested parties only as a convenience and without express or implied representation, assurance or other guarantee that any of the information is complete, correct, adequate, or representative of a true or typical picture of subsurface conditions on the site.

B. The Contractor, both during its status as Bidder and after execution of the Contract, shall satisfy themselves as to the nature, character, quality, and quantity of above ground and below ground conditions likely to be encountered. Any reliance on data made available by the Owner shall be at the Contractor's sole risk.

C. No claim whatsoever shall be made by the Contractor against the Owner or Construction Manager for or on account of such data available, or neglected to be made available, by the Owner or Construction Manager.

D. The Contractor at any time, and any holder of Bidding Documents during the period between advertisement for and receipt of bids, will be permitted to make test borings, test pits, soundings or similar subsurface investigations on the Site. Prior to making these investigations the Contractor and/or holder of Bidding Documents must notify the Construction Manager when and where they propose to make such investigations.

E. The locations where test boring samples may be examined, if any, is given in the Subsurface Exploration and Geotechnical Evaluation Report.

1.5 PROTECTION OF EXISTING STRUCTURES

A. The Contractor shall at all times have onsite, suitable and sufficient plant and materials to adequately protect, support and sustain any and all existing structures and facilities, whether above or below ground, and shall use same as may be necessary or required to protect, support and sustain any and all such structures as may become weakened, endangered, undermined, or uncovered.

B. The Contractor shall, at its own expense, support and sustain in their places and protect from direct or indirect damage all water, gas, air or other mains or pipes, sanitary and storm water sewers and drains, conduits, subways, service connections, buildings, poles, wires, fences, pavements, sidewalks, curbs, trees and other structures and property and appurtenances thereto on or in the vicinity of the site, and shall assume all liability for damage thereto, including damage arising out of settlement or lateral movement of walls of excavations, whether occurring during performance of the work or the 12-month period of guarantee.

C. In the event of damage or danger to any structure or facility, the Contractor shall immediately notify the Construction Manager, and shall promptly repair or protect the structure, at its own expense, as the Construction Manager may direct.

1.6 EXISTING STRUCTURES BELOW GROUND

A. The Contract Drawings show the location and character of certain existing subsurface structures and facilities likely to be encountered in excavations or located in such proximity to the work as to require precautions for their protection. The sizes, materials, locations and depths shown are only approximate, and the Contractor shall satisfy itself as to the accuracy and completeness of such information. The Contractor shall not be relieved from any of its obligations, nor be entitled to claim for damages or additional compensations, sustained or arising out of inadequacy or inaccuracy of the information given.

1.7 ABANDONED STRUCTURES

A. Any structures, facilities or appurtenances therefore which are abandoned or become so by reason of the work, shall, at the Contractor's expense, be broken up and filled or removed, as directed by the Construction Manager.

1.8 LATENT SUB-SURFACE CONDITIONS

A. In the event that latent sub-surface conditions are found to materially differ from those on which the plans and Specifications are based, the Contractor shall immediately notify the Construction Manager before they are disturbed. After prompt investigation, the Architect/Engineer will determine what changes, if any, should be made in the Plans and Specifications because of the revealed conditions, and shall advise the Construction Manager.

1.9 ADJUSTMENT OR CHANGES OF EXISTING STRUCTURES

A. If an underground pipe or other structure requires realignment or relocation not included in the Plans or Specifications, the Architect will issue a clarification and the Construction Manager will issue a Change Order for such work, and the Contractor shall be compensated. The Contractor

shall strip or uncover and support or sustain the structure at its own expense prior to such Change Order, as part of its work under the original Contract, and shall not be entitled to claim for damage or delay due to its presence or discovery.

B. Wherever existing utilities comes within limits of the work; the Contractor shall notify both the Construction Manager and the Utility before in any way disturbing it. Any work of realignment, relocation, removal or extension of the utilities shall be done as mutually agreed by the Utility, the Contractor and the Architect. The Contractor shall maintain satisfactory drainage of the excavation at all times from revelation of the structure until completion of its realignment or readjustment. Interruption of service by utilities shall be kept to a minimum. Prior to interruption, Contractor to notify Owner/Construction Manager of precise condition, and provide a brief event schedule outlining procedures and anticipated times of delays.

C. The Contractor shall not cause nor permit interference with or hindrance to any municipal department, individual, public service corporation, or other company in protecting its structures and facilities, nor in removing, replacing or relocating it.

1.10 NOTIFICATION OF OTHER PARTIES

A. In addition to notices to Utilities and others required elsewhere herein, the Contractor shall give written notice of its proposed construction operations to the owner of all public and private utilities at least seven days in advance of breaking ground in any area in which a utility is located. Copies of each such notice shall be simultaneously sent to the Construction Manager.

END OF SECTION 013420

SECTION 013430 - PROJECT PROCEDURES FOR RENOVATIONS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

B. Specification Section 01 51 00 – Temporary Facilities

1.2 SUMMARY

A. This Section includes the requirements for the project procedures during renovations and phased construction.

1.3 MAINTENANCE OF BUILDING CIRCULATION AND EXITS

A. Contractor shall maintain circulation corridors, exits and stairs in all building areas occupied by Owner or Public. The existing buildings will remain operational and open to the public during portions of the work.

B. Where temporary emergency egress from Owner occupied areas through construction areas are required; those areas shall be adequately protected to ensure the safety of occupants through the construction areas. This would include but not limited to protective – covered walkway through the construction area. It shall be the responsibility of the General Construction Contractor to provide this protection as directed by the Construction Manager.

C. All construction areas shall be securable by lock and key. If the construction areas are means of emergency egress from the construction area or means of egress from the Owner-occupied areas through construction areas; the doors shall swing outward in the direction of egress. These doors shall be provided with “panic” hardware installed in a manner to allow egress outward from the building, but upon closing of the door prevent unauthorized entry into the building. Contractors shall anticipate that these barriers and protective items will need to be modified and adjusted during the course of construction and shall include these changes as part of their Base Bid.

D. All Contractors shall cooperate with the Owner with respect to security of the building and the rules that they have developed to maintain security. This would include but not be limited to keeping doors locked all the times to prevent unauthorized entry into the construction area or into the Owner’s occupied areas. The Contractor shall not admit entrance into the existing facility or the construction area any person not associated with the construction project. All patrons, staff and visitors shall enter the building through designated entrances as established by Owner and/or Construction Manager. All construction personnel shall enter the construction area and/or the existing facility at entrances designated by the Construction Manager.

E. When building is occupied by Owner, “propping” of exterior doors is not allowed. In lieu of propping doors, contractor must provide attendant.

1.4 TEMPORARY CONTAINMENT PARTITIONS

A. Temporary dust containment partitions will be provided in accordance with Section 01 51 00 – Temporary Facilities to isolate all areas of construction work from occupied portions of existing buildings to prevent the spread of dust, odors and noise.

B. The work areas shall be maintained at a negative pressurization with respect to adjoining occupied areas. For the purpose of dust and contaminant isolation from occupied areas, containment partitions shall be airtight and capable of maintaining the construction areas negatively pressurized with respect to the occupied areas. Non-airtight construction barriers will not constitute acceptable containment partitions.

2.0 PART 2 - PRODUCTS

2.1 REMOVED MATERIALS AND EQUIPMENT

A. General:

1. All materials and equipment to be removed as part of the work shall become the property of the Contractor and be removed from the jobsite at the Contractor's expense unless otherwise shown on the drawings or specified.
2. When debris is transported through occupied areas of the existing building, receptacles shall be sealed and covered to eliminate the spread of dust and debris.

B. Items Retained by Owner:

1. The items that remain the property of the Owner after removal by the Contractor will be listed in each Contract or indicated on the drawings.
2. These items shall be carefully removed by the Contractor without damage and turned over to the Owner.

C. Items Re-Used as Part of the Work:

1. Items indicated to be re-used shall be carefully removed and stored by the Contractor until such time as they may be reinstalled.
2. Items removed by others and indicated to be reinstalled per the Contract Documents are to be coordinated with the Construction Manager for pickup.

END OF SECTION 013430

SECTION 013440 - WORK UNDER SPECIAL CONDITIONS

1.0 PART 1 - DESCRIPTION

1.1 WORK AFTER DARK

A. Unless specifically required elsewhere herein, no contractor shall perform exterior work after dark except in emergencies. When time permits, a contractor shall inform the Construction Manager in advance of such work and shall obtain approval. When time does not permit advance notice to the Construction Manager, they shall inform the Construction Manager at the earliest possible moment.

B. The placing of concrete shall be so scheduled as to be started early enough in daylight hours to allow sufficient time for the completion of the section under construction before dark, including the work of finishers.

C. When, in order to minimize interference with existing structures or utilities, or maintain traffic, it may, in the opinion of the Construction Manager, be expedient or necessary to do work after dark, such work shall be performed by the Contractor and the Contractor shall provide adequate lighting.

D. Nothing in this section shall preclude any contractor from working on the interior of the building after dark, as long as sufficient electric lights exist in the area of the work.

1.2 SATURDAY/OVERTIME/SHIFT WORK

A. Each Contractor shall provide at all times sufficient manpower to maintain the progress of the Work to the satisfaction of the Construction Manager and/or the Owner. The option to work extended hours and weekends is permitted with prior agreement by the Construction Manager. If required to make up or meet the schedule, the cost for premium time shall be borne by each individual Prime Contractor; if requested by the Construction Manager, the premium portion of the cost shall be borne by the Owner via change order.

B. No Saturday or overtime work shall be scheduled or performed by Contractors without prior approval by the Construction Manager. Proposed work schedule shall be submitted to the Construction Manager a minimum of 24 hours prior to proposed start unless otherwise directed or approved by Construction Manager.

C. Because work will be performed in an occupied building, it will be necessary for contractors to work night shifts, this is expected and encouraged. Any contractor(s) that want or find it necessary to work night shifts in order to complete the work as scheduled, should contact the Construction Manager 24 hours in advance of when the contractor(s) want to start the night shift. The Construction Manager will make every effort to schedule this night shift work with the Owner, taking into account the Owner activities at night. Other hours can be scheduled with the approval of the Construction Manager and the Owner. Any Contractor that does work a night shift shall be responsible to:

1. Maintain security of the building at the end of the night shift by ensuring that all windows and doors are closed, latched and locked.

2. Maintain security in the building by not allowing anyone other than its own work force to enter the building
3. Ensure that the work area is usable for its intended purpose for the next days use by the Owner. This includes that all Life/Safety Systems are in place and functioning, that all other systems are functioning properly and usable, all construction debris, dust, materials and tools are removed, and the area is clean and occupiable.
4. Cooperate and coordinate night shift activities with the Owner's maintenance/custodian staff that is on duty.
5. All construction personnel must exit the secured building prior to 12:30 am unless other arrangements have been made with the Construction Manager.

1.3 WORK ON SUNDAYS OR HOLIDAYS

A. No Contractor shall work on Sundays, or locally recognized legal Holidays, except in an emergency, and then shall confine its operations to only the work considered necessary to be performed at such time. In the event of an emergency, Contractor shall notify the Construction Manager the same day or as soon as possible.

1.4 LABOR REQUIREMENTS

A. With all of the above items, each Contractor shall secure the necessary or required paperwork and approval of the NYS Department of Labor and applicable Trade Unions prior to commencing work under these conditions.
B. Contractors are highly encouraged to apply for NYS DOL Dispensation at the beginning of the project, prior to starting construction.

1.5 WORK IN STORMS

A. If required by the Construction Manager, masonry work, and the mixing and placing of concrete shall be halted during rainstorms, and all fresh work shall be immediately protected with suitable coverings. The Contractor shall keep a sufficient quantity of such coverings at the site at all times.

B. No paving, exterior painting, fine grading, seeding or roofing shall be done during rain or snowstorms.

C. All roof deck shall be watertight at the end of each day. Contractor shall only remove in a day what they can replace that same day.

1.6 WORK IN COLD WEATHER

A. Certain Specifications contain provisions prohibiting the performance of certain work in cold weather or outline the conditions under which such work may be so performed. In the absence of specifics mentioned elsewhere in the Contract Documents, the judgment of the Construction Manager shall govern in any case where temperature may adversely affect or prevent the performance of quality work. Contractor(s) will not be due any additional compensation if the work is stopped due to weather.

B. Contractors are required to maintain the building envelope and insulation value during cold and / or adverse weather conditions.

END OF SECTION 013440

SECTION 013500 - PROJECT SAFETY AND HEALTH

Project Safety Program

Contractor acknowledges that it has read and understands any and all requirements set forth in the Contract Documents Contractor will comply, and ensure that anyone for whom Contractor is responsible, including, without limitation, vendors, subcontractors, suppliers and material persons of any tier and their respective its employees, workers, laborers or agents, comply, with all project safety requirements. In the event of a conflict between the project safety requirements and the Contract Documents, the more stringent shall take precedence and govern. Contractor acknowledges that this specification is not an all-inclusive listing of all of Contractor's obligations with regard to health and safety and Contractor agrees and warrants that it shall comply with any and all applicable Federal, State and Local laws, rules, regulations and requirements set forth in the Contract Documents.

Contractor's supervisor is responsible for adherence to the Project Safety Program on site. As part of these responsibilities Contractor's supervisor shall:

i. Enforce and maintain at a minimum two employees on site during all working hours
ii. Enforce the safety requirements set forth in the Site Specific Safety Plan (SSSP)
iii. Stop unsafe acts by workers that are not in compliance with the SSSP
iv. Conduct daily coordination meetings
v. Conduct emergency evacuation drills
vi. Ensure all workers and visitors wear proper personal protective equipment (PPE) at all times while on the Project site
vii. Conduct new worker safety orientations
viii. Enforce the smoking policy
ix. Enforce the drug and alcohol policy
x. Collect and make available safety data sheets (SDS)
xi. Prepare Job Safety Analysis (JSA) for all safety critical activities
xii. Complete and sign pre-task plans (PtPs) with workers
xiii. Obtain permits to work (PtW) where required
xiv. Conduct weekly tool box talks
xv. Enforce compliance with the project safety requirements

Pursuant to the contract, the Project safety program includes, but is not necessarily limited to, the items listed below:

1. **Project Safety Program Overview:** The objective of this program is to reinforce the belief that people are our most valued assets and their safety shall receive top priority in the day-to-day decision making process. Contractor acknowledges that health and safety is a top priority and that everyone has the right to go home Incident and Injury Free. Accordingly, Contractor must ensure a safe work environment for all workers and the surrounding public.

2. **Drug and Alcohol Policy:** All project sites, offices and trailers are designated as drug & alcohol free. Any worker consuming alcohol or illegal drugs on the Project or found under the influence of alcohol and or such drugs will be removed from the Project.
3. **Contractor's Site Specific Safety Plan (SSSP):**

1. Contractor. General requirements for the SSSP include:
    i. This plan shall be completed and made available to the Owner's Representative for review two weeks following award of the contract but in any event, no later than two weeks prior to the Project kick off meeting or in the case no such meeting occurs, commencement of the Project.
    ii. This plan shall supplement existing Contractor's written safety programs and focus on Site Specific Safety elements associated with the Contractor's Work.
    iii. The plan shall be submitted in both electronic format and print format and signed by Principal of the Contractor.

4. **Pre-Mobilization Kick-off Meeting:** The Contractor's project manager, superintendent(s), and foremen shall attend a pre-mobilization kick-off meeting at the project site a minimum of two (2) weeks prior to mobilization to review the Contractor's SSSP and applicable health and safety policies and procedures. At a minimum, the following items shall be reviewed:
    i. JSA portion of the SSSP for high and medium risk activities.
    ii. Daily/weekly/monthly requirements, meetings and documentation required
    iii. Project schedule
    iv. The Contractor's Fall Prevention Program is in line with the project policies and procedures regarding fall prevention.
    v. Project Fire Prevention Policy and requirements
    vi. Project work hours and delivery requirements
    vii. Project Specific Worker Orientation
    viii. PPE and welfare requirements
    ix. Training record requirements
    x. List of equipment to be utilized

5. **Contractor Supervision / Designated Safety Representative:**
    1. High-risk activities (including demolition, steel, concrete and erection work), additional shifts, or manpower increases may require additional safety representatives.
    2. The Contractor's safety representative is required to ensure all tasks requiring JSA's or permits are in compliance with these requirements , maintain records, organize and participate in training sessions, attend weekly, monthly and quarterly safety meetings.

6. **Pre-Task Planning (PtP):** The Contractor shall complete a daily Pre-task Plan before work begins for each task. The Contractor's Pre-task Plan form shall identify the task being performed, the steps taken to accomplish the task, the hazards of performing the task, the proposed actions for mitigation of the hazard and the responsible parties for ensuring that the plan is followed. The pre-task plan must be communicated to all workers performing the task in the form of a daily huddle. For high risk activities, a more detailed JSA (see the following paragraph), the Pre-task Plan review with the workers must include relevant risk mitigation strategies from the JSA. The PTP shall be made available, if requested, to the Owner's Representative. All workers present at their specific pre-task plan meeting must sign the Pre-task Plan before work begins.

7. **Job Safety Analysis (JSA):**
    1. The Contractor shall complete the Job Safety Analysis for the following high risk activities including but not limited to: demolition works, ground works including excavations and piling operations, lift or hoist installation and removal, non-standard lifting operations, operations likely to endanger the public, work on or adjacent to live electrical and pressurized systems, work in confined spaces and hazardous atmospheres, materials management including manual

handling focusing soft tissue injury prevention, work with any hazardous chemical or substance having a flammability or reactivity hazard rating of 4, work at heights, frame erection, façade work, roof work and window installation and cleaning.

2. JSAs shall outline in detail, the job steps, operations or sequence involved in performing the work and potential hazards and risks associated with them. JSAs shall reference the equipment used and any associated inspections, calibrations, registration, maintenance or testing of the equipment. Details of safety inspections and emergency procedures shall be outlined.

8. **Permits to Work:**
    1. The project requires Permits to Work (PtW). Permits to Work are Contractor generated checklists to be distributed to their workforce, subcontractors and vendors and posted in close proximity to the work area. Permits to Work are required for the following operations: crane lifts, fall arrest or fall restraint harness as the primary means of fall protection, entry into confined spaces, hot works, works on or adjacent to energized systems (e.g. electrical, chemical, pressurized) (LO/TO), excavations, ladder permits and works in occupied premises.
    2. Prior to the start of the work day, the Contractor PtW must be made available to the Owner's Representative for any permitted work activity. The Contractor must complete the form and ensure that all parties performing the work have a clear understanding of the hazards identified, prior to obtaining authorization to start work. The Contractor's foreman/superintendent shall monitor the work to ensure that all tasks are being performed pursuant to the PtW. If the Work is not being performed in compliance within the permit requirements, then the Work will be stopped and Contractor shall be responsible for all losses, costs, delays associated with such stoppage. Situations that could cause works to be stopped include, without limitation, violation of permit conditions, change in work site conditions, alarm or imminent danger and emergency situations, and lack of coordination and communication among trades. In the event of a Work Stoppage, a new permit must be completed and re-submitted for review and sign off before work will be permitted to continue.
    3. The PtW shall be displayed at all times in the area where the work is being performed and remain displayed in the area until the applicable Work has been completed.

9. **After Hours / Weekend Work:** All work activities out of normal working hours, including at night, shall have appropriate updated JSAs and PtPs in place. Contractor shall provide at least forty-eight (48) hours' notice of any work to be performed to the Owner's Representative Project Superintendent.

10. **Worker Safety Orientation:**
    1. The Contractor is responsible for conducting site orientations to all employees of the Contractor and their subcontractors, suppliers, material persons and vendors before commencing work on site.
    2. All workers will receive Fire Prevention Awareness Training during the orientation on the Project including the Fire Prevention requirements outlined in this specification. All workers are required to understand the site-specific Fire Prevention and No Smoking requirements.
    3. Worker orientation shall be provided in alternate language in the event any of the Contractor's workers are not fluent in English.

11. **Daily Coordination Meetings:** The Contractor is to provide field supervision, when requested, to attend Coordination Meetings.

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12. **Weekly Safety Toolbox Talks:** The Contractor shall conduct and document a weekly safety toolbox talk. The toolbox talk shall be relevant to the Contractor's Work and include applicable PtP for the week's work and any PtW and JSAs. A copy of the toolbox talk and attendance record shall be made available to the Owner's Representative upon request.

13. **Incident Reporting and Root Cause Analysis Requirements:** Contractor shall report all first aid incidents, injuries, near misses, environmental incidents and/or property damage to the Owner's Representative as soon as possible following the event and submit at a minimum an initial incident report to the Owner's Representative within 24 hours of the incident. Any incidents classified as critical must be investigated and will require Contractor's management to attend and participate in the root cause analysis (RCA) investigation. Any corrective actions required following the RCA investigation must be immediately implemented by the Contractor.

14. **Safety Notices / Violations:**
    1. Contractor acknowledges their sole responsibility for safety and shall correct any conditions or acts promptly.
    2. In the event the Contractor fails to correct any condition or act, the Owner's Representative reserves the right to take any necessary action and the costs of such actions shall be the responsibility of the Contractor in accordance with the terms and conditions of the contract.

15. **Disciplinary Program:**
    1. Owner's Representative reserves the right to direct the Contractor to remove any worker at any time.
    2. Owner's Representative reserves the right to direct the Contractor to remove any worker at any time in its sole discretion in the event such worker violates any health and safety policy, procedure or requirement, including, but not limited to, the following issues for which the project has a zero tolerance policy:
        i. Confined space requirements
        ii. Lock-out, tag-out requirements
        iii. Harassment of any kind
        iv. Possession of firearms
        v. No Smoking Policy
        vi. Alcohol or Drug Use
        vii. Falls Prevention Infractions
        viii. Security Infractions
        ix. Violence in the Workplace
        x. Tampering or destroying any critical fire safety equipment
        xi. Hot works violations
        xii. Any willful danage to the Owner's property.

SECTION 014533 - SPECIAL INSPECTION AND TESTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Special Inspection and Testing shall be in accordance with Chapter 17 of the 2020 Building Code of New York State (BCNYS).

B. The program of Special Inspection and Testing is a quality assurance program intended to ensure that the work is performed in accordance with the Contract Documents.

C. This specification section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Approved Special Inspection Agency, hereinafter referred to as the Special Inspector (SI), and other Agents of the SI, of their requirements and responsibilities.

D. The SI shall be the individual in charge of the Special Inspection and Testing program. The SI shall supervise and review the work of the Inspection and Testing Agents for each inspection or test. As explained in BCNYS Section 1704.2.1, the SI, and all its Agents, shall demonstrate competence to the satisfaction of the Registered Design Professional in Responsible Charge (RDPIRC) and the Building Official (BO) for inspection or testing of the particular type of construction or operation requiring special inspection or testing. Unless otherwise noted or agreed upon by the RDPIRC and the BO, the minimum qualifications are as follows:

1. Concrete Construction:

    a. Inspection: ACI Concrete Construction Special Inspector, ICC Reinforced Concrete Special Inspector, NICET Level II, Engineer-in-Training (EIT) with relevant experience, or Professional Engineer (PE) with relevant experience.
    b. Field Testing (sampling, slump and temperature testing only): ACI Field Testing Technician – Grade 1, or NICET Level I.
    c. Field Testing (other than sampling, slump and temperature testing): ACI Field Testing Technician – Grade 1, or NICET Level II.
    d. Laboratory Testing: ACI Concrete Laboratory Testing Technician – Grade 1, or NICET Level II.

2. Masonry Construction:

    a. Inspection: ICC Structural Masonry Special Inspector, EIT with relevant experience, or PE with relevant experience.
    b. Field Testing: ACI Field Testing Technician – Grade 1, or NICET Level II.
    c. Laboratory Testing: ACI Concrete Laboratory Testing Technician – Grade 1, or NICET Level II.

3. Structural Steel Construction and Steel Construction other than Structural Steel (as defined by AISC 303-2016):

a. Inspection (excluding welded connections): ICC Structural Steel and Bolting Special Inspector, EIT with relevant experience, or PE with relevant experience.
b. Inspection of Welded Connections: ICC Structural Welding Special Inspector, AWS Welding Inspector (WI) or Senior Welding Inspector (SWI). An AWS Associate Welding Inspector (AWI) is permitted to be used if under the direct supervision of WI, who is on the premises and available when weld inspection is being conducted.
c. Non-Destructive Testing (NDT) of Welded Connections: ASNT NDT Level II.

4. Soils:

a. Inspection: ICC Soils Special Inspector, EIT with relevant experience, PE with relevant experience.
b. Testing (sampling, sieve analysis, unit weight and moisture content tests only): NICET Level I.
c. Testing (other than sampling, sieve analysis, unit weight and moisture content testing): NICET Level II.

5. Sprayed Fire-Resistant Materials (SFRM): Registered Architect (RA) with relevant experience, EIT with relevant experience, PE with relevant experience, ICC Spray-Applied Fireproofing Special Inspector, or ICC Fire Inspector I.

6. Fire-Resistant Penetrations and Joints: IFC Firestop Special Inspector, Intertek Qualified Firestop Inspector, or ICC Firestopping Credential of Learning Achievement (CLA).

E. Frequency of Special Inspection or Testing: The individual special inspections and tests shall be performed either continuously or on a periodic basis, as defined below, in accordance with the Statement of Special Inspection and Testing:

1. Inspection, Continuous: The full-time observation of work requiring special inspection by an approved Special Inspector, or Agent, who is continuously present in the work area where the work is being performed.
2. Inspection, Periodic: The intermittent observation of work requiring special inspection by an approved Special Inspector, or Agent, who is present in the work area where the work has been or is being performed, and at the completion of the work.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Statement of Special Inspection and Testing: See Section 014533a.

1.3 PAYMENT

A. The Owner, or an Owner’s Authorized Agent, shall engage and pay for the services of the SI and its Agents.

B. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents, and any costs related to correcting the deficient work.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. The Statement of Special Inspection and Testing shall be submitted to the BO with the application for Building Permit.

B. The Contractor shall cooperate with the SI and its Agents, so the special inspections and testing can be performed without hindrance.

C. The Contractor shall provide adequate OSHA-compliant access for the Special Inspector and its Agents to perform their work. This includes access to pipe scaffolds, swing-stage scaffolds, and any other method of accessing the work areas that the Contractor or its agents use to perform the work of the Contract.

D. The Contractor shall review the Statement of Special Inspection and Testing and shall, unless other agreed arrangements have been made, be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the SI and/or the applicable Agents at least 24 hours in advance of a required test or inspection. Uninspected work requiring inspection may be rejected solely on that basis.

E. The Contractor shall provide incidental labor and facilities to:

1. Provide access to the work to be inspected or tested.
2. Obtain and handle samples at the site or at the source of products to be tested.
3. Facilitate tests and inspections.
4. Store and cure test samples.

F. The Contractor shall keep at the project site: the latest set of construction drawings, field sketches, approved shop drawings, and specifications for use by the Special Inspector and its Agents.

G. The Special Inspection and Testing program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program. All work subjected to special inspection and testing shall first be reviewed by the Contractor's Quality Control personnel.

H. The Contractor shall acknowledge each item listed as a discrepancy by the Special Inspection and Testing program in writing to the RDPIRC and Owner. The acknowledgment shall identify whether or not the discrepancy has been corrected, is in compliance with the contract documents, and is ready for re-inspection.

I. The Contractor shall ensure all products, materials or assemblies are properly labeled so the Special Inspector or its Agents can easily observe the label to confirm compliance with the approved construction documents.

J. The Contractor shall be solely responsible for construction site safety.

K. If the Contractor intends to utilize a fabricator that is not approved for fabricating components in their shop without shop special inspections and/or testing by the Special Inspector, the Contractor must request and receive approval from the DPIRC and BO prior to engaging the fabricator. Contractor shall reimburse Owner for any added costs for shop special inspections or testing that may be required.

1.5 LIMITS ON SPECIAL INSPECTOR AND TESTING AGENT AUTHORITY

A. Neither the SI nor its Agents may release, revoke, alter, or expand on the requirements of the Contract Documents.

B. The SI and its Agents will not have control over the Contractor's means and methods of construction.

C. Neither the SI nor its Agents shall be responsible for construction site safety.

D. Neither the SI nor its Agents shall have authority to stop the work.

1.6 RESPONSIBILITIES OF SPECIAL INSPECTOR AND INSPECTION AND TESTING AGENTS

A. The SI shall submit to the RDPIRC and BO for review and approval a copy of their qualifications and qualifications of all Agents, which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.

B. The SI, and all Agents, shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

C. The SI and its Agents shall have adequate equipment to perform the required tasks. The equipment shall be periodically calibrated in accordance with equipment manufacturers' recommendations.

D. The SI and its Agents shall notify the Contractor of their presence on the job site at the start of any required inspection or test.

E. The SI and its Agents shall notify the Contractor of the results of any inspection or test upon completion of the inspection or testing task, including any discrepancies noted. The SI shall report any discrepancies from the Contract Documents found during an inspection. If the discrepancies are not corrected during the inspection, the SI shall notify the RDPIRC and BO prior to the completion of that phase of work. Reports shall document all discrepancies identified and the corrective action taken.

F. The SI and its Agents shall prepare detailed reports of each inspection or test and submit the reports within three days of the inspection or test. Reports shall be in electronic format (legible handwritten reports may be submitted if final typed copies are not available) and include:

1. Date and time of test or inspection.
2. Name of inspector or technician and name of inspection or testing firm representing.
3. Location of specific areas tested or inspected.
4. Weather conditions (temperature, wind speed, humidity, cloud cover, etc.).

5. Description of test or inspection, including applicable ASTM standards.
6. Results of inspection and\or testing.
7. Identification of discrepancies.
8. Indication that contractor was made aware of discrepancies.
9. Whether or not the discrepancies were corrected.
10. Signature of inspector, or of the individual overseeing the inspection of testing.

G. Inspection and testing reports shall be submitted to the RDPIRC, Owner or Owner's Authorized Agent, and BO, or as agreed upon at the Special Inspection and Testing pre-construction meeting.

H. A Special Inspection and Testing pre-construction meeting shall be held by the SI. The meeting shall include any Inspection and Testing Agents, the Contractor and any applicable subcontractors, the Owner or Owner's Authorized Agent, and the RDPIRC. The purpose of the meeting shall be to identify the specifics of the Special Inspection and Testing program, including, but not limited to, the following:

1. Identify the SI and Testing Agents.
2. Review this specification section and Statement of Special Inspection and Testing.
3. Determine the distribution list for inspection and testing reports.
4. Provide contact information.
5. Determine which party shall schedule inspections and testing.

I. The SI and its Agents shall notify the RDPIRC by telephone or email of any test results which fail to comply with the requirements of the Contract Documents.

J. At the completion of the work requiring special inspections or testing, each Inspection and Testing Agent shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.7 FINAL REPORT OF SPECIAL INSPECTION AND TESTING

A. The Final Report of Special Inspection and Testing shall be completed by the SI and submitted to the RDPIRC, the Owner or Owner's Authorized Agent, and BO prior to the issuance of a Certificate of Use and Occupancy.

B. The Final Report of Special Inspections and Testing will document that all required inspections have been performed and that all discrepancies have been resolved. Any unresolved discrepancies shall be clearly noted.

1.8 SUBMITTALS BY OWNER TO THE BUILDING OFFICIAL

A. In addition to the submittal of the special inspection and testing reports in accordance with BCNYS Section 1704.2.4, reports and certificates shall be submitted by the Owner, or Owner's Authorized Agent, to the BO for each of the following:

1. Certificates of Compliance for the fabrication of structural, load-bearing or lateral load-resisting members or assemblies on the premises of a registered and approved fabricator in accordance with BCNYS Section 1704.2.5.1.

2. Certificates of Compliance for open-web steel joists and joist girders in accordance with BCNYS Section 2207.5.

PART 2 PRODUCTS (Not used)

PART 3 EXECUTION (Not used)

END OF SECTION 014533

STATEMENT OF SPECIAL INSPECTIONS

Project: MAINE-ENDWELL CSD 2022 CAPITAL IMPROVEMENT PROJECT – PHASE 4

Location: 750 FARM TO MARKET ROAD, ENDWELL, NY 13760

Owner: MAINE-ENDWELL CSD

Owner's Address: 750 FARM TO MARKET ROAD, ENDWELL, NY 13760

Architect of Record: KING + KING ARCHITECTS

Structural Engineer of Record: ST. GERMAIN & AUPPERLE CONSULTING ENGINEERS, PLLC

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the Building Code. It includes a Schedule of Special Inspection Services applicable to this project as well as the name of the special inspector and the identity of other approved agencies intended to be retained for conducting these inspections.

The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official, Structural Engineer and Architect of Record. Discovered discrepancies shall be brought to the immediate attention of the contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official, Structural Engineer and Architect of Record. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official, Structural Engineer and Architect of Record.

A *Final Report of Special Inspections* documenting completion of all Special Inspections and correction of any discrepancies noted in the inspections shall be submitted prior to the issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim report frequency:
☒ Per attached schedule.

Prepared by: Richard P. Aupperle III, PE

01/08/2025
Signature *Date*



Design Professional Seal

Owner's Authorization:

Signature *Date*

Building Official's Acceptance:

Signature *Date*

Schedule of Special Inspection Services

Project: MAINE-ENDWELL CSD 2022 CAPITAL IMPROVEMENT PROJECT – PHASE 4

The following sheets comprise the required schedule of special inspections for this project. The construction divisions which require special inspections are as follows:

- ☐ Soils and Foundations
- ☐ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Wood Truss Construction

Inspection Agents	Firm	Address
1. Engineer of Record Richard P. Aupperle III, PE	**St. Germain & Aupperle Consulting Engineers, PLLC**	**5711 W. Genesee St. Camillus, NY 13031 (315) 488-3550**
2. Geotechnical Engineer/ Special Inspector/Testing Laboratory:	**Kenney Geotechnical Engineering Services, PLLC**	**6901 Herman Road Syracuse, NY 13209 (315) 638-2706**
3. Geotechnical Engineer/ Special Inspector/Testing Laboratory:	**CME Associates**	**6035 Corporate Drive East Syracuse, NY 13057 (315) 701-0522**
4. Geotechnical Engineer/ Special Inspector/Testing Laboratory:	**Atlantic Testing**	**6085 Court Street Road Syracuse, NY 13206 (315) 699-5281**

Note: The inspection and Testing agent shall be engaged by the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the building official, prior to commencing work.

Seismic Design Category: **B**

Ultimate Design Wind Speed: **115 mph**

Wind Exposure Category: **B**

Qualifications of Inspectors and Testing Technicians

Project: MAINE-ENDWELL CSD 2022 CAPITAL IMPROVEMENT PROJECT – PHASE 4

The qualifications of all personnel performing Special Inspection activities are subject to the approval of the Building Official. The credentials of all Inspectors and Testing Technicians shall be provided if requested. It is recommended that the person administering the Special Inspection program be a Structural Engineer or a Professional Engineer experienced in the design of buildings.

Key for Minimum Qualifications of Inspection Agents:

When the Structural Engineer of Record deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agent Number* on the *Schedule of Special Inspections.*

PSE **Structural Engineer** – a licensed SE or PE specializing in the design of building structures. This may be required for the inspection of critical structural elements.

GE **Geotechnical Engineer** – a licensed PE specializing in soil mechanics and foundations. This may be required for the inspection of difficult soil conditions or deep foundations.

EIT **Engineer-In-Training** – a graduate engineer who has passed the Fundamentals of Engineering examination. This may be required for the inspection of elements that require some engineering training to properly evaluate.

ACI **American Concrete Institute - Level 1 Certified Concrete Field Testing Technician.** This certification is appropriate for individuals performing concrete sampling, slump tests, air-content tests, temperature tests, unit weight tests, and casting compression test cylinders.

AWS **American Welding Society – Certified Welding Inspector** (CWI). This certification is appropriate for individuals performing visual inspection of welds

ASNT **American Society of Non-Destructive Testing** – Level II or Level III. This certification is appropriate for individuals performing ultra-sonic testing of welds.

SMSI **Structural Masonry Special Inspector** – Certification by ICC.

SWSI **Structural Steel and Welding Inspector -** Certification by ICC.

SFSI **Spray-Applied Fireproofing Special Inspector -** Certification by ICC.

PCSI **Prestressed Concrete Special Inspector -** Certification jointly sponsored by ICC, BOCA and SBCCI with participation form PCI and PTI.

RCSI **Reinforced Concrete Special Inspector -** Certification jointly sponsored by ACI, ICC, BOCA and SBCCI.

MSI **Master Special Inspector -** Certification by ICC.

Schedule of Special Inspection Services

Project: MAINE-ENDWELL CSD 2022 CAPITAL IMPROVEMENT PROJECT – PHASE 4

Structural Steel: NYSBC 1705.2

Item	Agent No. (Qualif.)	Scope
1.Fabrication Certification/ Quality Control Procedures	1, 2, 3, or 4, PSE or SWSI	a) Shop fabrication to be AISC Certified OR fabrication shop to be inspected and provide written quality control procedures. Provide documentation.
2.Material Certification	2, 3, or 4, SWSI	a) Material verification of high strength bolts, nuts, and washers, and screws: Identification markings to conform to ASTM standards specified in the approved Construction Documents. Manufacturer certificate of compliance required. (Periodic)
	2, 3, or 4, SWSI	b) Material verification of structural steel and metal roof deck: Identification markings to conform to ASTM standards specified in the approved Construction Documents. Manufacturers certified mill test reports required. (Periodic)
3.Bolting	2, 3, or 4, SWSI	a) Inspection of high strength bolting: bearing type connections. (Periodic) 25% of Connections
	2, 3, or 4, SWSI	b) Slip-critical connections: (continuous and periodic)
4.Welding	2, 3, or 4, SWSI	a) Provide verification of weld filler material: Identification markings to conform to AWS specified in the approved Construction Documents. Manufacturer certificate of compliance required. (Periodic).
	2, 3, or 4, AWS	b) Inspection of Structural Steel Welding: All field welds (Periodic).
	2, 3, or 4, AWS	c) Inspection of Structural Steel Welding: All Full penetration field welds (Continuous).
	2, 3, or 4, AWS	d) Shear Studs: Hammer test 25% for weld
	2, 3, or 4, AWS	e) Multi-pass fillet welds (continuous). Single-pass fillet welds great than 5/16 inch (continuous).

	2, 3, or 4, AWS 2, 3, or 4, AWS 2, 3, or 4, AWS	f) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement (continuous). g) Shear reinforcement (continuous). h) Other reinforcing steel (periodic).
5.Structural Details	2, 3, or 4, SWSI 2, 3, or 4, AWS	a) Inspection of conformance to construction documents (Periodic). b) Inspection of steel frame joint details for compliance with approved construction documents (periodic).
6. Metal Roof Deck and Comp Metal Floor Deck	2, 3, or 4, SWSI	a) Inspection of details and 25% of connections for conformance to construction documents (Periodic)

SECTION 015100 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Supplemental General Conditions and other Division 1 Specification Sections, apply to this section.
B. Section 01 10 00 – Summary of Work

1.2 SUMMARY

A. This Section includes detailed requirements for temporary facilities and controls, including temporary utilities, support facilities, security and protection.

1.3 QUALITY ASSURANCE

A. Regulation: Each Prime Contractor / Subcontractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements
2. Health and safety regulations
3. Utility company regulations
4. Police, fire department and rescue squad rules
5. Environmental protection regulations
6. Health Department regulations
7. New York State Education Department requirements

B. Standards: Each Prime Contractor shall comply with NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”, ANSI-A10 series standards for “Safety Requirements for Construction and Demolition”, and NECA Electrical Design Library “Temporary Electrical Facilities”.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with the normal application of trade regulations and union jurisdictions.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

A. Not used

1.5 DESCRIPTION

A. Description: Each contractor shall provide its own temporary facilities, unless noted otherwise, including storage and office trailers, power, telephone, and all costs associated thereof.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Each Prime Contractor shall provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Temporary Containment Partitions

1. Nominal 3-5/8" – 25 gage metal stud.
2. Batt insulation.
3. Type X 5/8" fire rated gypsum wallboard with taped joints on both sides.
4. ½" fire rated plywood liner on the demolition side.
5. Containment partitions are to have a 6-mil flame retardant polyethylene liner.
6. Paint occupied side of partition: 1 coat primer, 1 coat paint.

C. Lumber and Plywood: Comply with requirements as outlined in the Specifications.

1. For fences and vision barriers, provide minimum 3/8 inch (9.5 mm) thick exterior plywood.
2. For safety barriers, temporary exit ramps, temporary entrances, and similar uses, provide minimum 5/8 inch (16 mm) thick exterior plywood.

D. Paint: Comply with requirements as outlined in the Specifications.

1. For job-built sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior prime.
2. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
3. For interior walls of temporary offices, provide two (2) coats interior latex-flat wall paint.

E. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

F. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

A. Water Hoses: Provide 3/4 inch (19 mm) heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles a hose discharge.

B. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

C. Electrical Power Cords: Provide grounded extension cords to connect to temporary power by Electrical Contractor. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio. See article 3.18 for temporary power and lighting by Electrical Contractor.

D. Lamps and Light Fixtures: If required in addition to temporary lighting by Electric Contractor, provide general service 26-watt compact fluorescent lamps required for adequate illumination. Provide guard cages or tempered-glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture. See article 3.18 for temporary power and lighting by Electrical Contractor.

E. Heating Units: Temporary heating units are by Mechanical Contractor. See article 3.14.

F. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

7. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
8. U.L. Labeled with current inspection tags affixed.

PART 3 - FACILITIES

3.1 TEMPORARY SANITARY FACILITIES

A. The General Construction Contractor shall carry an Allowance of $10,000.00 to provide portable toilets for all contractors use as noted below:

1. Furnish chemical toilets per OSHA 1926.51.C with hand washing facilities at the site for ALL Contractors, Subcontractors, etc. working at the site for the duration of the project. Maintain in a sanitary and clean condition at all times.
2. Toilets shall be maintained, located and removed as directed by Construction Manager. Contents shall be removed and disposed of in a manner and at such intervals as necessary to maintain sanitary conditions; at minimum, weekly.
3. Construction Manager’s daily report will be used to determine number of toilets should there be a disagreement among the Trades.
4. Contractor’s personnel will not be permitted to use the Owner’s facilities.

3.2 TEMPORARY WATER

A. Drinking Water: Each Contractor will provide potable water for drinking purposes for its own personnel on the site. This will be accomplished through the use of portable water containers. Furnish disposable drinking cups and receptacles to collect used drinking cups within the general location of the portable water container.

B. The Plumbing Contractor shall provide and maintain temporary water service for the construction sites. A minimum of two (2) frost free hose bibbs are required. At these locations the Plumbing Contractor shall provide a “Back Flow Prevention Device” to prevent contaminated water from backing up into the Owner’s domestic water system. Locations of

these outlets to be approved by the Construction Manager. Each Contractor is responsible for providing hoses for their own use. The Plumbing Contractor shall remove the temporary connections when and as directed by the Construction Manager.

3.3 SNOW AND ICE REMOVAL

A. The General Construction Contractor shall provide snow and ice removal of project road or work areas, parking areas, and maintain safe access to the construction site including all emergency egress pathways. Any snow accumulation of 3" or more shall be removed. Any ice conditions shall be sanded or removed to maintain safe passage into the construction areas. Snow and ice removal by GC-01 shall be included to cover the Logistics Area.

B. The General Construction Contractor shall provide all snow and ice removal off roof areas for installation of roofing work. Excluding work by other trades. They shall provide snow and ice removal for their own work.

3.4 SITE LOGISTICS (Included in GC-01 Contract) **See Attachment "A".**

A. The General Construction shall provide and maintain the following in accordance with the Site Logistics and Phasing plan:
   1. Temporary Construction Fencing
   2. Construction lay down area and parking area
   3. Temporary access roadways and construction entrances
   4. Protection of existing trees, bushes, and site amenities with in the lay down area.

B. Each Contractor must plan, provide and maintain his own access and egress as required into and out of the site, staging of trailer(s), materials, machinery, and equipment in agreement with the Construction Manager. Contractor shall maintain free and safe access on the jobsite for other related project personnel.

C. The General Construction Contractor shall maintain all temporary construction parking areas, temporary access roads and fences for the duration of the project. At the end of construction, the General Construction Contractor shall remove temporary fencing, temporary access roads, and stone and be responsible to repave, re-grade and seed existing areas disturbed as required to return the area to its original or specified condition.

D. The General Contractor shall restore the Logistics Area back to it's original condition upon completion (or substantial completion) of the project, or at the direction of the Construction Manager.

3.5 DUMPSTERS AND RUBBISH CONTAINERS

A. The General Construction Contractor shall carry an Allowance of $15,000.00 to provide multiple dumpsters for all trades, for the duration of the project, with exception to Hazardous Abatement Contract work, which the HC Contractor will provide their own.

   1. All Contractors are to participate in placing recyclable items in the correct dumpsters as directed by the dumpster's suppliers' guide lines and any local or state laws which govern recycling. The General Construction Contractor shall clearly indicate to other trades what materials are to be placed in which dumpster to conform with recycling

requirements. The other trades that are to use the dumpsters provided by the General Construction Contractor shall comply with the directions of the General Construction Contractor as to "crush" and condense debris placed in these dumpsters. This includes, but is not limited to, ductwork removed by the HVAC Contractor and empty boxes of any trades. Nothing in this specification shall relieve each Contractor from cleaning up their own debris and delivering debris to the proper dumpster.

2. The placement of any dumpster on the project sites shall be coordinated with the Construction Manager as to their location. The General Construction Contractor shall be responsible for the emptying and removal of the dumpsters they are providing, including all tipping fees.

B. The General Construction Contractor shall provide all required dumpsters relative to their scope of work for excess roofing materials. Include emptying, removal and all tipping fees.

C. Each Prime contractor is responsible to provide their own trash/debris collection receptacles and to empty them daily.

3.6 TEMPORARY BUILDING ENCLOSURES

A. The General Construction Contractor shall provide insulated temporary weather / air tight enclosures, when required, on a T&M cost basis. In all cases where temporary enclosures are required provide a detailed submission, including the materials that are going to be used in the temporary enclosure. These materials shall be of the type that does not promote the spread of flames and smoke in the case of a fire. Only materials approved by the Architect shall be used. All temporary enclosures are required to be insulated to conserve energy to temporarily heat the temporary enclosure.

B. Each Contractor is responsible to provide a fully secured insulated weathertight temporary plywood protection for all openings created by the respective Contractor creating the penetration for installation of their work. The MC-01 contractor will be responsible to weathertight protect roof openings as they occur prior to the GC-01 provided roofing contractor installing and flashing in curb/rails. If required, the MC-01 contractor will provide insulated sheet metal caps for new curbs until equipment arrives.

3.7 Temporary Office Trailers For Owner Use: **See Attachment "B"**

A. GC-01: Provide 64x48 Modular Trailer as described in attached Outline and Floor Plan. Include all delivery costs, set up costs, access stairs and ADA ramp, monthly rental costs, tear down cost and haul way costs. Trailer is to be in the District Office South parking lot as shown on attached Trailer Site Plan. Trailer Manufacturer is to provide an Insignia Certificate. For SED approval.

B. EC-01: Include costs associated with connecting (and disconnecting upon completion) existing panel and NYSEG fees for service (monthly bills are to go the M-E CSD). All costs of removal and restoration are to be included.

C. PC-01: Include costs associated with connecting (and disconnecting upon completion) to existing sanitary and water services including all excavation, piping, fittings and backfill. All costs for restoration are to be included.

3.7 TEMPORARY CONTAINMENT PARTITIONS

A. Not used

3.8 TEMPORARY FIRE PROTECTION

A. The General Construction Contractor shall provide and maintain portable fire extinguishers on each floor level and building area in accordance with OSHA requirements (1926-150).

B. Each contractor performing “Hot Work” is required to provide their own fire extinguishers.

C. Each contractor shall provide fire extinguishers at their jobsite trailer / equipment, toolbox locations, and stairways.

3.9 TEMPORARY FENCING, BARRICADING

A. Each Contractor shall provide and maintain temporary fencing, covers and barricading as required to keep unauthorized persons away from excavations and hazardous areas for which contractor is responsible. The Contractor(s) shall provide protection, which is acceptable to Construction Manager, and/or as specified in the Specifications and which meet or exceed current OSHA Requirements. Relocate all items at the direction of the Construction Manager.

B. Any contractor that creates or contributes to an unsafe condition, such as, but not limited to, a fall hazard shall correct the hazard immediately.

C. Each Contractor who requires temporary or permanent removal of perimeter and opening protection to perform their own work, shall remove and replace such protection promptly prior to leaving the area. Protection permanently removed shall be returned to the Contractor who provided the protection. Contractor shall not allow openings or edges to be unguarded or unprotected at any time, i.e. slab openings, trenches, elevator shafts, duct chases, stairwells, slab edges, etc.

D. The General Construction shall provide and maintain a galvanized chain link fence, six (6), eight (8) foot high with lockable gates (vehicle and man) to serve as the temporary construction fence and Contractor lay down areas, per Contract Drawings, Logistics and the Phasing Plans. The General Construction shall remove or relocate the fence as directed by the Construction Manager.

E. All other fencing shall be plastic orange construction fence.

F. When required for safety, each Contractor shall provide and maintain fences at its own expense, along the roadways and around the grounds for the protection of adjoining property and all persons lawfully using same.

3.10 CONSTRUCTION SIGNS

A. Each Contractor is required to provide all required construction site signage for traffic, safety and directions as it pertains to their scope of work. Provide all required temporary traffic controls as

required to facilitate the project. This includes warning signs, traffic signs, barrier, warning lights, etc.

B. The General Construction is required to provide all dual language safety signage with pictorial and verbal identification. Signage should include but is not limited to Caution, Danger and Warning signs for entry, hardhat requirements, interior emergency egress signage, visitors must report to the Construction Manager's office prior to entrance, etc.

C. Contractor shall provide, move, remove, and maintain all signs where indicated on the plans or as requested by the Construction Manager.

3.11 MAINTENANCE AND PROTECTION OF VEHICULAR AND PEDESTRIAN TRAFFIC

A. Each Contractor shall provide and maintain adequate traffic controls in areas impacting routine vehicular and pedestrian traffic patterns, including temporary lane closures, for the duration of the project. Each Contractor is responsible to ensure the safe and convenient passage of Owner's staff, motorists, pedestrians, adjacent property Owners', and Contractor's employees.

1. Construction traffic shall not be permitted on Owner driveways or staff/patron parking areas unless authorized by the Construction Manager and Owner.
2. Traffic shall be maintained over a reasonably smooth traveled surface which shall be so marked by signs, delineators, guide devices, barriers, pavement markings and other methods that a person who has no knowledge of conditions may safely and with a minimum of discomfort and inconvenience ride, drive, or walk, day or night, over all or any portion of the work under construction where traffic is to be maintained. Installation, moving, and removing of any such delineators or guiding devices shall be included.
    a. All reflective delineators, markers, or barriers shall be provided as specified in the New York State Manual of Uniform Traffic Control Devices.
3. Schedule and coordinate work to minimize the impact that removal of existing concrete, pavements and / or facilities shall have on Owner and public.

B. Each Contractor shall repair any damage to concrete and pavements caused by construction operations and the installation of temporary signs, railings, etc. necessary for the maintenance and protection of traffic.

C. Each Contractor shall employ a sufficient number of competent flagmen and/or temporary traffic lights to ensure safe passage of vehicular, equipment, and pedestrian traffic. Flagmen shall wear approved safety equipment and vests in conformance with the New York State Manual of Uniform Traffic Control Devices.

D. The General Construction shall provide temporary markings approved by the Construction Manager and Architect in the event that permanent markings may not be installed. In order not to inhibit bonding of permanent pavement markings, said locations shall be offset an appropriate distance from the location of permanent pavement markings.

E. Existing signs, markers, and delineators lost or damaged because of negligence on the part of the Contractor shall be replaced at the Contractor's expense.

F. The General Construction shall provide all street sweeping and / or clean up as required of roads, parking lots, and entrances to remove construction related dirt and debris on a daily basis, or as directed by the Construction Manager.

3.12 DUST AND EROSION PROTECTION

A. Not used

3.13 TEMPORARY STORAGE

A. Storage space is limited and will be permitted only in areas designated by the Construction Manager in advance. No indoor storage outside of current swing space rooms is allowed within the building.

B. Each Contractor is responsible for protection of their own stored materials, both interior and exterior. This includes removal and / or protection from snow, ice, rain, dirt, or other damage. All construction materials shall be stored in a safe and secure manner. Contractor shall assume full responsibility for the protection and safekeeping of products under this Contract stored on the site and shall cooperate with the Construction Manager to ensure security for the Owner's property. Fences around construction supplies or debris shall be maintained. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

C. Each Contractor shall obtain and pay for the use of additional storage or work areas needed for their operations.

D. Materials and/or assemblies that are sensitive to temperature and/or moisture, shall be stored in climate controlled facilities. If a contractor has no climate controlled facility, notify the Construction Manager well ahead and arrangements will be made at the Owner's expense.

3.14 TEMPORARY CLIMATE CONTROL

A. The Mechanical Contractor shall provide one temporary heater in each active swing rooms during the months of October through April. Temporary heaters shall be simple unit heaters suspended from the roof structure and connected to existing heating hot water main with Pex piping. Electric Contractor shall provide temporary electric. Upon completion of each swing room remove all temporary materials.

3.15 TEMPORARY USE OF ELEVATORS FOR HOISTING OR WORKERS

A. No existing or new elevators shall be used for transportation of materials or workers without the written consent of the Construction Manager.

Temporary protection is required if any contractor uses the elevator. Protection can not be kept in place during occupied hours of the school (installation and removal of protection daily). Any damage will be repaired by the school's elevator contractor and back charged to responsible contractor via change order.

3.16 TEMPORARY COVERED WALKWAYS

A. Not used

3.17 TEMPORARY STAIRS AND RAILINGS

A. Not used

3.18 TEMPORARY POWER AND LIGHTING

A. The Electrical Contractor shall carry an allowance of $20,000.00 to provide and maintain temporary power and lighting throughout all areas of the project during the entire construction phase for use by all Contractors. All costs associated with utility usage shall be the responsibility of the Owner.

B. The Electrical Contractor shall provide temporary construction power for building areas utilizing temporary power distribution panels centrally located for all Trade Contractors use.

1. Provide all conduit, wire, transformers, panelboards, circuit breakers, etc. necessary to establish and maintain temporary electrical services. Coordinate the locations to minimize the need to relocate temporary panels.
2. All temporary power distribution equipment shall utilize lockable covers, handles, or branch devices.
3. Each Contractor must supply drop cords, extensions and ground fault interrupters for their own work.

C. The Electrical Contractor shall provide, maintain, and remove all temporary lighting throughout all areas of the project during the entire construction phase for use by all Trade Contractors.

1. Lighting should be in accordance with OSHA minimum requirements.
2. Temporary light bulbs and any damaged temporary lights shall be replaced on a daily basis.

D. Comply with the National Electrical Code, OSHA and applicable local codes and utility regulations.

E. Do not overload circuits. Verify capacity of circuit prior to use. All receptacles to be GFCI protected.

3.19 TEMPORARY PHONES

A. Each contractor will make their own provisions as they require at their own expense and independent from the Owner’s phone system from a phone service in the vicinity of the construction trailer staging area.

PART 4 - EXECUTION

4.1 GENERAL

A. Temporary facilities shall be installed in accordance with applicable codes, or as directed by the Construction Manager.

B. Maintain temporary facilities throughout the construction period.
C. Contractor installing temporary facilities shall be responsible to remove them when they are no longer required or when directed by the Construction Manager.
D. Repair damage to the project site caused by the installation of temporary facilities, or as directed by the Construction Manager.
E. Any temporary protection that is removed by a Trade Contractor in order to undertake and / or complete their work, shall be reinstalled in its original form following the completion of the Work.

4.2 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

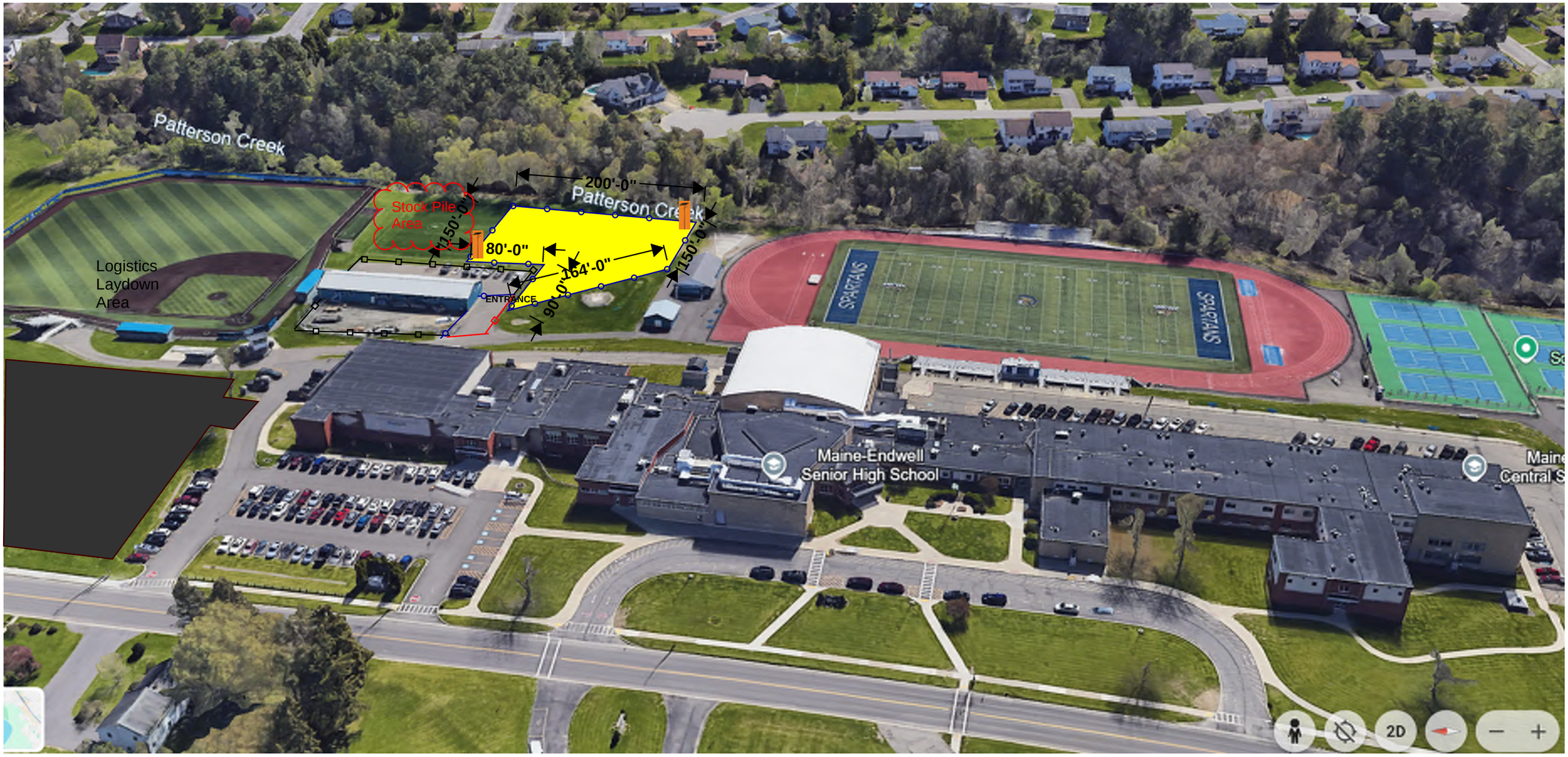
B. Each Prime Contractor shall provide facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

END OF SECTION 015100

ATTACHMENT "A" page 1/6

ME CSD 2022 Capital Improvement Project
Ph 4 High School
Logistics Plan
LP-01 08/05/2025

Scope of Work: Strip topsoil (35,400SF). Do not interfere with discus enclosure. Cut site 12". Install woven reinforced mariflex. Install total 12" compacted #2 crushed stone. Proof roll. SWPP requirements at topsoil pile. 6' High temporary panelized perimeter chain link fence with dunnage sand bags (bags to be maintained/replaced as needed), 20' swing gate (834 LF). Stabilized construction entrance. Removals and restoration including fence, spreading and grading topsoil, seeding (include line striping).



ATTACHMENT "A" page 2/6

Ph4 HS- GC-01 Logistics Area Legend

Existing Fence to remain.

New Fencing: 6'-0" panelized fence continuous around Logistics Area Perimeter.

Existing Fence to be Relocated for Project and Re-isntalled in original position upon completion.



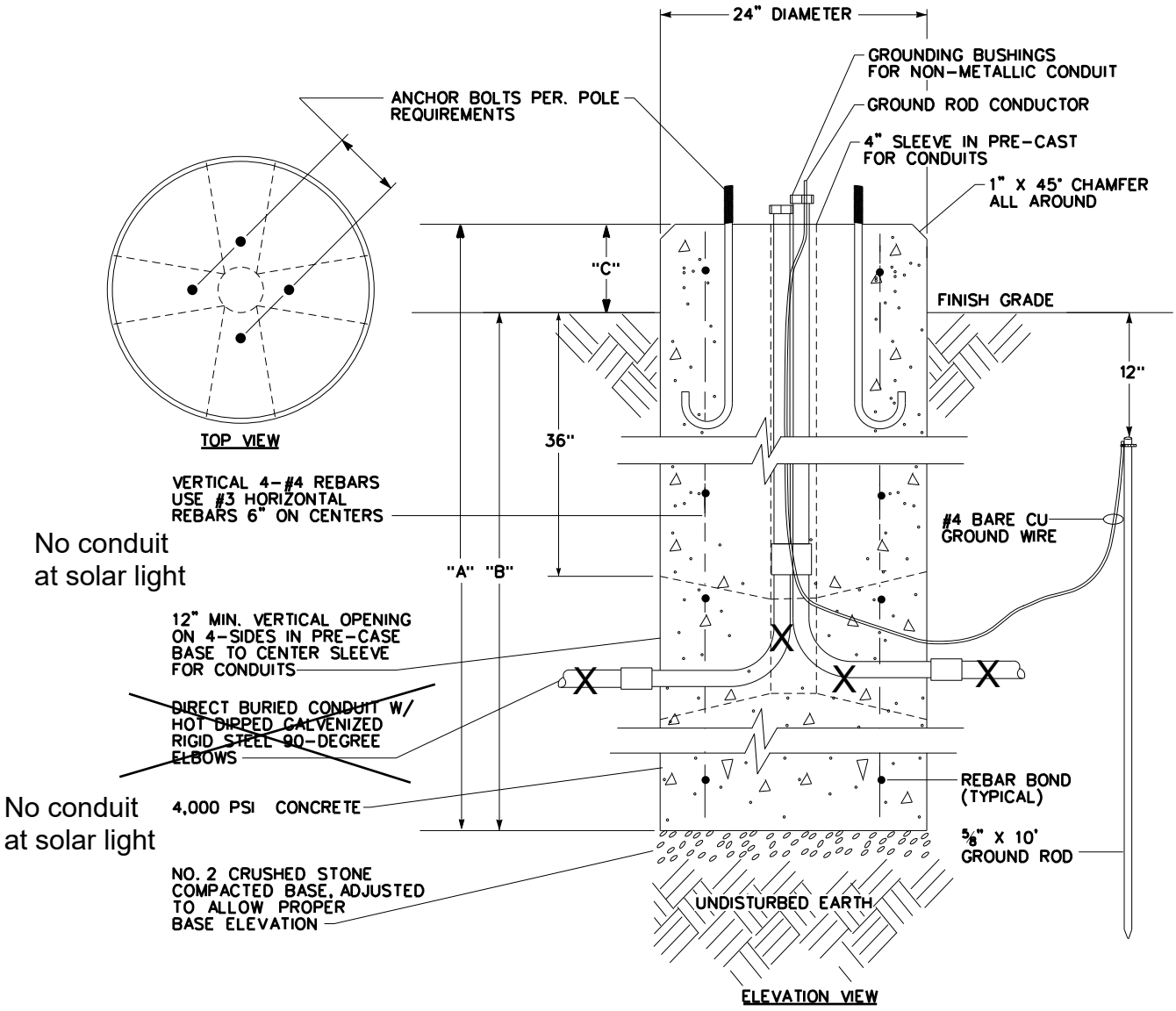
Solar Powered Light Pole and Base: Fonroche- CK Twin SmartLight Twin CK16B, or equivalent.
20Ft. Round Tapered Pole-Anchor Base-2 Nominal Height 20'
Refer to attached Cutsheet.

Precast Concrete Base: 24" diameter x 7'-0" (1'-0" above grass area) with ground rod conductor conduit.

The intent is to mount 2 solar light poles and bases in the Logistics Area at the beginning of the project and to remove and relocate the 2 lights to the South DO Parking Lot at the end of the project.

GC-01 to include all associated excavation and back fill, pre-cast bases, solar lights and programming, erection, grounding, relocation of lights and restoration in their bid.

ATTACHMENT "A" page 3/6



CONCRETE POLE BASE SIZE REQUIREMENTS			
POLE BASE LOCATION	OVERALL HEIGHT "A"	BELOW GRADE "B"	ABOVE GRADE "C"
GRASS AREAS	7'-0"	6'-0"	1'-0"
INSIDE PAVED AREAS	8'-0"	5'-0"	3'-0"

CONCRETE SITE LIGHTING POLE BASE DETAIL 5

NTS

M-E CSD South Lot Solar Light
Detail 5/E9.00 from Phase 1
11/3/23

ATTACHMENT "A" page 4/6



FONROCHE lighting AMERICA

Autonomous Solar Street Light

SMARTLIGHT TWIN CK 16B



Project: G7243-Endwell NY- Maine-Endwell School

Notes: Panels require clear, unshaded solar acess to the South

Fixture	Temp	Type	HS	Solar	Power Center	Option	Pole	Color (Pole)	Color (Fixture)	Tilt Panel
2[CK 16B	4K	T4	-	]-[P310F	3P	HW-MC	20Ft. Round Tapered Pole-Anchor Base-2-4FT Arm	BK	BK	45

The Most Reliable Solar Lighting in the World

We keep our solutions simple with Smartlight—one proven, powerful solar light that meets a wide range of needs. Its unique black solar panel looks elegant, day or night. No hanging wires or bulky battery box. No solar panel that looks like a high school science project. We use powerful components and smart controls to provide all the energy you need in a sleek package, so you can count on all-night lighting all year around.

175,000
SmartLight Systems Installed Worldwide

365
Nights of Lighting per Year Guaranteed

5 Years
Warranty, Including the Battery With No Pro-Rating

$0
Zero Trenching Cost, Zero Electric Bills and Zero Maintenance for 10 Years



Fonroche Lighting America • 4900 David Strickland Rd.. • Ft. Worth, Texas 76119
www.FonrocheSolarLighting.com • 339-225-4530 Ext. 1 • Sales@Fonroche.US

CK Twin SmartLight

Twin CK 16B ATTACHMENT "A" page 5/6

FONROCHE lighting AMERICA

Luminaire Product Code	Color Temp	Distribution	Color	House Side Shield Option	Weight Lbs Ea.	EPA Ft² Ea.
2[CK 16B	3000K, 4000K	T2,T3,T4	Black	NA	7	.26
Custom						

Solar Module Assembly Product Code / Description		Dimensions Solar Module	Module Frame & Back Sheet
P160F	160W PolyCrystalline Solar Module with Steel Mount - Tilt Adjustment (0,10,25 or 45 Degree) Mount Galvanized and Powder Coated. IEC 61730-1:2019 and IEC 61215-2:2017 Includes Hydrophobic Coating	43.31 x 33.46 x 1.57	Black
P270F	270W PolyCrystalline Solar Module with Steel Mount - Tilt Adjustment (0,10,25 or 45 Degree) Mount Galvanized and Powder Coated IEC 61730-1:2019 and IEC 61215-2:2017 Includes Hydrophobic Coating	66.93 x 40.55 x 1.81	Black
P310F	310W PolyCrystalline Solar Module with Steel Mount - Tilt Adjustment (0,10,25 or 45 Degree) Mount Galvanized and Powder Coated IEC 61730-1:2019 and IEC 61215-2:2017 Includes Hydrophobic Coating	66.93 x 42.13 x 1.57	Black

Heavy Duty Mount Adder (Required with 45 degree tilt)	
HW-MC	Heavy Duty Mount Galvanized with Marine Powder Coat Upgrade

Power 365 Assembly Product Code / Description	
1P	Power 365 Power Center with 312 Wh NiMH Battery Capacity -IP65
2P	Power 365 Power Center with 624 Wh NiMH Battery Capacity-IP65
3P	Power 365 Power Center with 936 Wh NiMH Battery Capacity-IP65
4P	Power 365 Power Center with 1248 Wh NiMH Battery Capacity-IP65

Batteries	
Chemistry	Nickel Metal Hydride
Operating Temperature	-40°C to +70°C
Warranty	5 Year Full Replacement
Certifications	EN 550 14-1 ; EN 55014-2 ; EN 61000-6-2 ; EN 61000-6-3

Controller
Battery Management System (BMS)
Anti-Black Out Control
3-Level Programmable Lighting Profiles

System Warranty and Certification	
System Warranty	5 Years
Solar Performance Warranty	25 Years
System Certification	CE

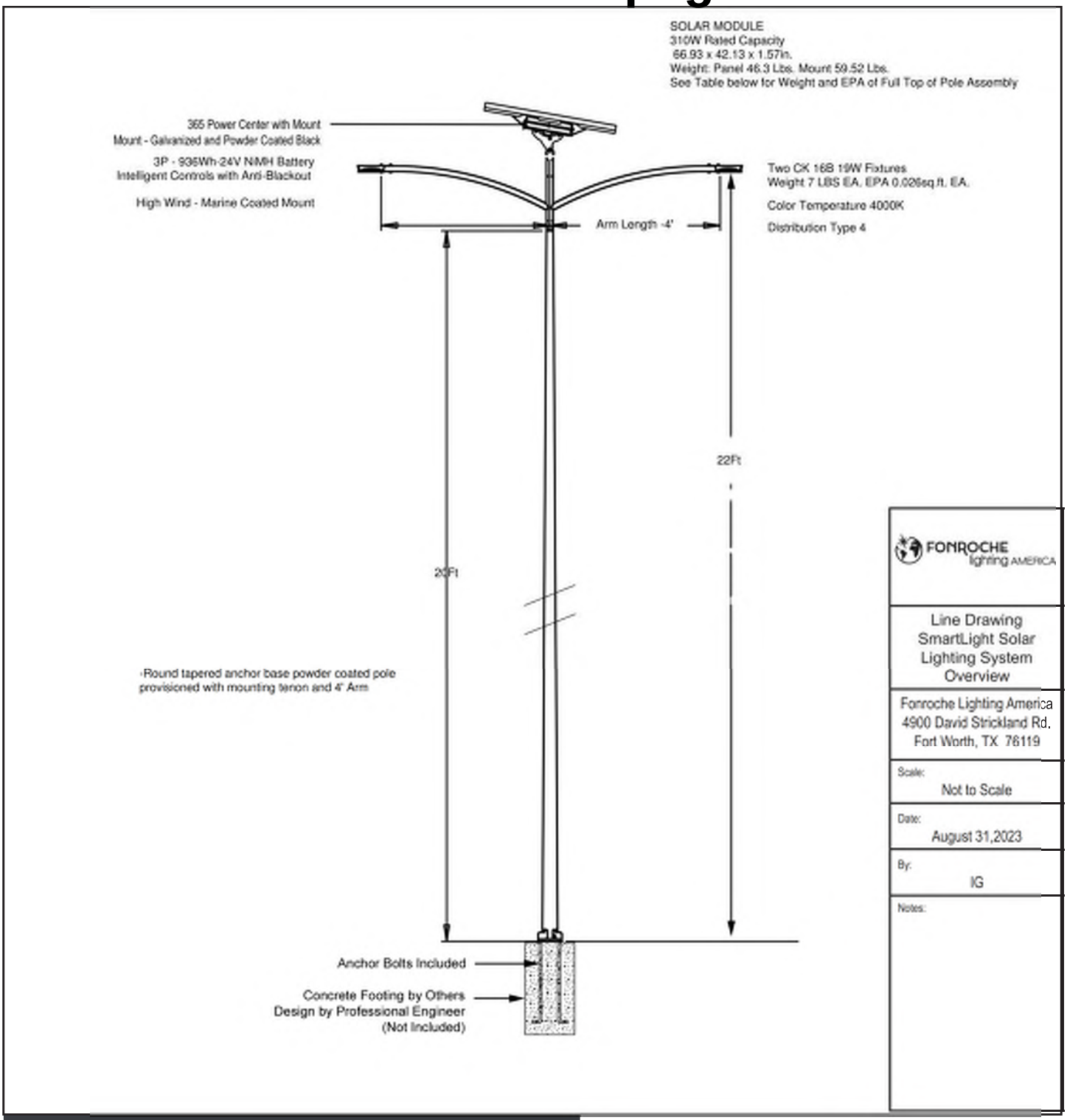
Total Top of Pole Assembly - Panel, Mounting, 365 Power Center

	Weight (Pounds)				EPA (Sq.Ft.)		
Solar Assembly	1P	2P	3P	4P	10° Tilt	25° Tilt	45° Tilt
P160F-HW-MC	102.73	113.31	123.89	134.48	2.67	3.89	7.45
P270F-HW-MC	120.37	130.95	141.53	152.12	4.10	7.24	13.93
P310F-HW-MC	120.37	130.95	141.53	152.12	4.12	7.38	14.36

Pole Selected Based on Project Conditions		Mounting Height
Product Code / Description	Nominal Height	4' or 6' Arm
14Ft. Round Tapered Pole-Anchor Base-2	14'	16'
20Ft. Round Tapered Pole-Anchor Base-2	20'	22'
25Ft. Round Tapered Pole-Anchor Base-2	25'	27'
14Ft. Round Tapered Pole-Direct Burial-2	14'	16'
20Ft. Round Tapered Pole-Direct Burial-2	20'	22'
25Ft. Round Tapered Pole-Direct Burial-2	25'	27'
CST - Pole		

[2[CK 16B	- 4K	- T4	-	]-[P310F	- 3P	]- HW-MC	- 20Ft. Round Tapered Pole-Anchor Base-2-4FT Arm	- BK	- BK	45
Fixture	Temp	Type	HS	Solar	Power Center	Option	Pole	Color (Pole)	Color (Fixture)	Tilt Panel

ATTACHMENT "A" page 6/6



TOTAL TOP OF POLE ASSEMBLY - PANEL, MOUNTING, 365 POWER CENTER

	Weight (Pounds)				EPA (Sq.Ft.)		
Solar Assembly	1P	2P	3P	4P	10° Tilt	25° Tilt	45° Tilt
P160F-HW-MC	102.73	113.31	123.89	134.48	2.67	3.89	7.45
P270F-HW-MC	120.37	130.95	141.53	152.12	4.48	7.24	13.93
P310F-HW-MC	120.37	130.95	141.53	152.12	4.48	7.38	14.36

FONROCHE lighting AMERICA

[2[CK 16B	- 4K	- T4	-	]-[P310F	- 3P	]- HW-MC	- 20Ft. Round Tapered Pole-Anchor Base-2-4FT Arm	- BK	- BK	45
Fixture	Temp	Type	HS	Solar	Power Center	Option	Pole	Color (Pole)	Color (Fixture)	Tilt Panel

Maine Endwell CSD- 2022 C.I.P. Ph 4 High School

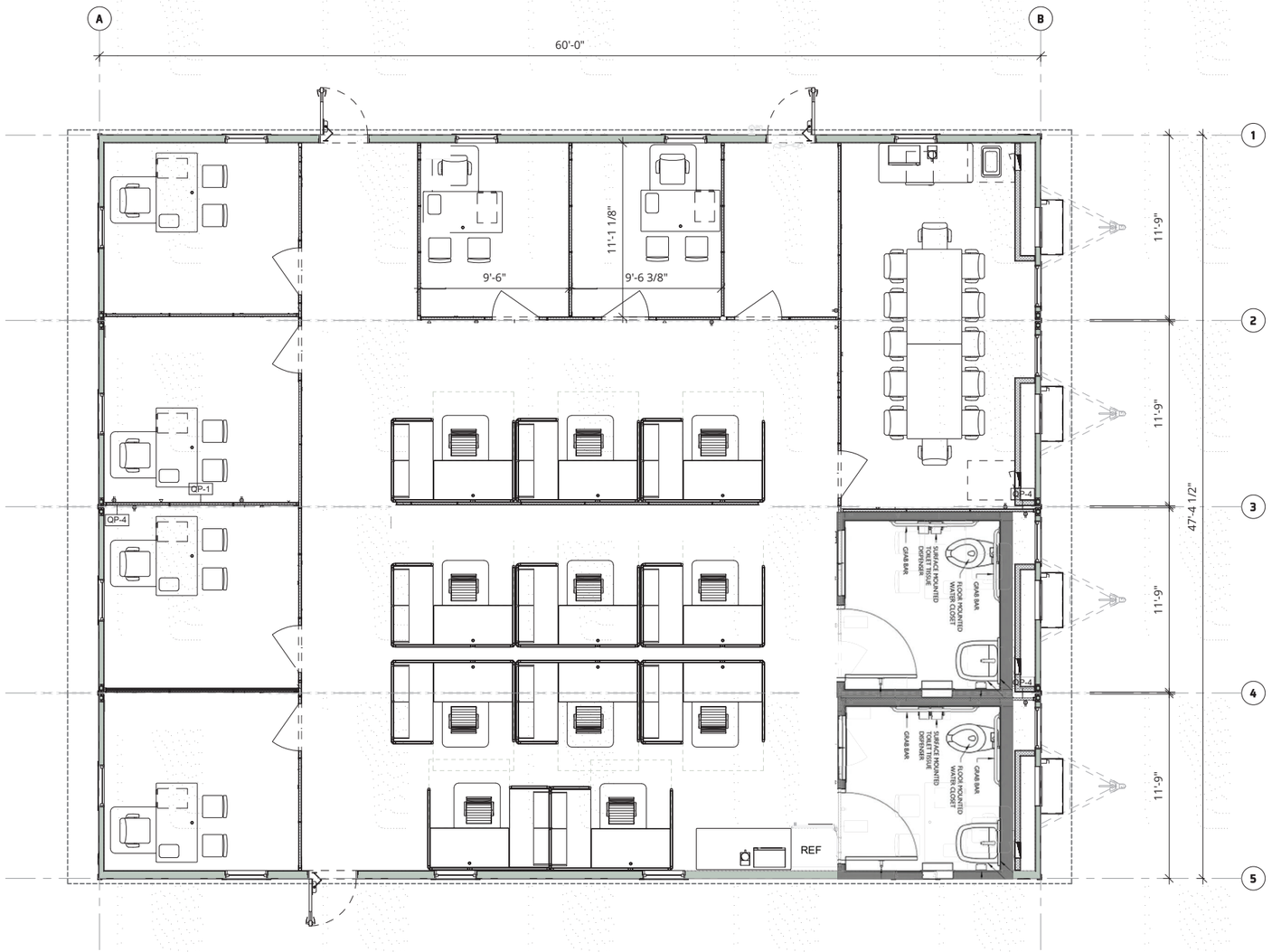
District Office Temporary Office Trailer Layout Site Plan

07.03.2025

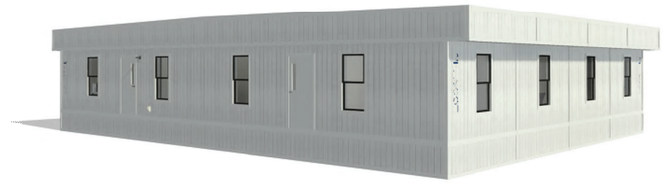
Attachment "B" 1/3



Attachment "B" 2/3



1 **FLOOR PLAN**
1/4" = 1'-0"



2 **3D View 1**



3 **3D View 2**

ELECTRICAL NOTES
-100 AMP NYSEG service to existing panel board.
-Each office to have 2 ea 2x4 light fixtures on Switch.
-Each office to have 4 duplex 20 amp receptacles and 3 data drops (phone, data & printer).
-

ISSUE	DATE	DESCRIPTION

FLOOR PLAN - 3-D

A-101

Attachment "B" 3/3

Modular Office Trailer Specifications

Rental Pricing Per Billing Cycle

64x48 Modular (60x48 Box)

Restroom - Standard

Prof. Entrance - Steps w/ Canopy

ADA/IBC Switchback Ramp - 36ft & Larger

Data Hub - Rental

Minimum Lease Billing Period: 9

Billing Cycle : Monthly

Estimated Delivery And Installation

Ramp - Knockdown & Return

Delivery - 12' wide

Return - 12' wide

Essentials Delivery Charge

Standard Complex Setup and Anchor

Standard Complex Skirting Removal

Standard Complex Vinyl Skirting

Standard Complex Knockdown

Delivery - Wide Load Escorts

Delivery - Wide Load Permits

Return - Wide load Escorts

Return - Wide load Permits

Fuel Surcharge Delivery

Fuel Surcharge Return

Ramp - Delivery & Installation

Recommended Items	Billing Frequency	Qty
Professional Cubicle Package	Recurring	10.00
Premium 4-Office/1-Conf. Package	Recurring	1.00
Premium Office Package	Recurring	2.00

SECTION 016000 – NYSED UNIFORM SAFETY STANDARDS FOR SCHOOL CONSTRUCTION (SECTION 155.5 REGULATIONS)

1.0 PART 1 - GENERAL

A. "The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy."

B. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos. Note, the project folder should contain a letter regarding the presence of asbestos.

C. "General safety and security standards for construction projects.

1. All construction materials shall be stored in a safe and secure manner.

2. Fences around construction supplies or debris shall be maintained.

3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.

5. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites."

6. No smoking is permitted on public school property, including construction areas.

7. Do not block fire exits or emergency egress windows with construction materials, equipment, or debris.

8. Each Contractor shall seal penetrations they make in floors or walls with fire resistant material.

9. Each Contractor shall cover temporary openings to prevent accidents, and to stop the possible spread of spilled liquids, construction dust, or fire.

D. "Separation of construction areas from occupied spaces. Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and containments into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or containments. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy-duty plastic sheathing may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.

1. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.

2. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

3. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session."

E. A plan detailing how exiting required by the applicable building code will be maintained.

F. A plan detailing how adequate ventilation will be maintained during construction.

G. "Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken."

H. "The contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline, or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes."

I. "The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied."

J. Adequate Ventilation During construction: Maintain existing ventilation systems in full functional operation in all areas of the building that are to be occupied during construction periods. No work shall be performed on systems serving occupied areas. Coordinate and schedule work on such systems with Owner to allow relocation of program activities prior to construction.

K. "Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied". Note, it is our interpretation that the term "building', as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.

L. Exterior work such as roofing, flashing siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

M. Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions of occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site facilitated by the Construction Manager.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

a. Contractor's superintendent.
b. Trade supervisor responsible for cutting operations.
c. Trade supervisor(s) responsible for patching of each type of substrate.
d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit two copies signed by professional engineer.

1.6 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect/Engineer of locations and details of cutting and await directions from Architect/Engineer before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to

confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017301 - SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for selective demolition.

B. Refer to other Sections for specific requirements and limitations applicable to selective demolition pertaining to individual parts of the Work.

1. Requirements of this Section apply to all Prime Contracts; refer to appropriate divisions for other requirements.

1.3 DEFINITIONS

A. Cutting: Physical modification of construction work, both new and existing, or removal of existing or installed materials necessary to permit installation or performance of other Work, including but not limited to; cutting, drilling, chopping, excavating, saw-cutting, trenching, backfill and compaction and other similar operations.

B. Patching: Restoration, replacement and installation of construction material, both new and existing, required to restore surfaces to original conditions and maintain fire rated assemblies after installation of other Work.

C. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain. Owner reserves the right to claim any or all salvaged material.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

E. New to remain: Protect all new construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 SUBMITTALS

A. Selective Demolition Plan: Submit a plan describing procedures at least 10 days before the time selective demolition will be performed for review and coordination. Include the following information:

1. Dates: Indicate when selective demolition will be performed.

2. Utilities: List utilities that selective demolition procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
3. Structural Elements: Where selective demolition involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
4. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing to Construction Manager that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
5. Schedule of selective demolition activities indicating the following:
    a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
    b. Interruption of utility services.
    c. Coordination for shutoff, capping, and continuation of utility services.
    d. Use of stairs and means of egress.
    e. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of other work.
6. Pre-demolition Photographs or Video recording: Show conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit to Construction Manager before Work begins.
7. Record drawings at Project closeout.
    a. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.5 QUALITY ASSURANCE

A. Perform removal work in careful workmanship manner with skilled labor protecting existing adjacent surfaces to remain.

B. Notify affected utility companies before starting work and comply with their requirements.

C. Pre-demolition Conference: If needed, conduct conference on site to review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

D. Requirements for Structural Work: Do not selectively demolish structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

E. Operational and Safety Limitations: Do not selectively demolish operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

F. Visual Requirements: Do not selectively demolish construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been selectively demolished in a visually unsatisfactory manner.

G. Costs caused by out of sequence work prematurely installed, defective work, or work not conforming to the Contract Documents, including costs for additional services of the Construction Manager and Architect/Engineer, will be paid for by the party responsible for out of sequence, rejected or non-conforming work.

H. Miscellaneous Elements: Do not selectively demolish the following elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise and vibration-control elements and systems.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition operations, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.
2. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain, demolished materials shall become the Contractor’s property and shall be removed from the site with further disposition at the Contractor’s option.
3. Carefully remove and salvage each item or object in a manner to prevent damage of new construction.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be selectively demolished and conditions under which selective demolition are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

B. Verify that utilities have been disconnected and capped.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

E. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly notify the Construction Manager and Architect for direction.

F. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

3.2 UTILITY SERVICES

A. If needed, maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition
2. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to Mechanical and Electrical Specification Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during selective demolition to prevent damage. Provide protection from adverse weather conditions for areas that might be exposed during selective demolition operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

E. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

F. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

G. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

H. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
   1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
   2. Protect existing site improvements, appurtenances, and landscaping to remain.
   3. Provide temporary weather protection, during interval between demolition and installation of new construction, to ensure that no water leakage or damage occurs to structure or interior areas.
   4. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.

I. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.

   1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

   1. Do not use water when it may damage new construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.

3.5 PERFORMANCE

A. General: Employ skilled workers to perform selective demolition. Proceed with selective demolition at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by selective demolition operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
5. Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

3.7 CLEANING

A. Sweep the building broom clean upon completion of selective demolition operation.

END OF SECTION 017301

SECTION 017310 - CUTTING AND PATCHING

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

B. Refer to Mechanical and Electrical Specification Sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

C. Each Prime Contractor shall refer to Specification Section 01 10 00 Summary of Work for additional Cutting and Patching requirements.

1.2 SUMMARY

A. This Section specifies the requirements for cutting, patching, demolition and alteration work without limiting the generality implied by the Specifications and Drawings. Refer to Section 01 10 00 for summary / scope of work.

B. Work of this Section applies to Each Prime Contractor and its Subcontractors. Prime Contractor and their Subcontractors shall provide required labor, materials, equipment, layouts, and other information for the cutting, patching, and alteration work shown, specified, or as implied to complete the work as described in this Specification Section or as indicated on the Contract Documents.

1.3 DEFINITIONS

A. Cutting and Patching covers adjustments to, and necessary reworking of, elements of construction in both new and existing work. The following definitions for cutting and patching apply to all Contracts.

1. Cutting: Physical modification of construction work, both new and existing, or removal of existing or installed materials necessary to permit installation or performance of other Work, including but not limited to; cutting, drilling, core-drilling, chopping, excavating, saw-cutting, trenching, backfill and compaction and other similar operations.

2. Patching: Restoration, replacement and installation of construction material, both new and existing, required to restore surfaces to original conditions and maintain fire rated assemblies after installation of other Work.

1.4 DESCRIPTION

B. Unless otherwise noted, each Prime Contractor shall be responsible for all cutting and patching, required in conjunction with the work of their contract and to:

1. Be familiar with all the Contract Documents, including other trades, to determine the extent of the cutting and patching requirements to be performed.

2. Ensure all components fit properly.
3. Remove out of sequence work installed prematurely.
4. Remove and correct defective work and work not conforming to requirements of Contract Documents.
5. Provide equipment, labor, materials, and incidentals necessary for cutting and patching as required for the installation of new work.

C. Coordination:
   1. Coordinate the installation of work with the work of other Contractors to minimize cutting and patching.

D. In addition to contract requirements, upon written instructions of the Construction Manager:

   1. All new work must be inspected prior to enclosing. If inspection has not been conducted, Contractor shall uncover newly installed work to provide for Construction Manager and Architect/Engineer's observation.

E. All Contractors shall bare the responsibility not to cut or otherwise alter the Owner's property or any separate Contractors' work except with the written consent of the Owner and of such separate Contractor. The Contractor shall not un-reasonably withhold from the Owner or any separate Contractor, consent to cutting or otherwise altering the work.

A. Each Contractor shall perform cutting and patching required for the installation of the work of their contract except where specifications or drawings specifically indicate otherwise. Each Contractor shall be responsible to review all the Contract Drawings for all trades to determine the extent of the cutting and patching that is required to install the work of their contract.

   1. Demolition, Cutting and Patching as indicated and as necessary to install new work in reconstruction areas of the existing building as indicated and in the new additions to the building as indicated.

   2. Salvage of Materials for reuse in the project, or where directed by the Construction Manager, salvage and delivery of specific items to Owner for its use where indicated or for use by Prime Contractor and Subcontractor for work of their trades as directed. The materials which are in good condition and which are specifically noted on the drawings for reuse in the project, shall be carefully removed and delivered to the Owner's Representative on the premises where directed, except for such items as the Owner may declare to be the Contractor's property to be legally disposed of offsite by the Contractor.

   3. Each Prime Contractor shall bear the cost of all cutting and patching required by and for the installation of their work unless otherwise indicated on the drawings or in the specifications. This shall include but not limited to the following:

      a. Cut existing architectural / structural components of the existing building as required for the installation of new work.

      b. Patch to match existing architectural / structural features after the new work has been installed by the contractor's work forces or work performed by other contractors.

c. Any modification to structural components required for pipes or conduits to pass through will require approval by the Architect and Structural Engineer.

d. Each Prime Contractor or their Subcontractor is responsible for the actual cutting, capping, removing, relocating or otherwise making safe equipment, systems, or components of the systems that relate to their Scope of Work.

e. Drilling or core drilling shall be performed by the respective trade requiring it for the installation of their equipment, systems or components of their systems.

f. Review existing building conditions and access to install equipment in the required locations. Systems to be installed in any areas with difficult access may need to be provided in sections. If it is deemed necessary to perform cutting and patching to facilitate access to certain areas to systems, then the responsibility of cutting and patching shall be by the contractor responsible for that system.

g. Furnish and set all sleeves for penetrations in new and existing construction. Contractors shall provide the sleeves as specified, along with an accurate layout of the location of where these sleeves are to be placed. These sleeves shall be numbered, and that number shall correspond to the location of the sleeve shown on the layout drawing.

h. Fire safe all penetrations through fire rated construction created due to the work of their contract. All penetrations through rated construction shall be sealed fire safe by a UL listed approved method. Patching of fire rated assemblies shall be made using new materials equal to the fire rating of the new or existing assembly.

1.5 SUBMITTALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

B. Any modification to structural components will require approval by the Architect and Structural Engineer.

1.6 QUALITY ASSURANCE

A. General: Structural and other conditions shall be verified with the Architect before proceeding with cutting, demolition and alterations work. Inspect structures prior to start of Work and notify the Architect in writing of any conditions detrimental to the execution of the Work.

B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

C. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

E. Costs caused by out of sequence work prematurely installed, defective work, or work not conforming to the Contract Documents, including costs for additional services of the Construction Manager and Architect/Engineer, will be paid for by the party responsible for out of sequence, rejected or non-conforming work.

F. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
   1. Water, moisture, or vapor barriers.
   2. Membrane and flashings.
   3. Exterior curtain-wall construction.
   4. Equipment supports.
   5. Piping, ductwork, vessels, and equipment.
   6. Noise and vibration-control elements and systems.

1.7 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

2.0 PART 2 - PRODUCTS

2.1 MATERIALS FOR REPLACEMENT OF WORK REMOVED

A. Materials for each trade or specialty involved in alterations, cutting, and patching shall be furnished and installed as specified in the respective specification sections or as specifically indicated on the drawings.

B. Where materials and installation are required but not specified, use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials. Samples of material finish or color are required for Architect’s approval.

C. Supplement relocated materials where required to complete work of the project with similar materials.

3.0 PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect existing condition of work, including elements subject to movement or damage during removal of adjacent materials.

1. Photograph existing damage, which could be misconstrued as damage resulting from the Work of this Contract. State location and date of photograph and file with the Architect prior to starting work.

B. After uncovering work, inspect conditions affecting installation of new products.

3.2 PREPARATION: PRIOR TO CUTTING

A. Provide shoring, bracing and support as required to maintain structural integrity of project.

B. Provide protection for materials on adjacent surfaces.

C. Provide protection when work will be exposed to the elements.

D. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operation. Each Prime Contractor is responsible to cover and protect furniture, equipment, etc. not being used in rooms where furniture and equipment will remain during Contractor working hours.

E. Take all precautions necessary to avoid cutting existing pipe, conduit, or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. Remove and store in protected location, material, which is to be reused and relocated.

B. Cutting shall be done in a manner that will not adversely affect the strength of the building. Holes and openings shall be neatly cut so as to provide a finished appearance and shall be patched around the edge where required for a finished appearance.

C. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances and finishes.

D. Restore work, which has been cut or removed. Provide new products to complete work in accordance with requirements of Contract Documents.

E. Refinish entire surfaces as necessary to provide an even finish:
   1. Continuous Surfaces: to nearest intersections.
   2. Assembly: entire refinishing.

F. Fill and patch openings and holes in existing construction when bolts, piping, ducts, conduit and other penetrating items are removed.

G. Visual requirements: Do no cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

H. Fire resistive integrity: Where holes or gaps remain from removed elements, fill void using solid fire resistive materials full depth of structure; terminate below finishes to allow new finish to be installed (see patching). Maintain the fire resistive and structural integrity of the structures.

I. Firestopping: All products used for through-penetration firestop systems shall be tested and meet all federal, state, and local codes.

J. Cutting: cut existing construction use methods least likely to damage elements to be retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

   1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. To avoid marring existing surfaces, cut or drill from the exposed or finished side into concealed surfaces.
   3. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or diamond core drill.

K. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

   1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
   2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. Where removal of walls or partitions extends from one finished are to another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new.
   4. Patching around piping and penetrations: Provide firestopping at perimeter of penetrations for smoke-tight seal to maintain integrity of fire resistive and smoke barrier qualities.
   5. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch, after the patched area has received primer and second coat.
   6. Patch, repair, or rehang existing ceiling as necessary to provide an even plane surface of uniform appearance.
   7. Where cutting or removal of Asbestos Containing Materials (ACM) on hydronic, domestic, storm or sanitary piping occurs, patching of insulation is required.

3.4 CLEANING

A. Daily cleaning of alteration areas of the building shall be the responsibility of each Prime Contractor.

B. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely, paint, mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

C. Dust generated by cutting and patching shall be controlled in a manner so as to prevent infiltration into occupied spaces. Contractor(s) responsible for dust infiltrating the existing duct systems shall bare the cost of cleaning these systems.

D. Demolished Materials shall be removed from the project site at frequent intervals. Piles of demolished materials will not be allowed to accumulate.

END OF SECTION 017310

SECTION 017400 - PROGRESS CLEANING

1.0 PART 1 - GENERAL

1.1 RELATED DCOUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the requirements for clean up requirements.

1.3 DESCRIPTION

A. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.

B. All occupied portions of the facility affected by the construction activity shall be cleaned at the close of each workday. No exceptions, All contractors on site each day will be responsible for cleaning up debris produced from their tasks.

C. Upon Substantial Completion of Work, remove balance of waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all exposed surfaces; leave project clean and ready for occupancy.

1.4 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with safety and insurance standards.

B. Hazards Control
   1. Store volatile wastes in covered metal containers and remove from premises daily.
   2. Prevent accumulation of wastes that create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, cement slurry or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into streams or waterways.

2.0 PART 2 - PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

3.0 PART 3 - EXECUTION

3.1 DURING CONSTRUCTION

A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials, DUST and rubbish.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust. Erect dustproof barriers to keep dust from drifting through the building.

C. Each day Contractor shall affect the following:
   1. Areas of intense activity, such as cutting and sawing must be swept clean and reorganized at the end of each day.
   2. Areas of moderate activity such as installation of plumbing, ductwork, electrical work must be returned to good order at the end of each day.
   3. Debris below scaffolds (and shoring/reshoring) must at all times, be kept sufficiently consolidated to keep walkways free of tripping hazards. These work areas must also be swept clean immediately upon removal of scaffolds.
   4. All swept up debris, waste materials, and packing must be removed and/or placed in the dumpster ~~by noon of the following workday.~~ No later than the end of each shift.
   5. All stored material must be kept in good order.
   6. As portions of the work are completed, all used and excess materials must be removed promptly.
   7. Daily clean-up and good housekeeping is the responsibility of each Contractor individually and will be monitored by the Construction Manager.
   8. Contractors shall promptly comply with requests to organize scattered materials.
   9. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
   10. At no times are waste or debris to be stored on the roof overnight and / or end of shift.

D. Separate and recycle as required by local authorities and regulations.

E. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights. The General Construction Contractor shall provide and maintain a trash chute at the existing buildings for use by all trades.

F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

G. Excess concrete, block, terrazzo mix, mortar or grout is the responsibility of the Contractor to remove from the site. These materials or like materials are not allowed to be buried on site.

H. Each Contractor working on site shall provide the Construction Manager with one worker as required by the Construction Manager to perform clean up at the site.

I. If a contractor does not keep up with daily clean-up/housekeeping, after notice from the CM, the CM will acquire a cleaning service and back charge the contractor for that amount via deduct

change order.

3.2 FINAL CLEANING

A. Each Contractor shall provide complete the final cleaning of all work installed under this Scope of Work, prior to acceptance by the Construction Manager and the Architect, and prior to the Owners occupancy.

B. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight exposed interior and exterior finished surfaces; polish surface so designated to shine finish.

C. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces

D. In preparation for substantial completion or occupancy, the Owner and Construction Manager will conduct an inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

E. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION 017400

SECTION 017700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the process and requirements for project closeout procedures for all Contractors.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor:
   1. Submit written notice through Construction Manager that Project, or designated portion of Project, is substantially complete.
   2. Submit list of major items to be completed or corrected and a list of all material to be turned over to the Owner.

B. Architect/Engineer in conjunction with Construction Manager will make an inspection within a reasonable time after receipt of notice.

C. Should Architect/Engineer consider that work is substantially complete:
   1. Architect/Engineer shall prepare and issue a Certificate of Substantial Completion, AIA G704, complete with signatures of Owner and Contractor, accompanied by Contractor's list of items to be completed or corrected, as verified, and amended by Architect/Engineer.
   2. Owner occupancy of Project or designated portion of Project:
      a. Contractor shall:
         i Cooperate with Construction Manager to obtain permanent/temporary certificate of occupancy.
         ii Perform final cleaning.
      b. Owner will occupy Project, under provisions stated in Certificate of Substantial Completion.
   3. Contractor shall complete work listed for completion or corrections prior to Owner occupancy.

D. Should Architect/Engineer consider that work is not substantially complete:
   1. Architect/Engineer shall immediately notify Construction Manager and Contractor, in writing, stating reasons.
   2. Contractor shall complete work and send second written notice to Architect/Engineer through Construction Manager, certifying that Project, or designated portion of Project, is substantially complete.
   3. Architect/Engineer will reinspect work.

1.4 FINAL INSPECTION PROCEDURES

A. Contractor shall submit written certification that:
   1. Contract Documents have been reviewed.

2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
5. Project is completed and ready for final inspection.
6. Owner's designated staff have been instructed on all equipment and systems and an Owner signed receipt furnished to the Construction Manager
7. All project record documents "As-Builts" have been submitted to the Architect/Engineer.
8. Operational and Maintenance Manuals have been submitted to the Architect/Engineer.
9. Owner has received the specified spare parts and maintenance items. A signed receipt by Owner representative shall be provided to the Architect/Engineer and/or Construction Manager.
10. All warranties and guarantees have been submitted to the Architect/Engineer.

B. Architect/Engineer will make final inspection within a reasonable time after receipt of certifications.

C. Should Architect/Engineer consider that work is not finally complete:
   1. Architect/Engineer shall notify Construction Manager and contractor, in writing, stating reasons.
   2. Contractor shall take immediate steps to remedy the stated deficiencies and send second written notice to Architect/Engineer through construction manager certifying that work is complete.
   3. Architect/Engineer will re-inspect work.

1.5 REINSPECTION COSTS

A. Should Architect/Engineer be required to perform second inspections because of failure of work to comply with original certifications of Contractor, Owner will compensate Architect/Engineer for additional services and deduct amount paid from final payment to Contractor.

B. All Contractors are required to complete all "punch list" items and all "close out" requirements within 30 (thirty) calendar days after substantial completion. If the Architect and Construction Manager are required to provide additional services, extend the duration of services to the Owner and/or perform additional inspections because the Contractor fails to comply with the requirements of the Contract, or the Contractor did not complete the work in accordance with the construction schedule, the amount of compensation paid to the Architect/Engineer and Construction Manager by the Owner for additional services shall be deducted from the final payment to the Contractor. If the Contractor does not complete the punch list work within 30 (thirty) calendar days after substantial completion, the Owner and Construction Manager retain the right to hire another Contractor to complete the punch list on a time and material bases and deduct the cost of completing this work and any and all other remaining punch list work items and deduct such cost from the Contractor's application for payment.

1.6 CLOSEOUT SUBMITTALS

A. Project Records Documents: Section 01 78 00.
Operating and Maintenance Data / Demonstration and Training: Section 01 78 10.
Warranties and Guarantees: Section 01 78 20

B. Spare Parts and Maintenance Materials: Conform to requirements of individual technical sections.

C. Deliver evidence of compliance with requirements of governing authorities.
    1. Certificates of Inspection
        a. Elevators.
        b. Plumbing
        c. HVAC
        d. Electrical
            i. NYBFU
        e. Others if required

D. Deliver Certificate of Insurance covering the warranty period as specified in the Contract Documents.

E. The Asbestos Abatement Contractor shall supply the following in addition to all other items listed herein:
    1. Physical/Exams and Worker Acknowledgment.
    2. All testing and lab results.
    3. Transportation and disposal records.

1.7 FINAL APPLICATION FOR PAYMENT

A. Refer to Specification 01 29 00 for final application for payment requirements.

END OF SECTION 017700

SECTION 019113 – COMMISSIONING REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning (Cx) is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall coordinate components of the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

B. The intent of the commissioning on this project is to fulfill the commissioning requirements of C408 of the 2020 Energy Conservation Construction Code of New York State (ECCCNYS). This overview is provided to outline those requirements and detail the responsibilities of all parties.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing Contractors to provide a finished and fully functioning product.

1.2 RELATED SECTIONS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

B. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 230593 – Testing and Balancing

2. Section 230923 – Temperature Controls

3. Refer to Section 230010 for additional requirements related to Operation and Maintenance Manuals.

4. Refer to section 230593 for additional testing and balancing requirements.

1.3 ABBREVIATIONS. The following are common abbreviations used in these Specifications.

A/E-	Architect and Design Engineer	FT-	Functional Performance Test
BACS-	Building Automation Control System	CM-	Construction Manager
CA-	Commissioning Authority	TAB-	Test and Balance
Cx-	Commissioning		
Cx Plan-	Commissioning Plan		

1.4 COORDINATION

A. Commissioning Team.

1. The commissioning team members shall include Commissioning Authority, the Owner's Construction Manager/Project Manager (CM), the Architect and Design Engineers, and the various construction contractors on the project with work associated with the systems to be commissioned ("contractor"). This generally includes, but may not be limited to representatives from the General Contractor (GC), the Mechanical (HVAC) Contractor(s) (MC), the Plumbing Contractor (PC), the Testing and Balancing Contractor (TAB), the Controls Contractor (CC), the Electrical Contractor (EC) and any other installing Subcontractors or suppliers of equipment. The Owner may designate facilities staff as members of the commissioning team.

2. The contents of these specifications describe the roles and responsibilities for each of the traditional commissioning team members. In the event that individuals serve multiple roles, the responsibilities shall equally apply.

B. Management.

1. The CA shall be provided directly by the Owner. The CA directs and coordinates the commissioning activities and reports to the CM and Owner. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling.

1. The CA shall work with the CM according to established protocols to schedule commissioning activities. The CA shall provide sufficient notice to the CM for scheduling commissioning activities. The CM shall regularly update the CA regarding construction progress, changes to commissioned systems, and expected completion. The CM shall inform the CA a minimum of 14 days in advance when initial start-up appointments are scheduled for commissioned systems. The CM shall integrate all commissioning activities into the master schedule and shall maintain an adequate window of time for each required activity. All parties shall address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan. The Commissioning Plan provides guidance in the execution of the commissioning process.

1. The CA shall distribute a draft Commissioning Plan in an industry standard format to the Commissioning Team as early as practical in the construction process.

2. Based on construction observations, changes in project scope or at the discretion of the CA, the commissioning plan may be updated throughout the construction process and during actual testing procedures as necessary to adequately validate the operation of systems being commissioned.

3. The commissioning plan shall contain, as a minimum:

   a. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.

   b. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.

   c. Functions to be tested, including, but not limited to, calibrations and economizer controls.

   d. Conditions under which the test will be performed. Testing shall affirm winter and summer design conditions and full outside air conditions.

   e. Measurable criteria for performance.

B. Commissioning Process. The following provides a brief overview of typical construction phase commissioning tasks and the general order in which they occur.

1. Commissioning during construction begins with the ongoing development of the Commissioning Plan by the CA. This includes formalizing testing procedures and processes.

2. A Pre-Commissioning meeting may be conducted by the CA. The commissioning testing procedures are reviewed at this time and opened for comment by additional team members.

3. Additional meetings may be required during construction to plan, coordinate, schedule future activities, and resolve issues. The additional meetings will be scheduled through the CM with necessary parties attending.

4. Appropriate documentation and communication paths (project dependent) are developed with all team members.

5. The CA will perform (three (3)) progress compliance inspections to determine deviations from contract documents, construction issues which may adversely affect the ability to commission the systems, and / or make recommendations to improve project outcome. In the event that observations require clarification from other members of the Commissioning Team, these requests for information shall be placed in writing and become part of the commissioning record.

6. Detailed equipment start-up procedures for major equipment shall be submitted to the CA for review and comment. Depending on project complexity, the CA may attend selected equipment startups, and shall be notified a minimum of 14 days prior to their scheduled date.

7. The CA develops specific equipment and system Functional Performance Test procedures and forms. These shall be presented within the Commissioning Plan or separate associated document package.

8. The Functional Performance Tests are executed by the Contractors under the direction of the CA. The CA documents functional performance test results.

9. Items of contract non-compliance in material, installation or setup are documented by the CA and forwarded in appropriate report format for correction at the Contractor's expense. Non-compliance issue resolutions shall be documented in a Commissioning Issues Log (or other acceptable format) by the CA. This log shall be maintained throughout the project, and include items noted during site inspections and functional performance testing.

10. Prepare a preliminary report of commissioning test procedures and results. Report is to be certified as a complete summary of findings and shall be forwarded to the Engineer for review and comment prior to being provided to the building Owner or Owner's Representative. Failure to provide this report in a timely manner may delay building occupancy. The report shall contain the following:

    a. Clearly labeled as "Preliminary Commissioning Report".

    b. Organized with mechanical and service hot water findings in separate sections to allow independent review.

    c. Itemization of deficiencies found during testing that have not been corrected at the time of report preparation.

    d. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.

    e. Climatic conditions required for the performance of deferred tests.

11. Seasonal or other deferred testing may be required to optimally test the systems and shall be conducted as required for system performance verification. These tests, and participation by all commissioning team members, shall be provided at no additional costs to the Owner.

12. The CA prepares a final report to document the results of the commissioning process. The final report shall be provided to the Owner or Owner's Representative within 90 days of receipt of the certificate of occupancy.

1.6 RESPONSIBILITIES

A. The general roles and responsibilities of the primary Cx team members toward the Cx process are outlined in this section. Other various additional startup activities related to the Cx process reside in the specific sections for equipment (boilers, chillers, etc), systems (Temperature controls), or activities (testing and balancing).

B. Architect (of A/E)

1. Construction and Acceptance Phase:

a. Attend any pre-commissioning scoping meeting and selected commissioning team meetings.

b. Perform usual and customary submittal review and construction observation.

c. Provide design narrative documentation requested by the CA necessary to clarify design intent.

d. Coordinate resolution of system deficiencies identified during commissioning, according to the Contract Documents.

e. Review and approve the O&M Manuals

C. Mechanical, Plumbing and Electrical Designers/Engineers (of the A/E)

1. Construction and Acceptance Phase:

a. Attend commissioning scoping meetings and other selected commissioning team meetings.

b. Perform usual and customary submittal review and construction observation.

c. Review TAB Strategies and Procedures Plan submittal, forward approved copy to Commissioning Agent for their use.

d. Provide design narrative and sequence documentation requested by the CA. The designers shall assist (along with the Contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

e. Participate in the resolution of system deficiencies identified during commissioning, according to the Contract Documents.

f. Review the Preliminary Commissioning Report, append any necessary comments, and transmit document to the Owner for record. Failure to review and transmit this manual to the Owner in a timely manner may delay final inspections and occupancy.

g. Review and approve the MEP/FP component of the O&M Manuals.

h. Approve air and water systems balancing reports.

i. Provide technical review and assistance to the Owner and Architect regarding CA comments reflecting upon the Commissioning Activities.

D. Commissioning Authority (CA)

1. Construction and Acceptance Phase:

a. Coordinate and direct the commissioning activities in a logical, sequential, and efficient manner using technical expertise, consistent protocols and forms, centralized documentation, clear and regular communications/consultation with all necessary parties, and frequently updated timelines/schedules.

b. Coordinate the commissioning work and, with the CM, ensure that commissioning activities are being scheduled into the master schedule.

c. Develop the Commissioning Plan document that describes construction phase commissioning activities.

d. Plan and conduct a pre-commissioning meeting and other commissioning meetings as needed.

e. Review and comment upon approved TAB Strategies and Procedures Plan. Where ambiguities exist, request clarifications from the Engineer.

f. Where project complexity indicates, attend the Testing and Balancing Conference.

g. Before startup, review the current control sequences and interlocks and work with Contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.

h. Perform three (3) site visits to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

i. Write the Functional Performance Test procedures and develop test forms for equipment and systems.

j. Analyze any functional performance trend logs and monitored data to verify performance.

k. Supervise manual Functional Performance Tests with installing Contractors. Coordinate retesting as necessary until satisfactory performance is achieved.

l. Maintain a master Commissioning Issues Log and testing records. Communicate test results and non-compliance issues to the CM. Recommend actions to resolve non-compliance issues.

m. Compile and maintain the Commissioning Record Manual.

n. Review, spot validate, and certify the accuracy and completeness of the lighting controls testing performed by the Electrical Contractor (see section(s) 260923 and paragraphs C408.3 through C408.3.2 of the 2020 Energy Conservation Construction Code of New York State for testing and documentation requirements).

o. Provide a final Commissioning Report providing the following information:

1) Organized with mechanical and service hot water findings in separate sections to allow independent review.

2) Disposition of deficiencies found during testing, including details of corrective measures used or proposed.

3) Outcome of deferred tests that could not be performed at the time of preliminary report preparation because of climatic conditions, and the conditions under which the tests were performed.

4) Functional performance test procedures used during the commissioning process, including measurable criteria for test acceptance (provided in report for repeatability).

2. Warranty Period:

a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

E. Construction Manager - Owner's Project Manager (CM)

1. Construction and Acceptance Phase:

a. Facilitate the coordination of the commissioning work by the CA. Maintain commissioning activity in the master schedule. For successful commissioning it is critical that the master schedule clearly denote adequate time frames for each of the following work segments:

1) Completion and startup of all mechanical equipment

2) Completion and pre-commissioning of temperature control systems (reference 230923.1.11

3) Completion of Testing and Balancing of HVAC Systems

4) Functional Testing of HVAC and remediation of Issues Log findings. **Functional testing shall not commence until the CA has received complete confirmation of and / or startup reports for all HVAC equipment from the Mechanical contractor and completed pre-commissioning forms from the Temperature Controls Contractor. The CA may, at their discretion, proceed with functional testing prior to receipt of a fully certified testing and balancing report, approved by the Engineer of Record.**

b. Review the final Construction Phase Commissioning Plan.

c. Coordinate and attend a pre-commissioning meeting and other commissioning team meetings.

d. When requested by the CA, observe startup and functional testing of selected equipment.

e. Coordinate the resolution of non-compliance and design deficiencies.

f. Review Commissioning Issues Log and follow up Contractors to achieve resolution of non-compliance issues.

g. Furnish a copy of all Contract Documents, as-built documents, addenda, change orders, approved submittals, and shop drawings related to commissioned equipment to the CA.

2. Warranty Period:

a. Assist the CA as necessary in the seasonal or deferred testing and

b. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

F. Contractors

1. Construction and Acceptance Phase:

a. The Contractors shall provide all tools or the use of tools to start, check-out, and functionally test equipment and systems.

b. Execute commissioning responsibilities according to the Contract Documents and schedule.

c. A representative shall attend a pre-commissioning meeting and other necessary meetings scheduled by the CM and CA to facilitate the Cx process.

d. Provide to the CA detailed start-up procedures, all requested submittal data, and specific Owner responsibilities required to keep warranties in force.

e. Execute Functional Performance Tests under the direction of the CA. The CA documents the Functional Performance Test process and results.

f. Correct non-compliance issues.

g. Prepare O&M Manuals according to the Contract Documents; clarify and update the original control sequences to as-built conditions.

2. Warranty Period:

a. Execute seasonal or deferred Functional Performance Testing, witnessed by the CA, according to the specifications.

b. Correct non-compliance issues and document resolutions in the Commissioning Issues Log and make necessary adjustments to O&M Manuals and as-built drawings for applicable issues identified in any seasonal testing.

G. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.

2. Assist in equipment testing per agreements with Contractors.

3. Include all special tools and instruments (e.g., tools only available from vendor or specific to a piece of equipment) required for testing equipment according to these Contract Documents.

4. Provide information requested by CA regarding equipment control sequences and testing procedures.

5. Review test procedures for equipment installed by factory representatives.

H. Owner (or Owner's Authorized Representative)

1. Construction and Acceptance Phase:

a. A representative shall attend a pre-commissioning meeting and other necessary meetings scheduled by the CM and CA to facilitate the Cx process.

b. Assist to the extent necessary with access and scheduling for testing of mechanical and service hot water systems.

c. Provide transmittal to the Code Official that acknowledges receipt of the Preliminary Commissioning Report. Failure to provide transmittal may delay final inspection and occupancy of the project. On request by the Code Official, release a copy of the Preliminary Commissioning Report for Code Official review, or authorize the CA to do so on behalf of the Owner.

1.7 SYSTEMS TO BE COMMISSIONED

Option 1 Example:

A. All energy consuming equipment as schedule on contract drawings.

B. All newly installed or modified / existing HVAC Control Systems as described on contract drawings and within Specification Sections 230923.

C. Lighting System Controls shall be tested by the contractors as described under section (s) 260923, Lighting System Functional Testing. The testing reports shall be provided to the commissioning authority upon completion for spot verification and inclusion in the project Commissioning Report.

2.0 PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required Functional Performance Testing shall be provided by the Division Contractor for the equipment being tested. For example, the mechanical (HVAC) Contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure and humidity sensors shall have an accuracy of + or - 2.0% of the value being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

3.0 PART 3 - EXECUTION

3.1 MEETINGS

A. Commissioning Scoping Meeting. The CA (through the CM) shall schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA (through the CM) as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Contractors. The CA will plan these meetings and will minimize unnecessary time being spent by the Contractors.

3.2 REPORTING

A. The CA will coordinate commissioning meetings and activities through the CM. The CA will develop and maintain the Commissioning Issues Log to document non-compliance issues and deficiencies noted throughout the Cx process. The CA will regularly submit the Commissioning Issues Log to the CM who is responsible for communicating deficiencies to the responsible Contractors and coordinating resolution to issues. The CM and all Contractors are responsible for detailing the resolution of issues in the Commissioning Issues Log and returning it regularly to the CA as issues become resolved.

B. A preliminary commissioning report shall be generated meeting the requirements of paragraph 1.5.B.10.

C. A final commissioning report shall be generated meeting the requirements of paragraph 1.6.D.1.m.

3.3 START-UP AND INITIAL CHECKOUT

A. The Contractor responsible for the purchase of the equipment shall attach completed manufacturer's detailed start-up and checkout procedures and the Contractor's normally used field checkout sheets.

B. Sensor and Actuator Calibration. In lieu of specifications to the contrary, all field-installed control components and sensors (e.g., temperature, relative humidity, CO_2, pressure) and all actuators (e.g., dampers and valves) on all equipment shall be pre-commissioned as described within section 230923.1.11. The following general format shall be used by the contractor for recording all calibration results. Alternate methods and recording formats may be used if approved by the A/E and CA. All test instruments shall have had a certified calibration within the preceding 12 months.

Temperature Controls Pre-Commissioning Checklist					
Project Name:					
IBC Project #:					
SED Project #:					
Analog Inputs					
Equipment	Point Name	Sensor Range	Reference Reading	Sensor Reading	Testing Method
Analog Outputs					
Equipment	Point Name	Output Range	Visual Verification	Upstream Temp	Downstream Temp
Binary Inputs					
Equipment	Point Name	Verified Closed Status	Verified Open Status	Associated Binary Output	
Binary Outputs					
Equipment	Point Name	Enable/Disable Verified	Associated Binary Input	Hard Wire Interlocks Tested	

C. Pre-Commissioning shall include completion of the following additional items. The Controls Contractor, via the Construction Manager, shall provide a notice to the Commissioning Authority certifying that the following have been completed and are ready for testing.

1. Communication Network Startup – All controllers and integration with factory controllers shall be completed.

2. Graphical User interface – the GUI shall be completed and ready for review for compliance with section 230923.

3. Software – The contractor shall certify that the software meets the requirements of the contract documents and is ready for functional testing.

D. Functional testing shall not proceed until pre-commissioning as described under this paragraph, including the notice of certification to the Commissioning Authority are complete, reviewed and accepted by both the CA and the A/E.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. The commissioning activities described in the Functional Performance Tests as contained in the commissioning plan shall be performed by the contractor under the direction of the CA. Each task shall be assigned to the appropriate trade, generally the specific contractor providing the equipment. Only skilled tradesmen knowledgeable in the operation of the equipment and systems shall be perform the each of the FT requirements.

B. Objectives and Scope. The objective of Functional Performance Testing is to demonstrate that each system is operating according to the documented Design Intent and Contract Documents. Functional Performance Testing facilitates bringing systems from a state of substantial completion to full dynamic operation. During the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

C. In general, each system will be operated through all critical modes of operation (e.g., seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verify each action and response documented in control sequences. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. may also be tested.

D. Test Methods.

1. Functional Performance Testing and verification may be achieved through a combination of manual testing (manual manipulation of the equipment and observation performance), monitoring field performance data and analyzing the results using the control system’s trend log capabilities or by stand-alone dataloggers.

2. Setup. Each function and test shall be performed under conditions that simulate actual conditions as closely as is practicable. The tradesmen executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. Upon completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition. In the event that commissioning leads to changes in the baseline control setpoints and / or parameters, these shall be closely documented by the CA and forwarded to the Owner and A/E team for technical evaluation.

3. Coordination and Scheduling. The Contractors via the CM shall provide sufficient notice to the CA regarding their completion schedule for the Pre-Commissioning activities and startup of all equipment and systems.

    a. In general, functional testing is conducted after control system Pre-Commissioning and startup and Testing and Balancing have been satisfactorily completed. The control system is to be sufficiently tested before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing to be is completed and debugged before functional testing of air-related or water-related equipment or systems

4. Problem Solving. The CA may recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, GC, Contractors and A/E.

3.5 DOCUMENTATION, NON-COMPLIANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all Functional Performance Tests using the specific procedural forms developed for that purpose.

B. Lighting control systems shall be tested by the Division 26 contractor as described in Section(s) 260923 and documented on the forms provided therein. The completed test forms shall be provided to the CA for field verification (on a spot-check basis) and inclusion in the project commissioning record.

C. Non-Compliance.

1. The CA shall record the results of the Functional Test on the test form. All deficiencies or non-compliance issues shall be noted and reported to the CM via a Commissioning Issues Log, developed by the CA.

2. Minor deficiencies identified during testing may be corrected during testing at the discretion of the CA. In such cases the deficiency and resolution will be documented on the Commissioning Issues Log.

3. Every effort will be made to expedite the testing process without compromising the integrity of the test procedures. However, the CA shall not be pressured into overlooking deficiencies or loosening acceptance criteria to satisfy scheduling or cost issues unless the Owner provides a written request to do so.

4. Each deficiency identified during testing shall be recorded on the Commissioning Issues Log. The CM shall coordinate resolution of any deficiencies. Any disputes regarding the validity of or responsibility for correcting a deficiency shall follow these guidelines:

    a. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.

    b. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

    a. The cost for the CA to retest / re-verify a Functional Test, after a second round of testing on a piece of equipment shall be provided by the party responsible for the defect or deficiency. In the event that multiple parties are responsible for test failures, any cost recovery for retesting shall be negotiated with the CM and subsequently assigned to the responsible parties.

6. Any required retesting by any Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

7. Failure Due to Manufacturer Defect. If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, all identical units may be considered unacceptable by the CA. In such case, the Contractor shall provide the Owner with the following:

    a. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.

    b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

    c. The CM shall determine whether a replacement of all identical units or a repair is acceptable.

    d. Two examples of the proposed solution shall be installed by the Contractor and the A/E and CA shall be allowed to test the installations for up to one week, where after the A/E, taking into account information provided by the CA shall decide whether to accept the solution.

e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

3.6 DEFERRED TESTING

A. Seasonal / Deferred Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design conditions) shall be completed as part of this contract. The CA shall note in the final commissioning report where environmental conditions did not allow for definitive results, or where testing could not be completed, and a description of requirements to complete the functional testing with a plan for implementation. The Owner and CM shall coordinate this activity with the Contractors. The results of this testing shall be forwarded to the CA to update the Commissioning Report. Any final adjustments to the O&M Manuals and as-built drawings due to the testing shall be made by the contractors.

END OF SECTION 019113

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:

a. Loose furniture, display cabinets, and other similar non-permanent fixtures.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 24 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. Remove and Salvage:

1. The Owner reserves the right to salvage materials or equipment they deem of value or able to be reused.

END OF SECTION 024119

SECTION 028213 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. The asbestos abatement work will consist of the removal and disposal of non-asbestos materials, asbestos containing materials and asbestos contaminated materials at the Maine-Endwell Central School District High School as a part of the Maine-Endwell CSD 2022 CIP – Phase 4 Senior High School Project (SED Project Number 03-11-01-06-0-010-030) .

B. Reference Drawings D X0.00, D X0.01, D X0.02, D X0.03, D X0.04 and D X0.05 for asbestos abatement notes, locations, quantities, and details. Reference the Bid Package "Information Available to Bidders" section for the Pre-Renovation Asbestos Survey Report.

C. Abatement operations shall include, but not limited to, the removal of the following asbestos containing and asbestos contaminated materials:

Drawing	Location	Description of ACM Material	Approximate Quantity (SF/LF)
X0.01	Ground Floor Area D Rooms 032.2, 032.3, 032.4, 034 & 034.1	Pipe Insulation	58 LF
X0.02	Ground Floor Area E District Office	Asbestos Floor Tile / Mastic Pipe Insulation (Room A3A Only)	2,300 SF 2 LF
X0.03	1st Floor Area D Bathrooms 124 / 126 and Library 127 Entry Hall	Pipe Insulation	108 LF
X0.04	1st Floor Area E Rooms 144, 147 & 149	Pipe Insulation	74 LF
X0.05	2nd Floor Area D	Pipe Insulation	40 LF

1. Asbestos Containing Floor Tile and associated Asbestos Containing Mastic: Asbestos containing floor tile (VAT) and associated asbestos containing mastic to be removed is present in the Ground Floor Area E District Office at the locations shown on Drawing D X0.02 and referenced in the Table above. The total quantity of VAT / Mastic to be removed is approximately 2,300 square feet. All non-asbestos cove base and its associated non-asbestos mastic shall also be removed as a part of abatement operations. VAT / mastic shall be removed up to / flush with any walls, equipment, and casework that is scheduled to remain. For walls scheduled to be removed, the wall base plate and underlying VAT / mastic shall be removed as a part of abatement operations. VAT /

mastic abatement operations shall be performed in a large-project negative pressure enclosure having attached airlock systems and utilizing a remote decontamination enclosure system as per the requirements of 12 NYCRR Part 56 Subpart 56-11.7 for Non-friable Flooring and/or Mastic Removal and Applicable Variance A-3 (AV-A-3) if chemical and low-speed buffers are used for mastic removal.

2. Asbestos Containing Hard-Packed Pipe Fitting Insulation and Asbestos Containing In-line Pipe Insulation: The asbestos containing in-line pipe insulation and pipe fitting insulation (ACM TSI) to be removed is present on hot water heating system lines located in non-asbestos hard ceiling plenum spaces (1' x 1' splined & adhered tile ceilings, sheetrock / joint compound ceilings and plaster ceilings), non-asbestos suspended ceiling tile plenum spaces, and non-asbestos interstitial wall spaces / wall chases (sheetrock / joint compound / plaster / CMU walls & chases) in the rooms as shown on Drawings D X0.01, D X0.02, D X0.03, D X0.04 and D X0.05 and referenced in the Table above. It should be noted that the presence of ACM TSI above existing hard ceiling systems is assumed based on the fact that the ceiling plenum spaces above the hard ceilings are inaccessible. The associated HW Heating Line ACM TSI quantities listed for these areas are based on existing Building Mechanical Drawings. ACM TSI removal in the included rooms / spaces ranges from 2 linear foot to 72 linear feet in a given room, with a total / overall quantity of approximately 282 linear feet. Removal shall be performed via glovebag operations within multiple minor-project and small-project negative pressure tent enclosures having attached airlock systems for access / egress and utilizing a remote decontamination unit. The various non-asbestos suspended ceiling tile systems, 1' x 1' adhered / splined ceiling tile systems, sheetrock / joint compound ceiling systems and plaster ceiling systems are scheduled to be removed by other trades. The asbestos contractor shall be responsible for creating all wall / chase openings as necessary to access / remove the ACM TSI within interstitial wall spaces / chases. Coordinate with all other trades regarding the specific locations / limits of wall & chase openings. Reference the Architectural Drawing Series for the non-asbestos wall / chase types and restoration requirements at each location. If ACM TSI in addition to that shown on the abatement drawings and referenced in the Tables above is encountered during construction, it shall be removed utilizing one of the requested Unit Pricing items.

D. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.

E. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

1.3 SPECIAL JOB CONDITIONS

A. The Contractor may submit for a Site Specific Variance to accomplish the Project. Variance petition shall be submitted to the Owners Representative for review and approval prior to submission to the New York State Department of Labor (NYS DOL).

B. Work shifts and working hours shall be as necessary to complete the project in the required time frame and shall be submitted to the Owner's Representative for review/approval. The Contractor shall coordinate and schedule all Work with the facility, the Owner, and the Owner's representative.

C. Contractor is to provide add / deduct unit prices for the following items. Reference Section 012200 "Unit Prices for additional unit pricing information and requirements.

1. ADD and DEDUCT Unit Price No. 1 - Removal of Asbestos Containing In-Line Pipe and Pipe Fitting Insulation – Price(s) shall be based on removing up to 25 linear feet of fitting insulation utilizing glovebags in a Minor-Project Negative Pressure Tent Enclosure up to 10' x 10' in size. Provide Cost per Tent.

   Unit prices shall include removal of non-asbestos ceiling system or creating Wall / Chase openings as necessary to access ACM insulation, construction of minor-project tent enclosure / airlock systems, glovebag removal of up to 25 linear feet of fitting insulation, waste packaging / disposal, and all other applicable requirements of 12 NYCRR Part 56 for minor-project glovebag in tent removal.

2. ADD Unit Price No. 2 - Removal of Wall-mounted Board and associated Asbestos Containing Mastic Glue Pucks – Price shall be based on removing a single board wall-mounted board and associated asbestos containing mastic glue pucks (10 square feet per board) via gross removal within in a Minor-Project Negative Pressure Tent Enclosure up to 12'' x 3' in size. Provide Cost per Tent.

   Unit prices shall include construction of minor-project tent enclosure / airlock systems, , removal of wall-mounted board and up to 10 square feet mastic glue pucks from wall substrate, waste packaging / disposal, and all other applicable requirements of 12 NYCRR Part 56 for minor-project NOB ACM tent removal.

D. Owner will provide a tie-in location for electric and water source. The contractor will be responsible for providing GFCI electrical panel(s) and connecting to the building system as necessary for project power.

E. Any air sampling necessary to meet OSHA requirements will be the responsibility of the Asbestos Contractor.

F. Waste Dumpster locations shall be approved by the Owner's Representative. All dumpsters receiving RACM Waste shall be lined, enclosed and lockable (i.e. no open-to dumpsters).

G. Locations of all Airlocks and Decontamination Enclosure Units shall be approved by the Owner's Representative.

1.4 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56 (herein referred to as 12 NYCRR Part 56), 40 CFR 61, 29 CFR 1926, AHERA Regulations, 40 CFR Part 763 Subpart E and as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.

C. The Contractor must maintain current licenses pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.

D. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Code Rule 56.

E. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance

F. The Contractor shall be responsible for compliance with The New York State Uniform Fire Prevention and Building Code, or its successor during all Work at the site.

G. The contractor shall be responsible for any waste water permits required to perform his work under this contract. Any cost associated with waste water permits shall be included in his Bid.

H. The contractor shall be responsible for any Local City and/or State building permits required to perform his work. Any cost associated with building permits shall be included in his Bid.

I. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.5 SUBMITTALS

A. Reference the Front–end and Division 01 documents for submittal requirements/procedures.

B. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit the documents listed below for review and approval prior to the commencement of asbestos abatement activities:
   1. Contractor license issued by New York State Department of Labor.
   2. Progress Schedule:
      a. Show the complete sequence of abatement activities and the sequencing of Work for each floor.
      b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area and Floor.
   3. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
   4. Building Occupant Notification: As required by regulatory agencies.
   5. Abatement Work Plan: Provide plans that clearly indicate the following:
      a. All Work Areas/containments numbered sequentially.
      b. Proposed locations and types of all decontamination enclosures.
      c. Location of water and electrical connections to building services.
      d. Waste transport routes through the building to the waste storage container.
   6. Disposal Site/Landfill Permit from applicable regulatory agency.
   7. NYS Department of Environmental Conservation Waste Transporter Permit.

C. On-Site Submittals: Refer to Part 3.1.D for all submittals, documentation, and postings required to be maintained on-site during abatement activities.

D. Project Close-out Submittals: Within 15 days of project completion, the Contractor shall submit an electronic pdf format copy of the documents listed below for review and approval prior to the Contractor's final payment.
   1. OSHA compliance air monitoring records conducted during the Work.

2. Daily progress log, including the entry/exit log.
3. Provide the Contractor's Acknowledgement Statement located in Appendix A of this specification section that lists all Workers used in the performance of the Project, including name and NYS DOL certification number. The Statement shall be notarized (Original notarized statement shall be sent to the owner).
4. Fully executed/signed Originals of all waste disposal manifests shall be submitted as per applicable State and Federal Regulations and time frame requirements.

1.6 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts.
2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
3. Environmental Consultant's duties, functions, and authority.
4. Contractor's Work procedures including:
   a. Methods of job site preparation and removal methods.
   b. Respiratory protection.
   c. Disposal procedures.
   d. Cleanup procedures.
   e. Fire exits and emergency procedures.
5. Contractor's required pre-work and on-site submittals, documentation, and postings.
6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
7. Temporary utilities.
8. Handling of furniture and other moveable objects.
9. Storage of removed asbestos containing and asbestos contaminated materials.
10. Waste disposal requirements and procedures, including use of the contractor's waste manifest.

C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.7 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
5. 29 CFR 1926, "Construction Industry" (OSHA)
6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)

8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
10. 40 CFR Part 763 Subpart E, “Asbestos-Containing Materials in Schools Rule”
11. TSCA Subchapter II: Asbestos Hazard Emergency Response (15 U.S.C. § 2641-2656)
12. 49 CFR 171-172, Transportation Standards (DOT)

C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL).
2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)

D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance
5. ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects.”

1.8 NOTICES

A. The Contractor shall provide notification of intent to commence asbestos abatement activities as indicated below.

1. If applicable, at least ten (10) Working days prior to beginning abatement activities, send written notification to:

U.S. Environmental Protection Agency
National Emissions Standards for Hazardous Air Pollutants (NESHAPS) Coordinator
26 Federal Plaza, New York, NY 10007.

The Contractor is required to send notification via mail or package delivery service that will provide proof of delivery and receipt.

2. At least ten (10) days prior to beginning abatement activities, submit notification to:

New York State Department of Labor
Division of Safety and Health, Asbestos Control Program.
State Office Campus, Building 12 - Room 454
Albany, NY 12240

Contractor shall print copy of electronic NYS DOL Notification Notice and post onsite.

B. The Contractor shall post and/or provide Building Occupant Notification at least 10 days prior to beginning abatement activities as required by Code Rule 56.

1.9 PROJECT MONITORING AND AIR SAMPLING

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall provide Project Monitoring and Air Sampling for the project.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall review and approve or disapprove all onsite submittals as required by section 3.01.

D. The Consultant shall staff the Project with a trained and certified person(s). This individual shall be designated as the Asbestos Project Monitor (APM).
   1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection of barriers and negative air system during non-working days).
   2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed .01 f/cc or background level.
      a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
      b. Standby time required to resolve the situation shall be at the Contractor's expense.
   3. The APM shall provide the following services:
      a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
      b. Provide abatement Project air sampling as required by applicable regulations and the Owner’s requirements. Sampling will include background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.
      c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
      d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner’s Representative.
      e. Monitor, verify, and document all waste load-out operations.
      f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
      g. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
   4. The following minimum inspections shall be conducted by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.
      a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
      b. Pre-Abatement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
      c. Work In-Progress Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.

d. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.

e. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation/critical barriers and equipment from the Work Area.

E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.

1. Unless otherwise directed by the Owner, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM). TEM clearance following AHERA protocols/methodology shall be followed for all large-project work areas.
2. Samples shall be collected as required by applicable regulations (New York State and/or AHERA) and these specifications. If Transmission Electron Microscopy (TEM) clearance air sampling is utilized by the owner, the clearance criteria and sampling protocols must be in compliance with AHERA. If PCM air sample analysis results exceed the satisfactory clearance criteria, then TEM analysis of the entire set of clearance air samples may be used, provided that a standard NIOSH/ELAP accepted laboratory analysis method is utilized that shall report each air sample result in fibers per cubic centimeter.
3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by Code Rule 56 shall be initiated. Notify all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by any delays.
4. The Environmental Consultant shall submit copies of all elevated air sample results collected during abatement and all final air clearance results to the Commissioner of Labor.

1.10 CONTRACTOR AIR SAMPLING

A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.

B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory, subject to approval of the Owner’s Representative.

D. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.

1.11 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
   1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
   2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
   3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.

B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner. The Project Supervisor shall be removed from the Project if so requested by the Owner.

C. The Project Supervisor shall maintain the bound Daily Project Log that also includes the entry/exit logs as required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log required by section 4.04 of the specifications.

D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.12 MEDICAL REQUIREMENTS

A. Before exposure to airborne asbestos fibers, provide Workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.
   1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
   2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within thirty (30) calendar days before or after the termination of employment in such occupations.
   3. Medical Examination records shall be maintained on site for each employee.

1.13 TRAINING

A. As required by applicable regulations, prior to assignment to asbestos Work instruct each employee with regard to the hazards of asbestos, safety and health precautions, and the use and requirements of protective clothing and equipment.

B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.1101. Provide respirator training and fit testing.

C. An onsite "tool box talk" is mandatory for all Contractor field personnel before the asbestos removal can begin. This talk will review Cornell University practices and procedures pertaining to asbestos control. Workers not complying with these specifications or Cornell University practices and procedures will be asked to leave the job.

1.14 RESPIRATORY PROTECTION

A. Select respirators from those approved by the Mine Safety and Health Administration (MSHA), and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.

C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day.

I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.15 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.
   1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
   2. Protect materials from unintended contamination and theft.
   3. Storage areas shall be kept clean and organized.

C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

1.16 TEMPORARY UTILITIES

A. Temporary shutdown of HVAC and lock out of electric power to abatement work areas shall be the responsibility of the contractor and shall be coordinated with the owner. If electrical circuits, machinery and other electrical systems in or passing through a given regulated abatement work area must stay in operation, the contractor shall isolate/seal the live electric as per the requirements of 12 NYCRR Part 56 Subpart 56-7.7.

B. The Owner will provide a tie-in location to building power for the Contractor's GFCI electric panel for project power. All temporary power to the work areas shall be brought in from outside the work area through a ground-fault circuit interrupter at the source. The contractor will be responsible for all temporary power (including the power required by the owner's representative for air sampling equipment). All operations associated with electrical service work (i.e. lockout, temporary power hook-up, etc.) shall be performed by a licensed electrician.

C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
   1. The entire Work Area shall be kept illuminated at all times.
   2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.

D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.

E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 PRODUCTS

2.1 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.2 SIGNS AND LABELS

A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.

1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend:

DANGER
ASBESTOS CANCER AND LUNG DISEASE
HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' AFF.

B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.

1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172:

RQ HAZARDOUS
SUBSTANCE
SOLID, NOS
ORM-E, NA 9188
ASBESTOS

3. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:

Generator Name
Facility Name
Facility Address

2.3 DAILY PROJECT LOG

A. Provide a Daily Project Log. The log shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Owner's Representative; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other New York State Department of Labor requirements.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. All persons entering and exiting the Work Area shall sign the log and include name, social security number, and time.

D. The Project Supervisor shall document all Work performed daily and note all inspections required by Code Rule 56, i.e. testing and inspection of barriers and enclosures.

2.4 SCAFFOLDING AND LADDERS

A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.

B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.5 SURFACTANT (AMENDED WATER)

A. Wet all asbestos-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

B. Approved Manufacturer:
1. International Protective Coatings Corp.: Serpiflex Shield
2. American Coatings Corp.: EPA 55 Asbestos Removal Agent
3. Certified Technologies: CerTane 2075 Penetrating Surfactant

2.6 ENCAPSULANT

A. Encapsulant shall be tinted or pigmented so that application when dry is readily discernible.

2.7 DISPOSAL BAGS, DRUMS, AND CONTAINERS

A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.

B. Provide 30 or 55 gallon capacity fiber, plastic, or metal drums capable of being sealed air and water tight if asbestos waste has the potential to damage or puncture disposal bags. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.

C. Containers and bags must be labeled in accordance with 40 CFR Part 61 NESHAPS and Code Rule 56. When the bags/containers are moved to the lockable hardtop dumpster from the waste decontamination system washroom, the bags must also be appropriately labeled with the date they are moved on the bag/container in waterproof markings.

D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.8 HEPA VACUUM EQUIPMENT

A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

2.9 POWER TOOLS

A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

2.10 POLYETHYLENE SHEETING

A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.

B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Should visible emissions or water leaks be observed outside the Work Area, immediately stop Work and institute emergency procedures per Code Rule 56. Should there be elevated fiber levels outside the Work Area, immediately stop Work, institute emergency procedures per Code Rule 56, and notify all employers and occupants in adjacent areas. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. Medical approval, fit test reports, and NYS DOL certificates shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.

C. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:
   1. Contractor license issued by New York State Department of Labor.
   2. Certification, Worker Training, Medical Surveillance:
      a. New York State Asbestos Handler certification cards for each person employed in the removal, handling, or disturbance of asbestos.

      b. NYS Department of Health Certificate of Asbestos Safety Training DOH-2832 for each person employed in the removal, handling, or disturbance of asbestos.

      c. Evidence that Workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.

      d. Documentation that Workers have been fit tested specifically for respirators used on the Project.

   3. Daily OSHA personal air monitoring results.
   4. NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.

5. NYS Department of Environmental Conservation Waste Transporter Permit.
6. Project documents (specifications and drawings.)
7. Notifications and variances (site specific and applicable.) Ensure that the most up-to-date notifications and variances are on-site.
8. Applicable regulations.
9. Safety Data Sheets for all supplies/chemicals used on the Project.
10. Approved Abatement Work Plan.
11. List of emergency telephone numbers.
12. Magnahelic manometer semi-annual calibration certification.
13. Supervisor's Daily Project Log.
14. Entry/Exit Logs.

D. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
1. Contractor license issued by New York State Department of Labor.
2. Air Sample Log.
3. Air sample results.
4. Project Monitor Daily Log
5. Asbestos Survey Report.
6. A copy of ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects."

E. Each Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

F. All demolition necessary to access asbestos containing materials for removal must be conducted within negative pressure enclosures by licensed asbestos handlers. Demolition debris may be disposed of as construction and demolition debris provided the Abatement Project Monitor determines that it is not contaminated with asbestos and there has been no disturbance of ACM within the enclosure. If the demolition debris is determined to be contaminated or ACM has been disturbed, it must be disposed of as asbestos waste.

3.2 PERSONNEL DECONTAMINATION ENCLOSURE

A. Provide a personnel decontamination enclosure system when required. The system shall be contiguous to the Work Area unless the use of a remote unit is permitted by Code Rule 56 or a Site Specific Variance. The decontamination enclosure shall not be located within the work area unless isolation barriers are installed. If the decontamination unit is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry.

B. For attached Unit, access to the Work Area will be from the clean room through an air-lock to the shower and through an air lock to the equipment room. Each airlock shall be a minimum of three feet from door to door. Additional air locks shall be provided as required by Code Rule 56 for remote decontamination enclosures.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil polyethylene sheeting. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.

D. The entrance to the clean room shall have a lockable door. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.

E. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six Workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.

F. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.

G. The equipment room shall be used for the storage of tools and equipment. A walk-off pan filled with water shall be located in the Work Area outside the equipment room for Workers to clean foot coverings when leaving the Work Area. A labeled 6 mil plastic ACM waste bag for collection of contaminated clothing shall be located in this room.

H. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Asbestos Project Monitor.

3.3 WASTE DECONTAMINATION ENCLOSURE

A. Provide a waste decontamination enclosure system when required. The system shall be contiguous to the Work Area unless the use of a remote unit is permitted by Code Rule 56 or a Site Specific Variance. The decontamination enclosure shall not be located within the work area unless isolation barriers are installed. If the Unit is accessible to the public it shall be fully framed and sheathed to prevent unauthorized entry.

B. The waste decontamination enclosure system shall consist of a holding area, air lock and washroom. The airlock shall be a minimum of three feet from door to door. The entrance to the holding area shall have a lockable door.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil polyethylene sheeting on walls and ceiling. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.

D. Where there is only one egress from the Work Area, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.

E. The waste wash room water shall be drained, collected, and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.

F. In small asbestos Projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.4 WORK AREA ENTRY AND EXIT PROCEDURES

A. Access to and from the asbestos Work Area is permitted only through the personnel decontamination enclosure unless otherwise stipulated in a Site Specific Variance, the Cornell Ithaca Campus-Wide Variance, or 12 NYCRR Part 56 Subpart 11 Special Projects.

B. Workers shall sign the entry/exit log upon every entry and exit.

C. The following procedures shall be followed when entering the Work Area:
   1. Before entering the Work Area, Workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators.
   2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.

D. The following procedures shall be followed when exiting the Work Area:
   1. Before leaving the Work Area, gross asbestos contamination will be removed by brushing, wet cleaning and/or HEPA vacuuming.
   2. In the equipment room, Workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room.
   3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal.
   4. Upon exiting the shower, Workers shall don new disposable clothing if the Work shift is to continue or street clothes to exit area. Under no circumstances shall Workers enter public non-Work Areas in disposable protective clothing.

E. If remote decontamination enclosures are permitted by Code Rule 56 or a Site Specific Variance, workers shall wear two disposable suits for all phases of Work. Workers exiting the work area shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another work area via the designated pathway required by Code Rule 56.

3.5 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

A. For Minor Project negative pressure tent work areas, a HEP-vacuum shall be utilized for negative air as per 12 NYCRR Part 56-11.3

B. For small-project and large-project work areas, provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement and 6 air changes for non-friable flooring and/or mastic removal.

C. Such filtration systems must be made operational after critical and isolation barriers are installed but before wall, floor, and ceilings are plasticized and shall be operated 24 hours per day during the entire Project until the final cleanup is completed and satisfactory results of the final air samples are received from the laboratory.

D. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2

hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.

E. A minimum of one additional filtration unit of at least the same capacity as the primary unit(s) shall be installed and fully functional to be used during primary unit (s) filter changing and in case of primary failure.

F. At no time will the unit exhaust indoors, within 15 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building. Exhaust ducting shall not exceed 25' in length unless the conditions of AV-A-2 are utilized. Provide construction fencing at ground level exhaust termination locations per Code Rule 56.

G. Upon electric power failure or shut-down of any filtration unit, all abatement activities shall stop immediately and only resume after power is restored and all filtration units are fully operating. For shut-downs longer than one hour, all openings into the Work Area, including the decontamination enclosures, shall be sealed.

H. For all OSHA Class I removal Work Areas, the Contractor shall provide a manometer to verify negative air pressure. Manometers shall be read twice daily and recorded within the Daily Project Log.

I. For all small and large project work areas, there shall be at least a 4 hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers.

J. Once installed and operational, the Contractor's Supervisor shall conduct daily inspections of the Work Area to insure the airtight integrity of the enclosure and operation of the negative air system. Findings shall be recorded within the Daily Project Log. Inspections shall also be conducted on days when no abatement activities are in progress per Code Rule 56 (i.e. weekends).

3.6 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. Asbestos-containing materials shall be removed in accordance with the Contract Documents and the approved Asbestos Work Plan. Only one type of ACM shall be abated at a time within a Work Area. Where there are multiple types of ACM requiring abatement, Code Rule 56 procedures for sequential abatement shall be followed.

B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.

C. One Worker shall continuously apply amended water while ACM is being removed.

D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.

E. Upon removal of ACM from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc.

F. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. Cleanup of accumulations of loose debris or waste shall be performed whenever there is enough accumulation to fill a single bag or container and minimally at the end of each workshift.

G. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.

H. Power or pressure washers are not permitted for asbestos removal or clean-up procedures unless approved in a Site Specific Variance.

I. All open ends of pipe and duct insulation not scheduled for removal shall be encapsulated using lag cloth.

J. All construction and demolition debris determined by the Environmental Consultant to be contaminated with asbestos shall be handled and disposed of as asbestos waste.

K. The use of metal shovels, metal dust pans, etc. are not permitted inside the work area.

3.7 EQUIPMENT/WASTE CONTAINER DECONTAMINATION & REMOVAL PROCEDURES

A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The persons in the Work Area shall not enter the airlock. No gross removal operations are permitted when waste transfer is in progress.

B. The containers and equipment shall be removed from the airlock by persons stationed in the washroom during waste removal operations. The external surfaces of containers and equipment shall be cleaned a second time by wet cleaning.

C. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated 6 mil plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.

D. The clean recontainerized items shall be moved into the airlock that leads to the holding area. Workers in the washroom shall not enter this airlock.

E. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from the holding area.

F. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

G. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.

H. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.8 NON-FRIABLE FLOORING AND/OR MASTIC REMOVALS

A. The following procedures may only be used for the removal of non-friable flooring and/or mastic materials using manual and chemical methods. These procedures shall not apply to beadblaster use or other abrasive abatement methods.

B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel and waste decontamination enclosures may be utilized and shall be constructed at a location in accordance with the approved Work Plan.

D. The Work Area shall include critical barriers and perimeter splash-guard.

E. Negative air shall be maintained at six (6) air changes per hour.

F. OSHA compliance air monitoring is required per section 1.10.

G. ACM removal shall follow procedures defined in section 3.6.

H. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double- bagging. The bags or containers shall then be transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.

I. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
   3. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
   4. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces covered with plastic in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The Asbestos Project Monitor shall determine adequacy of coverage.
   5. After the encapsulant has been applied and the required waiting/settling and drying time has elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
   6. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed. Following this, the decontamination enclosures shall be removed.

3.9 TENT ENCLOSURES

A. Tent enclosures may only be used where specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor.

B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel and waste decontamination enclosures shall be constructed when required, based on the scope of the tent work scope. Configuration shall be as required by Project size. For tent enclosures with gross abatement of friable materials, a contiguous decontamination system shall be constructed, maintained and utilized, except for minor size tent enclosure work areas where a remote decontamination enclosure is permitted by Code Rule 56.

D. The Work Area shall be precleaned. All objects and equipment that will remain in the restricted area during abatement shall be sealed with two layers of six mil polyethylene and tape.

E. The tent shall be a single use barrier constructed with a rigid frame and at least two layers of six mil polyethylene unless one layer of six mil polyethylene is otherwise permitted by Code Rule 56. Tents with twenty (20) square feet or less of floor space or no gross removal of friable ACM shall be constructed of one (1) layer of six mil polyethylene and shall include walls, ceilings and a floor (except portions of walls, floors and ceilings that are the removal surface) with double folded seams. All seams shall be sealed airtight using duct tape and/or spray adhesive.

F. The tent shall be constructed with at least one airlock for worker/waste egress.

G. A monometer shall be used for all OSHA Class I abatement.

H. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes shall be maintained for friable gross removal tent enclosure work areas. In a Minor size abatement tent enclosure work area a HEPA vacuum may be used to maintain the required air changes.

I. OSHA compliance air monitoring is required per section 1.09.

J. ACM removal shall follow procedures defined in section 3.07.

K. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed and shall then be placed in a second bag/container before being transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.

2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.

3. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.

4. After the waiting/settling and drying time requirements have elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.

5. Upon receipt of satisfactory final clearance air sampling results, the tent shall be collapsed into itself, placed in suitable disposal bags, and transported to the waste decontamination enclosure. Isolation and critical barriers shall then be removed.

3.10 GLOVEBAG REMOVAL

A. Glovebag removals may only be used as specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor. Glovebags may only be used on pipe or duct insulation.

B. In addition to conformance with applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications.

C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

D. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure.

E. Glovebag removals shall utilize commercially available glovebags of at least six mil thickness. Use shall be in accordance with the manufacturer's instructions and the following minimum requirements:
   1. The sides of the glovebag shall be cut to fit the size pipe being removed. Tools shall be inserted into the attached tool pocket.
   2. The glovebag shall be placed around the pipe and the open edges shall be folded and sealed with staples and duct tape. The glovebag shall also be sealed at the pipe to form a tight seal.
   3. Openings shall be made in the glovebag for the wetting tube and HEPA vacuum hose. The opening shall be sealed to form a tight seal.
   4. All glovebags shall be smoke tested by the Asbestos Project Monitor under negative pressure using the HEPA vacuum before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.
   5. After first wetting the materials to be removed, removal may commence. ACM shall be continuously wetted. After removal of the ACM, the piping shall be scrubbed or brushed so that no visible ACM remains. Open ends of pipe insulation shall be encapsulated.
   6. After the piping is cleaned, the inside of the glovebag shall be washed down and the wetting tube removed. Using the HEPA vacuum, the glovebag shall be collapsed and then twisted and sealed with tape with the ACM at the bottom of the bag.

7. A disposal bag shall be placed around the glovebag that is then detached from the pipe. The disposal bag is then sealed and transferred through the washroom to the waste storage container.

F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.11 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.

B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape, staples, and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment.
1. Finishes unable to be restored shall be replaced under this Contract at the Contractor's expense.
2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.

C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be fires-topped using materials and systems tested in accordance with ASTM E814 on Projects where re-insulation is part of the required work.

PART 4 DISPOSAL OF ASBESTOS WASTE

4.1 TRANSPORTATION AND DISPOSAL SITE

A. The Contractor's Hauler and Disposal Site shall be approved by the Owner's Representative.

B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.

C. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.

D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Part 364 Asbestos Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.

E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Manifests.

F. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site as identified on the notifications with no unauthorized stops.

4.2 WASTE STORAGE CONTAINERS

A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.). No open containers will be permitted on-site (i.e. open dumpster with canvas cover, etc.) unless specifically permitted by a Site Specific Variance.

B. The Environmental Consultant shall verify that the waste storage container and/or truck tags (license plates) match that listed on the New York State Department of Environmental Conservation Part 364 permit. Any container not listed on the permit shall be removed from the site immediately.

C. The container shall be plasticized and sealed with two (2) layers of 6 mil polyethylene. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.

D. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

E. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.

F. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.

4.3 ASBESTOS WASTE MANIFESTS

A. The proposed asbestos waste manifest shall be submitted to the Owner’s Representative prior to the start of the project for review and approval.

B. The Manifest shall be completed by the Contractor and verified by the Environmental Consultant that all the information and amounts are accurate and the proper signatures are in place.

C. The Manifests shall have the appropriate signatures prior to any waste being removed from the site.

D. Copies of the completed Manifest shall be retained by the Environmental Consultant and the Contractor and shall remain on site for inspection.

E. Upon arrival at the Disposal Site, the Manifest shall be signed by the Disposal Facility operator to certify receipt of ACM covered by the manifest. The Disposal Facility operator shall return the original Manifest to the Contractor.

F. The Contractor shall forward copies of the Manifest to the Owner’s Representative within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor. Originals of all waste disposal manifests shall be submitted by the Contractor to the Owner’s Representative with the final close-out documentation.

END OF SECTION 02 82 13

Attachment A

CONTRACTOR'S ACKNOWLEGEMENT STATEMENT

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

Re: Abatement of Asbestos Containing Materials

_____
(Project Title)

_____
(Project Location)

_____
(Project Number)

In consideration of the following individuals' employment in connection with the abatement, handling, and disposal of asbestos containing materials at the referenced project, I hereby certify that the employees: a) have received the medical examinations required by OSHA 29 CFR 1926.1101; b) have been fit tested specifically for respirators used on the Project; and c) have received training as required by OSHA 29 CFR 1926.1101 in the proper handling of asbestos containing materials, including the health implications and risks involved, as well as the use and limitations of the respiratory equipment to be used.

Employee Name	Asbestos Certificate Number

Supervisor Signature

_____

(Notary block here)

Printed Name

_____

_____
Title

Page ____ of ____

SECTION 028313 - LEAD-BASED PAINT

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. The Contractor shall be held to have read all Bidding Documents, Contract Drawings, and Division 1 specification sections, and in the execution of the work he will be bound by all of the conditions and requirements herein.

B. The Pre-Renovation XRF Lead-Based Paint Survey Report is included in the Bid Package "Information Available to Bidders" section and indicates the various building structural members to be impacted as a part of the project are that are coated with lead-based paint.

1.2 CONDITIONS

A. For all locations where lead-based paint must be removed, the Contractor shall remove, contain, capture, collect and dispose of the lead-based paint and lead containing materials in compliance with all current and pending Federal and State regulations, including the Environmental Protection Agency (EPA) 40 CFR Part 745, 8 NYCRR Chapter II Sub-Chapter J Part 155.5, the Resource Conservation and Recovery Act (RCRA), the Hazardous and Solid Waste Amendment (HSWA) the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the Occupational Safety and Health Administration (OSHA), including 29 CFR 1926 for protection of workers.

B. The Contractor shall bear responsibility for insuring that the waste is properly handled at each stage of operation and properly stored in approved containers. The District shall be the generator of the waste, and shall supply its EPA I.D. number and address for use in filling out the manifests. The Contractor shall be responsible for the preparation of the manifest (information and tracking form) to be signed by all applicable parties. The Contractor shall allow two weeks for the District to review and sign the completed manifests.

C. The Contractor shall retain an environmental or chemical testing laboratory, accredited by the State of New York, as legally required to sample and test the waste in accordance with EPA method 1311, Toxicity Characteristic Leaching Procedure (TCLP).

D. Waste classified as hazardous shall be shipped off site for treatment or recovered and reused in compliance with Federal and State regulations. Obtain all applicable permits. Provide certification of disposal to the District.

E. All work areas involving demolition, cutting, modification, etc., to any existing building structural members identified as being coated with lead-based paint shall be considered a lead hazard area per 29 CFR 1926 for the protection of workers unless the contractor removes the potential sources of air borne lead.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 028313

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.
    a. Refer to Part 4 “Extent of Work”, at the end of this Section, for work areas.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of underlayment, adhesives, and floor-covering systems certify in writing that products are compatible.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

C. IIC-Rated Assemblies: For IIC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E492 and classified according to ASTM E989 by an independent testing agency.

2.2 HYDRAULIC CEMENT UNDERLAYMENTS

A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/16 inch (1.5 mm) and that can be feathered at edges to match adjacent floor elevations. Installs up to 1/16 inch up to 1/2 inch.

1. Product: Subject to compliance with requirements, provide:
   a. Ardex K60 Arditex – Rapid Setting, Latex Smoothing, Self-Leveling Underlayment Compound (Basis of Design)
2. Cement Binder: ASTM C150/C150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.
3. Compressive Strength: Not less than 3,500 psi at 28 days when tested according to ASTM C109/C109M.
4. Flexural Strength: Not less than 1,000 psi at 28 dyas when tested according to ASTM C348.
5. VOC: 0
6. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Flash Patch / Skim Coat Finish Underlayment: A blend of Portland-cement and other hydraulic cements mixed with water to produce a trowel-on underlayment that can be applied in feather-edge thickness minimum to a maximum thickness of ½ inch.

1. Product: Subject to compliance with requirements, provide:
   a. Ardex Feather Finsh – Self-Drying Cement-Based Finishing Underlayment (Basis of Design)
   b. Compressive Strength: Not less than 4,200 psi at 28 days when tested according to ASTM C109/C109M.
   c. VOC: 0

C. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

D. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

E. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

F. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. Product: Subject to compliance with requirements, provide:
   a. Ardex P51 Primer.
      1) Absorbent concrete may require two applications to minimize the potential for pinholes forming.

G. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.

H. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

2.3 MOISTURE CONTROL

A. Moisture Mitigation Barrier: One-coat, 100% solids epoxy resin moisture management system for RH readings up to 100% in new or existing concrete. ASTM E96 – 0.06 perms.
1. Design Make: Ardex MC Rapid.

B. Primer System: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.

C. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.

1. Install underlayment reinforcement recommended in writing by manufacturer.

D. Metal Substrates: Mechanically remove, according to manufacturer's written instructions, rust, foreign matter, and other contaminants that might impair underlayment bond. Apply corrosion-resistant coating compatible with underlayment if recommended in writing by underlayment manufacturer.

E. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.

F. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

PART 4 - EXTENT OF WORK

4.1 WORK AREAS

A. Contractor shall coordinate the scope of work of this Section with architectural drawings. Contractor shall level all existing floors prior to installation of new floor finish.

B. Contractor shall provide and install primer and moisture control system WHERE INDICATED at existing floors scheduled to receive new floor finish over a concrete slab, whether on-grade or elevated.

END OF SECTION 035416

SECTION 051200 – STRUCTURAL STEEL

1.0 PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete reinforcing steel
B. Miscellaneous and ornamental ironworks
C. Steel anchors for work of other trades.
D. Setting anchor bolts in concrete.
E. Grouting base or leveling plates for columns, beams, and/or joists.
F. Erecting loose lintels.
G. Metal deck
H. Steel joists
I. Field painting, except as required in this section for touch-up.

1.2 RELATED WORK FURNISHED BUT NOT INSTALLED

A. Loose base or leveling plates for column, beams, and/or joists.
B. Exterior and interior loose lintels.
C. Anchor bolts for structural steel only.

1.3 DESCRIPTION OF WORK: Work covered by this section shall include all labor, material, equipment, and services necessary to complete the job as shown or called for on Architectural and Structural Drawings. Also included, but not limited to, shall be:

A. Structural steel beams, girders, and columns
B. Miscellaneous and connecting material
C. Hung and clipped lintels
D. Roof frames for all Mechanical and Architectural openings and roof drains.
E. Continuous angles

1.4 SUBMITTALS: Submit for review an electronic copy of all erection plans and detailed shop drawings checked by the Fabricator. Unchecked shop drawings will not be reviewed. Reproduction of Contract Drawings are not to be substituted for erection drawings. Revise as necessary. Review of shop drawings does not relieve Fabricator of responsibility for fit, detail design of connections, or for supplying all necessary materials. Supply reviewed prints for field use as necessary. Drawings shall be submitted early enough to allow adequate time for proper review.

1.5 STANDARDS: Structural steel framing is to conform to codes, standards, and specifications of the following (latest date):

A. American Society for Testing and Materials (ASTM)
B. American Welding Society (AWS)
C. American Institute of Steel Construction (AISC)
D. Occupational Safety and Health Standards (OSHA).
E. New York State Building Code.

1.6 INSPECTIONS: Work may be inspected both at the shop and in the field by the Engineer, or the testing authority, for the following:

A. Shop inspection for workmanship only.
B. Responsibility for accuracy of fit and soundness of connections rests solely with the Contractor.
C. Final inspection for workmanship and fit made in the field after work has been fitted in place.
D. Material accepted in shop shall not prevent final rejection at the site or after erection if it fails to conform to drawings and specifications.
E. All major field and/or shop butt welded splices shall be checked and certified by an independent testing laboratory accepted by the Engineer. All costs for such testing shall be paid by this Contractor. Such testing shall be non-destructive radiographic. All butt welds shall have 100% penetration and fusion.

1.7 FABRICATION: Structural steel fabrication shall conform to the following:

A. Workmanship and details shall conform to AISC "Specifications for Fabrication and Erection of Structural Steel for Buildings", latest edition. Fabricator/Erector shall be AISC certified unless noted otherwise on plans.
B. Shop connections are welded unless noted otherwise on plan or section.
C. Substitution of shapes and/or modification of details by the Fabricator must be accepted by the Engineer in writing.
D. Mill bearing surfaces to true planes. Fit abutting surfaces closely.
E. Details of lintel and other steel requiring accurate alignment shall provide for slotted holes and/or washers for truing up steel as required.
F. Provide any special details shown on plans.
G. Punch as required for nailers. Check locations where punching is required by referring to Architectural details.
H. All Architectural clearances must be maintained.
I. Minimum bolt size is 3/4" diameter.
J. Provide bearing plates and anchors for all beams bearing on masonry where other detail is not specified.
K. All connections shall be properly designed for standard end loads of the member connected unless noted otherwise on the plans. Shop connections shall be welded and performed by operators who have been qualified previously by tests as per American Welding Society's "Standard Qualification Procedure" to perform the type of work required. Use equipment supplying the proper current, electrodes suitable for positions and other conditions of intended use. Appearance, quality of welds made, and methods of correcting defective work shall meet the American Welding Society's "Code for Arc Welding in Building Construction".
L. Field connections shall be bolted in standard framed connections as shown in the AISC manual and designed for loads as indicated in paragraph 1.07 K above.
M. All high-strength bolts are to be designed in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

2.0 PART 2 – PRODUCTS

2.1 STRUCTURAL STEEL SHAPES: shall be manufactured from material conforming to ASTM A992 with sizes as shown on the drawings. No second-hand material permitted. Submit two each of all certified mill test reports.

2.2 STRUCTURAL STEEL CHANNELS, PLATES, AND ANGLES: shall be manufactured from material conforming to ASTM A36 with sizes and thicknesses as shown on the drawings. No secondhand material permitted. Submit two each of all certified mill test reports.

2.3 WELDING RODS: shall conform to E60 or E70 series of ASTM A233, manual shielded arc welding and shall be suitable to the position and condition of intended use.

2.4 BOLTS: shall conform to the following:

A. High-strength bolts - ASTM A325 N in bearing type connections, except where noted otherwise.
B. Common bolts - ASTM A307

2.5 FINISH: Apply one thorough and complete coat of #10-1009 Gray Primer, Tnemec Company, Inc. All moisture, scale, rust, grease, or mud shall be removed before painting. Wire brush or sandblast if necessary. Shop coat is not to be omitted at piece marks. Shop coat is to be omitted at areas to be field welded, contact surfaces within friction type connections, welded shear studs and all surfaces to be permanently embedded in concrete or covered by sprayed-on fire proofing. Note: Minimum thickness per coat of paint shall not be less than 2 mil. Paint thickness shall be verified by an independent testing laboratory accepted by the Engineer and paid for by this Contractor. Exterior lintels and other exposed members shall be hot dipped galvanized at the rate of 1.25 oz. per square foot of surfacing in compliance with ASTM A-123 or A-153 as applicable.

2.6 SHEAR CONNECTOR STUDS: 3/4" diameter x 3-1/2" long headed solid flux shear connector studs, Nelson Division of TRW, Inc.

2.7 STRUCTURAL TUBING: ASTM A500 Grade B.

2.8 STRUCTURAL PIPE: ASTM A53 Grade B.

3.0 PART 3 – EXECUTION

3.1 WORKMANSHIP: Care shall be exercised at all times to avoid damage through careless handling during unloading, storing, and erecting. Dropping of steel will not be permitted. Damaged steel will be replaced at no cost to the General Contractor or the Owner. Provide adequate equipment to perform work without damage to construction and provide complete safety for public, personnel, and property.

3.2 INSTALLATION

A. Provide temporary cable bracing with turnbuckles in sufficient numbers to prevent distortion or damage to the framework due to wind or erection forces. These cables shall be used to plumb and line columns before final bolting and shall be left in place to insure the lateral stability of the building.

B. Field burning of holes is prohibited. Field correction of holes by drilling and reaming only.
C. Field weld all slotted connections after final adjustment.
D. All columns must be plumb before final bolting. After tightening anchor bolts, upset threads to lock.
E. Field painting of structural steel is not required, except for:
    1. Touch-up field welds, bolts, abrasions of shop coat, etc. to provide complete coverage.
    2. Touch-up paint is to be the same as the shop coat.
    3. All touch-up painting is to be completed before the Erector leaves the site.

END OF SECTION 051200

SECTION 053123 – METAL ROOF DECK

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Deck Supports
B. Insulation
C. Framing for roof openings

1.2 DESCRIPTION OF WORK: Work covered by this section shall include all labor, materials, equipment, and services necessary to complete the job as shown or called for on the Architectural or Structural Drawings. Also included, but not limited to, shall be:

A. Reinforced roof drain sump pans where required
B. Metal cants, ridge plates, valley plates, and rubber deck closures.
C. Sound insulation for acoustical deck

1.3 SUBMITTALS: Submit for review an electronic copy of all erection plans and detailed shop drawings checked by the Fabricator. Unchecked shop drawings will not be reviewed. Review of shop drawings does not relieve Fabricator of responsibility for fit, detail design of connections, or for supplying all necessary materials.

1.4 SECTION PROPERTIES: are to conform to the "Specification for the Design of Cold Formed Steel Structural Members" as published by the American Iron and Steel Institute and to the specifications of the Steel Deck Institute. Where possible, deck sheets shall extend over three or more supports.

2.0 PART 2 – PRODUCTS

2.1 METAL ROOF DECK: Shall be 1 ½" metal roof deck manufactured by a member of the Steel Deck Institute. Deck shall have a minimum positive section modulus of Sp = 0.198 in^3 and a minimum uncoated thickness of 0.0295. Gauge shall be determined by section modulus, minimum 22 GA. Type "B" or "BA" deck, wide rib, United Steel Deck, Inc. or accepted equal. See plans for deck locations.

2.2 DECK FINISH: Deck shall be galvanized and conform to the requirements of ASTM A525 coating class G60.

3.0 PART 3 – EXECUTION

3.1 INSTALLATION: The steel deck shall be plug welded to the supports at 12 inch centers at the ends of the sheets and at each interior support (36/4 pattern) unless noted otherwise on Structural Drawings. End welds and those occurring at laps shall be plug welded through all thicknesses. Installation shall be done in accordance with Factory Mutual "Loss Prevention Data", Sheet 1-28.

Alternate: Powder actuated fastening systems may be used in accordance with manufacturer's recommendations. Hilti or accepted equal.

Side laps for interlocking deck shall be button punched. Side laps for overlapping edge sheets shall be secured with minimum #10 Teks self-tapping screws. Welding shall not be used for side laps. Spacing between fasteners and supporting members shall not exceed (3) feet.

3.2 FIELD CUTTING: The Erector of the steel deck is to perform all skew cutting as well as the cutting of all deck openings 12 inches and larger.

3.3 WORKMANSHIP: All welding and/or steel fastener installations shall be done by competent, experienced mechanics. All welds, promptly upon completion, shall be given a protective coating compatible with the deck finish.

END OF SECTION 053123

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent.

C. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Hem-fir; WCLIB or WWPA.

2.2 PLYWOOD

A. APA B C, Group 1, "Exterior Type" thickness as indicated on drawings for exterior use of where plywood will be subjected to moisture or high humidity. Uses: Roof decking/blocking and sheathing.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat ONLY items in immediate direct contact with masonry or concrete.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 FASTENERS

A. General: Fasteners shall be of size and type indicated on drawings and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

2. Expansion anchors: Meeting Federal Spec. FF-S-325, Group II Type 4 Class 1. Material to be Stainless steel. Use: Anchoring to cast in place concrete.

3. Sleeve Anchors: Meeting Federal Spec. FF-S-325, Group II, Type 3, Class 3. Material to be Stainless steel. Head type as appropriate for application. Use: Anchoring to masonry.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Where wood-preservative-treated lumber is installed adjacent to ferrous metal decking or structural components, install continuous membrane separator between wood and metal. (40 mil PVC, EPDM, polyethylene or asphaltic membrane is acceptable)

B. Builders Hardware: The contractor shall furnish all rough hardware such as nails, screws, bolts, etc. as required to complete the work.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated on drawings and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates as detailed on drawings. Generally, Generally anchor spacing to not be greater than 16” O.C. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Nailers, blocking or furring set to the deck, slab, or wall may be fastened with drive screws, except where bolting is indicated on the drawings.

D. Nailing: In accordance with industry standards of good practice.

3.3 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

1. Sealant shall have a VOC content of 250 g/L or less.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Tremco, Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1. Sealant shall have a VOC content of 250 g/L or less.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Head-of-Wall, Fire-Resistive Joint Firestopping Systems.

1. UL-Classified Systems: HW-D 1069.
2. Assembly Rating: 1 hour or 2 hours- Refer to Drawings.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II percent compression.
5. L-Rating at Ambient: Less than 1 cfm/ft. (cu. m/s x m).
6. L-Rating at 400 Deg F (204 Deg C): Less than 1 cfm/ft. (cu. m/s x m).
7. F-Rating: 2 hours.

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Latex joint sealants.
3. Acoustical joint sealants.

B. Related Sections:

1. Section 042000 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Section 079500 "Expansion Control" for building expansion joints.
3. Section 088000 "Glazing" for glazing sealants.
4. Section 092900 "Gypsum Board" for sealing perimeter joints.
5. Section 093000 "Tiling" for sealing tile joints.
6. Section 095123 "Acoustical Tile Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.

2. Conduct field tests for each application indicated below:

a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.

a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

4. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.

4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Pre-installation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer**.**

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

2.0 PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790. (Design Make)

b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.

c. Pecora Corporation; 301 NS.

d. Tremco Incorporated; Spectrem 1.

B. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; 898.

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolac.

b. Bostik, Inc.; Chem-Calk 600.

c. Pecora Corporation; AC-20+.

d. Tremco Incorporated; Tremflex 834.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; AC-20 FTR.

b. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

3.0 PART – EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

a. Concrete.

b. Masonry.

c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.

b. Glass.

c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.

b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

a. Whether sealants filled joint cavities and are free of voids.

b. Whether sealant dimensions and configurations comply with specified requirements.

c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered

satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces (**JS-01**).

1. Joint Locations:

a. Isolation and contraction joints in cast-in-place concrete slabs.

b. Tile control and expansion joints.

c. Joints between different materials listed above.

d. Other joints as indicated.

1. Joint Sealant: Urethane. Single component, pourable, traffic grade

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces (**JS-02**).

1. Joint Locations:

a. Construction joints in cast-in-place concrete.

b. Control and expansion joints in unit masonry.

c. Joints in exterior insulation and finish systems.

d. Joints between different materials listed above.

e. Perimeter joints between materials listed above and frames of doors &

windows.

f. Control and expansion joints in ceilings and other overhead surfaces.

g. Other joints as indicated.

1. Joint Sealant: Silicone. Single component, nonsag, neutral curing, Class 100/50.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces **(JS-03)**.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.

b. Control and expansion joints in tile flooring.

c. Other joints as indicated.

1. Joint Sealant: Urethane. Single component, pourable, traffic grade.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces (**JS-04)**.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.

b. Perimeter joints of exterior openings where indicated.

c. Tile control and expansion joints.

d. Vertical joints on exposed surfaces of interior unit masonry and partitions.

e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.

f. Other joints as indicated.

2. Joint Sealant: Latex

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces (**JS-05)**.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

b. Tile control and expansion joints where indicated.

c. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces (**JS-06)**.

1. Joint Location:

a. Acoustical joints where indicated.

b. Other joints as indicated.

2. Joint Sealant: Acoustical.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Light frames and glazing installed in hollow metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include construction details, material descriptions, core descriptions hardware reinforcements, profiles, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

C. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.

D. Samples for Verification: Samples are only required by request of the architect.

E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, “Recommended Specifications for Standard Steel Doors and Frames”.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing achorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within warranty period.

1. One (1) year from substantial completion on both material and workmanship.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. CECO Door Products (C), ASSA ABLOY

B. Curries Company (CU), ASSA ABLOY

C. Steelcraft, Allegion (S)

D. de La Fontaine (DLF)

E. Republic, Allegion (R)

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

D. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

E. Glazing: Comply with requirements in Section 088000 "Glazing."

2.4 INTERIOR STEEL DOORS

A. Construct hollow-metal doors to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.

1. Doors Type: As indicated in the Door and Frame Schedule.
2. Thickness: 1-3/4 inches.
3. Face: Uncoated steel sheet, minimum thickness of 16-gauge (0.053 inch).
4. Edge Construction: Full Flush seamless with continuously welded edge seam.
   a. Fabricate door to be flush with one continuous face free from joints, tool markings and abrasions, and with provision for glass and/or louvers as indicated.
5. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
6. Core: Manufacturer's standard honeycomb core.
7. Fire-Rated Core: Manufacturer's standard laminated mineral board core for temperature rise-rated doors.
8. End Channels: Cose top and bottom of door with same material as face sheets, minimum 18-gauge. Steel flush channel, projection welded.
9. Exposed Finish: Primed and Field Finished.

2.5 INTERIOR STEEL FRAMES

A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Frames; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule

1. Frame Materials: Uncoated steel sheet, minimum thickness of 14-gauge (0.067 inch).
2. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
3. Hollow metal panel: Same material, construction and finish as adjacent doors assemblies.
4. Glazing bead: 18-gauge (0.42 inch), screw applied with countersunk holes, butted corners.
5. Frame Assembly: Continuously welded through the entire profile, dressed smooth with seamless face.
   a. Knockdown shall only be allowed where required by field conditions. Review and approval of architect required.
6. Exposed Finish: Primed and Field Finished.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter stainless steel bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
4. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long.
5. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
1. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
2. Floor anchors to be formed form material, not less than 0.042 inches thick.

C. Dust/Mortar Box: Provide dust/mortar box at strike location on drywall and masonry frames. Provide mortar guards on hinge reinforcements on masonry frames.

D. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections “Door Hardware” and “Access Control Hardware”.
1. Provide electrical knock out boxes with a dual ½-inch and ¾-inch knockouts.
2. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
3. Electrial knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section “Door Hardware”.
4. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

E. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.7 LIGHT OPENINGS AND GLAZING

A. Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow

multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

1. Glazing moldings fabricated from 18-gauge, (0.042 inch) minimum.
2. Formed integral with hollow metal frames, a minium of 5/8 inch high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secured side of interior doors and frames.
3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
5. Profile to match those used on wood door vision kits.

2.8 LOUVERS

A. Provide louvers for non-fire rated doors where indicated. Louvers shall be welded inverted V-type or Y-type. Inverted vanes shall not be less than 18-gauge thickness.

1. Louvers for exterior doors shall be provided with insect and/or bird screens.
2. Provide louvers of same material as door sheet.

2.9 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, smoke-rated frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Surface applied hardware: Factory reinforced only, 14-gauge (0.067 inch).

2. Hinge and pivot reinforcements: 7-gauge (0.167 inch).

3. Lock front reinforcement: 14-gauge (0.067 inch).

4. Flush bolt reinforcement: 14-gauge (0.067 inch).

5. Closer reinforcement: 14-gauge (0.067 inch).
   a. Provide combination of parallel and regular arm mount reinforcing on all frames regardless if a closer is specified.

6. Other reinforcement: 14-gauge (0.067 inch).

2.10 STEEL FINISHES

A. Factory Prime Finish: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory coat of rust inhibiting shop primer.

1. Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate, compatible with substrate and finish coatings.

B. Factory Finish Doors: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on or powder-coated finish consisting of prime coat and topcoat, complying with ANSI/SDI A250.3.

1. Color and Gloss: As selected by Architect from manufacturer's standard range.

C. Field Finish Frames: Clean, prepare, and field apply two-coats of finish per Division 09 Painting Specification.

1. Color and Gloss: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Prior to installation, adjust and securely brace welded hollow metal frames square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 “Manufacturing Tolerances Standard Steel Doors and Frames.”

D. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.
2. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Solidly pack mineral-fiber insulation inside frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum ¾ inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

C. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touch-up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanizing openings) or finish paint.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

1.1 PART 1 - GENERAL

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Light frames and glazing installed in wood doors.

B. Related Sections:

1. Division 08 Section “Door Schedule”.
2. Division 08 Section "Hollow Metal Doors and Frames".
3. Division 08 Section "Glazing".
4. Division 28 Section "Access Control".

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A208.1 – Wood Particleboard.
3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.4 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.

2. Indicate dimensions and locations of mortises and holes for hardware.

3. Indicate dimensions and locations of cutouts.

4. Indicate requirements for veneer matching.

5. Indicate location and extent of hardware blocking.

6. Indicate construction details not covered in Product Data.

7. Indicate doors to be factory finished and finish requirements.

8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.

a. Provide samples for each species of veneer and core material.

b. Finish veneer faced door samples with same materials proposed for factory finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer’s warranty.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL10C.

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.

2. Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.

3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

2. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

3. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

C. Warranty Period for Solid Core Interior Doors: Life of installation.

1.9 PART 2 - PRODUCTS

1.10 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.

2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.

b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

1.11 CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.

2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.

B. Blocking: As indicated under article “Blocking”.

C. Fire Resistant Composite Core Doors:

1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.

2. Blocking: As indicated under article “Blocking”.

3. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

1.12 BLOCKING

A. Non-Fire-Rated Doors:

1. Provide blocking as indicated below:

a. HB1: 5 inch in doors indicated to have closers and overhead stops.

b. HB5: Two 5 inch x 14 inch corner blocking, in doors indicated to have flush bolts.

B. Fire Rated Doors:

1. Provide blocking as indicated below:

a. HB1: 5 inch in doors indicated to have closers and overhead stops.

b. HB5: Two 5 inch x 14 inch corner blocking in doors indicated to have flush bolts.

c. HB7: 5 inch stile blocking.

d. HB8: 5 inch x 14 inch corner blocking and two 5 inch x 14 inch lock blocking on doors to have vertical rod exit devices.

1.13 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASSA ABLOY Wood Doors (GR): GPD Series.

2. Eggers Industries (EG): Premium Series.

3. Marshfield-Algoma (MF): Signature Series.

B. Interior Solid Core Doors:

1. Grade: Premium.

2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.

a. Plain Sliced Red Oak, A grade faces.

b. Veneer species may vary with building / location. Field verify.

3. Match between Veneer Leaves: Book match.

4. Assembly of Veneer Leaves on Door Faces:

   a. Running Match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Transom Match: Continuous match.

7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.

10. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

1.14 LIGHT FRAMES AND GLAZING

A. Metal Frames for Light Openings in Fire Rated Doors over 20-minute Rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

   1. Manufacturers:

      a. Air Louver (LV).

      b. All Metal Stamping (AP).

      c. Anemostat (AN).

      d. Pemko (PE).

   2. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

1.15 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.

   1. Comply with requirements in NFPA 80 for fire rated doors.

   2. Undercut: As required per manufacturer’s templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."

3. Louvers: Factory install louvers in prepared openings.

4. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

1.16 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.

2. Staining: Custom stain to match architect’s sample.

3. Sheen: Satin.

1.17 PART - EXECUTION

1.18 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.19 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

C. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

D. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

F. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

1.20 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 087100 – DOOR HARDWARE

GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:

a. Swinging doors.

2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
3. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
3. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.

1.03 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

3. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architects hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Quantity, type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.

e. Fastenings and other pertinent information.
f. Location of each hardware set cross-referenced to indications on Drawings.
g. Explanation of all abbreviations, symbols, and codes contained in schedule.
h. Mounting locations for hardware.
i. Door and frame sizes and materials.
j. Name and phone number for local manufacturer's representative for each product.
k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
    1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

4. Key Schedule:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
        1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

    f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

5. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product data for electrified door hardware:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

a. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.

4. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Factory order acknowledgement numbers (for warranty and service)
d. Name, address, and phone number of local representative for each manufacturer.
e. Parts list for each product.
f. Final approved hardware schedule, edited to reflect conditions as-installed.
g. Final keying schedule
h. Copies of floor plans with keying nomenclature
i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.05 QUALITY ASSURANCE

A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

F. Keying Conference

1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

    a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

G. Pre-installation Conference

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

H. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer’s original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.07 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.08 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.

a. Locksets:
1) Mechanical: 10 years.

b. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.09 MAINTENANCE

A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics, functionality and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

   1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners

   1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
   4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Ives 5BB series.
2. Acceptable Manufacturers and Products: Hager BB series, McKinney TA/T4A series, PBB BB series.

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

    a. Exterior: Heavy weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
    b. Interior: Heavy weight, steel, 4-1/2 inches (114 mm) high

3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

    a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
    b. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. 2 inches or thicker doors:

    a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
    b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins

8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

2.04 CYLINDRICAL LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage ND series
2. Acceptable Manufacturers and Products: Best 9K series, Sargent 10X Line

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
9. Locksets on doors to normally occupied spaces shall incorporate inside trim with visual Locked/Unlocked indicators.

    a. Lever Design: Schlage 06A.

2.05 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage FSIC.

B. Requirements:

1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. Conventional cylinder with large format interchangeable core (FSIC).

C. Construction Keying:

1. Replaceable Keyed Construction Cores.

    a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.

1) 3 construction control keys
2) 12 construction change (day) keys.

b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.06 KEYING

A. Scheduled System:

1. Existing Schlage factory registered system:

a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:

a. Replaceable Construction Cores
1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
a) 3 construction control keys
b) 12 construction change (day) keys.
2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c. Provide keys with the following features:
1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2) Patent Protection: Keys and blanks protected by one or more utility patent(s).

d. Identification:
1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
2) Identification stamping provisions must be approved by the Architect and Owner.
3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.

5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.
1) Change (Day) Keys: 3 per cylinder/core.
2) Permanent Control Keys: 3.
3) Master Keys: 6.

2.07 DOOR CLOSERS

A. Manufacturers

1. Scheduled Manufacturer and Product: LCN 4010/4110
2. Acceptable Manufacturers: Sargent 281. Less PRV, TownSteel TDC40

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.08 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs.
b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs.
c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs.

2.09 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.10 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.11 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Protection Plates: BHMA 630 (US32D)
2. Wall Stops: BHMA 630 (US32D)

EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.

H. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. Hardware items are referenced in the following hardware. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

Abbreviation	Name
IVE	H.B. Ives
LCN	LCN Commercial Division
SCH	Schlage Lock Company
ZER	Zero International Inc

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 01

For use on Door #(s):
A1-1 A1-2
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 02

For use on Door #(s):
A3
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND53TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 03

For use on Door #(s):
A10-1 A19-1
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 04

For use on Door #(s):
A23A
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
2	EA	MANUAL FLUSH BOLT	FB358		626	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	SINGLE DUMMY TRIM	ND170 RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
2	EA	WALL STOP	WS406/407CVX		630	IVE
2	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 05 - Not Used

Hardware Group No. 06

For use on Door #(s):
A21
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 07

For use on Door #(s):
A10A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	ND53TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 08

For use on Door #(s):
A10 A19

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	SILENCER	SR64		GRY	IVE

END OF SECTION

SECTION 088000 - GLAZING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.

B. Related Sections:

1. Division 08 Section "Hollow Metal Frames."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

2. Design Wind Pressures: As indicated on Drawings.

3. Design Snow Loads: As indicated on Drawings.

4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, provide glass to resist design wind pressure based on glass type factors for short-duration load.

5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick

2. For laminated-glass lites, properties are based on products of construction indicated.

3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).

5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data is submitted based on previous testing of current sealant products and glazing materials matching those submitted.

2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass of the following products; 12 inches (300 mm) square.

1. Acid etched glass.

2. Coated glass.

3. Fire-protective glazing products.

4. Fire-resistive glazing products.

5. Laminated glass.

6. Insulating glass.

C. Glazing Schedule: Use same designations indicated on Drawings for glazing and glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the manufacturer and SGCC. Label shall indicate

manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: **10 years** from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: **10 years** from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: **10 years** from date of Substantial Completion.

2.0 PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Quality-Q3, and complying with other requirements specified.

1. Glass: Insulated glass units as specified – heat tempered

2. Silicone Coating Color: As selected by Architect from manufacturer's full range of standard colors.

2.3 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch (5-mm) nominal thickness; faced on one surface with a clear glazing film; fire-protection rated and impact safety-rated, complying with testing requirements in 16 CFR 1201 for Category I and II materials. Conforms to positive pressure standards and passes required hose stream test.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Basis-of- Design: Schott Pyran Platinum F.

b. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite NT

c. Safti First; SuperLite C/SP.

d. Vetrotech Saint-Gobain; SGG Keralite FR-F.

C. Laminated Ceramic Glazing: Multi-ply polished glass-ceramic with special interlayer, fire-protection rated and impact safety, 3/8” (9mm); complying with testing requirements in16 CFR 1201 for Category I and II materials. Conforms to positive pressure standards and passes required hose stream test. Fire rating up to 90 minutes (up to 180 minutes in doors) with hose stream test.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Basis-of-Design: Schott Pyran Platinum L

b. Vetrotech Saint-Gobain: Keralite Select FR-L

c. Technical Glass Products: Firelite Premium Plus.

2.4 FIRE-RESISTIVE-RATED GLAZING

A. Fire-Resistive-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistive ratings indicated, based on testing according to ASTM E-119 and NFPA 251 for temperature rise.

B. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Basis-of-Design Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.

b. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.

c. Vetrotech Saint-Gobain; SGG Swissflam N2

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. EPDM complying with ASTM C 864.

2. Silicone complying with ASTM C 1115.

3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM silicone or thermoplastic polyolefin rubber gaskets, compatible with glazing and complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of

insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790.

b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.

c. May National Associates, Inc.; Bondaflex Sil 290.

d. Pecora Corporation; 890.

e. Sika Corporation, Construction Products Division; SikaSil-C990.

f. Tremco Incorporated; Spectrem 1.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for

application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.10 MONOLITHIC-GLASS TYPES

A. **Glass Type T**: Clear fully tempered float glass.

1. Thickness: 6.0 mm

2. Type 1, Quality Q3: of class, kind, and condition indicated.

3. Provide safety glazing labeling.

2.11 FIRE-PROTECTION-RATED GLAZING TYPES

A. **Glass Type FPG-1**: Up to 45-minute fire-rated glazing; film-faced ceramic glazing.

1. Provide safety glazing labeling.

B. **Glass Type FPG-2**: Up to 90-minute fire-rated glazing; film-faced ceramic glazing.

1. Provide safety glazing labeling.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep systems.

3. Minimum required face and edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of

dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088700 – GLAZING FILMS

PART 1 - GENERAL

1.1 SUMMARY

A. Glazing film applied to existing and new glazing assemblies.

1.2 REFERENCE STANDARDS

A. ASTM F1642 – Standard Test Method for Glazing and Glazing Systems Subject to Air blast Loadings.

B. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Consumer Products Safety Commission; current edition.

C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

D. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

C. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Record of product certification for safety requirements.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Installation methods.

D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color and patterns.

E. Specimen warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of security glazing films with minimum 10 years successful experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufactures unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent—based materials, in accordance with requirements of authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

A. Provide a 5-year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Decorative Films LLC: www.decorativefilm.com

1. SOLYX Colored Window Film – Sand Blasted

B. Requests for substitutions will be considered in accordance with provisions in Division 01.

2.2 MATERIALS

A. Colored Window Film – Sand Blasted: Translucent, embossed, vinyl film that simulates colored sandblasted glass adhered to glass.

1. Applied to 1/4-inch-thick clear annealed glass.

2. Surface applied film.

3. Thickness: 3 mil.

4. Color: Refer to Finish Schedule.

5. Film Type: Polymeric Vinyl.

6. Adhesive Type: Pressure Sensitive.

7. Width: 48 inches.

8. UV Rejection: 99%.

9. Infra-Red Rejection: <30%.

10. Solar Absorption: 35%.

11. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).

12. Light Transmission of Film Applied on ¼ inch thick Clear Annealed Glass:

13. Visible Light Transmission: <55%.

B. Anchoring System: DOW 995 or GE SCS2000 SilPruf Structural Sealant with high impact styrene trim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Shop/Factory-Applied Film: Verify that conditions meet the manufacturer's requirements for the proper application and performance of film. Fabricator shall be authorized by the film manufacturer.

B. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.

C. Examine glass and frames. Send that existing conditions are adequate for proper application and performance of film.

D. Verify glass is not cracked, chipped, broken, or damaged.

E. Verify that frames are securely anchored and free of defects.

3.2 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

B. Accurately cut film with straight edges to required sizes allowing 1/16-inch to 1/8-inch gap at perimeter of glazed panel unless otherwise required by anchorage method.

C. Seams. Seam film only as required to accommodate material sizes; seam without overlaps.

D. Clean glass prior to film installation with neutral cleaning solution.

E. Peel back release liner and apply film to glass. Using squeegees, push out solution between film and glass.

F. Once film is installed, anchor the edges of the film by applying approved structural sealant and high impact styrene to the edges of the frames and film.

G. Clean glass and excess structural sealants from finished surfaces

H. Remove any labels or protective covers.

3.4 FILM VERIFICATION

A. Awarded contractor will be required to verify that film installed meets the requirements highlighted in this bid. By submitting a bid, you as the contractor understand that three pieces of glass, chosen at random will be removed and film applied will be measured to verify that film installed meets specifications as requested. Film may need to be removed as part of the verification process.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATION SUBMITTALS

A. Evaluation Reports: For firestop tracks, from ICC-ES.

2.0 PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dietrich Metal Framing; Max Trak (SLT) Slotted Deflection Track.

2) MBA Building Supplies; Slotted Deflecto Track.

3) Steel Network Inc. (The); VertiTrack VTD Series.

4) Superior Metal Trim; Superior Flex Track System (SFT).

5) Telling Industries; Vertical Slip Track.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.

b. Grace Construction Products; FlameSafe FlowTrak System.

c. Metal-Lite, Inc.; The System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

2. Depth: As indicated on Drawings.

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

J. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Post-installed, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.

2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.

2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16 inches (406 mm) 400 mm o.c. unless otherwise indicated.

b. Multilayer Application: 16 inches (406 mm) 400 mm o.c. unless otherwise indicated.

c. Tile Backing Panels: 16 inches (406 mm) 400 mm o.c. unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.

    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Z-Furring Members:

1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c., unless noted otherwise.

2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space

second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to steel roof deck.

5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

2. Tile backing panels.

B. Related Requirements:

1. Section 06, "Sheathing" for gypsum sheathing for exterior walls.

2. Section 09, "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

2.0 PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. National Gypsum Company.
5. USG Corporation.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.

2. Long Edges: Tapered.

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C13125, with manufacturer's standard edges.

1. Thickness: 5/8 inch.

2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

B. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edgtes.

1. Core: 5/8 inch, Type X.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2. Shapes (as indicated on Drawings):

a. Cornerbead.

b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. L-Bead: L-shaped; exposed long flange receives joint compound.

d. U-Bead: J-shaped; exposed short flange does not receive joint compound.

e. Expansion (control) joint.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet.

2. Shapes:

a. Cornerbead.

b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound

transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.

   b. Grabber Construction Products; Acoustical Sealant GSC.

   c. Pecora Corporation; AC-20 FTR

   d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.

   e. USG Corporation; SHEETROCK Acoustical Sealant.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.

2. Type X: Where required for fire-resistance-rated assembly and as indicated on Drawings.

3. Abuse-Resistant Type: As indicated on Drawings.

4. Moisture- and Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.

2. Fasten with corrosion-resistant screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.

2. LC-Bead: Use at exposed panel edges.

3. L-Bead: Use where indicated.

4. U-Bead: Use where indicated.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.

2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 2: N/A

3. Level 3: N/A

4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6” Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- (150-mm-) long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.

    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:

    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.

7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
8. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48)

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency

D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 5 or less.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS **(ACT-1)** (ALL AREAS UNLESS INDICATED OTHERWISE)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.

2. USG Corporation. (Design Make: Model #86785 MARS ClimaPlus)

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Classification: Provide fire-resistance-rated panels as follows:
1. Type and Form: Type III, Form 2, mineral base with factory applied latex paint.
2. Pattern: F Course
3. Fire Rating: Class A

D. Color: White

E. Humidity/Sag Resistance: High

F. Light Reflectance (LR): Not less than 0.90

G. Ceiling Attenuation Class (CAC): Not less than 35

H. Noise Reduction Coefficient (NRC): Not less than 0.75

I. Articulation Class (AC): Not less than 200

J. Edge/Joint Detail: Angled Tegular

K. Recycled Content: 69%

L. Thickness: 3/4”

M. Modular Size: 24”x24”

N. Warranty: 30-Year Limited System Warranty.

O. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. USG Corporation. Design Make: USG DX 15/16” Exposed Tee

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (15-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate duty system.
2. End Condition of Cross Runners: butt-edge type.
3. Face Design: Flat, flush
4. Cap Material: Cold-rolled steel
5. Cap Finish: white

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Postinstalled expansion anchors.
b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316.
d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- diameter bolts.

2.6 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:

a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no

panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic-rubber base.

2. Resilient molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 6 inches long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE, RB-1

A. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous)
2. Style and Location:

a. Style B, Cove: where scheduled

B. Thickness: 1/8” thick

C. Height: 4 inches, unless indicated otherwise or required to match field conditions.

D. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

E. Outside Corners: Preformed

F. Inside Corners: Preformed

G. Colors: As selected by Architect from Manufacturer’s Standard Colors.

2.2 RUBBER MOLDING ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Johnsonite, Tarkett Company

B. Description: Rubber transition strips.

C. Locations: From all floor finish-to-finish conditions where an elevation change is unavoidable.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.

   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than **9**pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.

a. Miter or cope corners to minimize open joints.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Vinyl composition floor tile (VCT)

B. ACTION SUBMITTALS

C. Product Data: For each type of product.

D. Shop Drawings: For each type of resilient floor tile.

   1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   2. Show details of special patterns.

E. Samples for Initial Selection: For each type of floor tile indicated.

F. Samples for Verification: Full-size units of each color and pattern of floor tile required.

G. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

B. Warranty.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations indicated.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation material in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer. Store floor tiles on flat surfaces per manufacturer.

B. Materials and adhesive must be acclimated to the installation area for a minimum of 48 hours prior to installation.

1.8 FIELD CONDITIONS

A. The permanent mechanical system must be on for seven days prior to, during and after installation. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor tile installation and for 48 hours after floor tile installation.

D. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2. Smoke Density ASTM E662: Passes, <450

2.2 STANDARD VINYL COMPOSITION FLOOR TILE (**VCT**)

A. Basis-of-Design Product: Subject to compliance with requirements, provide “Standard Excelon Imperial” products by Armstrong Commercial Flooring, Inc. or a comparable product from one of the following manufacturers:

B. Mannington Mills, Inc.

C. ASTM F 1066, Class 2, through-pattern tile.

D. Wearing Surface: Smooth with Fast Start Factory Finish

E. Thickness: 0.125 inch (3.2 mm).

F. Size: 12 by 12 inches (305 mm by 305 mm).

G. Colors and Patterns: To match existing patterns and colors.

H. Warranty: Five (5) year commercial warranty when installed in accordance with manufacturer’s recommendations.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
1. Do not install resilient flooring over gypsum-based patching and/or leveling compounds.

B. Primer: Type recommended by floor tile and adhesive manufacturers to suite floor tile and subtrate conditions.
1. Luxury Vinyl Tile (LVT) Primer: Shaw 9050 pH Blocker/Floor Primer.

C. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

D. Floor Polish / Barrier Coat: Provide protective, liquid floor-polish products recommended by floor tile manufacturer and acceptable to the Owner.

E. Moisture Mitigation Barrier: One-coat, 100% solids epoxy resin moisture management system for RH readings up to 100% in new or existing concrete. ASTM E96 – 0.06 perms.
   1. Design Make: Ardex MC Rapid

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate pass testing.
   4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

      a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level measurement.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Use neutral cleaner and cool water and scrub with a low-rpm machine or auto scrubber using a red pad or brush. (Brown or black pads are too aggressive.)
4. Remove the cleaning solution with wet-dry vacuum or auto scrubber until the floor is dry.
5. Rinse the floor with clean water. Repeat the rinse process if necessary to remove all haze.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Finish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying finish:

1. VCT: Apply 4 coats of finish per manufacturer's recommendations.

E. Cover floor tile with paper-based protection system until Substantial Completion. Do not use a plastic adhesive based protection system. Repair and maintain protection system as needed during the course of the work.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modular carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.

4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: An established manufacturer who is both ISO 1400K and ISO 9001 certified.
   1. The manufacturer must provide an active product reclamation program. Manufacturer will recycle EcoWorx carpet tile free of charge for quantities of 500 SY or more within the continental United States or 5000 SY globally.

B. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
   1. Additional Environmental Qualifications:
      a. Green Label Plus Certified
      b. Cradle to Cradle Certified Gold
      c. NSF 140 Gold
      d. Health Product Declaration
      e. Declare Label, red list compliant
      f. No PVC components

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

   1. Build mockups at locations and in sizes shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

1.10 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty: Lifetime Commercial Limited.

PART 2 - PRODUCTS

2.1 CARPET TILE **(CPT-2)**

A. Basis of Design: Subject to compliance with requirements, provide **Patcraft Organic Interruption Saturate tile** or Architect approved equal.

B. Color: **#00530 Slate Cobblestone** unless otherwise indicated on the Finish Legend.

C. Collection: Organic Interruption Saturate.

D. Traffic Rating: Heavy.

E. Style Number: I0662 Color Reveal

F. Pattern: Ashlar.

G. Fiber Content: Solution Q Extreme Nylon.

H. Pile Characteristic: Multi-Level Pattern Loop.

I. Density: 5564 oz./cu. yd. (0.21 g/cu. cm).

J. Pile Thickness: 0.11 inches (2.79 mm).

K. Stitches: 11.33 per inch (44.62 per 10 cm).

L. Gage: 1/10 inch (39.37 per 10 cm).

M. Tufted Weight: 17 oz./sq. yd. (57.40 g/sq. m).

N. Primary Backing/Backcoating: Non-Woven Synthetic.

O. Secondary Backing: Ecoworx Tile.

P. Size: 9 by 36 inches (22.86 by 91.44 cm).

Q. Applied Treatments:

1. Soil-Resistance Treatment: SSP Shaw Soil Protection.

R. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D2646.
4. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
5. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
6. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
7. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.
8. NBS Smoke: Less than 450 according to ASTM E 662.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vinyl wall covering.

2. Felted Acoustic wall covering.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.

C. Samples: For each type of wall covering and for each color, including custom colors, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.

D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450or less.

2.2 VINYL WALL COVERING **(WCV-1, WCV-2)**

A. Basis of Design Product: Subject to compliance with requirements, provide **Arc|Com; "Abstract"** or Architect approved equal product.

B. Description: Vinyl wall covering.

C. Roll Width: 54 inches.

D. Backing: Recycled Non-Woven (10% Post Consumer Recycled Content)

E. Weight: Type II, 20.00 oz per linear yard.

F. Tear Strength: 34 x 25

G. Tensile Strength: 89 x 88

H. Fire Rating: Class A.

I. Color: As indicated on the Finish Legend.

2.3 FELTED ACOUSTIC WALL COVERING **(WCV-3)**

A. Basis of design Product: Subject to compliance with requirements, provide: **Wolf Gordon "Interval"** or Architect approved equal product.

B. Description: Felted acoustic wall covering.

C. Roll Width: 63 inches.

D. Backing: Fused Polyester.

E. Weight: 25.00 oz per linear yard.

F. Fire Rating: Class A.

G. Noise Reduction Coefficient (NRC): 0.2.

H. Color: As indicated on Finish Legend.

2.4 VINYL WALL COVERING **(WCV-4)**

A. Basis of Design Product: Subject to compliance with requirements, provide **Wolf Gordon; "Juxtapose"** or Architect approved equal product.

B. Description: Vinyl wall covering.

C. Roll Width: 54 inches.

D. Content: 100% Vinyl

E. Backing: Osnaberg

F. Weight: 1.5 oz per square foot.

G. Fire Rating: Class A.

H. Colors: As indicated on the Finish Legend.

2.5 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.

B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099123 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION OF WALL COVERING

A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

C. Install wall covering without lifted or curling edges and without visible shrinkage.

D. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

E. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 099113 – EXTERIOR PAINTING

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel.

B. Related Sections include the following:

1. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

2.0 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Sherwin-Williams Company (The).
2. Or Equal.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range of colors.

2.3 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E1.

2.4 QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

1. VOC Content: E Range of E2.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance of paint materials with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 11.

a. Basis of Design: Duration Exterior Acrylic Latex (Satin) by Sherwin Williams.

1) Location: Exterior structural steel, lintels, doors, and frames.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete masonry units (CMUs).
2. Gypsum wall board (GWB)
3. Plaster
4. Steel Substrates

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Benjamin Moore & Co.
2. Glidden Professional.
3. Pratt & Lambert.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMUs): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Latex System MPI INT 4.2A:

a. Block Filler: Block filler, latex, interior/exterior**,** MPI #4.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, satin (MPI Gloss Level 4)**,** MPI #43.

B. Steel Substrates

1. Latex System:

a. Primer Coat: Rust-Inhibitive, Water Based: MPI #107.

b. Intermediate Coat: Latex, Interior, matching topcoat.

c. Topcoat: Latex, interior Gloss, (Gloss Level 6, except minimum gloss of 6.5 units at 60 degrees), MPI #114.

C. Galvanized-Metal Substrates:

1. Latex System:

a. Primer Coat: Primer, Galvanized, Water Based, MPI #134.

b. Intermediate Coat: Latex, Interior, matching topcoat.

c. Topcoat:Latex, interior Gloss, (Gloss Level 6, except minimum gloss of 6.5 units at 60 degrees), MPI #114.

D. Galvanized-Metal Substrates:

1. Epoxy System:

a. Primer Coat: Primer, Galvanized, MPI #134

b. Intermediate Coat: Epoxy, interior, matching topcoat.

c. Topcoat: Two Part Epoxy, Semi-Gloss, High solids, high build, fast drying polyamide epoxy. Macropoxy 646 Fast Cure.

E. Gypsum Board Substrates

1. Latex System

a. Prime Coat: Primer sealer, latex, interior MPI #50

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, flat, (MPI Gloss Level 1) MPI#53

1) Locations: Soffits

d. Topcoat: Latex, interior satin (MPI Gloss Level 4), MPI #43.

1) Locations: Walls

END OF SECTION 099123

SECTION 101100 – VISUAL DISPLAY SURFACES

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Decorative Markerboards.

B. Related Sections:

1. Division 10 Section, “Display Cases” for tack surfaces in built-in trophy and display cases.

2. Division 12 Section, “Manufactured Plastic Laminate Casework” for tack board in reception and other desks.

3. Division 6 Section, “Interior Architectural Woodwork” for tack board in wood circulation desk.

1.3 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

1. Include rated capacities, and operating characteristics.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.

2. Show locations of special-purpose graphics for visual display surfaces.

3. Include sections of typical trim members.

C. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of porcelain-enamel face sheet, and tackboard assembly.

2. Include accessory Samples to verify color selected.

D. Samples for Verification: For each type of visual display surface indicated.

1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.

2. Trim: 6-inch- (152-mm-) long sections of each trim profile.

3. Accessories: Full-size Sample of each type of accessory.

E. Product Schedule: For visual display surfaces MB-markerboard, TB-tackboard, see markerboard/ tackboard schedule on A5.01.

F. Qualification Data: For qualified Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

H. Maintenance Data: For visual display surfaces to include in maintenance manuals.

I. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.

B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.8 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.

b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

2.0 PART 2 – PRODUCTS

2.1 DECORATIVE MARKERBOARD ASSEMBLIES **(MB-1, MB-2, MB-3)**

A. Writeable Wall Panel Product: Tempered safety-rated glass board.

B. Product: Float by Clarus or Equal

1. Sizes: As indicated on the Interior Elevations.

2. Color: As indicated on the Finish Legend.

3. Finish: Magnetic, gloss.

4. Thickness: ¼” tempered glass.

5. Mounting: Manufacturer's standard, concealed mounting with anchors.

2.2 FABRICATION

A. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

2. Provide manufacturer's standard vertical-joint H-trim system between abutting sections of markerboards.

3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.

4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.

C. Examine walls and partitions for proper preparation and backing for visual display surfaces.

D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height 36 inches (914 mm) above finished floor to top of chalktray.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain motor-operated, sliding visual display units.

END OF SECTION 101100

SECTION 101400 – SIGNAGE

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Room Signs: Modular, Acrylic/PVC based, plaque signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.

2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

1. Acrylic/PVC sheet.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Plaque: 6 inches (150 mm) square including border.

2. Acrylic Sheet: 6 inches (150 mm) square for each color required.

3. Accessories: Manufacturer's full-size unit.

E. Sign Schedule: Indicate all rooms to receive signage. Use same designations indicated on Drawings.

F. Qualification Data: For Installer.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Surface Burning Characteristics:

1. All interior signs shall be fabricated of materials tested and certified to meet the following burning properties:

a. Flame Spread: ASTM E84 Class A, not more than 25;

b. Smoke Density: ASTM D2843 not over 75; or ASTME84 not over 450.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: One year from date of Substantial Completion.

2.0 PART 2 – PRODUCTS

2.1 MATERIALS

A. Sign Sheet: High impact Acrylic/PVC Thermoplastic Alloy, pressure molded. ASTM D 4802, Category A-1, Type UVA (UV absorbing).

2.2 MANUFACTURERS

A. The materials or items included in this Section shall be products of the same quality and design of the manufacturers used herein for reference, or accepted substitutes:

1. Manufacturers of Signs:

a. Mohawk Sign Systems.

b. Best Sign Systems.

c. ASI Sign Innovations, Inc.

1) Room Signs Design Make: ASI Signs – Inform.

2.3 ROOM SIGNAGE

A. Description:

1. General: Refer to Part 4 “Signage Types” for size, color, graphic, and text height/font.

2. Signs shall be manufactured from high impact acrylic/PVC thermoplastic alloy, pressure molded using co-molding process. Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque surface using manufacturer’s process.

a. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated.

1) Custom logo graphics as inidicated.

b. Colors: High contrast semi-matte integral colors for graphics. All integral resins are UV stabilized resins using automotive grade pigments.

1) Selected from manufacturer’s full range of standard high contrast, semi-matte colors.

3. Fabrication: Panel depth .25 inch. with attachable backplate panel depth: 0.125 inch.

a. Sign Size: As indicated on drawings..

b. Sign Shape: Rectangular with radiused corners.

4. Mounting Height: As indicated.

5. Mounting Location: As indicated.

6. Mounting Type: Mechanical anchor mounting (MA) with color match exposed head, unless otherwise noted.

B. **Wayfinding Signs:** As indicated on drawings.

C. **Room Designation Signs**: Room Identification signs beyond the wayfinding signs indicated on the drawings shall be supplied by the owner to match their existing sign systems.

2.4 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied color surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards and noted on drawings.

B. Textures: Matte Non-Glare, as selected from the manufacturer's standards.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

1. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer.

3.2 INSTALLATION

A. General: Coordinate locations of signs with Owner and Architect prior to installation. Install signs using mounting methods in compliance with the manufacturer's instructions.

1. Install signs level, plumb, and at the height indicated with sign surfaces that are free from distortion or other defects in appearance.

B. Wall Mounted Room Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Concealed Mounting: Perimeter vinyl tape.

3.3 CLEANING AND PROTECTION

A. At the completion of installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

4.0 PART 4 – SIGNAGE SCHEDULE

4.1 SIGNAGE TYPES

A. General: See drawings for sign types, sizes and quantities.

END OF SECTION 101400

SECTION 122413 - ROLLER WINDOW SHADES

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 3 inches (76 mm) square. Mark inside face of material if applicable.

2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.

3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.10 WARRANTY

A. Roller Shade Hardware, Chain and Shadecloth Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

2.0 PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Draper Inc. (Design Make: Clutch-Operated FlexShade)

2. MechoShade Systems, Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.

a. Loop Length: Full length of roller shade.

b. Limit Stops: Provide upper and lower ball stops.

c. Chain-Retainer Type: Clip, jamb mount.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of inside face of shade or Left side of inside face of shade.

2. Direction of Shadeband Roll: Regular, from back of roller

3. Shadeband-to-Roller Attachment: Manufacturer's standard method

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shade Fabric: Phifer, Sheerweave Infinity 2, 1% Openness, 100% TPO Composition, Fire Classification NFPA 701-10 TM#1, Certified Greenguard and Greenguard Gold.

1. Color: To be Selected from manufacturer’s full range.

E. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.

b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches (102 mm).

2. Endcap Covers: To cover exposed endcaps.

3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/18 inch (3.18mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.

2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

1. GENERAL

1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. SUMMARY

A. Section Includes:

1. Plastic-laminate-clad casework, hardware, and accessories as shown and listed on drawings and specified herein. Include all countertops, splashes, supports, shelving, and filler panels necessary for a complete casework installation. Work includes standard items, modified standard items, and custom items, as detailed on the drawings and indicated as work of this section.

B. Related Requirements:

1. Section 061000 "Rough Carpentry”
2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring casework.
3. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
4. Section 096513 "Resilient Base and Accessories" for resilient base applied to plastic-laminate-clad casework.
5. Division 22 “Plumbing” for sinks, fittings, traps, stops, and service lines.
6. Division 26 “Electrical” for fixtures service lines, conduit wiring.

3. DEFINITIONS

A. Definitions in the AWI/AWMAC/WI's "Architectural Woodwork Standards" apply to the Work of this Section.

1. Exposed Portions of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.

a. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets after installation shall not be considered exposed.

2. Semi-exposed Portions of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semi-exposed.

3. Concealed Portions of Casework: Include sleepers, web frames, dust panels, and the surfaces not usually visible after installation.

4. PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

B. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

5. COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

6. ACTION SUBMITTALS

A. Product Data: For each type of product including but not limited to casework, hardware, core material, and accessory.

B. Shop Drawings: For plastic-laminate-clad casework.

1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
2. Indicate types and sizes of casework.
3. Indicate manufacturer's catalog numbers for casework.
4. Show fabrication details, including types and locations of hardware.
5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.

C. Shop Drawings: For countertops.
1. Include plans, elevations, section, and attachments to other work including casework and reinforcements required for installation.
2. Indicate shapes, edge and backsplash profiles.
3. Indicated cutouts for plumbing fixtures, heating grilles, electrical devices, etc.
4. Show methods of joining and installation details.

D. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

E. Samples for Initial Selection: For casework exterior and interior, countertops and edging, and hardware finishes.

F. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.

    a. Provide one Sample applied to core material with specified edge material applied to one edge.

2. Thermoset Decorative Panels: 8 by 10 inches, for each color, pattern, and surface finish.

    a. Provide edge banding on one edge.

3. Hardware: One unit of each type of exposed hardware.

4. Grilles: One unit of each type of specified grille for countertop and ventilated toe board.

G. Full-Size Samples for Verification Purposes: If requested, the architect reserves the right to thoroughly review full cabinet samples to the point of dismantling the cabinets if deemed necessary to verify materials and construction details. Full size units shall be of each type of material indicated, showing the full range of variations expected.

1. Base Cabinet: One full-size, 16-inch-wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
2. Wall Cabinet: One full-size, 12-inch-wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.
3. Full-Size Samples: Maintain at Project site during construction in an undisturbed condition as a standard for judging the completed Work. Unless otherwise indicated, approved sample units may become part of the completed Work if in undisturbed condition at time of Substantial Completion. Notify Architect of their locations.

7. INFORMATIONAL SUBMITTALS

A. Qualification Data: For casework manufacturer and Installer and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience**.**

B. Sample Warranty: For special warranty.

C. AWI Quality Certification: Casework manufacturer must be duly certified for premium grade from the AWI Quality Certification Program for sections 400 (Architectural Cabinets) and 1600 (Modular Cabinets).

8. QUALITY ASSURANCE

A. Manufacturer and Installer upon request must provide the following proof of ability to perform under this contract.

1. Casework of a nationally recognized casework manufacturer who has been providing and installing products in the projects vicinity for at least five (5) years may be considered for approval providing it is equal in construction and design according to the drawings and specifications.

2. Minimum of five (5) completed installations of equal size and educational requirements that can be inspected prior to the award of the contract.

3. Financial and technical resources of sufficient scope to assure prompt and satisfactory performance in the production, delivery and installation of all work specified under this section so as not to delay the progress of the work.

4. Failure to meet any of these requirements and qualifications may be sufficient cause for the rejection of proposed supplier.

B. The specifications and drawings define and show the essential minimum requirements as to the quality of materials, hardware, finish, construction design, function, and overall workmanship of the equipment. All equipment and casework must strictly comply with these specifications.

C. Where a definite material or manufacturer is specified, it is not the intent to discriminate against any product of another manufacturer. However, it is the intent of this specification to provide for the Owner a quality and educationally functional installation of equipment and casework, and to exclude inadequate or inferior products.

D. The use of catalog numbers and specific requirements set forth in drawings and specifications are not intended to preclude the use of acceptable casework manufacturers' products. Named manufacturers are used for the purpose of establishing quality of material, construction, and workmanship.

E. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 548.

F. Single-Source Responsibility: Obtain plastic laminate casework from one source of a single manufacturer.

9. DELIVERY, STORAGE, AND HANDLING

A. All casework specified herein shall be delivered to the job site as required, received, and handled by the contractor or his authorized agent.

B. All casework shall be delivered in one piece where possible. When it is impractical to do so, such casework may be delivered in sections and assembled in position. An authorized factory mechanic shall supervise assembly.

C. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

10. FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during remainder of construction period.

1. Relative humidity shall be maintained between 30% and 55%, and temperatures between 60 and 70 degrees F.

B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

11. WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.
d. Deterioration of finishes.

2. Warranty Period: Five (5) years from date of Substantial Completion. Defects reported within the guarantee period will be corrected without charge.

3. All non-casework items not manufactured by the casework supplier such as sinks, fixtures, apparatus, equipment and accessories shall be covered under the original manufacturer's warranty.

4. Warranty shall be in the form of a letter addressed to the Owner and Architect, signed by an officer of the company responsible for fabrication of the casework.

2. PRODUCTS

1. MANUFACTURERS

A. Casework Manufacturers: Subject to compliance with requirements, provide products by one of the following or an architect approved equal:

1. Case Systems, Inc., 2700 James Savage Road, Midland, Michigan 48642. (Design Make)

2. TMI Design, 50 South Third Avenue West Avenue West, Dickinson, ND 58601.

3. LSI Corporation of America, Inc., 2100 Xenon Lane, Minneapolis, MN 55441

4. Stevens Industries, Inc., 704 W Main Street, Teutopolis IL 62467

B. Listing of manufacturers does not imply the standard product of that manufacturer is acceptable. Upgrading or performance enhancements may be required; refer to specifications and drawings for product requirement.

2. GENERAL REQUIREMENTS FOR CASEWORK

A. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: **Premium**.
2. Provide labels and certificates from certification program indicating that casework complies with requirements of grades specified.
   a. Contractor shall register the Work under this Section with AWI's Quality Certification Program at www.awiqcp.org or by calling 855-345-0991.

B. Product Designations: Drawings indicate sizes, configurations, and finish materials of manufactured plastic-laminate-clad casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish materials, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

3. PLASTIC-LAMINATE-CLAD CASEWORK

A. Design: Frameless cabinet construction with the following door and drawer-front style:
1. **Flush Overlay**.

B. Exposed Materials:

1. Plastic-Laminate Grade: **VGS**.

   a. For exposed surfaces unless otherwise indicated. Meeting the definition and performance requirements of ANSI/NEMA 3 LD - 2005. GP-28 balanced with a minimum grade CLS.

   b. Colors and Patterns: As selected by Architect from manufacturer's full range.

   c. Grain Direction for Wood-Grain Plastic Laminate:

      1) Doors: Vertical with continuous vertical matching.
      2) Drawer Fronts: Vertical with continuous vertical matching.
      3) Face Frame Members: Lengthwise.
      4) End Panels: Vertical.
      5) Bottoms and Tops of Units: Side to side.
      6) Knee Space Panels: Vertical.
      7) Aprons: Horizontal.

2. Edgebanding: **PVC**.

a. Provide 3mm and .020” PVC that is color-through, satin finish, and applied using hot melt adhesive and radiuses by automatic trimmers. Hand tool applying and trimming of edge shall not be allowed.

b. PVC Edgebanding Color: As selected by Architect from casework manufacturer's full range but no less than 50 color coordinated options.

C. Semi-exposed Materials:

1. Thermally Fused Melamine Laminate: For semi-exposed and concealed surfaces unless otherwise indicated. Meeting the definition and performance requirements of ANSI/NEMA 3 LD - 2005 for GP-28. Cabinet manufacturer shall submit panel manufacturer’s current published specification stating ANSI core properties and NEMA finish properties.

a. Color shall match interior, Almond, Grey, or White. Surface texture shall be similar to exterior finish.
b. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed. All panels must be of balanced construction.

2. Cabinet Liner: For semi-exposed and concealed surfaces where exterior surface is GP-28 laminate for proper balancing such as semi-exposed face of doors, drawer heads, finished end panels. Meeting the definition and performance requirements of ANSI/NEMA 3 LD - 2000, CLS.

a. Color shall match interior, Almond, Grey, or White. Surface texture shall be similar to exterior finish.

3. Unless otherwise indicated, provide specified edge banding on all semi-exposed edges.

D. Miscellaneous Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood.
3. Hardboard: Use only for specialty cabinet components where specifically indicated.
   a. Hardboard shall not be used as the back panel for casework.

4. CABINET HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Butt Hinges: Stainless steel, .095” thick, semi-concealed, five-knuckle hinges complying with ANSI/BHMA A156.9, Institutional Grade 1, with anti-friction bearings, non-removable pin and hospital tips. Each hinge shall be secured with a minimum of nine No. 8 screws.

1. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high.

2. Degrees of Opening: 270 degrees without binding.

C. Pulls: For use at base and wall cabinets; use solid stainless steel, 5/16” diameter, wire pulls, fastened from back with two screws.

1. For sliding doors, provide recessed stainless steel flush pulls.
2. Locate one pull at centerline of drawer regardless of width to ensure was of operation and maximize drawer slide life.

D. Pulls: For use at tall cabinets; use 3-point locking system consisting of dummy handle on left hand door and 3-point locking handle on right hand door, providing positive latching engagement at top, bottom and middle of door. Rod ends for 3-point system to extend into cabinet body and have a steel plate guide to protect the anchoring hole from wear. Exterior handle finished to match adjacent casework hardware.

E. Door Catches: Powder-coated, dual, self-aligning, heavy-duty permanent magnet catch. Provide two catches on doors more than 48 inches high.

F. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.

1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
2. Drawers: Provide one bumper on back side of drawer front at each corner.

G. Drawer Slides: ANSI/BHMA A156.9, Type B05091.

1. Heavy Duty: (Grade 1HD-100) Epoxy-coated steel, bottom mount, full-extension, self-closing with captive polymer roller and positive stop, extending up the side of drawer. Slide shall be 100-lb. load rating and must prevent drawer from contacting cabinet body.
2. File Drawer Slides: (Grade 1HD-100) Epoxy-coated steel, bottom mount, full-extension, self-closing with captive polymer roller and positive stop, extending up the side of drawer. Slide shall be 100-lb. load rating and must prevent drawer from contacting cabinet body, for drawers more than 6 inches high or 24 inches wide.
3. Pencil Drawer Slides: Grade 2, for drawers not more than 3 inches high and 24 inches wide.
4. Keyboard Slides: Grade 1HD-100, for computer keyboard shelves.
5. Trash Bin Slides: Grade 1HD-100, for trash bins not more than 20 inches high and 16 inches wide.

H. Label Holders: Stainless steel, sized to receive standard label cards approximately 1 by 2 inches, and attached with screws or brads.

1. Provide label holders where indicated on drawings.

I. Drawer and Hinged-Door Locks: Cylindrical (cam) type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1. Lock core is removable with a control key, permitting Owner to easily change lock arrangements without tools.

1. Provide a minimum of two keys per lock and six master keys for each system.
2. Provide locks where indicated on drawings.

3. Inactive door of base and wall cabinets shall be secured by using an elbow catch. Tall cabinets may use a catch chain release.

    a. Master key for up to 225 key changes. Master key one level with the potential of 40 different, non-interchangeable master key groups.

J. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door unit.

K. Adjustable Shelf Supports: Two-pin-locking injection molded clear plastic shelf rests complying with ANSI/BHMA A156.9, Type B04013. Shelf support shall have anti-tip locking tabs as approved in AWI 400B-T-9 for premium grade. Clips shall be rated for a minimum of 300 pounds per clip.

1. Shelf supports at hardboard shelves shall be matching single pin with anti-tip locking taps.

L. Ventilation Grilles: Where indicated on the drawings or otherwise required, provide ventilation grilles for installation in sub-base toe board and countertops at all locations where wall mounted fin tube radiation is situated behind cabinets. Grilles shall be equivalent to the following:

1. Toe Kick Grille: Perforated 1/8” aluminum with baked enamel finish. Grille face with 1/2” square openings with 1/4” bars. To be secured with oval head screws, countersunk at twelve inches on center and finished to match grille.

    a. Design Make: Architectural Grille #208, or equal.

    b. Color to match cabinet base.

2. Counter Grille: Extruded aluminum pencil-proof bars with 30 degree angled deflection, 7/32 inch thick bars on 7/16 inch spacing. Border frame to be 1/2 inch wide with spring slip mounting. External fasteners will not be accepted.

    a. Design Make: Titus Linear Bar Diffuser #CT-PP-3 with #11B border.

M. Tote Trays: Where indicated as part of the cabinet, tote trays are to be made from molded fiberglass in the sizes indicated or required by the cabinet model. Plastic or polystyrene tote trays are not acceptable.

1. Supported by individual polycarbonate channels mounted to cabinet ends and partitions with two integral 5mm diameter pins and secured with one screw. Height adjustable on 1-1/4” centers.

N. Cable Grommets: Where indicated on the drawings, provide a molded plastic grommet with 2 inch hole and plastic cap with slot for wire passage.

1. Design Make: Mockett and Company, Inc. #TG or equal.

2. Color to be selected from manufacturer’s standard colors.

O. Coat Hooks: Double prong zinc plated.

P. Closet Rods: One inch diameter zinc plated rod with captive sockets.

Q. Table Leg Shoes: Leg shoes to be closed bottom style, 2-1/4 inches square and older of 1/8 polyethylene. Shoes to be non-marring and sized to meet project conditions.

R. Mirrors: Teacher wardrobe mirror to be 8 inch by 10 inch tempered safety glass.

S. Casters: Shall be 4" (3" diameter wheel) nominal height with ball bearing action capable of swiveling 360 degrees. Caster shall have non-marring wheels available in both locking and non-locking. Caster shall have a minimum load rating of 165 pounds per caster.

T. Countertop Supports: Aluminum 2 inch by 2 inch by 1/4 inch "T" extrusion. Provide 18 inch by 18 inch deep bracket for 25 inch deep countertops and 18 inch by 24 inch deep bracket for 30 inch deep countertops.

1. Design Make: Rakks Bracket #EH in clear anodized finish.

5. MATERIALS

A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

C. Softwood Plywood: DOC PS 1.

D. Particleboard: ANSI A208.1, Grade **M-2 Industrial**, according to the American National Standard (ANSI) for Mat-Formed Wood Particleboard, ANSI/NPA A208.1-2009 and shall meet or exceed the following:

1. Density: 45 lbs/cu. ft.

2. Moisture Content: 6%

3. Modulus of Rupture: 2400 psi.

4. Internal Bond: 80 psi.

5. Hardness: 500 pounds.

6. Linear Expansion: 0.35%

7. Thickness Tolerance: +/- 0.008" panel average.

8. Face Screw Holding: 247 pounds.

9. Edge Screw Holding: 225 pounds.

10. Formaldehyde Content: Provide only particleboard with no added urea formaldehyde content in adhesives or binder.

E. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.

F. Hardboard: ANSI A135.4, Class 1 tempered with a S2S surface finish and must meet or exceed the hardboard product standard ANSI-A135.5.

G. Glass for Glazed Doors: Clear tempered glass complying with ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.

H. Adhesives: Do not use adhesives that contain urea formaldehyde. PVA and EVA adhesives shall be mechanically applied. Use of contact adhesives will not be permitted.

6. FABRICATION

A. General Plastic-Laminate-Clad Cabinet Construction: As required by referenced quality standard, but not less than the following for all cabinets:

1. Structural Components: All structural components shall be 3/4-inch particleboard with balanced surfaces unless indicated otherwise. All body components shall be secured utilizing concealed interlocking mechanical fasteners as approved by the Architectural Woodwork Standards 1st Edition-2009 Section 10 subsection 4.4.20.4. They shall be especially designed for the use of joining particleboard panels.

a. All joints are to be tight-fitting and will not rupture or loosen due to dimensional changes in the particleboard, racking of casework during shipment or installation, or normal use

2. Back Panels: All back panels shall be 1/2-inch thick particleboard surfaced both sides for balanced construction. Fully captured on both sides and bottom with continuous adhesive bead at joint. Face-mounted, stapled backs are not acceptable.

a. Mounting Stretchers are 3/4-inch thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.

b. When cabinet backs are exposed, a finished 11/16-inch thick decorative laminate back panel shall be substituted for stretchers.

3. Doors: All door fronts shall be balanced construction with high-pressure laminate bonded to both sides of a 11/16-inch particleboard core with an overall finished dimension of 3/4-inch except as noted below:

a. Doors over 48-inches in height shall be high-pressure laminate bonded to both sides of 1-1/8-inch particleboard core with an overall finished dimension of 1-3/16-inch. Cabinet depths shall be adjusted so all door and drawer fronts align.

b. All doors shall be a maximum of 24-inches wide.

c. Stiles and Rails of Glazed Doors 48-inches high or less shall be 3/4 inch thick, with particleboard cores. Glazed doors more than 48-inches high shall be 1-1/8 inches thick.

4. Shelves: Whether adjustable or fixed shall be 1-inch-thick particleboard, balanced surfaces and have a .020-inch thick PVC front edge matching the shelf. Special-use cabinets such

as cubical compartments, mail, or locker type may require 3/4-inch shelves of other thickness. Coordinate with drawings.

a. Shelving Adjustability: A 5mm diameter row hole pattern 1-1/4-inch on center shall be forced in cabinet ends for adjustable shelves. This row-hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.

5. Base / Toe Kick: Shall be individually attached exterior grade plywood, 4-inches high for base cabinets and tall cabinets. Base shall support and carry the load of the end panels and the cabinet bottom, directly to the floor. The base shall be let-in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against the wall. There shall be a front-to-back center support for all bases over 30-inches wide.

6. Drawer Fronts: 3/4-inch balanced particleboard, removable and attached to drawer box sub-front with screws from inside of drawer. Drawer fronts shall be balanced with high-pressure laminate bonded to both sides.

7. Drawer Sides, Backs, and Sub-front: 1/2-inch particleboard surfaced both sides for balanced construction, with glued multiple, fluted dowel joints at a minimum of 32mm on center. Top edge shall be nominal .020-inch PVC matching the drawer color.

8. File Drawer Sides: Shall have full height sides supporting a heavy-duty support rail for hanging file folders. Painted steel supports or metal file frames set into the drawers are not acceptable.

9. Drawer Bottoms: 1/2-inch-thick particleboard glued and dadoed into front, back, and sides of drawers to create a non-racking, non-deflecting platform that is carried directly by “L” shaped, bottom mount drawer glides. Glides are secured with 1-1/2-inch long screws driven through the platform and into the drawer sides.

10. Drawer Parting Rails: Horizontal parting rails between drawers shall be 3/4-inch particleboard with balanced surfaces, secured to and further reinforcing cabinet ends. When drawer stacks are keyed individually, the parting rail shall run full depth of cabinet to prevent pilfering.

11. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework.

B. Wall Cabinet Construction: Additional requirements specific to wall cabinets:

1. All wall cabinets bottoms shall be of 1” thick particleboard core mechanically fastened to end panels and secured to the bottom stretcher.

2. An upper 3/4-inch thick stretcher shall be located behind the back panel with two mechanical fasteners per end and secured to the cabinet top with #8 x 2” plated flat head screws.

a. A lower 3/4-inch thick stretcher shall be located behind the back panel and attached to the end panels with mechanical fasteners.

C. Base Cabinet Construction: Additional requirements specific to base cabinets:

1. All based cabinets, except sink cabinets, shall have a solid ¾-inch thick sub-top fastened to the ends with mechanical fasteners.

2. All sink cabinets shall have a vertically mounted front stretcher panel supporting the countertop, a split removable back panel, and four steel corner gussets used to secure the countertop.

a. An upper ¾-inch thick stretcher shall be located behind the back panel and attached to the end panels with mechanical fasteners. This stretcher is also fastened to the full sup-stop thus capturing the back panel.

D. Tall Cabinet Construction: Additional requirements specific to tall cabinets:

1. An intermediate fixed shelf shall be provided on all general storage cabinets to maintain internal dimensional stability under heavy loading conditions.

2. A ¾-inch top and intermediate stretcher shall be located behind the back panels and attached to the end panels with mechanical fasteners.

a. The intermediate stretcher is secured to the intermediate shelf, thus capturing the back panel, with #8 x 2” plated flat head screws.

7. PERFORMANCE

A. Materials shall be tested and certified to meet the following burning properties:

1. Flame Spread (ASTM E84): Class C, not more than 200.

2. Smoke Density: (ASTM D2843) not over 75; or (ASTM E84) not over 450.

3. Self-Ignition Temperature: (ASTM D1929) not less than 600 deg F.

B. Adhesives shall be UL listed as part fo the laminate application.

C. Five Knuckle Institutional Hinge: ANSI 156.9.4.1, 2, 3, 4: Two hinges mounted 23” on center on a 23-7/16 inch wide x 19-11/16 inch high cabinet door shall be capable of supporting 100 pound test load located 1-inch from the outside edge of the door.

1. Cycle, open and close, from 5 degrees open through 95 degrees open with no failure to hinges, door, or cabinet end panel.

2. The maxium horizontal permanent hinge set shall not exceed .030 inch.

D. Adjustable Cabinet Shelving: When supported only at the ends, shelving shall not deflect in excess of 1/4-inch when loaded as follows:

1. Standard School or Library Shelving – 50 pounds/square foot.

E. Wall Hung Cabinet Load Test: Earthquake test procedure developed by the “Woodwork Institute of California” (Woodwork Institute) for casework used in California schools and hospitals.

1. A 48-inch high x 12-inch deep x 48-inch wide wall hung cabinet using mechanical fastening devices shall support 2,000 pound dead load concurrently with 982 pound lateral pull out load. Tese complies with loads specified in Title 17 with safety factor of two.

8. COUNTERTOPS, CAPS or STOOLS

A. High-Pressure Decorative Laminate: General purpose, HGS, high-pressure decorative laminate on horizontal surface, conforming to NEMA Standard LD3-2005, with impact resistant 3 mm PVC edging. Countertops shall conform to ANSI A161.2-1998 Performance Standards for Fabricated High-pressure Decorative Laminate Countertops.

1. Laminate bonded to 1-1/8 inch thick solid core particle board backsplashes shall be ¾ inch thick particle board with HGS laminate finish provided loose or field installation except at post-formed laminate tops.

a. Where indicated on the drawings.

b. Front edge to be 1-1/4 inch deep PVC.

2. All countertops within 36 inches of a sink shall be 1 1/8 inch nominal thickness moisture resistant particle board core as required to match adjacent countertops.

3. All joints shall be secured with adhesive and tight joint fasteners.

4. Provide coordination among trades and cutouts where necessary.

B. Solid-Surface Resin Polymer: Cast acrylic type with integral coloring, stain resistant to domestic chemicals and cleaners meeting ANSI Z124-1980 and ANSI SS1. Performance Standards complying with Class A surface burning characteristics per ASTM E84. Flame Spread Index: 25 or less. Smoke Developed Index: 450 or less. Matt Finish.

1. Fabricate of ½-inch thick, solid-surface material with front edge built up with same material and front profile as detailed.

2. Countertops shall be 1-1/4 inch thick at all exposed edges composed of 1/2 inch solid surface and ¾ inch particle board or 7-ply hardwood veneer plywood substrate. Provide with ½ inch thick loose splashes, 4” high unless noted otherwise.

3. Integral sink bowls complying with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish. Sizes as indicated.

4. Basis of Design: E.I. du Pont de Nemours and Company, or equal.

a. Provide colors from manufacturer’s full range or as indicated.

3.EXECUTION

1. EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2. INSTALLATION

A. Grade: Install casework to comply with same quality standard grade as item to be installed.

B. Install casework level, plumb, and true in line; shim as required using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Comply with SEFA 2.3.

C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

E. Fasten casework to adjacent units and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards."

F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

G. Adjust operating hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

H. Countertop installation shall comply with SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints with internal supports placed to prevent deflection.

1. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.

2. Provide required holes and cutouts for service fittings provided under other scopes of work.

3. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

4. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3. FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.

1. Inspection entity shall prepare and submit report of inspection.

4. CLEANING AND PROTECTION

A. Empty drawers of dirt and dust. Wipe out cabinets' interiors to remove dirt and dust. Remove pencil or other marks, excessive adhesive, etc. from cabinets and countertops. Remove all packaging, scraps, and debris resulting from casework installation activities.

B. Make final adjustments to doors and drawers. Doors shall swing freely, catches shall hold securely, and all other doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding and without excessive slide play.

C. Keys shall be appropriately labeled and turned over to the Owner.

D. Repair or remove and replace defective work as directed on completion of installation.

E. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

F. Protect countertop surfaces during construction with self-adhering plastic, water-resistant covering. Remove upon space turn-over.

END OF SECTION 123216

SECTION 142400 - ELEVATOR UPGRADE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes upgrade of existing hydraulic passenger elevator including:
1. New Pixel microprocessor controls by Elevator Controls
2. New digital car position indicator in car operating panel
3. New electronic curtain device to re-open car door
4. New in car digital traveling lantern in front return panel
5. New laminate cab panels with stainless steel handrails, grid style ceiling with Lexan panels
6. Firemen’s service, phase I and II
7. New stainless steel car operating panel
8. New Illuminated surface mount Car and Hall push button fixtures
9. New ADA hands free emergency telephone in car
10. Refurbish Car and Hoistway Doors
11. Refurbish door tracks hangers and interlocks
12. New closed loop GAL MOVFR door operator
13. New car top inspection station
14. New selector landing system
15. New submersible hydraulic tank unit

1.3 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for all components being replaced as part of this project.

B. Shop Drawings:
1. The contractor is responsible to examine, measure, and otherwise determine that the work can be performed as specified. Any discrepancies or ambiguities found in the specifications shall be reported to the architect.
2. Include plans, elevations, sections, and large-scale details indicating service at each landing; machine room layout; coordination with building structure; relationships with other construction; and locations of equipment.
3. Include large-scale layout of car-control station.

C. Samples for Initial Selection: For finishes involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer performing elevator maintenance, service repairs and moderation for minimum of five years.

1.7 CODE REQUIREMENTS

A. Work covered by these specifications is to be done in full accordance with Federal, State and City codes, ordinances and elevator safety orders that are in effect at the time of execution of the contract

B. All of the requirements of the State of NY are to be fulfilled by the contractor and subcontractors. The entire elevator plant, including all elevator equipment and work, shall be in accordance with the latest edition and supplements of the American National Standard Safety Codes for elevators, dumbwaiters, escalators, and moving walks, ASME - A17.1-2013, NY State Building Code, The National Electrical

1.8 MAINTENANCE

A. A. Maintenance during use, including cleaning, lubricating and adjusting equipment and components for proper elevator operation shall be performed only by the elevator manufacturer. Cost for maintenance shall be covered under modernization contract

B. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment and manufacturer shall have a service office and full time service personnel within 120-miles radius of the project site.

C. The Elevator Contractor shall furnish preventative maintenance, on all equipment, described herein, for a period of twelve (12) months commencing on the date of final acceptance of the

entire elevator system. The maintenance shall include systematic examination, adjustment and lubrication of all elevator and related equipment.

D. The Elevator Contractor shall repair or replace electrical and mechanical part whenever required and shall use only genuine, standard parts produced by the Manufacturer of the equipment installed.

E. All maintenance work shall be performed by competent personnel under the supervision and a direct employee of the Elevator Contractor.

F. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.10 COORDINATION

A. Coordinate locations and dimensions of other work specified in other Sections that relates to the work of this section.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXISTING ELEVATOR DESCRIPTION: M-E High School Elevator #EL-2

A. Type: Passenger

B. Capacity: 2500

C. Model: Hydraulic

D. Stops: 3

E. Openings: 3 Front

F. Speed: Retain Existing

G. Power: Retain Existing (Field Verify)

H. Operation: Full automatic (Field Verify)

2.2 ACCEPTABLE CONTRACTORS AND MANUFACTURERS

A. Acceptable Contractors:
1. Elevattitt, Inc. Syracuse NY (Design Make)
2. Independent Elevator Companies
3. Schindler Elevator
4. ThyssenKrupp Elevator

B. Substitutions: See section 01 60 00 - Product Requirements

2.3 BEAMS AND FLOOR SLABS

A. Reuse any and all existing beams / floor slabs.

2.4 POWER UNIT

A. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

B. Hydraulic Silencers:
1. System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit

C. Pump Motor:
1. Replace existing pump motor. Provide standard manufacture electric motor specifically designed for oil-hydraulic elevator service. Duty rating shall comply with specified speeds and loads.

D. Oil Control Unit: The following components shall be built into a single housing: Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.

E. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve

F. Up start and start valve shall be externally adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.

G. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

H. Lowering valve and leveling valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed to insure smooth “down” stops and starts. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling when the slowdown is initiated.

2.5 CONTROL OPERATION

A. NO PROPRIETARY SOFTWARE / HARDWARE EQUIPMENT SHALL BE INSTALLED

B. Automatic
1. Operate elevator without attendant capable of balancing service and continuing operation.
2. Operate the buttons located at each floor and in the car. Registration of calls by momentary pressure on buttons shall cause the car to respond to passenger demand. Car shall slow down automatically at landings corresponding to calls registered on car and hall buttons. Make stops in the natural order of floors for each direction of travel irrespective of the order in which calls are registered. Simultaneous to initiation of slow down to answer a hall call, cancel that call. Hold hall button ineffective until car doors are closed after passenger transfer. Cancel car calls in the same manner. Cancel car call upon direction reverse.
3. Use easily re-programmable system software. Design basic algorithm to optimize service based on equalizing system’s response to registered hall calls at shortest possible level and equalizing trip time at the shortest possible level.

C. Automatic Stopping Accuracy
1. Stop car within 3/16” above or below the landing sill. Avoid over-travel, as well as under-travel, and maintain stopping accuracy regardless of load in the car

D. Fire Fighter’s Service:
1. Provide new controls, per code, to operate and recall the elevator to designated or alternate floor in fire or other emergency condition. Provide sensor signal wiring from hoistway or machine room connection point to controller terminals. Provide visual /audible signals until return is complete automatic operation is restored.

E. Independent Service:
1. Provide controls for operation of elevator from car buttons only.

F. Emergency Lighting and Alarm:
1. Provide new car-mounted battery unit with solid-state charger to operate alarm bell and lighting, per code. Battery is to be rechargeable with a five (5) year minimum life expectancy. Provide test button in service cabinet of car station, which causes illumination of emergency lighting and alarm

G. Access Switch Service:
1. Provide lobby access switch service operation at top and bottom landings for service personnel to service the elevator.

2.6 CONTROL PANELS

A. Controllers:
1. Demolition: Remove existing control system.
2. New Control Cabinet: Securely mount all assemblies, power supplies, chassis, switches, relays and other items on substantial, completely enclosed cabinet with covers and ventilation to prevent overheating, to be installed in the machine room.
    a. Switch and relay design: Magnet operated with contacts of design and material to insure maximum conductivity; long life and reliable operation without overheating or excessive wear, and provide a wiping section to prevent sticking due to fusion.
    b. Provide switches carrying highly inductive currents with arc deflectors or suppressers.
    c. New soft start motor starter.
    d. Provide new selector and leveling system
3. Microprocessors – related hardware:
    a. Fabricate printed circuit boards with FR4 or G10 glass epoxy material with a minimum equivalent one-ounce copper.
    b. Coat all printed circuitry with tin-lead.
    c. Include built-in noise suppression devices that provide a high level of noise immunity based on double-sided printed circuit boards
    d. Include built-in noise suppression devices that provide a high level of noise immunity based on solid state hardware and devices
    e. Provide supplies with noise suppression devices
    f. Isolate inputs from external devices (such as push-buttons) with opt isolation modules.
    g. Provide a separate regulated power supply for each computer chassis.
    h. Design control circuits so that one side of power supply is grounded to provide for testing.
    i. Under no circumstances shall safety circuits be affected by accidental grounding of any part of the system.
    j. Design the system so that it will start properly when power is restored in the event of a power failure or interruption.
    k. Provide system memory so that data is retained in the event of power failure or disturbance.
4. Power supplies: UL or CSA recognized with short-circuit protection.
5. Wiring: UL or CSA labeled copper wires for factory wiring. Neatly route all wiring interconnections and securely attach connections to studs or terminals.
6. Permanently mark component locations (relays, fuses, P.C. boards, etc.) with symbols
7. Provide extender boards when commuting devices are used inside a computer chassis to facilitate access to the printed circuit cards utilized
8. Use stable capacitor or crystals as the time basis for electronic time delay devices.
9. Battery Lowering
10. Card reader provisions for hall fixtures

2.7 GUIDE RAILS

A. Re-use existing car guide rails.

2.8 CAR GUIDE SHOES

A. Retain and refurbish existing slide/roller guides as necessary.

2.9 PLATFORM, CAR FRAME

A. Reuse existing, thoroughly clean, tighten attachments where loose, and replace where missing. Remove all rattles and annoying noises.

B. Provide work light on top of car conforming to code.

C. Provide code conforming car sill toe guard on car.

2.10 BUFFERS

A. Reuse existing, thoroughly clean, tighten attachments where loose and replace where missing, and paint.

2.11 TOP OF CAR LANDING SWITCH ASSEMBLY AND HOISTWAY SWITCHES

A. Remove all existing and provide new switches to be compatible with new and retained components

2.12 NEW TOP OF CAR MAINTENANCE STATION

2.13 Remove existing and provide new code compliant car top station. Include a new car top light with guard and a 120 VAC, 20AMP rated GFI-C receptacle. Provide operation in conformance to code.

2.14 PIT EMERGENCY STOP SWITCH

A. Provide new to comply with code.

2.15 EMERGENCY CAB LIGHTING AND ALARM BELL

A. Provide and install new emergency lighting and alarm system. Light to be located in Main Car Station. Equipment and installation is to comply with code.

2.16 CAR AND HOISTWAY - DOORS AND ENTRANCES

A. Retain existing hoistway doorframes. Provide all new hangers, hanger rollers, eccentrics, release devices, door closers, interlocks, door restrictors, gate switch and clutch. Provide solid state door operator with necessary programming tools

B. All hoistway sills will be retained. New car sill is to be installed.

C. New doors shall be UL fire rated 1-1/2 hour.

D. Finish shall be #4 stainless steel.

2.17 ELECTRICAL WIRING

A. Provide complete, new insulated wiring to connect all parts of new equipment and interface with retained components.

B. Insulated wiring shall have (NEC 600 VOLT) insulation, type THW for power items. Type TF in sizes # 16 and # 18 may be used for push buttons and control items. Install provided wiring in metal conduits. Existing raceways, and conduits may be reused if practical and if in conformance to code.

C. Provide new traveling cables between the car and controller. Provide NEC type ETT with thermoplastic insulation. Each cable conductor shall be color-coded and have at least 10% spare conductors per AWG. All cables provided will contain steel supporting fillers for hanging to remove the weight from the wires. Cables must be flexible and suitably supported to reduce strain on individual conductors to a minimum and always be free from contact with the hoistway construction or other equipment.

D. All insulated conductors and conduits or tubing as well as fittings including metal boxes troughs and ducts to comply with the requirements of the National Electrical Code

E. Provide dedicated ground where required by control equipment manufacturer. Ground all motors, controller cabinets, junction boxes and disconnects.

2.18 SIGNAL AND OPERATING FIXTURES

A. Remove existing operating fixtures and signals and provide new as follows:
   1. Provide surface mount operating fixtures for car and hall calls, fixtures should be located and designed to comply with NEII, ASME A17.1; UFAS; and ANSI A117.1. Cover plate finish for car interior operating fixtures shall meet code and are to be #4 brushed stainless steel finish. Lobby and landing fixtures shall meet code and have a #4 brushed stainless steel finish

B. Car operating panel: Provide new car operating panel with all devices to meet current code
   1. Car call push buttons and call registered lights
   2. Fire Service operating panel
   3. Locate push buttons and other switches as may be required by code. Locate fan, light,
   4. independent service and other auxiliary switches to provide the operation specified herein in the upper portion of the service panel. Locate to conform to ADA Requirements
   5. All warning signs, capacity, fire service instructions and required graphics shall be engraved in the new car station. All engraving should be paint filled
   6. Provide integral direction arrows and Position Indicator in main car operating panel

7. Provide two-way communication system with self dialing capabilities. Speaker and actuating button to be an integral part of the car operating pushbutton panels. Provide lights, bells, or other announcements as needed to comply with ADA requirements

C. Hall Stations: Provide new hall operating fixtures with all devices to meet current code
   1. Provide new code compliant surface mounted fixtures at all floors. All fixtures to include integral digital position indicator
   2. Call registered buttons and lights: Provide an integrally mounted light in all landing push buttons. When pressed, the push-button will light to indicate that a demand has been registered. After the demand has been answered, the light will be extinguished
   3. Access switches at top floor.
   4. Fire service equipment at main floor. (Main and alternate floors to be determined
   5. Hall stations shall have CARD ACCESS capabilities

D. Car traveling lantern:
   1. Provide directional illuminated arrows showing direction of travel of elevator mounted in car door jamb.
   2. Provide bell or chime audible to notify waiting passenger(s) the direction of travel. One ring for up and two rings for down direction.

E. Where operating fixtures or signals are relocated provide over-size cover plate to conceal cutout holes or renovation

2.19 SIGNAGE

A. Provide labeling and identification of various switches and components as required by code and for safe convenient use. Provide signs as required by code, including instructions, information and notification or warning to users. Provide Braille markings at each landing entrance.

2.20 WALL PANELS – CEILING/LIGHTING – FLOORING

A. Provide new interior standard elevator cab finishes and devices in keeping with the existing cars finishes, mounting, and clearances. Colors to be selected by architect from manufacturers standard range.

2.21 FIRE FIGHTER'S SERVICE

A. Provide emergency fire fighters service phase 1 and 2 to comply with ASME- A17.1 safety code for elevators. Provide all wiring, operating fixtures, signals and informational or instruction signage as required. Smoke and heat sensors, wiring to elevator controller in machine room and lobby enunciator will be provided by others. All fire fighter service phase 1 and 2 instructions shall be engraved in the hall stations. Provide contrasting paint filled engraving

PART 3 - EXECUTION

3.1 TESTING AND FINAL ACCEPTANCE

A. Upon completion of the installation and before the elevator is placed in service, perform Acceptance Inspection and Test to determine that all parts of the equipment and installation conform to these specifications and referenced standards and codes. All protective devices and safety equipment must function as required.

3.2 CLEAN-UP AND PAINTING

A. Clean all new and reused components to remove all construction debris, dirt, rust or other impurities

B. All metal surfaces shall be painted with two (2) coats of rust inhibiting paint after installation. Including but not limited to, guide rails (EXCEPT GUIDE SURFACES), pit equipment, dust covers and fascias.

C. Clean all horizontal and vertical surfaces within the hoistway including walls, floors, beams, ledges, brackets, vent louvers, screens, etc., all shall be brushed down and vacuumed to remove accumulated lint, dust and dirt.

3.3 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate and maintain elevator.

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of four hours or less.

END OF SECTION 142400

SECTION 220010 - BASIC PLUMBING REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 22.

1.2 SCOPE OF WORK

A. Include in bid all labor, materials, tools, plant, transportation, excavation, equipment, insurance, temporary protection, permits, taxes and all necessary and related items required to provide complete and operational systems shown and described.

B. References to Codes and Standards called for in the Contract Documents mean the latest edition, amendment and revisions to the codes and standards in effect on the date of these Contract Documents.

C. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports.

2. Fire Stopping.

3. Flashing and Sealing.

4. Cutting and Patching.

D. Contract shall include, but not be limited to:

1. Plumbing.

1.3 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies.

B. The following is a list of Codes and Standards that will apply to this project:

1. 2020 Building Code of New York State (BCNYS).

2. 2020 Existing Building Code of New York State (EBCNYS).

3. 2020 Energy Conservation Construction Code New York State (ECCCNYS).

4. ASHRAE Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings.

5. 2020 Plumbing Code of New York State (PCNYS).

6. 2020 Fuel Gas Code of New York State (FGCNYS).

7. New York State Department of Labor Rules and Regulations.

8. New York State Department of Health.

9. Federal Occupational Safety and Health Administration - OSHA.

10. National Life Safety Code, NFPA 101.

11. National Electrical Code, NFPA 70.

12. Local Codes and Ordinances for Endwell, NY.

13. NEMA Standards.

14. Underwriters Laboratory (UL).

15. Factory Mutual and/or Owner's Insurance Carrier.

16. National Fire Protection Association (NFPA) - All chapters.

17. New York State Education Department - "Manual of Planning Standards."

1.4 LICENSING & PERMITS

A. The Contractor shall hold a license to perform the work as issued by the State of New York.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid.

C. Refer to General Conditions of the Contract for additional requirements.

1.5 GLOSSARY

ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials

AWSC	American Welding Society Code
AWWA	American Water Works Association
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FM	Factory Mutual Insurance Company
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYBFU	New York Board of Fire Underwriters
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
SHI	Steel Boiler Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
TIA	Telecommunications Industry Association
UFPO	Underground Facilities Protective Organization
UL	Underwriter's Laboratories, Inc.

1.6 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN.
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work is not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner’s Representative.
Owner’s Representative	The Prime Professional
Prime Professional	Architect or Engineer having a contract directly with the Owner for professional services.
Provide	Furnish, install and connect ready for use.

Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Rough-in	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.7 BASIS OF DESIGN

A. The contract documents are prepared on basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Make required changes in work of all other trades, at no increase in any contract. Provide larger motors, electrical feeders, circuit breakers, equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of roughing and connections by other trades. Remove and replace door frames, access doors, walls ceilings or floors required to install other than design make equipment. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.8 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Owner's Representative.

1.9 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation .dgn format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. A request must be made in writing to the Engineer with the requested individual files. The contractor will then be sent a CAD Release Form and must sign the form to obtain electronic drawings.

1.10 QUALITY ASSURANCE

A. Manufacturers of equipment shall be firms regularly and currently engaged in the production of equipment and accessories provided. The design and size of each item of equipment provided for this project needs to have been in satisfactory and efficient operation on at least three (3) installations for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

C. Apply and install materials, equipment, and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Owner's Representative for resolution.

D. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching.

E. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, which are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

2.0 PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL MINIMUM REQUIREMENTS

A. Provide Materials That Meet the Following Minimum Requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.

2. All equipment and material for which there is a listing service shall bear a UL label.

3. Potable water systems and equipment shall be built according to AWWA Standards.

4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA/CSA label.

5. Electrical equipment and systems shall meet UL Standards and requirements of the N.E.C. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.

6. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

7. The listing of a manufacturer as "acceptable" does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.2 SUBSTITUTIONS

A. The Materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted in writing to the Architect and Engineer a minimum of ten (10) days prior to the date for receipt of Bids.

1. Each request shall include the name of the proposed material or equipment being substituted, cut sheets, installation drawings, performance and test data, warranties and location of three (3) similar installations with reference names of Owner or Facility personnel responsible for maintaining equipment.

2. At that time, the equipment will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders.

C. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are unacceptable and will not be considered.

2.3 FACTORY-ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of same manufacturer.

2. Constituent parts which are alike shall be product of a single manufacturer.

3. Components shall be compatible with each other and with the total assembly for intended service.

4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment which serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATIBILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

2.5 SPECIAL TOOLS

A. If any part of equipment requires a special tool for assembly, adjustment or maintenance thereof and such tool is not readily available on commercial tool market, it shall be furnished by the Contractor.

2.6 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36

2. Cold-Formed Steel Tubing - ASTM A 500

3. Hot - Rolled Steel Tubing - ASTM A 501

4. Steel Pipe - ASTM A 53, Schedule 40, welded.

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.7 FIRE STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants.

2. Nelson Electric Fire-Stop System Putty, CLK and WRP.

3. Thomas & Betts - S-100 FS500/600,

4. Carborundum Fyre Putty.

3.0 PART 3 - EXECUTION

3.1 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections.

B. Shop drawings shall be dated and contain the following information. Incomplete submittals will not be accepted. Number each submittal.

1. Name of project.

2. Name of prime professional.

3. Name of prime contractor.

4. Description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.

C. All products specified in an individual Division 22 section shall be submitted at the same time.

D. Indicate deviations from contract requirements on Letter of Transmittal.

E. Corrections or comments made on the Shop Drawings during the review do not relieve Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

3.2 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings drawn at not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings As Follows:

1. HVAC Contract will prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be in AutoCAD format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, lighting fixtures, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Reposition proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of Base Bid Contracts. Minor revisions need not be redrawn.

2. HVAC Contract will provide AutoCAD files and/or prints and submit the base plan to all major trades' Contractors.

3. Electrical and Plumbing Contracts will each draft location of piping, conduits and equipment on the base plan as provided by the HVAC Contract such that a complete coordination of all trades is represented, and areas of conflict and recommended resolutions are noted.

4. Do not install equipment, equipment foundations or piping until Coordination drawings have been approved.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for Construction Safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature required to provide safe conditions for all workmen and site visitors.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Prior to beginning work inspect and test all existing systems that will be affected by the work in this contract. Provide a report to the Owner indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.

B. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the Owner prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, which is determined to have been caused by the work in this contract.

C. The Owner's representative shall determine if the contractor has damaged existing systems or construction and approve the repairs.

3.5 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the Owner's asbestos management plan. Prior to performing such work identify areas containing asbestos, notify the Owner so that they may make arrangements for abatement and/or containment prior to work proceeding. The contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 Sections for further requirements.

3.6 REMOVALS

A. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that Owner wishes to retain that do not contain asbestos material shall be delivered to location directed by Owner. Items that Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated, Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, tubing, supports, fixtures, etc. Visit each room, crawl spaces and roofs to determine total Scope of Work.

B. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all pipe, valves, fittings, insulation, conduit, panels, and all hangers, including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, conduits and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

C. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction.

3.7 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems and building. Perform first seasons winterizing in presence of Owner's operating staff.

3.8 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Owner’s representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in-contract work without reflected ceiling location plans.

2. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to ensure proper location and size of connections to ensure proper functioning of all systems and equipment. Obtain written authorization from the Owner’s representative or other contractor for any “rough ins” that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by this contractor at no expense to the Owner.

3. For equipment and connections provided in this contract, prepare roughing drawings as follows:

a. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

3.9 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction," for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch, cut or abandoned holes left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.10 CONCEALMENT

A. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.11 CHASES

A. In Existing Buildings:

1. Drill holes for floor and/or roof slab openings.

2. Multiple pipes smaller than 1" properly spaced and supported may pass through one 6" or smaller diameter opening.

3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18-gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 inches above floors.

4. In wall openings, drill or cut holes to suit. Provide 18-gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire-stopping similar to that for floor openings.

3.12 FIRE-STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.

3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

4. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Apply fire stopping within the temperature and humidity limits permitted by the manufacturer.

6. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.13 FLASHING AND SEALING

A. Provide non-ferrous flashing pieces, skirts, hoods and collars as required to make pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Apply all flashing and sealers within the temperature and humidity limits permitted by the manufacturer.

3.14 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Supports shall meet the approval of the Owner's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For Precast Panels/Planks and Metal Decks, support plumbing work as determined by manufacturer and Owner's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.15 PAINTING

A. This Contract Includes the following:

1. Painting for all cut and patch work performed as part of Division 22 contract.

2. Painting required for touch-up of surfaces damaged due to the installation of division 22 work.

3. Painting as required to repair finish of equipment furnished.

4. Refer to Division 9 Sections for general description of materials and methods.

5. Painting as called for on Division 22 Drawings.

3.16 ADDITIONAL ENGINEERING SERVICES

A. In the event that the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's expenses in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

B. In the event that the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's expense in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant’s hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

3.17 ALL TRADES TEMPORARY HEAT

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

3.18 TEMPORARY FACILITIES

A. Refer to the standard General Conditions of the contract for Construction and Supplemental General Conditions.

1. Continuity of operation of existing facilities will require temporary installation or relocation of equipment and piping.

2. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.

3. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining pressurized.

3.19 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

3.20 PLUMBING EQUIPMENT CONNECTIONS

A. Provide complete plumbing connections to all plumbing equipment. Provide control connections to equipment where indicated on the drawings. Provide valves on piping ahead of each piece of equipment.

B. Provide all piping, trim, accessories and connections as required for proper equipment operation of Equipment provided by this contract, Owner-Furnished Equipment and Equipment furnished by other contracts,

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.21 PLUMBING INSTALLATIONS

A. All installations shall comply with the following requirements:

1. Coordinate plumbing systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.

2. The Architect shall control the placement of all wall and ceiling mounted plumbing equipment and devices in all rooms with the exception of mechanical and electrical equipment rooms. When drawing details are not available, consult with the Architects representative for actual location.

3. Verify all dimensions with field measurements.

4. Arrange for all chases, slots and openings in other building components, which are not indicated on drawings, to allow for plumbing installations.

5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

6. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule.

7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

8. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer the conflict to the Architect.

9. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

10. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

11. All tolerances in alignment and leveling, and the quality of workmanship for each stage of work shall be as required by the manufacturer and subject to approval by the Owner’s representative.

12. All finished equipment surfaces damaged during construction shall be brought to "as new" condition by touch up or repainting. Any rust shall be removed and primed prior to repainting.

13. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

14. No plumbing equipment shall be hidden or covered up prior to inspection by the Owner's representative. All work that is determined to be unsatisfactory shall be corrected immediately.

15. All plumbing work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

16. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his approval. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.22 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary plumbing and electrical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing facilities or services.

3.23 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owner's designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed prior to acceptance repeat the instructions if asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer's certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e., variable frequency drive and pumps) both manufacturers shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up including problems that occurred and their method of resolution.

C. Refer to Division 1 Sections for additional requirements.

3.24 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items. Bind above items in a three ring binder with name of project on the cover. Deliver to Owner's Representative before request for acceptance.

3.25 RECORD DOCUMENTS

A. Prepare and provide record documents in accordance with Division 1 Sections. In addition to those requirements provide the following:

1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.

2. Take dimensions from a given fixed benchmark, such as the corner of a building, and neatly and clearly indicate same on Record Drawings.

3. Provide Record Drawings for all Contract Work.

4. Incorporate all field changes, change orders and other modifications into the final Record Drawings.

END OF SECTION 220010

SECTION 220502 - PLUMBING PIPING SYSTEMS AND ACCESSORIES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Schedule of all pipe materials, fittings and connections to be utilized on this Project.

1. Pipe and fitting material data sheets identifying compliance with specified approvals and listings.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. All piping and fittings used on this Project shall be new and marked with manufacturer's name; and shall comply with all applicable ASTM and ANSI Standards.

2.2 STEEL PIPING AND FITTINGS

A. Pipe: ASTM A53, or ASTM A106 seamless, Schedule 40 weight; black finish; ends threaded for screwed (threaded) connections.

B. Fittings: Same material and pressure class as adjoining pipe.

1. Threaded fittings: Malleable iron, black or galvanized finish as called for.

C. Joints and Connections:

1. Threaded connections:

a. Unions: ASA malleable cast iron, bronze to iron seat, 300 lb. wwp; for sizes 2 inch and smaller.

b. Flanges: Cast iron companion type; for sizes 2-1/2 inch and larger.

D. Gauge And Instrument Connections: Nipples and plugs for adapting gauges and instruments to piping system shall be IPS brass.

2.3 COPPER PIPE AND SOLDER FITTINGS

A. Pipe, Above ground: Hard temper, ASTM B88; Type L or DWV, as called for. Plans show copper tube sizes.

B. Tees, Elbows, Reducers: Wrought copper; solder end connections; ASME B16.22; ASTM B828.

1. Cast copper alloy fittings are prohibited for medical vacuum piping systems.

C. Unions And Flanges:

1. 2 inch and smaller: Unions, solder type, wrought copper, ground joint, 150 lb. swp.

2. 2-1/2 inch and larger: Flanged, wrought copper, companion type, ASME drilled, solder connection, 150 lb. swp.

D. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. No-lead solder and flux shall comply with requirements of NSF-372, ASTM B813, ASTM B32.

2. Make: Harris "Bridgit", Lucas-Milhaupt Warwick "Silverbright 100", Canfield Technologies "100% Watersafe".

2.4 SOIL PIPE AND FITTINGS

A. Pipe: ASTM A74 service weight cast iron, coated.

B. Fittings: Service weight type with “push-on” type fittings with ASTM C564 extra heavy neoprene gasket of same manufacturer as piping.

C. No-Hub:

1. Pipe: ASTM A888 no-hub cast iron, coated.

2. Fittings: Cast iron no-hub pattern with neoprene gasket and 24 gauge, Type 304 stainless steel heavy duty clamp assembly; ASTM C1540.

a. Make: Charlotte Pipe, Clamp-All, Husky, Tyler “Widebody”.

2.5 ACID RESISTANT PIPING AND FITTINGS

A. Chlorinated polyvinyl chloride (CPVC):

1. Pipe and fittings:

a. Pipe: Schedule 40 chlorinated polyvinyl chloride (CPVC) for chemical waste drain applications, ASTM F441.

b. Fittings: Schedule 40 CPVC, drainage pattern, solvent welded, ASTM D3311.

c. Solvent weld (cement) joints shall conform to ASTM F493.

d. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States.

2. Accessible piping below counters, sinks and equipment: Provide 1½ inch and 2 inch, flanged, mechanical joint or solvent welded unions at traps to permit disassembly.

3. Piping through wall or floor at roughing point for sinks and equipment is to be provided with male IPS threaded adapter.

4. Follow manufacturer's recommendations for proper installation.

5. Make: Charlotte ChemDrain CPVC-CW.

6. Reference Standards (latest revision of each standard applies):

a. ASTM D 1784, Rigid CPVC Vinyl Compounds

b. ASTM F 441, CPVC Plastic Pipe, Schedule 40 and 80

c. ASTM F 493, Solvent Cements for CPVC Pipe and Fitting

d. ASTM D 3311, Standard Specification for Plastic Fitting Patterns

e. NSF Standard 14, Plastic Piping Components and Related Materials.

2.6 SPECIAL FITTINGS

A. Copper To Cast Iron: Cast bronze, cast iron to sweat adapter.

B. No-Hub, Cast Iron: Proper adapter to piping being connected.

2.7 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: Anvil International, Carpenter & Patterson, Cooper B-Line, PHD Manufacturing.

B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated or PVC coated where in contact with copper piping. Cadmium plated or galvanized for non-copper piping.

2. Adjustable ring type where piping is installed directly on hanger for piping 3 inch and smaller.

3. Adjustable steel clevis type for piping 4 inch and larger.

4. Nuts and rods with electroplated zinc or cadmium (0.005 inch minimum) finish.

C. Spacing Schedule:

1. Pipe Hangers:

a. Plumbing Piping: Hanger spacing shall comply with Section 308 and Table 308.5 of the 2020 Plumbing Code of New York State (PCNYS).

b. Fuel Gas Piping: Hanger spacing shall comply with Section 407, Section 415 and Table 415.1 of the 2020 Fuel Gas Code of New York State (FGCNYS).

2. Cast-iron pipe: Each horizontal joint, 5-feet maximum O.C.

D. Cast Iron No-Hub Supports:

1. In accordance with manufacturers recommendations.

2. Vertical piping supported at each stack base and at each floor. Freestanding vertical pipe should be adequately staked or braced during construction to maintain alignment. Bases of stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction or by other methods approved by the Owner's Representative.

3. Horizontal piping supported within 24 inch each side of the coupling joint at 10 foot intervals for 10 foot pipe lengths and at 5 foot intervals for 5 foot pipe lengths. Supports or hangers placed to maintain alignment and grade with provision made to prevent shear. Greater than 3 inch diameter pipe braced at changes of direction to prevent horizontal movement.

E. Piping systems with material not listed above, supported and protected in accordance with manufacturer's recommendations.

F. Supports:

1. For weights under 1000 lbs.: "Drill-In" inserts equal to Phillips "Red Head" "U" Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.

2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs.

3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.

G. Trapeze Hangers:

1. Hangers shall be supported with rod sized with a safety factor of four.

2. May be manufactured type "U" shaped channel, or suitable angle iron or channel.

3. Securely fasten piping to trapeze with "U" bolt or straps, dissimilar metals shall not touch, use isolation gaskets.

4. Acceptable Manufacturer: Globestrut, Kindorf, Unistrut, B-Line, or approved equal.

H. Pipe Insulation Shields:

1. Galvanized steel shields, minimum 180° arc, unless otherwise indicated. MSS SP-58 Type 40.

2. Shields for use with hangers and supports per the following schedule:

Pipe Size	Shield Length	Shield Gauge
1/2" – 3”	12”	18
4”	12”	16
5” – 6”	18”	16

2.8 ROOF SUPPORTS FOR NATURAL GAS PIPING

A. Pillow block pipe support stand with polycarbonate base and stainless steel threaded rods, nuts, roller-bearing and shaft, aluminum pipe strap. Pillow block spacers as needed to raise pipe above roof. Support stand and spacers shall include the following:

1. Rounded edges to prevent damage to roof membrane.

2. Drainage ports to prevent ponding.

B. Make: Miro Industries, or approved equivalent. Contractor shall determine finished mounting height above roof surface for proper ordering of support stands.

1. Pipe sizes 1-1/2” and smaller: Miro Industries, model 1.5 + Spacer + Pipe Strap.

2. Pipe sizes 2” and 3”: Miro Industries series 3-RAH, with pipe strap.

2.9 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.

B. Cleanout plugs, bushings, nipples, required for instruments and gauges to be brass.

2.10 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces.

2. Sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18-gauge minimum and braced to prevent collapsing.

2.11 SEALING ELEMENTS

A. Waterproof Type:

1. Exterior walls, below grade, and above basement or vault floor: Synthetic rubber material with zinc plated bolts.

2. Design Equipment: Garlock "Link-Seal".

3. Acceptable Manufacturers: Garlock, Flexicraft, or Roxtec.

2.12 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814.

B. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly.

C. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.13 STACK SLEEVE

A. With flashing clamp and threaded pipe sleeve extension.

B. Design Equipment: Jay R. Smith Series 1720 with caulking recess and flashing clamp.

C. Acceptable Manufacturer: Josam, Jay R. Smith, Zurn, Wade.

2.14 PIPING MATERIALS AND SCHEDULE

A. See Exhibit P1, "Plumbing Piping Materials", at end of this Section for general plumbing piping systems.

B. See Exhibit P2, “Fuel Systems Piping Materials”, at end of this Section for natural gas piping systems.

3.0 PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

A. Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction.

B. Accurately establish grade and elevation of piping before setting sleeves.

C. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring.

D. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance.

E. Offset piping and change elevation as required to coordinate with other Work. Avoid contact with other mechanical or electrical systems. Make changes in direction and branch connections with fittings.

F. Provide adequate means of draining and venting units, risers, circuits and systems.

G. Conceal piping unless otherwise called for. Do not install valves, unions and flanges in inaccessible locations.

H. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction.

I. Install piping parallel with lines of building, properly spaced to provide clearance for insulation.

J. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

K. Plastic pipe is prohibited in plenums and stairs. Plastic pipe shall not be installed exposed in places of assembly.

3.2 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, or from other piping, nor by vertical expansion bolts. Support piping with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing, using proper diameter rod for pipe size.

B. Provide additional structural steel members, having one coat rustproof paint, where required for proper support.

C. Provide oversized hangers where insulation/supports must pass between pipe and hanger.

1. Provide pipe insulation shield at all points of support for insulated piping. Center shields on all hangers and supports outside of insulation. Install shields in manner to prevent cutting or puncturing insulation jacket.

D. Provide continuous support or extra supports for plastic pipe per manufacturer's requirements.

E. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible; "C" type not permitted on joists.

F. Provide riser clamps for each riser at each floor.

G. Use trapeze hangers where a group of piping can be installed.

H. Roof supports for Natural Gas Piping:

1. Install supports in accordance with manufacturer's installation instructions.

2. Adjust height of each support to achieve proper height and level before installing natural gas pipe.

3. Secure natural gas pipe to roof support with pipe strap.

4. Make final adjustments to provide even distribution of load on all supports.

3.3 PIPE CONNECTIONS

A. No-Lead Solder Connections: Nonacid flux; clean off excess flux and solder. Solder and flux shall comply with requirements of NSF-372.

B. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.

C. Solvent Cement Connections: Comply with manufacturer's written installation guidelines and instructions.

3.4 SLEEVES

A. Provide for pipes passing through floors, walls or ceilings. Extend 1/8 inch above finished floor in finished areas. In above grade Mechanical Rooms and other areas with floor drains, use steel pipe sleeves 2 inch above floor.

B. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for.

C. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating.

D. Fill abandoned sleeves with concrete.

3.5 SLEEVE PACKING

A. Seal Void Space At Sleeves As Follows:

1. Interior locations: Firmly pack with fiberglass and caulk.

2. Exterior walls above grade: Use link-seal or approved sealing element.

3. Cored holes: Use sealing element.

4. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods.

5. Waterproofed floors: Use waterproof sealing element, device or compound.

3.6 ESCUTCHEON PLATES

A. Provide polished chrome escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.7 TESTS

A. Refer to other Division 22 Sections for testing of Plumbing Systems.

3.8 PIPE LINE SIZING

A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "P1" – PLUMBING PIPING MATERIALS

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Domestic water interior/hot, cold and circulating 4" and smaller	Type L or M copper	Wrought copper pressure-connect pressure fittings and couplings	Press-connect joints
Sanitary, vent and storm	Service weight cast iron soil pipe or Type DWV copper	Cast iron hub and spigot, No-hub or wrought copper; drainage pattern	Neoprene gasket compression type, no-hub neoprene gasket and stainless steel clamp assembly or no-lead solder
Indirect waste	Type L copper, Type DWV copper	Wrought copper	No-lead solder
Acid waste and vent	CPVC	CPVC	Solvent welded

EXHIBIT "P2" – FUEL SYSTEMS PIPING MATERIALS
(Notes at end of Exhibit "P2")

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Natural gas (exterior above grade) SEE NOTE 1	Schedule 40, black steel, paint with 3 coats	2" and smaller malleable; 2-1/2" and over butt welded. Paint fittings with 3 coats	Threaded and welded

NOTES FOR EXHIBIT "P2":

NOTE 1: Exposed exterior natural gas: For steel pipe, one coat of alkyd primer and two coats of exterior acrylic latex gloss enamel. Color as selected by Owner or Architect. Apply paint in accordance with manufacturer's directions. Remove spilled and splattered paint from all surfaces.

END OF SECTION 220502

SECTION 220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. All valves and accessories listed under “Part 2 – Products” of this Section.

1. Submit cut sheets, specifications and dimensioned drawings.

2. Submit compliance with ANSI/NSF-372 for valves intended to supply drinking water.

2.0 PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. Valves shall have following requirements:

1. Working pressure stamped or cast on bodies per MSS SP-25.

2. Stem packing serviceable without removing valve from line and shall be free of asbestos.

B. Makes:

1. Gas valves: Homestead, Jomar, Nordstrom (Flowserve Corp.), Resun (R&M Energy Systems), Watts.

2. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

2.2 GAS VALVES

A. 2 inch and smaller: Brass body, threaded ends, full port ball valve, UL listed, CSA approved to 0.5 psig and 5 psig. Watts FBV-3C.

B. 2½ inch and larger: Manual actuated with lever actuators, short pattern, lubricated plug type, 200 lb. WOG, flanged, UL listed and CSA approved. Homestead Figure 612.

C. Solenoid Valves for gas line emergency shutoff: Normally closed operation, two way valve compatible for Ansul restaurant system. UL listed, mechanical valve.

1. Make: ANSUL 55607 or approved equal.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment and fixtures.

2. Use extreme care and caution when soldering valve connections to piping to prevent valve seat damage. Apply heat with the flame directed away from the center of the valve body. Inspect all valves after soldering, tighten valve packing nut and make adjustments if required to ensure valve operates properly. Replace all damaged valves.

3. Provide valves at major building and system sections, and where shown on Contract Drawings.

END OF SECTION 220523

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

A. Submit product data for each identification material and device, and for all items specified under “Part 2 - Products” of this Section.

B. Submit valve schedule for all piping systems typewritten on 8 1/2 inch x 11 inch paper, indicating code number, location and valve function. Submit with O&M Manuals.

C. Submit schedule of piping, equipment and valve identification for review before labeling. Confirm naming/numbering is consistent with Owner’s naming/numbering convention prior to labeling.

1.4 ACCEPTABLE MANUFACTURERS

A. Brady Co., Brimar Industries, Craftmark, Seton, or approved equal.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Provide manufacturer's products of categories and types required for each application.

2.2 PIPING IDENTIFICATION

A. Pipe Labels (Inside buildings):

1. Piping/Insulation with outside diameter of 5-7/8 inches and less: Provide acrylic plastic wrap-around type markers with directional flow arrows, UV resistance and legend printed four (4) times for 360° visibility. Make: Seton “Setmark” snap-on wrap around type pipe markers.

2. Piping/Insulation with outside diameter of 6 inches and greater: Provide acrylic plastic strap-on type markers with directional flow arrows, UV resistance and legend printed two (2) times minimum. Make: Seton “Setmark” strap-on wrap around type pipe markers.

B. Pipe labels shall conform to the following identification table:

PIPE SERVICE	IDENTIFICATION/LABEL
Natural Gas	NATURAL GAS
Sanitary and / or Waste	SANITARY DRAIN
Acid Waste	ACID WASTE
Acid Vent	ACID VENT
Indirect Waste	INDIRECT WASTE
Domestic Cold Water	DOMESTIC COLD WATER
Domestic Hot Water	DOMESTIC HOT WATER
Domestic Hot Water Recirculation	DOMESTIC HOT WATER RETURN

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify all plumbing services with 1/4" letters above the valve number ("PLBG."). Attach to valves using brass "jack" chain and brass "S" hook. Make: Seton Style No. M4507 tags, Style No. 16182 chain and Style No. 16195, 6 and 7 No. hooks.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room or in location as directed by the Owner.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project. Provide a valve tag chart for all valves provided on the project.

B. Provide piping identification with directional flow arrows for all piping provided on project.

1. Provide labels on straight runs of piping at 20'-0" intervals, minimum.

2. Provide labels where piping enters and leaves a partition, wall, floor or ceiling.

3. Adhesive type or stenciled labeling is unacceptable. Provide wrap-around type labels only.

END OF SECTION 220553

SECTION 220700 - PLUMBING INSULATION

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

B. Plumbing insulation shall comply with the requirements of the 2020 Energy Conservation Construction Code (ECCCNYS).

1.2 SUBMITTALS

A. All items listed under “Part 2 – Products” of this Section.

1. Submit manufacturer’s data sheets.

B. Schedule of all insulation applications for this project.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Insulation, Jackets, Adhesives, And Coatings, Shall Comply With The Following:

1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments not permitted.

2. Insulation, including finishes and adhesives on the exterior surfaces of pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less; as tested by ASTM E84 (NFPA 255) and UL 723 methods.

3. Asbestos or asbestos bearing materials are prohibited.

2.2 PIPE INSULATION (RIGID TYPE)

A. Preformed rigid sectional pipe covering, 4 lb. nominal density fiberglass; ASTM C547, Class 1. White Kraft outer surface bonded to aluminum foil and reinforced with fiberglass yarn.

B. Maximum thermal conductivity (k), in units of Btu/sq. ft. hr. ^{o}F/in.:

Fluid Operating Temperature	Max. Thermal Conductivity	Mean Rating Temperature
40° F - 60° F	0.27	75° F
105° F - 140° F	0.28	100° F
Greater than 140° F	0.29	125° F

2.3 PLASTIC JACKETING

A. PVC jacket, UV-resistant, 20 mill thickness; ASTM D1784, Class 14253-C. Solvent adhesive welded joints.

2.4 MAKE

A. Fiberglass: Certainteed, Knauf, Johns Manville, Owens-Corning, or approved equal.

B. Adhesives: Childers, Foster Products, Tremco; numbers designate quality of adhesive.

2.5 MATERIALS AND SCHEDULES

A. See Exhibits at the end of this section.

3.0 PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide Thermal Insulation:

1. Insulation is required on piping unless otherwise called for.

2. Install insulation only on clean, dry surfaces and after work has been tested.

3. Install insulation on cold surfaces with continuous unbroken vapor seal.

4. Exposed surfaces shall be white.

5. Pipes shall be individually insulated.

B. Do not cover inspection stampings, openings, petcocks, handholes, manholes, access doors, plugged outlets, air vents, plugged openings or petcocks.

C. Install insulation, accessories, coverings and jackets in accordance with manufacturer's installation instructions.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed.

B. Piping In Exterior Walls, Spaces, Overhangs, Attics, and Or Where Subject To Freezing: Insulate pipe with double the thickness called for.

1. Piping In Wall Chases: In addition to the above, pack chase with loose glass fiber insulation.

C. Joints In Section Pipe Covering Made As Follows:

1. Standard: Longitudinal laps and butt joint sealing strips cemented with Foster 85-20 or factory applied pressure sensitive adhesive lap seal. Stapled with outward clinching staples.

2. Vapor barrier: For cold services, Longitudinal laps and 4 inch vapor barrier strip at butt joints shall be sealed with white Foster 85-20. Seal ends of pipe insulation at valves, flanges, and fittings with white Foster 85-20.

D. Pipe Insulation Shields:

1. Refer to Section 220502, Plumbing Piping Systems and Accessories, for requirements.

2. Provide pipe insulation shield at all points of support for insulated piping. Center shields on all hangers and supports outside of insulation. Install shields in manner to prevent cutting or puncturing insulation jacket.

E. Fittings, Valves And Flanges:

1. General:

a. Concealed: Insulating cement of the same thickness as adjacent pipe insulation. Cold water to be vapor sealed with Foster 30-36 "Seal-Fas".

b. Exposed: Premolded fitting covers of the same material and thickness as the adjacent pipe insulation and finished with glass cloth applied and coated with Foster 30-36 "Seal-Fas."

2. Optional: In lieu of the standard method above, the Contractor has the option of using Zeston, Ceel-Co, or Proto. Tape all joints at covers.

a. Fitting covers shall have fiberglass insulation inserts from the factory. Insulation inserts shall have 1.5 pcf minimum density; ASTM C553, Type III.

b. PVC fitting covers shall be UV-resistant.

3.3 RECOVERING

A. Field apply 6 oz. white glass cloth, cemented and applied over standard jacket. Properly cut at fittings to avoid wrinkles and coat with Foster 30-36. Leave ready for painting. Provide as called for.

3.4 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

3.5 EXISTING WORK

A. Insulate existing piping and equipment as called for on the Contract Drawings. Insulation material and thickness shall comply with Exhibits in this Section.

EXHIBIT "I" - PIPE INSULATION MATERIALS
(Notes are at end of Exhibit "I")

SERVICE	INSULATION MATERIAL	PIPE SIZE	INSULATION THICKNESS	REMARKS
AC unit drains and overflows (Indirect Waste piping)	Glass fiber	All sizes	1/2"	
Domestic cold water	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1" 1/2"	
Domestic hot water (up to 140o)	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1-1/2" 1"	
Domestic hot water return (up to 140o)	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1-1/2" 1"	

NOTES FOR EXHIBIT "I":

NOTE 1: Exposed insulation within kitchen 102 shall be covered with PVC jacket.

END OF SECTION 220700

SECTION 221100 - FACILITY WATER DISTRIBUTION

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices of the following publications, codes, standards, and listings:

1. 2020 Plumbing Code of New York State (PCNYS).

2. ANSI/NSF-61, Drinking Water System Components – Health Effects.

3. ANSI/NSF-372, Drinking Water System Components – Lead Content.

1.3 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

B. Written certification for domestic water system tests. Submit with O&M Manuals.

2.0 PART 2 - PRODUCTS

2.1 DOMESTIC WATER SYSTEMS PIPING

A. Refer to Section 220502, “Plumbing Piping Systems and Accessories” for piping materials.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall conform to Article 1.2 of this section and shall be provided in a workmanlike manner as determined by the Owner's Representative and the Contract Specifications.

3.2 PIPING

A. Run all water piping slightly off level to low points. Provide drain valves and caps at all low points in the domestic water system.

B. Provide water hammer arrestors where shown or specified. Provide water hammer arrestors where solenoid or quick closing valves are installed. Refer to Section 223000, “Plumbing Equipment”.

C. Branch headers serving flush valves and fixtures shall be run full size to the last fixture being served unless otherwise noted.

D. All exposed water piping in kitchens shall be chrome plated brass from insulation to fixture or equipment connection.

E. All exposed water piping under fixtures shall be chrome plated brass.

F. Provide dielectric pipe fittings when connecting systems of dissimilar metals. Refer to Section 220502, “Plumbing Piping Systems and Accessories”.

G. Supply piping to all fixtures, faucets, shower accessories, hydrants and flush valves shall be anchored to prevent movement. Provide additional structural members and supports as required.

3.3 ASBESTOS PIPE

A. General: Existing water main piping and/or pipe insulation may contain asbestos. Cutting, drilling or other disturbance of this material shall be conducted as specified by New York State Department of Labor, Industrial Code Rule No. 56 "Asbestos". The methods and procedures specified in New York State Department of Labor, Industrial Code Rule 56 shall constitute minimum measures and shall in no way relieve the Contractor of sole responsibility for the means, methods, techniques, sequences or safety measures taken in connection with the work.

3.4 STERILIZATION

A. Provide sterilization of water piping in accordance with all requirements of the New York State Health Department, Public Water Supply Guides, Division of Sanitary Engineering, Bureau of Public Water Supply.

3.5 TESTS AND FLUSHING

A. Provide all necessary items to complete proper testing of all domestic water piping. Isolate existing systems as required.

B. Flush all water piping to remove debris, sediment, dirt, rust, corrosion and other foreign material. Flush all piping before connecting to fixture faucet and flush valves. Refer to Section 224200, “Commercial Plumbing Fixtures”. Utilize open pipe ends wherever possible.

C. Piping Supplying Domestic Water: Test at 125 psi hydrostatic pressure for two hours. All tests shall be witnessed by Engineer or Owner’s Representative.

D. For all Exterior Piping:

1. Joints in pipelines shall not be covered with backfill until after successful completion of leakage tests and observance of the tests by the Engineer or the Owner’s Representative.

E. A successful air test is not acceptable as the final test; however, the Division 22 contractor shall provide interim air testing of piping as construction progresses.

F. Make all leaks tight. No caulking of leaks shall be permitted. Remove and replace all defective fittings, piping and connections.

G. Collect bacteriological test samples after testing and flushing is complete. A minimum of two (2) samples shall be taken. Locations of samples shall be designated by the Owner's Representative. Collect samples in sterile bottles and send to NYS DOH approved laboratory for analysis.

1. Submit sample test results to Owner's Representative.

2. Contractor shall disinfect, flush and re-test domestic water piping until sample test results are satisfactory.

H. Required lead testing shall be provided by the School District. Lead testing shall be in accordance with the requirements outlined in the New York State Department of Health Regulation 10CRR-NY, Subpart 67-4, Lead Testing in School Drinking Water.

I. Pay all costs of tests. Perform all tests in a safe manner. Remove all discharged water resulting from testing procedures.

J. Certify in writing that all required domestic water tests have been conducted and successfully completed. Submit all certifications to the Owner's Representative.

END OF SECTION 221100

SECTION 221301 - FACILITY WASTE WATER SYSTEMS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 RELATED WORK

A. Basic Plumbing Requirements.

B. Plumbing Piping Systems and Accessories.

C. Identification for Plumbing Piping and Equipment.

D. Plumbing Equipment.

1.3 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

B. Shop drawings for precast concrete interceptors. Shop drawings shall show all dimensions, inlet and outlet piping connections, access covers and risers, and water-tight joint details.

C. Submit written certification for sanitary, storm and vent piping system tests. Submit with O&M Manuals.

2.0 PART 2 - PRODUCTS

2.1 PLUMBING DRAINAGE SYSTEM

A. Refer to Section 220502, Plumbing Piping Systems and Accessories, for piping materials.

3.0 PART 3 – EXECUTION

3.1 GENERAL

A. Prior to commencing work, the Contractor shall verify all inverts and locations. Any discrepancy between the plans and field conditions shall be reported in writing to the Owner’s Representative and Engineer within three (3) days of discovery. No work shall start until all discrepancies have been resolved. All costs related to Contractor's failure to verify and/or report discrepancies or problems will be borne by the Contractor.

3.2 EQUIPMENT CONNECTIONS

A. Plumbing Contractor Shall:

1. Provide all roughing, and final waste and vent connections to equipment requiring same as called for by the Contract Documents.

2. Refer to the Contract Documents for roughing schedules, equipment and lists indicating scope of connections required.

3. Provide adapters and all necessary piping, fittings and connections from roughing point to equipment.

4. Install controls and devices furnished by others as noted on the Construction Documents.

3.3 INTERIOR PIPING INSTALLATION

A. Minimum Pitch:

1. Piping 3 inches and smaller: 1/4 inch per foot.

2. Piping 4 inches and larger: 1/8 inch per foot.

B. Paint exposed waste and vent piping 2 inches and over with chromium paint.

3.4 ASBESTOS PIPE

A. General: Existing sewer main piping may contain asbestos. Cutting, drilling or other disturbance of this material shall be conducted as specified by New York State Department of Labor, Industrial Code Rule No. 56 "Asbestos". The methods and procedures specified in New York State Department of Labor, Industrial Code Rule No. 56 shall constitute minimum measures and shall in no way relieve the Contractor of sole responsibility for the means, methods, techniques, sequences or safety measures taken in connection with the work.

3.5 TESTING

A. General: Provide all necessary items to complete proper testing of Work. Isolate existing systems as required.

1. Pay all costs of test. Perform all tests in a safe manner. Remove all discharged water resulting from testing procedures.

2. Provide written certification that tests have been conducted and successfully completed. Submit to Owner's Representative.

B. Pipe testing:

1. Test all sections of storm, sanitary, waste and vent piping installed by this Project. Test existing piping as called for.

2. Maintain 10 feet head of water above highest point of section being tested for a minimum of two hours, or until all joints are inspected and proved tight.

3. For interior piping, leaks of any volume detected in sewers or in floors or walls of appurtenant structures shall be permanently stopped. Should any leaks, defective joints or defective construction be found they shall be promptly made good. Should any defective pipes or specials be discovered they shall be removed and replaced with sound pipes or specials in a satisfactory manner at the Contractor's expense.

4. Air test not acceptable as final test.

END OF SECTION 221301

SECTION 221600 - FACILITY NATURAL GAS SYSTEMS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices of the following publications, codes, standards, and listings:

1. 2020 Fuel Gas Code of New York State (FGCNYS).
2. 2020 Building Code of New York State (BCNYS).
3. American Gas Association (AGA).
4. Local Utility Company: NYSEG.
5. Local Building Code: Endwell, NY.

1.3 SUBMITTALS

A. Provide submittals for all items specified under “Part 2 – Products” of this Section.

B. Submit written certification for natural gas system tests. Submit with O&M Manuals.

2.0 PART 2 - PRODUCTS

2.1 PIPING

A. Interior and Exterior:

1. Refer to Section 220502, "Plumbing Piping Systems and Accessories," for piping materials and requirements.

2.2 VALVES

A. Refer to Section 220523, "General Duty Valves for Plumbing Piping" for valve requirements.

3.0 PART 3 - EXECUTION

3.1 GAS PIPING

A. General:

1. Make arrangements with Local Utility Company for adjustments and modifications to existing service, meter and regulator. PAY ALL COSTS.

2. Gas piping is prohibited from penetrating building foundation walls at any point below grade per the 2020 FGCNYS. Gas piping shall enter and exit a building above grade.

B. Exterior, Above Grade:

1. Steel Pipe:

a. Piping shall be coated or protected and maintained to minimize corrosion. Refer to Section 220502, "Plumbing Piping Systems and Accessories," for requirements.

b. Provide transition fitting for connecting steel piping to MDPE [HDPE] pipe. Adapter shall be provided above grade. Install transition fitting in accordance with manufacturer’s written instructions.

3.2 GAS PIPING TESTS

A. Provide necessary items to complete proper testing of natural gas piping systems.

B. Perform tests as required by Local Utility Company and in accordance with the 2020 FGCNYS. Tests shall be witnessed by Owner’s Representative and Local Utility Company. Make arrangements and pay costs.

C. Interior and exterior gas piping tests:

1. Test pressure and duration: 1.5 times the maximum working pressure, but not less than 3 psig, for one hour.

a. Test medium shall be air or nitrogen. Oxygen is prohibited as testing medium.

b. Contractor may provide interim air testing of piping as construction progresses.

2. Tests shall be performed before connection to appliances and equipment.

D. Provide written certification that tests have been conducted and satisfactorily completed. Submit to Owner's Representative.

END OF SECTION 221600

SECTION 230010 - BASIC MECHANICAL REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 23.

B. Section 019113 - Commissioning Requirements

1.2 SCOPE OF WORK

A. All portions of the work shown in the construction documents shall be bid by the Mechanical Contractor. Responsibility for performance of subcontractors and trades as lower tier contracts, such as electrical, shall be included as part of the Mechanical Contractor's scope of work.

B. Include in bid all labor, materials, tools, plant, transportation, excavation, equipment, insurance, temporary protection, permits, taxes, services and all necessary and related items required to provide complete and operational systems shown and described.

C. References to codes and standards called for in the Contract Documents mean the latest edition, amendment and revisions to the codes and standards in effect on the date of these Contract Documents.

D. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports
2. Access Doors and Panels
3. Fire Stopping
4. Cutting and Patching

E. Contract shall include, but not be limited to:

1. HVAC
2. General Contracting work as related to the HVAC Contract
3. Temperature Controls
4. Testing and Balancing of Mechanical Systems

1.3 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies having jurisdictional authority. In the event of conflict between these contract documents and the governing rules, regulations, and codes, the most stringent standards shall apply as directed by the Engineer and/or Authorities having jurisdiction.

B. Codes and standards that apply to this project include, but are not limited to:

1. 2020 Building Code of New York State (BCNYS)
2. 2020 Existing Building Code of New York State (EBCNYS)
3. 2020 Energy Conservation Construction Code of New York State (ECCCNYS)
4. 2020 Fire Code of New York State (FCNYS)
5. 2020 Fuel Gas Code of New York State (FGCNYS)
6. 2020 Mechanical Code of New York State (MCNYS)
7. 2020 Plumbing Code of New York State (PCNYS)
8. ASHRAE Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings.
9. New York State Department of Labor Rules and Regulations.
10. New York State Department of Health Regulations.
11. New York State Education Department - “Manual of Planning Standards”.
12. Federal Occupational Safety and Health Administration (OSHA) Regulations
13. Local Codes and Ordinances for Endwell, NY.
14. Factory Mutual and/or Owner’s Insurance Carrier
15. New York Board of Fire Underwriters.
16. 2022 ASHRAE 15, Standard for Refrigeration Systems.

1.4 LICENSING & PERMITS

A. The Contractor shall hold a license all necessary licenses to perform the scope of work at the project location.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid.

C. Refer to General Conditions of the Contract for additional requirements.

1.5 GLOSSARY

ADA	Americans with Disabilities Act
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FM	Factory Mutual Insurance Company
GAP	Global Asset Protection
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories, Inc.

1.6 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.

Inspection	Visual observations by Owner's Site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional, Construction Management, or other entity contractually authorized by the Owner for the services referenced.
Prime Professional	Architect / Architectural Entity or Engineer / Engineering Entity having a contract directly with the Owner for professional services.
Professional Engineer	Individual or Entity licensed to perform Engineering services in the State of New York
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Roughing	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.7 BASIS OF DESIGN

A. The contract documents are prepared on the basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Contractor shall provide changes in work of all other trades at no increase in any contract. Provide larger motors, electrical feeders, circuit breakers, equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assumes responsibility for proper location of roughing and connections by other trades. Remove and replace door frames, access doors, walls, ceilings or floors required to install other than design make equipment. Contractor shall retain the ultimate responsibility for function of equipment and materials which are not the basis of design for the contract documents. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.8 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Owner's Representative.

B. In the event of conflict between the drawings and specifications, or discrepancies within either, this shall be brought to the attention of the Engineer for resolution prior to submission of bids. In the event that the contractor fails to note these discrepancies prior to submission of bids or in writing within their bid submission, the Engineer shall resolve the discrepancy such that the design intent is provided. The contractor shall provide all labor, materials and equipment to correct the installation deficiencies as defined by the Engineer.

1.9 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation 'dgn' format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. If the Contractor requests electronic CAD files from the Engineer and this request is granted, the Contractor shall submit application to the Engineer identifying each drawings to process the request.

1.10 QUALITY ASSURANCE

A. Manufacturers of equipment shall be firms regularly and currently engaged in the production of equipment and accessories provided. The design and size/capacity of each item of equipment provided for this project needs to have been in satisfactory and efficient operation on at least three (3) installations for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

C. Apply and install materials, equipment, and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Owner's Representative for resolution.

D. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching.

E. All work shall be done in a neat and workmanlike manner. All methods of construction or details of workmanship, not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and construction indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

F. In the absence of specific information within other sections of this project manual, all work of this project shall be provided with a one year labor and materials warranty against defects in equipment, materials and workmanship, starting from the date of project substantial completion.

2.0 PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL MINIMUM REQUIREMENTS

A. Provide materials that meet the following minimum requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.

2. All equipment and material for which there is a listing service shall bear a UL label.

3. Gas-fired equipment and systems shall meet AGA Regulations and shall have an AGA label

4. Electrical equipment and systems shall meet UL Standards and requirements of the NEC. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with UL Standards and the requirements of the NEC.

5. Communications equipment shall meet all FCC Regulations

6. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

7. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.2 SUBSTITUTIONS

A. The materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted in writing to the Architect and Engineer a minimum of ten (10) days prior to the date for receipt of Bids. Each request shall include the name of the proposed material, product or equipment being substituted, cut sheets, installation drawings, performance and test data, warranties and location of three (3) similar installations with reference names of owner or facility personnel responsible for maintaining equipment. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders. Failure to follow the guidelines described above may result in equipment being rejected at submittal based solely on failure to follow the above guidelines.

C. Approval by the Architect and/or Engineer to proceed with a substitution does not relieve the contractor from meeting all of the dimensional requirements and maintaining the full functionality and performance of the material, product or equipment used as the basis of design.

D. Electrical Design Changes Due to Mechanical Substitutions – It shall be the responsibility of all Contractors to transmit all changes of electrical characteristics to the Electrical Contractor which result from any substitutions PRIOR to starting any work. Any and all extra charges by the Electrical Contractor due to these changes are to be paid by the Contractor making the change.

E. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are unacceptable and will not be considered.

2.3 FACTORY-ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of the same manufacturer.

2. Constituent parts which are alike shall be products of a single manufacturer.

3. Components shall be compatible with each other and with the total assembly for intended service.

4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. Components of equipment shall bear the manufacturer's name or trademark, model number and serial number on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment which serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATIBILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

2.5 SPECIAL TOOLS

A. If any part of equipment requires a special tool for assembly, adjustment or maintenance thereof and such tool is not readily available in the commercial tool market, it shall be furnished by the Contractor as required for the duration of the project and turned over to the Owner in serviceable condition upon completion of the scope of work. Contractor shall obtain written sign off by the Owner certifying that the Owner is in receipt of such tools.

2.6 SAFETY GUARDS

A. Provide guards on all shafts and couplings and all V-belt and sheave assemblies to prevent damage to equipment and injury to personnel.

2.7 LIFTING ATTACHMENTS

A. Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered without bending or distortion of shape, such as rapid lowering and braking of load.

2.8 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36

2. Cold-Formed Steel Tubing - ASTM A 500

3. Hot - Rolled Steel Tubing - ASTM A 501

4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal fasteners shall be zinc-coated (type, grade and class as required).

2.9 ACCESS DOORS AND PANELS

A. Steel access doors and frames shall be factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.

B. Provide access doors at all locations where equipment access for service, repair, and/or adjustment may be required. This shall include access to all air balance dampers. (In lieu of access to air balance dampers above hard ceilings or in chase walls, Contractor may submit for approval for use of remote regulators.)

C. Construction:

1. Frames:

a. 16 gage steel with 1 inch wide, exposed, perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast-in-place concrete, or ceramic tile.

b. 16 gage steel, perforated flanges with bead for gypsum or plaster wall board.

c. 16 gage steel with galvanized, expanded metal lath and exposed casing bead, welded to perimeter of frame for full bed plaster applications.

2. Access Doors:

a. Provide 14 gage sheet steel, flush panel doors with concealed, continuous, factory-installed piano hinge, primed and painted, set to open 175 degrees in unrated partitions.

b. Provide fire-rated, insulated, flush panel doors, with continuous piano hinge and self-closing mechanism rated for 1-½ hour “B” labeled, in fire-rated partitions.

3. Provide flush, screwdriver operated cam locks on all access doors.

4. Access doors shall be gasketed type where installed in rooms or spaces required to maintain a positive or negative pressure requirement to adjacent rooms or spaces.

2.10 CONCRETE BASES

A. Provide concrete bases for all floor mounted equipment. Provide 3000# concrete, camfer edges, trowel finish and securely bond to floor by roughing slab and coating with cement grout. Provide a minimum of one ½” rebar dowel for every 2 sq. ft. base area, anchored 2” into floor and base to eliminate movement, minimum of 4 dowels per base. Bases shall be nominal 4” high unless otherwise indicated, shaped and size to accommodate equipment, and extend 4” beyond equipment footprint in all directions. Set equipment anchor bolts in sleeves before pouring. After anchoring and leveling, fill equipment bases with grout.

2.11 FIRE STOPPING

A. Fire-stopping for openings through fire and / or smoke rated walls and floor assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated by ASTM E814.

B. Submit for approval all fire stop systems and materials for approval by the Engineer

C. Acceptable Manufacturers:

1. Hilti Firestop Systems

2. Dow Corning Fire-Stop System Foams and Sealants.

3. Nelson Electric Fire-Stop System Putty, CLK and WRP.

4. Thomas & Betts - S-100 FS500/600,

5. Carborundum Fyre Putty.

2.12 REFRIGERANT SYSTEMS

A. Refer to equipment schedules on the contract drawings for refrigerant type, classification and charge quantity for Basis of Design equipment. Refer to the related sections of the project manual for additional requirements.

B. For equipment which deviates from the Basis of Design equipment scheduled refrigerant type, classification or charge quantity, Contractor shall provide changes in work of all trades, including their own, necessary for meeting all ASHRAE 15 2022 requirements at no increase in any contract. This shall include the costs of additional engineering services. Refer to paragraph 3.19 of this section.

3.0 PART 3 - EXECUTION

3.1 SUBMITTALS: SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections. Shop Drawings shall be dated and contain: name of project; name of prime professional; name of prime contractor; description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. Incomplete submittals will not be accepted. All products specified in an individual Division 23 Section shall be submitted at the same time. Number each submittal. Indicate deviations from contract requirements on Letter of Transmittal. Corrections or comments made on the Shop Drawings during the review do not relieve the Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

B. Approval of shop drawings will not relieve this contractor from responsibility for deviations from the contract documents. It is the responsibility of the Contractor to meet the requirements of these documents. All errors or omissions in the product data are to be corrected by this contractor irrespective of any approvals by the Architect or Engineer.

C. Pre-test submittals must be written in report format, submitted and signed off on by the Owner and Engineer prior to the start of any construction work, including demolition.

D. Shop drawings include, but are not limited to, the submissions listed below. Refer to individual specification sections for specific requirements and additional submission requirements.

SECTION	DESCRIPTION	REQUIRED SUBMISSIONS
230010	Basic Mechanical Requirements	Access doors Fire Stopping Special requirements related to substitutions Sheet metal shop / coordination drawings Operation and Maintenance Manuals Record Documents / Drawings
230130	Mechanical Cleaning of HVAC Systems	Shop drawings locating all proposed duct penetrations and ceiling access holes in plaster ceilings. Provide MSDS sheets on all solvents, cleaners and disinfectants to be used on project.
230506	Painting of Mechanical Work	Product data for vehicles, primers and paints. (name, title, manufacturer, mfr's stock number, color name & number, & application instructions). Submit a schedule of surfaces/systems to be painted along with paint products and colors that shall be applied.
230509	Roof Curbs and Equipment Supports	Typical detail and schedule for equipment. Details shall include cross-sectional view illustrating clearly the type of curb being submitted, i.e. double wall insulated, with or without cant.
230513	Motors	Motor info with equipment submittal for equipment served.
230514	Electric Wiring	Complete wiring diagram for equipment and systems.
230519	Gauges and Thermometers	Manufacturer's data for each gauge and thermometer type. Submittal shall clearly designate where each device shall be utilized, including the scale range.
230523	Valves	Valves and accessories
230550	Wind Restraints for HVAC Systems.	Manufactures technical product data for wind restraint systems. Provide professional engineer stamped and signed calculations, and details of wind restraint systems to meet total design lateral force requirements for support and restraint of mechanical and electrical systems.
230553	Mechanical Identification	Manufactures technical product data and installation instructions for each identification material and device. Valve schedule for each piping system typewritten on an 8-1/2. X 11 in. (minimum) indicating code number, location and valve function. Schedule of pipe, equipment and name identification for review before stenciling or labeling. Confirm naming/numbering is consistent with Owner's convention.

230593	Testing, Adjusting and Balancing	Quality-Assurance Submittals Sample Report Forms Report of plan review for balancing devices necessary to achieve proper system balance but not specified Certified Testing, Adjusting, and Balancing Reports (including any specified pre-testing of systems) Warranty Documentation
230700	Insulation	Manufacturer data. Schedule of insulation applications. Certifications to demonstrate compliance specifications and governing regulations, including proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.
230923	Temperature Controls	Control System Submittal Pre-Commissioning Report As-Built documentation and drawings Operations and Maintenance Manuals / Closeout Documentation Training Agenda and Documentation Warranty
232000	Piping Systems and Accessories	Schedule of pipe materials, fittings, connections and accessories by piping system.
232023	Pumps	Shop drawings and performance curves on pumps and pump accessories. Clearly indicate which equipment is being submitted.
232133	Water Systems Specialties	Shop drawings on water system specialties
233000	Sheet Metal and Ductwork Accessories	Shop drawings of all sheet metal equipment being provided. Submit a complete shop standard manual including construction details for all shop fabricated materials. Ductwork Detail Drawings. Exhaust and kitchen hood details.
233316	Fire and Smoke Dampers	Types, schedule of sizes, locations, and installation arrangements of all dampers. Manufacturers UL listed installation details for each mounting arrangement.
233400	Fans	Shop drawings on fans, motors, drives, and accessories. Include all fan curves and fan operating point.
233713	Registers and Diffusers	Registers/Grilles/Diffusers. Room schedule listing size, throw, direction of throw, accessories, finish, material type and color chart.
233726	Louvers and Penthouses	Louvers including all blade types, finishes and arrangements. Penthouses including materials, finishes and accessories. Provide original color charts for selection of finish

234000	Air Filters and Accessories	Filter product data including certification date, pressure drops at the scheduled airflow, schedule of filter sizes for each system. All filter accessories, including framing systems, fastening clips, manometers, and differential pressure gauges.
236429	Air Cooled Chiller	Drawings indicating components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, strainers, and valves required for a complete system. Provide data on capacities, weights, specialties and accessories, electrical requirements and wiring diagrams. Manufacturer's Installation Instructions: Indicate rigging, installation, and start-up procedures. Manufacturer's Performance Data: Indicate energy input versus cooling load output from 10 to 100 percent of full load. ARI certified part load performance data for 100%, 75%, 50% and 25% load.
237313	Air Handling Units	Shop drawings on air handling units.
237413	Packaged Rooftop Unit	Packaged rooftop unit and accessories. Complete installation details, drawings, installation and start-up instructions, wiring diagrams, and instruction manuals from manufacturer of equipment.
238116	Split System Air Conditioner	Split system air conditioner. Manufacturers wiring diagrams Refrigerant piping schematics showing accessories.
238129	Variable Refrigerant Flow System	All associated equipment data, Fan coil units, condenser, piping diagram, controls. Include BACNet object list and integration requirements in coordination with 230923 when specified to be integrated with BMS.
238210	Hydronic Gravity Heating Equipment	Shop drawings on gravity heating equipment with color selection chart. Clearly indicate which equipment is being submitted.
238216	Coils	Shop drawing on coils.
238219	Fan Coil Unit	Room fan coil units and accessories including coil capacities, grille type and filters.
238223	Unit Ventilators	Unit ventilators and accessories including heating and cooling coil capacities, inlet and outlet types. Color chart.

3.2 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of color coded paper drawings or electronic files (dwg or rvt) not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings as follows:

1. Division 23 shall prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be AutoCAD format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, light fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Re-position proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc. Provide these adjustments as part of Base Bid Contracts.

2. Coordination drawings to include positioning of fire, smoke and combination damper assemblies, associated actuators and access / inspection doors and shall consider ceiling construction in final positioning based on ceiling type on either side of partition or barrier for optimum result.

3. Division 23 will provide AutoCAD files and prints and submit the base plan to all major trades' Contractors.

4. Division 26 (Electrical), Division 22 (Plumbing) and Division 21 (Fire Protection) will each draft location of piping, conduits, equipment, etc. on the base plan as provided by Division 23 such that a complete coordination of all trades is represented and areas of conflict and recommended resolutions are noted.

5. Do not install any equipment, equipment foundations, ductwork, or piping until Coordination Drawings have been approved. Failure to receive approval prior to installation of the aforementioned items, will put the risk on the contractor to remove and reinstall at the engineer’s discretion. Additional time spent by the engineer in the field reviewing construction progress due to not receiving ductwork shop drawings and coordination drawings prior, will be considered an additional service by the consultant, which shall be paid by the contractor and deducted from any moneys owed to the contractor. The consultant’s hourly rate will apply.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for Construction Safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature(s) required to provide safe conditions for all workmen and site visitors.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Existing conditions are taken from field observations and prior construction documents and are not guaranteed. The contractor shall field verify all existing conditions. No allowance will be made for additional costs due to Contractors failure to verify existing conditions.

B. Prior to beginning work, inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the Owner prior to beginning work. If existing damage is not documented and submitted, the Contractor shall repair all damage found at the completion of the project that is determined to have been caused by the work of this contract. Repairs shall restore the area to like new condition.

C. The Owner's Representative shall determine if the Contractor has damaged existing systems or construction and shall approve the repairs.

3.5 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The Contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the Owner's asbestos management plan. Prior to performing such work, identify areas containing asbestos. Notify the Owner so that arrangements may be made for abatement and/or containment prior to work proceeding. The Contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 Sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 sections for further requirements.

3.6 REMOVALS

A. Demolition of mechanical systems will include removal and deprogramming of multiple control system devices and sensors. Coordinate with Owner for quantity and type of devices which they desire to retain. Remove all components in good condition and turn over to the Owner's representative.

B. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that the Owner wishes to retain that do not contain asbestos or PCB Material shall be delivered to location directed by the Owner. Items that the Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos and/or PCB's shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated. Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, lighting, ductwork, tubing, supports, fixtures, etc. Visit each room, each crawl space and each roof to determine total Scope of Work. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all pipe, valves, fittings, insulation, conduit, panels, and all hangers, including the top connection and any fastenings to building structural systems. Where pipe and ductwork is removed and no new connections are planned or shown, cap, seal and insulate the pipe and ductwork which remains. Seal all openings, after removal of equipment, pipes, ducts, conduits and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

D. The shutting down of the existing HVAC systems shall be properly coordinated with the Owner. Provide the necessary personnel in shutting down the systems as necessary to facilitate the intended work. Water and glycol systems shall be fully drained prior to any removals. The Contractor shall propose to the Owner the points of isolation of the system to minimize the duration of the shutdown for draining, performing the necessary work and refilling of the system. Systems containing a glycol solution shall be drained in a manner to collect the solution in containers for storage or disposal. Glycol solution not utilized for refilling the systems upon completion of work shall be removed from the site and properly disposed of in a legal manner by the Contractor. Upon completion of removals and new work, the Contractor shall refill and vent the systems to return the systems back to their original operation condition.

3.7 STORAGE AND PROTECTION OF MATERIALS

A. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

B. Refer to "General Conditions of the Contract for Construction."

3.8 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems and building. Perform first seasons winterizing in presence of Owner's operating staff.

3.9 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Owner’s Representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.

2. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owner’s Representative or other contractor for any “rough ins” that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the Contractor at no expense to the Owner.

3. For equipment and connections provided in this contract, prepare roughing drawings as follows:

   a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.

   b. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and manufacturer’s recommended service clearances to allow for required maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

D. All equipment requiring service and / or access shall be provided adequate clearances for this purpose. Any clearances described in manufacturer’s information, code requirements, etc., shall be taken into account in determining final rough-in positions. Reasonable access for maintenance and service shall be maintained. The most stringent standard, as determined by the Engineer, shall apply.

3.10 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction," for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch all abandoned penetrations left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.11 CONCEALMENT

A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.12 CHASES

A. New Construction:

1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of "General Building Construction Plans and Specifications." Mechanical and Electrical Trades work shall provide all other openings required for their contract work.

2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.

3. Assume responsibility for correct and final location and size of such openings.

4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2" above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.

6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction Contractor.

B. In Existing Buildings:

1. Drill holes for floor and/or roof slab openings.

2. Multiple pipes smaller than 1" properly spaced and supported may pass through one 6" or smaller diameter opening.

3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2" above floors.

4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire-stopping similar to that for floor openings.

3.13 ACCESS DOORS AND PANELS

A. Provide access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.

B. Provide access doors, sized to permit compete access for all items requiring adjustment, such as balance dampers above solid ceilings.

C. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

D. Adjust hardware and panels after installation for proper operation.

E. Access doors and panels shall operate freely and be fully usable for their intended function.

3.14 FIRE-STOPPING

A. Fire-stopping for openings through fire and smoke rated wall and floor assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire-rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.

3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

4. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Apply fire stopping within the temperature and humidity limits permitted by the manufacturer.

6. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.15 FLASHING AND SEALING

A. Openings through roofs shall be flashed in a manner to not affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of the contract. Provide non-ferrous flashing pieces, skirts, hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Where openings for pipe/duct penetrate through roofs into equipment pipe chases, mechanical spaces or penthouses, the penetration of the roof deck/slab shall be sleeved, sealed and firestopped as required. Insulate at base of pipe chase, mechanical space or penthouse to match insulation value of the roofing system.

C. Apply all flashing and sealers within the temperature and humidity limits permitted by the manufacturer.

3.16 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Supports shall meet the approval of the Owner's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For Precast Panels/Planks and Metal Decks, support mechanical/electrical work as determined by manufacturer and Owner's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.17 GENERAL INSTALLATIONS REQUIREMENTS

A. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed

B. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule. Pay close attention to equipment that must be installed prior to building enclosure.

C. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

D. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

E. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

F. No equipment shall be hidden or covered up prior to inspection by the Owner's Representative. All work requiring inspection which is concealed prior to approval shall be re-opened for inspection at the Contractor's expense. All work that is determined to be unsatisfactory shall be corrected immediately.

G. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

H. Install access panels or doors where units are concealed behind finished surfaces.

3.18 PAINTING

A. This Contract Includes the following:

1. Painting for all cut and patch work performed as part of Division 23 contract.

2. Painting required for touch-up of surfaces damaged due to the installation of Division 23 work.

3. Painting as required to repair finish of equipment furnished.

4. Refer to Section 099000-Painting, for general description of materials and methods.

5. Painting as called for on Division 23 Drawings and/or Specifications.

3.19 ADDITIONAL ENGINEERING SERVICES

A. In the event the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

B. In the event the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

3.20 ALL TRADES TEMPORARY HEAT

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

3.21 HVAC MAINTENANCE OF SYSTEMS DURING TEMPORARY USE PERIODS

A. Provide each air handling system with a set of pre-filters in addition to the permanent filters. Furnish four sets of pre-filters for each system for use when system is operated for temporary heating or cooling. During such use, change pre-filters as often as directed by Owner's Representative. Provide necessary temporary throwaway filters in all return openings to keep dust out of ductwork. Change as often as necessary. Remove all such temporary filters upon completion. Use supply units only. Do not operate return fans.

B. Blank-off outside air intake opening during construction. Install first set of permanent filters and pre-filters. Install filters over all return air openings with adequate efficiency and capacity to keep construction dust and debris out of the duct systems. Contamination of the duct systems shall necessitate cleaning to dust free condition.

C. Adjust dampers on supply system.

D. Set all heating coil control valves for manual operation.

E. Do not install any grilles or diffusers at room terminal ends of ducts until permission is given.

F. Assume responsibility for systems and equipment at all times, even though used for temporary heat or ventilation.

G. Repair or replace all dented, scratched or damaged parts of systems.

H. Remove concrete, rust, paint spots, other blemishes, then clean.

I. Just prior to final acceptance, remove used final filter. Deliver all unused sets of pre-filters to the Owner and obtain written receipt. Properly lubricate system bearings before and during temporary use. Maintain thermostats, freeze stats, fire stats, overload devices, and all other safety controls in operating condition

3.22 TEMPORARY FACILITIES

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

1. Continuity of operation of existing facilities will require temporary installation or relocation of equipment and piping.

2. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.

3. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining pressurized.

3.23 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

B. Cleanliness of construction shall extend to include the interior and exterior surfaces of all equipment and systems provided under this contract. This includes, but is not limited to:

1. Unitary equipment exposed to occupant use (cabinet heaters, baseboard systems, etc.) Shall be thoroughly cleaned for final use both inside and out prior to project completion.

2. Equipment located in mechanical spaces shall be cleaned on the exterior such that no significant accumulation of debris or dirt is evident.

3. Interiors of all air handling equipment (rooftop systems, air handlers, etc.) shall be thoroughly cleaned on the interior such that no evidence of dust, dirt or debris remains prior to project turnover.

4. Ductwork systems – Ductwork shall be delivered to the job site with ends capped or covered to eliminate contamination during transportation and site storage. All open ends shall remain covered during the entire course of the construction process. Ductwork with evidence of dust, dirt or debris shall be thoroughly cleaned by an approved method prior project turnover.

3.24 HVAC EQUIPMENT CONNECTIONS

A. Provide final steam, condensate, hot water, glycol, chilled and condenser water, drain, vent, oil line and gas connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and rail connections extended to floor drains.

B. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.

C. Refer to manufacturer's drawings and specifications for requirements of medical equipment, laboratory equipment and special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.25 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary mechanical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing mechanical facilities or services.

3.26 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owner's designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed. Prior to acceptance repeat the instructions. If asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer's certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e. adjustable speed drive and air handling unit) both manufacturers shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up, including problems that occurred and their method of resolution.

C. Refer to Section 017500 - Starting and Adjusting and Section 017700 – Closeout Procedures for additional requirements.

3.27 OPERATION AND MAINTENANCE MANUALS

A. In addition to requirements stated elsewhere in these specifications, provide Operating and Maintenance manual(s) which include the following:

1. Approved Submittal documentation for all equipment stating size and selected options for each piece of equipment requiring maintenance.

2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance (excepting equipment not furnished as part of this project). Routine maintenance actions shall be clearly identified. The data shall include internal wiring diagrams and spare parts lists.

3. Name and address of each equipment supplier and at least one service agency for each piece of equipment.

4. HVAC and service water controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings and at control devices or, for digital control systems, in programming instructions.

5. A narrative of how each system is intended to operate, including recommended setpoints. Include emergency operating instructions, seasonal changeover, freeze protection and precautions necessary for Owner operations of systems.

6. As-built drawings for the project (see Record Documents) and piping diagrams.

B. Bind above items in a three ring binder with name of project on the cover. Deliver to Owner's Representative before request for acceptance. Provide copy of O&M Manual in electronic format on CD or other media format acceptable to the Owner. All documents shall be in PDF format, with the exception of record drawings which shall be provided in AutoCAD compatible drawing format.

3.28 RECORD DOCUMENTS

A. In addition to all requirements elsewhere in the Contract Documents, prepare and provide record documents of the as-constructed work which meets the following minimum standards:

1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.

2. Ductwork and Piping:

a. All ductwork and piping shall be clearly dimensioned with its outside dimensions (diameter or length X width) at each unique section/piece.

b. Elevations of all ductwork and piping shall be clearly identified. Elevation should be taken in respect to the finish floor and bottom of ductwork or pipe.

c. X/Y dimensions should be included for all ductwork and piping to provide precise location from a fixed bench-mark such as the corner of a building, column, etc., and neatly and clearly indicate same on reproducible prints.

3. Provide Record Drawings for all Contract Work. Document the location of control devices isolation valves, safety devices and equipment.

4. Incorporate all field changes, change orders and other modifications into the final Record Drawings.

5. Record drawings shall contain all corrections from construction documents to as-built conditions and shall be submitted for review and approval.

6. Drawing format:

   a. Documents shall be provided in PDF formant or, where fully developed in CAD, in AutoCAD compatible file format. Submittal media shall be as acceptable to the Owner and Engineer

   b. Drawings scale shall not be less than 3/8" = 1'-0".

   c. Marked up PDFs of the contract documents will not be acceptable

3.29 SALVAGEABLE MATERIALS

A. Salvageable materials will be reviewed and identified by the Owner. Instruction shall be given to the Contractor whether the Owner will remove salvageable materials, or whether contractor is to remove and deliver salvageable materials to a pre-designated site.

B. HVAC items normally accepted as salvage by the Owner:

   1. Temperature control and automation hardware

END OF SECTION 230010

SECTION 230130 - MECHANICAL CLEANING OF HVAC SYSTEMS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

B. The cleaning work for this project includes the complete ventilation duct work and associated components for the following systems:

1. Existing to remain Auditorium supply and return air ductwork to remain, including RGD's associated with equipment replacement, existing to be modified or as noted on plans.

2. Existing to remain classroom exhaust/relief ductwork, including RGD's.

3. Existing to remain Pool AHU (PDU-01): provide cleaning of entire air handling system, including return air, supply and, outside air, relief air, and all associated RGD's.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

1.3 QUALITY ASSURANCE

A. Ductwork shall be cleaned in compliance with latest edition of the following standards:

1. Mechanical cleaning of non-porous air conveyance system components, NADCA ACR 2015.

2. Plans and Specifications which exceed the requirements in any of the referenced standards.

B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of Work. The Duct Cleaning Contractor or subcontractor shall be a member of the National Air Duct Cleaners Association (NADCA) and shall have at least one year of experience in this field. The Contractor shall produce a reference list to the Owner and Project Engineer of projects successfully completed of a similar size and scope.

1.4 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Shop drawings locating all proposed duct penetrations and ceiling access holes in plaster ceilings.

B. Provide MSDS sheets on all solvents, cleaners and disinfectants to be used on project.

2.0 PART 2 - PRODUCTS

2.1 DUCT DISINFECTANT

A. Equal to madacide as supplied by Mateson Chemical, EnviroCon as manufactured by Bio-Cide International, Inc., or approved equal.

2.2 SANITIZER

A. An E.P.A. registered sanitizer "Oxine" as manufactured by Bio-Cide International or approved equal. Product shall be a mixture of Oxychloride Compounds.

2.3 ENCAPSULANT

A. A duct liner adhesive coating, Foster 40-10 or 40-23, as manufactured by Foster Products Corporation, Cover-Al as manufactured by Mateson Chemical Corporation, or approved equal shall be used. It shall be a quick setting waterbase adhesive and coating designed for field application to faced or unfaced fiberglass duct liner insulation, or to unfaced fiberboard ductboard insulation. The coating shall dry to form an effective air erosion preventive coating, sealing and reinforcing the surface. The coating shall be resistant to fire, water, oil, grease, bacteria and fungus.

2.4 COATING

A. A mechanical insulation repair coating, Tough Coat, as manufactured by Vac System Industries, Inc., or approved equal shall be used. The coating material shall contain an anti-microbial agent, shall not affect the thermal or acoustic properties of the insulation, and shall conform to NYS Mechanical Code.

2.5 PLENUM PAINT

A. Porous Surface: The paint shall be Porta-Sept as manufactured by Porter Paints, Inc., or approved equal. Paint shall contain an EPA registered anti-microbial, Intercept, which inhibits the growth of bacteria, mold, mildew and fungi.

B. Non-Porous Surface: The coating shall be Tough-Coat as manufactured by VAC Systems Industries or approved equal. Coating shall meet NYS Mechanical Code and contain an anti-microbial agent.

3.0 PART 3 - EXECUTION

3.1 PRE-CLEANING PREPARATIONS

A. Prior to start of work, the HVAC system is to be carefully inspected and checked for all conditions affecting the cleaning. Defects are to be reported in writing to the Project Engineer and work will not proceed until all defects have been documented. Commencement of work will constitute acceptance of the conditions of the area to which the cleaning work is to be performed and all defects in work resulting from such accepted service will be corrected by this trade without additional expense to the Owner. No cleaning is to be performed to ducts where the process has the capability of damaging the duct lining. The decision to clean and/or encapsulate these areas will be made by the Project Engineer after review of the Contractor's findings and the Project Engineer has seen the field conditions.

B. Disassemble all removable items as required for access to work area. Store the removables in a Project Engineer approved storage area until the completion of the cleaning work.

C. Fire protection devices (such as smoke detectors, panel, etc.) shall be protected prior to cleaning procedures. They are to be cleaned and tested at the conclusion of work.

D. The Contractor shall coordinate the shutdown and reactivating of the fire alarm system to avoid accidental alarms during the cleaning process and related work.

E. The Contractor shall coordinate the shutdown of the air handling equipment with the Owner before starting work, and shall conform to OSHA requirements regarding fan motor disconnect lock-out/tag-out.

F. The Contractor shall have samples collected by gathering the gross debris from the surface of the duct at a minimum of three (3) locations per system prior to and after cleaning. This shall be accomplished by utilizing protective clean surgical gloves to handle the surface debris. A 100 cm^2 area shall be scraped and the debris placed in a 4 oz. sterile container with screw cap. The container shall be adequately marked as to sample location, date, and time as a minimum. The NADCA vacuum test is also an accepted method to attain a sample. The total weight will be established per 100 cm^2 of surface area.

3.2 GENERAL REQUIREMENTS

A. Containment. Debris removed during cleaning shall be collected and precautions must be taken to ensure that debris is not otherwise dispersed outside the ACS during the cleaning process. After ACS cleaning, any areas which could be affected by the cleaning contractor's work must be as clean as their condition prior to the commencement of the cleaning operation.

B. Particulate Collection. Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size particles shall be used (See EPA's Building Air Quality). When the Particulate Collection Equipment is exhausting outside the building, Mechanical cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to control debris removed from the ductwork or ceiling plenum. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to ensure that exhausted air does not re-enter the building.

C. Filtration Integrity. When using Particulate Collection Equipment exhausting inside the building, contractors shall be able to certify equipment effectiveness of 99.97% collection efficiency for 0.3-micron size particles through DOP test results, from an independent testing agency, for any collection device intended for use on a particular job.

D. Controlling Odors. All reasonable measures shall be taken to control offensive odors and/or mist vapors during the cleaning process.

E. Component Cleaning. Cleaning methods shall be employed such that all Non-Porous surface components must be Visibly Clean. Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

F. Air-Volume Control Devices. Dampers and any air-directional mechanical devices inside the ductwork must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

G. Access Holes. Any access holes cut for the cleaning process must be repaired so that they shall not significantly alter the airflow. All openings made to facilitate the cleaning must be sealed in accordance with industry standards and local codes, using materials acceptable, under those standards and codes. (See Specification Section 233000 and SMACNA's HVAC Duct Construction Standards - Metal and Flexible, 2005).

1. Access doors in ductwork shall be a minimum size of 16 x 12 and installed in locations as shown on drawings. All other openings required by the contractor to properly clean the ductwork may be access holes patched as per the contract documents.

2. Patch all access holes to match existing duct material. Patches shall be installed in a manner to maintain duct pressure class. Sealant shall be applied to mitigate any duct leakage.

3.3 HEALTH AND SAFETY

A. Cleaning contractors shall comply with all applicable federal, state and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) should be followed when working in accordance with this standard.

B. No processes or materials shall be employed in such a manner that they will create adverse health effects to the building occupants, cleaning contractors, or general public.

C. Disposal of Debris. All debris removed from the ACS shall be disposed of in accordance with all applicable federal, state and local requirements.

3.4 MECHANICAL CLEANING

A. Interior Duct Surfaces:

1. The interior of all ducts shall be brushed and mechanically vacuumed such that all metal surfaces are visibly clean and capable of Non-Porous Surfaces Cleaning Verification as described in the NADCA Standards. No cleaning method should be used which could potentially damage components of the ductwork or negatively alter the integrity of the system.

3.5 VERIFICATION

A. General. Verification of cleanliness will be determined after Mechanical Cleaning and before the application of any treatment or introduction of any treatment-related substance. Verification of Non-Porous Surface Cleaning and Verification of Coil Cleaning shall be conducted after Mechanical Cleaning and before the system is restored to normal operation.

B. Verification of Non-Porous Surface Cleaning:

1. All Non-Porous Interior Duct/Air Handling Unit Surfaces must be Visibly Clean and capable of passing the NADCA Vacuum Test.

2. The weight of Debris collected by the NADCA Vacuum test, as outlined in Appendix A of the NADCA Standards, shall not exceed 1.0 mg/100cm^2.

3. The Contractor shall include in the bid the cost for four independent vacuum tests to be performed at the time and location as directed by the Engineer. If any areas fail, the entire system shall be recleaned and retested at no cost to the Owner.

3.6 SEQUENCE OF WORK

A. Since the systems must be operational during the normal work hours unless coordinated in advance with the Owner and occupants. The Contractor shall submit to the Owner a procedure for cleaning the ductwork and installing filters which will minimize contamination of already cleaned areas. This sequence must be approved by the Owner and Project Engineer prior to starting work.

3.7 SANITIZATION

A. A sanitizing agent shall be applied to all supply and return air metal only ductwork cleaned as part of this project. Application and preparation shall be as per manufacturer's recommendations.

B. The Contractor must demonstrate to the Project Engineer how the application method is capable of dispensing the sanitizing solution to the entire surface areas of the ductwork.

3.8 REPORT

A. The Contractor will submit three (3) copies of the final report to the Project Engineer outlining the conditions and work completed on each HVAC system.

B. The report shall contain a tabulation of the vacuum test taken before and after the cleaning process.

C. The report shall contain the findings of tests performed on the air quality (i.e. presence of CO_2 VOC, etc.).

D. The report shall contain the findings of tests performed on the debris collected with the ACS (i.e. the composition of the material).

E. The report shall contain photographic or video documentation of representative areas of the ductwork systems cleaned as part of the project. This photo documentation shall show both before and after pictures verifying visual inspection.

END OF SECTION 230130

SECTION 230506 - PAINTING OF MECHANICAL WORK

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Painting of mechanical related work specified in the Contract Documents including, but not limited to, the following:

1. Exposed piping systems
2. Exposed ductwork systems
3. Exposed mechanical insulation
4. Exposed mechanical equipment
5. Color-coded work
6. Steel supports, hangers and rods
7. Access Doors

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

1.3 SUBMITTALS

A. Submit product data for vehicles, primers and paints including name, title, manufacturer, manufacturer's stock number, color name and number, and application instructions. Submit a schedule of surfaces/systems to be painted along with paint products and colors that shall be applied.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver painting materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label showing the following information:

1. Name and title of material
2. Manufacturer's stock number and date of manufacture
3. Contents by volume, for major pigments and vehicles
4. Thinning instructions
5. Application instructions
6. Color name and number

B. Store materials in approved fire-safe location with adequate ventilation. Area must be kept clean.

2.0 PART 2 - PRODUCTS

2.1 GENERAL PAINTING PRODUCT REQUIREMENTS

A. Painting products based on a system by Rust-Oleum. Other equivalent systems may be approved.

B. Steel surfaces – normal temperatures:

1. First Coat – Rust-Oleum #769 Red Primer.

2. Second Coat – Rust-Oleum #7400 Zinc Chromate Primer.

3. Third Coat – Rust-Oleum finish, colors as directed.

C. Steel surfaces – elevated temperatures above 150 degrees F.

1. First Coat – Rust-Oleum #819 heat resistant primer.

2. Second Coat – Rust-Oleum #55 heat resistant aluminum finish paint, color to match existing or as directed by Engineer.

3. Machinery, equipment and apparatus having factory applied prime coat shall be painted as specified above except omit first coat.

D. Vehicles and thinners: Comply with governing regulations and recognized safe practices in handling, use and drying of paint vehicles and thinners. Compatibility of paint products is the Contactor's exclusive responsibility. Select paint products to ensure freedom from problems relating to vehicles and thinners of type and within limits recommended by paint manufacturer.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Clean surfaces before applying paint products. Remove oil and grease prior to mechanical cleaning. Comply with paint products manufacturer's instructions for surface cleaning and preparation. Remove surface applied accessories which are not to be painted, and reinstall after completion of painting. Protect non-removable items not to be painted, by covering with paper or plastic film.

B. Ferrous metal surfaces: Remove mill scale and loose rust on surfaces which are not zinc coated or shop/factory prime coated.

1. Clean shop applied prime coats on metal surfaces, and repair (touch-up) prime coats wherever abraded or otherwise damaged, prior to application of paint system.

2. Zinc coated surfaces: Clean with non-petroleum based solvent. Wash with copper sulfate solution and flush with water, unless surface has been pre-treated, or unless treatment is not recommended by manufacturer of prime coat.

3.2 PAINT SYSTEM APPLICATION

A. Comply with manufacturer's recommendations for mixing or stirring paint products immediately before application.

B. Application limitations: Paint every accessible surface of each unit of work indicated to be painted, regardless of whether in location recognized as "concealed" or "exposed" except as otherwise indicated.

1. Omit painting on machined sliding surfaces and rotating shafts of equipment, and on nonferrous finished metals including chrome plate, stainless steel, special anodized aluminum, brass/bronze and copper, and on plastics and similar finished materials, except where specifically indicated to be color-coded by painting.

2. Omit painting on required name plates, labels, identification tags, signs, markers, printed instructions, performance ratings, flow diagrams and similar test and graphics, located within the scope of work indicated to receive paint application.

3. Omit specified prime coat of paint system for metal surfaces where surface has shop applied prime coat of equivalent quality. Apply prime coat on other surfaces to be painted, comply with paint manufacturer's instructions for prime coating where not otherwise indicated. Apply additional prime coats where suction spots or unsealed areas appear.

C. Apply paint in accordance with manufacturer's directions. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Apply paint at edges, corners, joints, welds and exposed fasteners in manner which will ensure dry-film thickness equal to that of flat surfaces. Allow sufficient time between successive coats for proper drying (comply with manufacturer's drying instructions).

1. Number of coats: Number indicated is minimum number, apply as many coats as are necessary to cover.

2. Coating thickness: Apply paint in uniform coats without thinning and in application thickness recommended by manufacturer for each coat.

3. Apply paint in smooth finish without noticeable texture, cloudiness, spotting, holidays, laps, brush marks, runs, sags, ripples, ropiness and other surface imperfections.

3.3 CLEAN UP AND PROTECTION, PAINTING

A. During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day. Do not leave in paint storage area.

B. Spattered surfaces: Upon completion of painting work, clean paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting work. Correct damage by cleaning, repairing or replacing and repainting as directed. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings installed for protection of work not to be painted, after completion of painting operations. At completion of work by other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 230506

SECTION 230509 - ROOF CURBS AND EQUIPMENT SUPPORTS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation of roof curbs, as shown in the Contract Documents. This section applies to equipment used to support mechanical system components and is inclusive of curbs, equipment supports, support stands and penetration housings.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This contractor shall coordinate all final rail selections, including anchoring details to both equipment and building roof deck, with the requirements of specification Section 230550 (Wind Restraint for HVAC Systems). Final determinations as provided by the Engineer of Record for the seismic and/or wind restraint calculations shall override any similar information provided within these specifications and the project drawings.

1.3 SUBMITTALS

A. Typical detail and schedule for equipment used to support mechanical system components shall include cross-sectional view illustrating clearly the type of curb being submitted, i.e. double wall insulated, with or without cant.

2.0 PART 2 – PRODUCTS

2.1 ROOF CURBS

A. Curb constructed of galvanized steel, with continuous welded corner seams and painted at all welds. 20 gauge up to 36”., 18 gauge 38 to 72”., 16 gauge over 72” in any dimension. Double wall with liner and 1-1/2” minimum thickness 3# density fiberglass insulation. All fans and rooftop penthouses to have minimum 24" high curbs. Provide curb with gasket on top to make airtight seal between curb and ventilator, fan, or air handling unit. Curb provided with raised cant, flanged or recessed to coordinate with roofing type. Curb flange shall suit roof construction, wind restraint requirements and type of insulation being applied.

B. Design Equipment: RPS Model RC Series.

C. Acceptable Make: Pate, Shipman & Son, RPS.

2.2 ROOF CURB ADAPTER

A. Adapter constructed of 16-gauge galvanized steel, with continuous welded corner seams and painted at all welds. Double wall with liner and 1-1/2” minimum thickness 3# density fiberglass insulation. Minimum 1-1/2” wide wood nailer. Minimum height 8”.

B. Design Make: RPS Style CA-1 and CA-2.

C. Acceptable Make: Pate, Shipman & Son.

2.3 EQUIPMENT SUPPORTS

A. Double wall, 2 in. x 8 in. wood blocking, minimum 18" high. Fully insulated in the interior cavity with rigid insulation on supports which are 10" or wider. Constructed of 18 gauge galvanized steel with continuous welded corner seams and painted at all welds. 1 ½" minimum thickness 3# density fiberglass insulation. Constructed of heavier gauge steel where standard curb cannot support unit weight. Provide with top cap counter flashing. Support provided with raised cant, flanged or recessed to coordinate with roofing type. Support flange shall suit roof construction, wind restraint requirements and type of insulation being applied.

B. Design Equipment: RPS Model ER-2A.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

2.4 PIPE SUPPORTS ASSEMBLY

A. Same construction as "Equipment Supports." Provide with full length steel bracket, U-bolts and accessories as required to secure piping to the pipe support as detailed on Contract Drawings.

B. Design Equipment: RPS Model ER-2A.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

2.5 PIPE CURB ASSEMBLY

A. 2" x 2" continuous cap blocking, fully insulated with rigid 1-1/2" 3# density insulation. Minimum 18" high. Constructed of 18 gauge galvanized steel with welded at all contact points. Painted at all welds. Acrylic coated, ABS rib reinforced curb cover and integral counter flashing, size and number of pipe and conduit openings as required to suit job conditions. EPDM protective rubber pipe boots and stainless steel clamps secured around each pipe individually. Curb provided with raised cant, flanged or recessed. Curb flange shall suit roof construction and type of insulation being applied.

B. Design Equipment: RPS N Series with RC Series curb system.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Height as recommended by equipment manufacturer, not less than described in Part 2.0. This Contractor shall be responsible for exact size, length, and location and shall set and secure each curb to roof. Shim and level curb as required. Provide curb and supports for all roof-mounted equipment. All roof penetrations shall be made through an appropriate curb. All roof-mounted equipment including fans, air handling units, etc., shall be set on an equipment support unless otherwise noted. Refer to Contract Drawings for details on plenums extending from curbs.

END OF SECTION 230509

SECTION 230513 – MOTORS

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit motor information with submittal for equipment served, when applicable. Motor submittal shall include manufacturer's name and model number, motor type, motor characteristics including voltage, phase, horsepower, and speed.

1.3 RELATED SECTIONS

A. Section 262923 – Adjustable Speed Drives

2.0 PART 2 – PRODUCTS

2.1 MOTORS

A. General Requirements:

1. Motors built for 60 Hz operation, three phase for 1/2 hp and larger; single phase for 1/3 hp and smaller. In compliance with NEMA Standards, wound specifically for nameplate voltage, and selected for appropriate duty and environment. Minimum service factor of 1.15 at rated voltage and frequency. Bearings ABMA L10 rated for 5 years continuous, non-severe duty. V-belt connected motors with adjustable slide rail bases and pulleys. Motors shall have Class F insulation system, with Class B temperature rise. Maximum allowable motor temperature rise for open drip-proof or totally enclosed fan cooled (TEFC) type at 1.15 service factor shall be 80°C above 40°C ambient up to 300 hp. NEMA locked rotor KVA code as required to match unit equipment torque characteristics. Single-phase motors shall be capacitor start, induction run, or split phase type. Polyphase motors shall be constant speed, squirrel cage, unless otherwise called for. Motors for solid state driven, variable speed fans or AHU units shall be designed for definite purpose energy efficient drive control.

2. Fractional HP Fan Motors between 1/12 and 1 hp shall be electronically commutated motors or have a minimum motor efficiency of 70%, rated in accordance with DOE 10 CFR 431. Motors shall be provided with motor speed adjustment for balancing and / or remote control as may be required by the sequences of operation. The use of belt driven fans to sheave adjustments for air flow balancing in lieu of varying motor speed is permitted.

   a. Exceptions:

      1) Motors in the air stream of fan coils and terminal units that only provide heating to the space served.

      2) Motors in systems which meet the efficiency ratings in part 403 of the IECC while accounting for motor power in the efficiency calculations.

3. Three Phase Motors rated 1 hp and greater shall meet the following nominal efficiency ratings:

   a. Minimum Nominal Full-Load Efficiency for 60 Hz NEMA General Purpose Electric Motors (Subtype I) rated 600 Volts or less (Random Wound)

Motor Horsepower	Number of Poles	Open Drip Proof Motors			Totally Enclosed Fan Cooled Motors		
		2	4	6	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200	3600	1800	1200
1		77.0	85.5	82.5	77.0	85.5	82.5
1.5		84.0	86.5	86.5	84.0	86.5	87.5
2		85.5	86.5	87.5	85.5	86.5	88.5
3		85.5	89.5	88.5	86.5	89.5	89.5
5		86.5	89.5	89.5	88.5	89.5	89.5
7.5		88.5	91.0	90.2	89.5	91.7	91.0
10		89.5	91.7	91.7	90.2	91.7	91.0
15		90.2	93.0	91.7	91.0	92.4	91.7
20		91.0	93.0	92.4	91.0	93.0	91.7
25		91.7	93.6	93.0	91.7	93.6	93.0
30		91.7	94.1	93.6	91.7	93.6	93.0
40		92.4	94.1	94.1	92.4	94.1	94.1
50		93.0	94.5	94.1	93.0	94.5	94.1

Note: Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

b. Minimum Average Full Load Efficiency Polyphase Small Electric Motors:

Motor Horsepower	Open Motors			
	Number of Poles	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200
0.25		65.6	69.5	67.5
0.33		69.5	73.4	71.4
0.50		73.4	78.2	75.3
0.75		76.8	81.1	81.7
1		77.0	83.5	83.8
1.5		84.0	86.5	83.8
2		85.5	86.5	N/A
3		85.5	86.9	N/A

c. Minimum Average Full Load Efficiency for Capacitor-Start Capacitor-Run and Capacitor-Start Induction-run Small Electrical Motors

Motor Horsepower	Open Motors			
	Number of Poles	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200
0.25		66.6	68.5	62.2
0.33		70.5	72.4	66.6
0.50		72.4	76.2	76.2
0.75		76.2	81.8	80.2
1		80.4	82.6	81.1
1.5		81.5	83.8	N/A
2		82.9	84.5	N/A
3		84.1	N/A	N/A

d. Minimum Nominal Full-Load Efficiency of General Purpose Electric Motors (Subtype II) and all Design B Motors Greater than 200 Horsepower

Motor Horsepower	Number of Poles	Open Drip Proof Motors				Totally Enclosed Fan Cooled Motors			
		2	4	6	8	2	4	6	8
	Synchronous Speed (RPM)	3600	1800	1200	900	3600	1800	1200	900
1		NR	82.5	80.0	74.0	75.5	82.5	80.0	74.0
1.5		82.5	84.0	84.0	75.5	82.5	84.0	85.5	77.0
2		84.0	94.0	85.5	85.5	84.0	84.0	86.5	82.5
3		84.0	86.5	86.5	86.5	85.5	87.5	87.5	84.0
5		85.5	87.5	87.5	87.5	87.5	87.5	87.5	84.0
7.5		87.5	88.5	88.5	88.5	88.5	89.5	89.5	85.5
10		88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5
15		89.5	91.0	90.2	89.5	90.2	91.0	90.2	88.5
20		90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5

25		91.0	91.7	91.7	90.2	91.0	92.4	91.7	89.5
30		91.0	92.4	9.4	91.0	91.0	92.4	91.7	91.0
40		91.7	93.0	93.0	91.0	91.7	93.0	93.0	91.0
50		92.4	93.0	93.0	91.7	92.4	93.0	93.0	91.7
60		93.0	93.6	93.6	92.4	93.0	93.6	93.6	91.7
350		95.0	95.4	95.4	NR	95.4	95.4	95.0	NR
400		95.4	95.4	NR	NR	95.4	95.4	NR	NR
450		95.8	95.8	NR	NR	95.4	95.4	NR	NR
500		95.8	95.8	NR	NR	95.4	95.8	NR	NR

Note: Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

4. Nominal Motor Voltage Table:

Nominal System Voltage	Motor Nameplate
480V - 3 phase	460 volt
240V - 1 phase and 3 phase	230 volt
208V - 1 phase and 3 phase	200 volt
120V - 1 phase	115 volt

5. Motor Application:

Environment/Location	Motor Enclosure Type
General Purpose	Open drip-proof, TEFC, or encapsulated
Outdoors, below grade or high humidity	TEFC
Packaged Refrigeration Compressors	Hermetic or semi-hermetic

6. Make: Need not be all of same make, but one of the following: General Electric, Gould, Reliance, Westinghouse, Marathon, Baldor or equal.

2.2 SHAFT GROUNDING RINGS

A. Motors for Use with Adjustable Speed Drives:

1. All motors with Adjustable Speed Drives, whether factory provided or field applied, shall be equipped with shaft grounding rings.

2. Shaft Grounding Ring on NEMA Premium® and inverter duty motors consisting of conductive microfibers and grounding path.

B. Shaft Grounding Kit for Field Installation

1. Field applied shaft grounding ring for motors controlled by adjustable speed drives designed to be installed by contractor.

3.0 PART 3 – EXECUTION

3.1 MOTORS

A. Furnished by equipment manufacturer and especially manufactured and/or selected, mounted, and installed for intended use. Install motors accessible for maintenance and belt adjustment.

3.2 REPLACEMENT OF EXISTING MOTORS

A. Field verify existing motor characteristics and provide motors as called for. Modify or replace existing motor mounts and bases to accommodate the replacement motors. Replace drive and driven sheaves and provide a heavy duty belt set.

3.3 SHAFT GROUNDING RINGS

A. Motors: Wire Shaft Ground Kit on motors for use with Adjustable Speed Drives

1. Ensure shaft grounding kit is installed on motor accordance with manufacturer's recommendation.

2. Shaft grounding ring (SGR) is bolted directly to the motor end bracket or installed with conductive epoxy to ensure ground connection from the SGR to motor frame.

END OF SECTION 230513

SECTION 230514 - ELECTRIC WIRING

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation of motor control, equipment manufacturer remote device and temperature control wiring as required for a fully functional system. Provide interlock wiring from safety devices (freezestats, flow switches, etc.) to control panels. Provide wiring and conduit required to connect devices furnished as part of or adjunctive to the automatic temperature control system and for motor control regardless of the source of supply. Control wiring includes 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 120 volt maximum. Provide devices required for proper system operation, including special electrical switches, transformers, disconnect switches, relays, and circuit breaker protection.

B. Coordinate all work with Division 26, "Electrical".

1.2 RELATED SECTIONS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This Section applies to all work provided under division 23.

1.3 WORK NOT INCLUDED

A. Power wiring for motors, motor starters and associated starting and control equipment, as well as the motor starters (except in the case of equipment specified to have packaged controls/starters), are included in Division 26, "Electrical," unless otherwise called for.

1.4 QUALIFICATIONS

A. Wiring installed in compliance with all requirements of Division 26, "Electrical" and the National Electric Code.

1.5 SUBMITTALS

A. Provide submittals including complete wiring diagrams for equipment and systems. Deliver wiring diagrams to proper trades in time for roughing of conduit, equipment connections, and to avoid delay in construction schedule. Wiring diagrams and roughing information shall clearly indicate scope of work that is part of the Work of Division 26, "Electrical".

2.0 PART 2 – PRODUCTS

2.1 PRODUCTS

A. Refer to Division 26 specifications for required wiring materials.

B. All wiring system materials within plenums shall be non-combustible or shall be listed and labeled as having a flame spread index not more than 25 and a smoke developed index of not more than 50 when tested in accordance with ASTM E84 or UL 723. These requirements include control system components and all associated components. All electrical and control components not conforming to these requirements must be fully contained in a non-combustible enclosure or raceway unless listed and labeled for such use under UL 2043.

C. Combustible electrical wires and cables and fiber-optic cables exposed within a plenum shall be listed as having a peak maximum optical density of 0.50 or less and an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft. or less when tested in accordance with NFPA 262 or shall be installed in metal raceways or sheathed cable. Combustible optical fiber and communication raceways exposed within a plenum shall be listed to the same maximum and average optical densities and flame spread distance under ANSI/UL 2024. Only plenum rated wires and cables shall be installed in plenum rated raceways.

3.0 PART 3 – EXECUTION

3.1 GENERAL

A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

B. All wiring which passes through an enclosure, wall stud, framing, or other material where abrasion to the wiring system is a long term risk shall be protected using bushing inserts. Electrical tape or other removal media is not considered proper protection against abrasion.

C. Final connections to equipment shall be provided with using flexible whips no longer than 18 inches in length terminated using appropriate connectors.

D. Conduits mounted directly to the outside of insulated plenums, equipment or ductwork shall be installed using appropriate standoff's to avoid compressing the insulation and reducing the value. Repair all insulation damaged during conduit and wiring system installation.

E. Wiring shall be appropriately trimmed and terminated at all equipment. Bundled excess wiring "loops" will not be permitted.

3.2 WIRING FOR CONTROL SYSTEMS

A. Provide motor control, temperature control, interlock, safety device and instrumentation wiring for equipment. All wiring shall be in conduit. Refer to Division 26 for type of conduit to be used in specific applications. Provide 18 in. long flexible conduit at motors and devices subject to vibration. Conduit shall be supported on 5 ft. centers. Do not attach directly to hot surfaces, piping, or ductwork. Control wiring shall be in separate conduit from all other wiring. Provide green grounding wire circuited from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel heating device, thermostat, or device with potentials in excess of 50 volts. Size ground wire as required by NEC.

B. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required to provide specified functions.

C. Where allowable by Code and contract documents, temperature control wiring may be installed without conduit. Installation and wire insulation types shall be as described by NEC, Article 725. All low voltage wiring circuits 50V and under shall:

1. When installed horizontally above accessible ceilings low voltage wiring may be run without conduit. Cables shall be supported using bridle rings attached to building structure. Wherever possible, wiring shall be bundled to avoid clutter in the ceiling cavity, and wiring runs shall be provided parallel and perpendicular to building lines.

2. All exposed wiring in occupied spaces shall be run in surface metal raceway, wiremold v700 series where no access is available to wall cavity.

3. In locations where control wiring is being run to wall mounted sensors, the conduit within the stud wall, as well as the junction box, shall be of non-metallic construction. Carlon Flex-Plus Blue Electrical Non-metallic Tubing and Accessories, or equal.

4. All cases not specifically covered by the above cases shall be run in conduit.

3.3 EQUIPMENT WIRING

A. Provide power and control wiring between sections of electric radiation units, between shipping splits, and between remote panels, thermostats, disconnect switches, and their respective units. Provide control wiring from the package control system, to each respective electric heat coil, reheat coil or motor. Properly mount control package. Power wiring to and including disconnect switch shall be by Division 26 "Electrical".

3.4 FIELD WIRING IN STARTERS, CONTROLLERS, AND PANELS

A. Wiring within starters, controllers, and temperature control panels, shall be routed neatly in gutter space, away from moving and/or heat producing parts. Provide 30 ampere, 600 volt rated terminal blocks. Do not place more than two wire connections on pilot device or relay terminal. Where more than two circuit connections are required, use terminal blocks. Provide nylon self-insulated, locking type spade lugs for all control wires. Cables and wires shall be neatly bundled and lashed with nylon cable straps. All wiring installed in a single enclosure shall be rated for the maximum voltage in said enclosure or physical separation provided in compliance with the NEC.

END OF SECTION 230514

SECTION 230519 - GAUGES AND THERMOMETERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit manufacturer's data for each gauge and thermometer type. Submittal shall clearly designate where each device shall be utilized, including the scale range.

2.0 PART 2 - PRODUCTS

2.1 WATER PRESSURE GAUGES

A. Construction shall be Bourdon tube type; 4-1/2 in. diameter minimum dial face, in stainless steel case and plastic lens. Phosphor bronze tube, phosphor bronze bushed rotary movement, silver brazed or soldered to brass socket and brass tip, 1/4 in. bottom connection. Accuracy, one (1.0) percent of included scale range. White dial face with black numerals, graduated in pounds per square inch (psi); equipped with bronze adjustable pressure snubber and ball valve. Ball valve shall meet the requirements of Specification Section 230523 for the system it is serving.

B. Make: American, Ashcroft, Crosby, Duro, Marsh, Moeller, Trerice, Weiss, Weksler.

2.2 PIPING SYSTEM THERMOMETERS

A. Vertical liquid filled type - Industrial type, black molded ABS or aluminum case with glass or plastic front, mercury free blue reading column, V-shaped aluminum scale, black numerals. Union flange mounted, separable socket, extension necks where required; range as called for based on service. Universal adjustable type, 9 in. scale size. For installation in water systems where the maximum temperature is less than 120°F: graduations of 1°F, accurate to within 1°F. For installation in hot water systems: graduations of 2°F, accurate to within 2°F.

1. Make: American, Moeller, Trerice, Weiss, Weksler.

2.3 PRESSURE/TEMPERATURE TEST PLUGS

A. 1/4 in. NPT plug shall be capable of receiving either a pressure or temperature 1/8 in. o.d. probe. Dual seal core of Nordel 275°F with zero leakage from vacuum to 500 psig.

B. Makes: Peterson Equipment Company, Sisco P/T plugs.

3.0 PART 3 - EXECUTION

3.1 WATER PRESSURE GAUGES

A. Provide ball valve on each gauge line meet the requirements of Specification Section 230523.

B. Provide water pressure gauge in piping systems where called for and where scheduled below:

1. Provide ball valve in each pump inlet and outlet tapping, or in piping adjacent to same. Range: 30 in. vacuum to 100 psi.

2. Compression tanks: 0 to 100 psi range.

3. Each water make-up valve assembly: 0 to 60 psi range.

3.2 PIPING THERMOMETERS

A. Mounted in oversize tee or elbow if necessary, to provide as little restriction as possible to fluid flow and maintain sensing bulb fully in measured media, with stems of proper length to allow accurate reading. Locate adjacent to control sensing equipment. Arrange so as to be easily read from floor.

B. Select thermometers from manufacturer's standard equipment such that anticipated measurements will reside generally in the middle third of the instrument's range.

3.3 TEST PLUGS

A. Provide test plugs at gauge and thermometer locations as called for.

END OF SECTION 230519

SECTION 230523 – VALVES

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment, and services as required for the complete installation and related work designated in contract documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Valves and accessories.

2.0 PART 2 – PRODUCTS

2.1 VALVES:

A. General: Valves shall meet the following requirements:

1. Working pressure shall be stamped or cast on bodies.

2. Stem packing shall be serviceable without removing valve from line.

3. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

B. Swing Check Valves – HVAC Systems (Non-Potable Water Systems):

1. **CV-01 -** Bronze 2" and Under (Threaded and Soldered End Connections):

a. Valves shall be suitable for 125 SWP/200WOG, 150 SWP/300 WOG or 300 SWP/ 1000WOG, renewable disc, T-Pattern or Y-Pattern.

b. Body and Cap: Bronze ASTM B62.

c. Lever: Stainless steel or brass.

d. Disc: Bronze ASTM B16, ASTM B453, or ASTM B61.

e. Acceptable Makes: Milwaukee 509/1509 (Class 125), 515/1515 (Class 150) or 507 (Class 300), Hammond IB904//IB912 (Class 125), IB515Y (Class 150) or IB949 (Class 300), Crane 37/ (Class 125), 137 (Class 150) or 36E (Class 300), Nibco T-413/S-413 (Class 125), T-433/S-433 (Class 150) or T-473 (Class 300), Apollo 161T (Class 125), 164T (Class 150).

2. **CV-03 -** Cast Iron 2 ½" and Larger (Flanged End Connection):

   a. Valves shall be Class 125 or Class 250, bolted cap.

   b. Body and Bonnet: Cast iron ASTM A126, Class B.

   c. Seat Ring: Bronze ASTM B62

   d. Disc: Cast iron ASTM A126, Class B or cast bronze ASTM B62

   e. Hinge: Ductile iron ASTM A536 or cast bronze ASTM B62.

   f. Acceptable Makes: Milwaukee F-2974A (Class 125) or F-2970-M (Class 250), Crane 373 (Class 125) or 39E (Class 250), Powell Figure 559 (Class 125), Lunkenheimer Figure 1790 IBBM (Class 125), Nibco F-918-B (Class 125) or F-968-B (Class 250).

C. Ball Valves: Domestic - Potable Water:

1. **BV-01 -** Bronze 2" and Under (Threaded and Soldered End Connections):

   a. Valve shall be suitable for 600 psi WOG non-shock, 150 psi WSP full port with blowout proof stem.

   b. Lead Free.

   c. Body: Bronze.

   d. Stem: Type 316 Stainless Steel ASTM A276.

   e. Ball: Type 316 Stainless Steel ASTM A276.

   f. Seats and Seals Stem Packing and Thrust Washer: PTFE.

   g. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.

   h. Adjustable stem packing.

   i. Acceptable Makes: Watts LFB6080-G2-SS (threaded) and LFB6081-G2-SS (solder), Apollo 77CLF-140-C (threaded) and 77CLF-240-C (solder), Milwaukee UPBA400S (threaded) and UPBA450S (solder), Nibco T-585-66-LF (threaded) and S-585-66-LF (solder), Hammond UP8303A (threaded) and UP8313A (solder).

D. Ball Valves – HVAC Systems (Non-Potable Water Systems):

1. General – Where ball valves are specified, provide 6" ball valves in 5" pipe. Provide required reducers.

2. **BV-03 -** Bronze 2" and under (Threaded and Soldered End Connections)

   a. Valve shall be suitable for 600 psi WOG non-shock, 150 psi WSP full port with blowout proof stem.

   b. Body: Bronze.

   c. Stem: 316 Stainless Steel.

   d. Ball: 316 Stainless Steel.

   e. Seats and Seals Stem Packing and Thrust Washer: PTFE.

   f. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.

   g. Adjustable stem packing.

   h. Acceptable Makes: Watts LFB6080-G2-SS (threaded) and LFB6081-G2-SS (solder), Apollo 77C-140 (threaded) and 77C-240 (solder), Milwaukee BA400S (threaded) and BA450S (solder), Nibco T-585-66 (threaded) and S-585-66 (solder), Hammond 8303A (threaded) and 8313A (solder).

3. **BV-08 -** Carbon Steel 2 1/2" to 12" (Flanged End Connection):

   a. Valve shall be Class 150 designed for 285 psi WOG non-shock, 150 psi at 365°F saturated steam or Class 300 designed for 740 psi WOG non-shock, full port, split body, raised face flange, with blowout proof stem conforming to ANSI/ASME B16.34, ANSI/ASME B16.10, ANSI/ASME B16.5, MSS SP-25 and MSS SP-72

   b. Body: ASTM A216 GR WCB Carbon Steal.

   c. Stem: Stainless steel Type 316 ASTM A276.

   d. Ball: Stainless steel Type 316 ASTM A276.

   e. Seats and Seals Stem Packing and Thrust Washer: PTFE/RPTFE.

   f. Handle: Lever for valves below 6" and gear operators for 6" through 12".

   g. Adjustable stem packing (graphite).

   h. Acceptable Makes: Milwaukee F20CS, Nibco F-515-CS-F-66-FS (Class 150) or F-535-CS-F-66-FS (Class 300), Jamesbury 9150 (Class 150) or 9300 (Class 300), Apollo 87A-200 Series (Class 150) or 87A-900 (Class 300), Watts G4000 and G4000M1 (Class 125)

E. Valves for Gauges and Instruments – HVAC Systems (Non-Potable Water Systems):

   1. Ball valve ½" in size meeting the requirements above for the services specified.

F. Hose Threaded Drain and Manual Vent Valve (Non-Potable Heating Hot Water, Chilled Water, Heating Glycol and Cooling Glycol Systems Operating at a maximum pressure of 125 psi and temperature of 200°F or Below):

1. **DBV-01** - Bronze ½" and ¾" (Threaded and Soldered End Connections)

a. Valve shall be suitable for 400 psi CWP, 2-piece, full port ball valve with blowout proof stem, ¾" hose connection.

b. Body: Bronze ASTM B584 or Brass ASTM B283.

c. Stem: Brass ASTM B16, silicon bronze ASTM B371 alloy C69430 or ASTM B99 alloy C65100.

d. Ball: Chrome plated brass ASTM B16 alloy C36000, ASTM B125 alloy C37700 or ASTMB282 alloy C37700.

e. Seats and Seals Stem Packing and Thrust Washer: PTFE and RPTFE.

f. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.

g. Adjustable stem packing.

h. Acceptable Makes: Watts LFFBV-3C-CC (threaded) and LFFBVS-3C-CC (solder), Apollo 70-100-HC (threaded) and 70-200-HC (solder), Milwaukee BA100H (threaded) and BA150H (solder), Nibco T-585-70-HC (threaded) and S-585-70-HC (solder), Hammond 8501H (threaded) and 8511H (solder).

G. Balance Valve:

1. **General:**

a. Where contractor submits "termination kits" with integral balance valve for approval, use does not preclude the need to provide separate equipment isolation valve. Balance valves are not to be used for isolation duty. Provide separate isolation valve in compliance with Exhibit A of this section.

2. **GBV-01** - Globe Type Balancing Valve:

a. Balancing valve and flow meter stations suitable for use on heating and cooling systems.

b. Maximum Pressure Drop 5.0 Ft. or less.

c. Calibrated balance valve with provisions for connecting a portable differential pressure meter. Meter connections to have built-in check valves.

d. Multi-turn handle for precision adjustment.

e. Balance valve size shall be based upon gpm range rather than pipe size. Select flow balancers such that the range of pipe flow resides in the middle 50% of the manufacturer's recommended operating range for the device.

f. Operating temperature range -4 – 248°F. Suitable for 300psi at 150°F.

g. Brass: Solder or threaded body to match piping system up to 2".

h. Cast Iron: Grooved or flanged bodies to match piping system 2 ½ - 12".

i. Acceptable Makes: Armstrong CBV, Tour & Anderson 780 Series, Griswold "Speedset", Macon STV

3.0 PART 3 – EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment.

2. Provide at major building and system sections.

3. Provide chain wheels, guides, and chain loops for valves, where called for or in Mechanical Rooms where valves are mounted higher than 8'-0" AFF.

4. Isolating valves for individual fan convectors, room units, terminal units, or other similar apparatus may be inside cabinet or at connection to branch main where accessible.

5. Locate valves with stems at or above horizontal positions and swing check valves in horizontal position only.

6. Provide hose threaded drain valves at all piping system low points, strainers, equipment, and as called for heating hot water systems, chilled water systems, glycol heating systems and glycol cooling systems operating at or below 125 psi and 200°F. Drain or blowdown valves for water and glycol systems operating above 125 psi and 200°F, and steam systems shall be provided with valves specified in Exhibit 'A'. Provide Cap or plug at valve discharge.

B. Balance Valves:

1. Provide on zone or riser returns, on each hydronic unit and where called for. Meter connection points shall not point downward.

2. Install device in pipe line per manufacturer's instructions for upstream and downstream distances.

3.2 VALVE SELECTION

A. Provide valve types for the specific services as specified in Exhibit 'A'. Valve changes shall be made only as reviewed by Owner's Representative.

EXHIBIT - 'A' - VALVE TYPE (HVAC)

Notes are at the end of Exhibit 'A'

Service	**Check**	**Ball**	**Balancing**	**Special Purpose, Drains and Manual Air Vents**	**Notes**
Hot water heating operating at 125 psi or below (Optional)	CV-01 Class 125and CV-03 Class 125	BV-03,	GBV-01	DBV-01	Note 1,2,3
Hot water heating operating at 125 psi or below (Optional)	CV-01 Class 125 and CV-03 Class 125	BV-03 and BV-08 Class 150	GBV-01	DBV-01	Note 1, 2
Glycol chilled water and Chilled water operating at 125 psi or below (Optional)	CV-01 Class 125and CV-03 Class 125	BV-03,	GBV-01	DBV-01	Note 1, 2
Glycol chilled water and Chilled water operating at 125 psi or below (Optional)	CV-01 Class 125 and CV-03 Class 125	BV-03 and BV-08 Class 150	GBV-01	DBV-01	Note 1, 2
Domestic water		BV-01			

NOTES FOR EXHIBIT "A":

NOTE 1: Hose threaded drain and vent valves DBV-01 shall only be used on heating hot water, chilled water, glycol heating and glycol cooling systems operating pressure at or below 125 psi and temperature at or below 200°F. Systems operating pressure above 125 psi and operating temperature above 200°F, or sizes above ¾" shall be provided with the listed service valve with the open end of the valve provided with a threaded plug or cap.

NOTE 2: Where options are indicated for the valve connection types (threaded, soldered or welded) in this specification section, refer to Specification Section 232000 for the specific requirement for the connection type for the intended service.

END OF SECTION 230523

SECTION 230550 – WIND RESTRAINT FOR HVAC SYSTEMS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Support and brace mechanical and electrical systems, as called for, to resist directional wind forces (lateral, longitudinal and vertical) for components attached to curbs and for curbs attached to structure.

1.3 APPLICABLE CODES AND STANDARDS

A. Provide work in compliance with the following codes and standards.

B. Building Code of New York State, Section 1603.

C. Mechanical Code of New York, Section 301.

D. American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures – Standard ASCE/SEI 7-10.

1.4 QUALITY ASSURANCE

A. General:

1. The contractor shall provide calculations and details of wind restraint systems to meet total design lateral force requirements for support and restraint of mechanical and electrical systems, sealed and signed sealed by a New York registered Professional Engineer.

2. Systems requiring wind restraint:

a. 237413 - Packaged Rooftop Unit

b. 236429 - Air Cooled Chiller

c. 233000 - Sheetmetal and Ductwork Accessories

d. 238116 - Split System Air Conditioner

e. 232000 - Piping Systems and Accessories

f. 233400 – Fans

g. 233726 - Louvers and Penthouses

1.5 SUBMITTTALS

A. Submit wind force level (Fp) calculations for applicable building code. Submit pre-approved restraint selections, installation details, and plans indicating locations of restraints.

B. Calculations, plans, restraint selection, and installation details shall be signed and sealed by a professional engineer licensed in the State of New York and experienced in wind restraint design.

C. Submit manufacturer's product data.

D. For each piece of equipment that requires wind restraint as outlined in this section, include the following:

1. Dimensioned Outline Drawings of Equipment Unit: Identify the center of gravity and locate and describe mounting and anchoring provisions.

2. Anchorage: Provide detailed description of equipment anchorage devices on which the calculations are based and their installation requirements. Identify anchor bolts, studs and other mounting devices. Provide information on the size, type and spacing of mounting brackets, holes and other provisions.

2.0 PART 2 – PRODUCTS

2.1 CODE INFORMATION

A. This project is subject to the wind bracing requirements of the Building Code of New York State, International Building Code and American Society of Civil Engineers ASCE 7. The following criteria are applicable to this project, see Structural Engineering plans for data.

1. Basic Wind Speed (V) (Per ASCE 7-10).

2. Importance Factor (I) (Per ASCE 7-10).

3. Exposure Category (Per ASCE 7-10).

4. Height and Exposure Adjustment Coefficient (Per ASCE 7-05).

5. The mean height of the structure (h_{mean}) shall be determined thru coordination with Architectural plans and the General Contractor.

2.2 WIND BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Design analysis shall include calculated dead loads, wind loads, and capacity of materials utilized for the connection of the equipment or system to the structure.

2. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.

3. All wind restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in Section 2.1.

B. Friction from gravity loads shall not be considered resistance to wind forces.

3.0 PART 3 – EXECUTION

3.1 INSTALLATION

A. Wind Restraint of Piping:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines and all certified data.

2. Installation of restraints shall not cause any change in position of equipment or piping, resulting in stresses or misalignment.

3. Transverse piping restraints shall be at 40-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

4. Longitudinal restraints shall be at 80-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

5. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24 inches of the elbow or ice or combined stresses are within allowable limits at longer distances.

6. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints.

7. Branch Lines may not be used to restrain main lines.

8. Provide reinforced clevis bolts when required.

9. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offset, loops, anchors and guides shall be installed as required to provide specified motion capability and limit motion of adjacent piping.

10. Do not brace a system to two independent structures such as roof and wall.

B. Wind Restraint of Electrical Services:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines manual and all certified data.

2. Installation of restraints shall not cause any change in position of equipment or piping, resulting in stresses or misalignment.

3. No ridged connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

4. Do not install any equipment, piping, duct or conduit that makes rigid connections with the building unless isolation is not specified.

5. Prior to installation, bring to the Architect's/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

6. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or wedge-type concrete anchors. Consult Structural Engineer of record.

7. Overstressing of the building structure shall not occur from overhead support of equipment. Bracing attached to structural members may present additional stresses. The Contractor shall submit loads to the structural engineer of record for approval in this event.

8. Brace support rods when necessary to accept compressive loads. Welding of compressive braces to the vertical support rods is not acceptable.

9. Provide reinforced clevis bolts where required.

10. Do not brace a system to two independent structures such as a roof and wall.

C. Wind Restraint of Ductwork and Equipment:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines and all certified submittal data.

2. The interaction between mechanical and electrical equipment and the supporting structures shall be designed into the restraint systems.

3. Friction clips shall not be used for anchorage attachments.

4. Expansion anchors shall not be used for non-vibration isolated equipment rated over 10HP.

5. Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction and vertical restraints shall be provided to resist overturning.

6. Installation of restraints shall not cause any change in position of equipment or ductwork, resulting in stresses or misalignment.

7. No ridged connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

8. Do not install any equipment or duct that makes rigid connections with the building unless isolation is not specified.

9. Prior to installation, bring to the Architect's/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

10. Bracing may occur from flanges of structural means, upper truss cords of bar joists, cast in place inserts, or wedge-type concrete anchors. Consult Structural Engineer of record.

11. Overstressing, of the building structure shall not occur from overhead support of equipment. Bracing attached to structural members may present additional stresses. The Contractor shall submit loads to the Structural Engineer of record for approval in this event.

12. Brace support roads when necessary to accept compressive loads. Welding of compressive braces to the vertical support rods is not acceptable.

13. Provide reinforced clevis bolts where required.

14. Do not brace a system to two independent structures such as a roof and wall.

END OF SECTION 230550

SECTION 230553 - MECHANICAL IDENTIFICATION

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

A. Prior to Ordering Products: Submit manufacturer's technical product data and installation instructions for each identification material and device. For valve tags include proposed tag methodology, including code number, location and valve function. For piping systems and equipment submit proposed schedule of pipe, equipment and name identification for review and approval. Confirm naming / numbering is consistent with any Owner’s naming / numbering convention.

B. As-built submission – Provide final valve schedule for each piping system in both 8-1/2 in. X 11 in. (minimum) and WORD format, indicating code number, location and valve function.

1.4 MAKES

A. Allen Systems, Inc., Brady (W.H.) Co.; Signmark Div., Industrial Safety Supply Co., Inc., Seton Name Plate Corp., Marking Services Incorporated, or approved equal.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Provide manufacturer's standard products of categories and types required for each application. In cases where there is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.

2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Snap-on type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color coded pipe markers, complying with ANSI/ASME A13.1.

2. Stencil paint: Apply black or yellow stencil paint directly to covering or bare pipe; color to contrast with background. Stencil as follows:

Pipe or Covering	Size Stencil Letter
½", ¾", 1", 1-1/4"	1/2"
1-1/2", 2"	3/4"
2 ½" and over	1"

B. Lettering:

1. Piping labeling shall conform to the following list:

Pipe Function	Identification
Pumped Condensate	PC
Cold Water (Domestic Water)	CW
Heating Water Supply	HWS
Heating Water Return	HWR
Chilled Water Supply	CWS
Chilled Water Return	CWR
Refrigerant	R
Vent	V
Overflow	OF
Drain	D
Natural Gas	NG

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify between heating and plumbing services with 1/4" letters above the valve number.

2. Equal to Seton Style 300 Cat.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room.

2.4 EQUIPMENT IDENTIFICATION

A. General:

1. Provide engraved acrylic or vinyl plates for each major piece of mechanical equipment provided.

2. Nameplates: 3/4" x 2-1/2" equal to Seton Cat. #2060-20.

3. Provide for the following equipment:

a. Air handling units

b. Fans

c. Pumps

d. Chillers

e. Heat exchangers

f. Condensate pumps

g. Energy recovery units

h. Fan coil units

i. Unit heaters/cabinet heaters

j. Filters

k. Duct coils

l. Terminal units (VAV/CV)

m. Fire dampers

n. Smoke dampers

2.5 DUCTWORK IDENTIFICATION

A. Identification Types:

1. Stencil paint: Apply black or yellow stencil paint directly to insulation or bare sheetmetal; color to contrast with background. Stencil as follows: 2" Stencil Letters.

2. Provide arrow indicating direction of airflow.

3. Label outside air ducts with the outside air minimum CFM rate.

4. Label supply air duct main at air handling unit discharge with the unit maximum CFM rate.

B. Lettering:

1. Ductwork labeling shall conform to the following list:

Duct Function	Identification
Return Ductwork	RA
Relief Ductwork	REA
Exhaust Ductwork	EA
Supply Ductwork	SA
Outside Air Ductwork	OA

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project.

B. Provide equipment tags for all equipment listed in Equipment Identification Section above.

C. Provide piping identification with directional flow arrows for all piping on project. Maximum every 10’-0”. Provide tags on piping at all coil terminations. For piping installed through rooms, provide at least one pipe label in each room, for each pipe function.

D. Provide Ductwork identification with directional arrows for all ductwork on project. Maximum every 10'-0”. Provide at least one duct label in each room for each duct function.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

B. This Contractor shall reference the entirety of Divisions 22 and 23 as they apply to this work.

C. Refer to specification Section 019113 for commissioning requirements related to this project.

1.2 SUMMARY

A. Provide labor, materials, equipment and services to perform operations required for testing, adjusting, and balancing HVAC systems to produce design objectives, including, but not limited to the following:

1. Pre-demolition testing of existing systems.

2. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.

3. Adjusting total HVAC systems to provide indicated quantities.

4. Measuring electrical performance of HVAC equipment.

5. Setting quantitative performance of HVAC equipment.

6. Verifying that automatic control devices are functioning properly.

7. Calibration of flow (air and water) sensors provided by the 230923 contractor

8. Reporting results of the activities and procedures specified in this Section.

1.3 SUBMITTALS

A. Quality-Assurance Submittals: Submit copies of evidence that the Testing, Adjusting, and Balancing contractor and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" article below.

B. Sample Report Forms: Submit required number of sets of sample testing, adjusting, and balancing report forms.

C. TAB Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in "Preparation" article below. Include a complete set of report forms intended for use on this Project with each copy. Included in this plan shall be a thorough description of means and methods pertaining to maintenance of systems balance in detailed coordination with all phasing requirements for this project

D. Certified Testing, Adjusting, and Balancing Reports: Submit required number of copies of reports prepared, as specified in the Submission of Certified Balance Reports Section, on approved forms certified by the registered contractor; include registration number.

E. Warranty: Submit required number of copies of the warranty specified in the "Warranty" Article below.

1.4 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing contractor certified/registered by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Contractor shall have performed as a member in good standing with recognized procedures for no less than five (5) years including projects of the magnitude and design of this project. Balancing Contractor must be approved by the Engineer. See Section 1.3.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC or NEBB's Standards for Testing, Adjusting, and Balancing, or approved equal.

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC or NEBB national standards.

E. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. The Owner may occupy all or part of the site and existing building during the entire testing, adjusting, and balancing period as required. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations. It is the intent to have all possible balancing procedures complete prior to any Owner occupancy. Contractor shall perform the necessary work in an expedient and accurate manner which best serves the need of verifying proper installation and operation of the installed systems and allowing prompt Owner occupancy.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls contractor, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Coordinate TAB activities with temperature control system setup and calibration

1.7 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by this Contractor under requirements of the Contract Documents.

B. NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing contractor fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified contractor has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

3. Copy of the performance guarantee shall be included in each final certified air balance report.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide all required instrumentation and tools, including, but not limited to ladders, recording meters, gauges, thermometers, voltmeters, anemometers, Pitot tubes, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers and tachometers. Instruments used shall be accurately calibrated as per AABC or NEBB requirements

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are located as required in the Contract Documents and installed per manufacturer’s requirements. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operations. All deficiencies shall be reported to the Engineer in writing within 60 days from award of contract. Failure to provide notice within this time period may require that any devices required for proper balance of these systems be installed at the cost of this contractor.

B. Examine approved submittal data of all HVAC systems and equipment.

C. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions and/or cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems"; or in SMACNA's "HVAC Systems-Duct Design". Compare this data with the design data and installed conditions.

D. Examine system and equipment installations to verify that they are complete and ready for testing.

E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing. Any noted deficiencies should be reported immediately to the Engineer for further action.

G. Examine strainers for clean screens, removal of startup screens and proper perforations.

H. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

I. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

J. Examine equipment for installation and for properly operating safety interlocks and controls.

K. Examine automatic temperature control system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in mixing boxes.

4. Automatic modulating and shutoff valves are properly connected.

5. Temperature sensors are located to avoid adverse effects of sunlight, drafts, and cold walls. Sensors are located to sense only the intended conditions.

6. Sequence of operation for control modes is according to the Contract Documents.

7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

8. Interlocked systems are operating.

9. Changeover from heating to cooling mode occurs according to design values.

L. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures immediately to the Engineer for further action.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete. Equipment rotation has been checked.

2. Hydronic systems are filled, clean, strainers cleaned, startup screens removed and system free of air.

3. Automatic temperature control systems are operational.

4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices has been provided.

8. Filters are clean and in place, including pre-filters and final filters where applicable.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. All systems shall be tested and verified to be in compliance with the performance characteristics contained in the contract documents. All testing shall be performed in compliance with the requirements of NEBB or AABC Standards for Testing and Balancing, or within the standards described in this section. The more stringent standard shall apply.

B. Adjusting and balancing shall be accomplished as soon as the systems are completed to the extent required to allow the work to proceed, and before the Owner takes possession. Verify that the system is properly vented, cleaned, and strainers are cleared with startup mesh removed prior to balance.

C. Cut insulation, ducts, and pipes for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the Insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan speed control levers, and similar controls and devices, indicating final settings.

E. Adjusting and balancing shall be accomplished under appropriate outdoor temperature conditions. All outdoor conditions (Db, Wb, and a description of the weather conditions) at the time of testing shall be documented in the report.

F. Identify flow balancers and dampers in systems which cannot be manipulated to satisfy balancing requirements. Return to site after remedial actions are performed to adjust corrected systems.

G. Traverse duct mains to determine total air system delivery quantities after all outlets have been set and, if necessary prior to final adjustment if the system does not meet design requirements. A sum of room CFM's is not acceptable.

3.4 FUNDAMENTAL AIR SYSTEM BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan total volume.

1. Determine system diversity factors. Prepare plan to simulate system diversity

2. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

3. Check the airflow patterns from the outside air louvers and dampers and the return and exhaust air dampers, through the supply fan discharge and mixing dampers.

4. Locate start-stop and disconnect switches, electric interlocks, and motor starters.

5. Verify that motor starters are equipped with properly sized thermal protection.

6. Check dampers for proper position to achieve desired airflow path.

7. Check for airflow blockages.

8. Check condensate drains for proper connections and function.

9. Check for proper sealing of air-handling unit components

B. Air System Balancing Procedures:

1. The procedures in this article apply to all supply, return, and exhaust air systems.

2. Adjust fans to deliver total design air flows within the maximum allowable speed (rpm) listed by the fan manufacturer.

3. Measure fan static pressures to determine actual static pressure as follows:

   a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

   b. Measure static pressure directly at the fan outlet or through the flexible connection.

   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

   d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

4. Measure static pressure across each air-handling unit component.

5. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions in the event that adverse resulting conditions occur which make the system unable to achieve design performance levels.

6. Adjust fan speed higher or lower as required to meet as installed conditions. Provide new sheaves as required. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan speed changes.

7. Do not make fan speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

8. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design air flows within specified tolerances.

   a. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved. Where sufficient space in submains and branch ducts is unavailable for pitot tube traverse measurements, measure air flow at terminal outlets and inlets and calculate the total air flow for that zone.

b. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design air flows within specified tolerances.

9. Measure terminal outlets and inlets without making adjustments. Measure terminal outlets using a direct reading hood or the outlet manufacturer's written instructions and calculating factors.

10. Adjust terminal outlets and inlets for each space to within +/- 10% of design airflow. Make adjustments using volume dampers rather than the dampers at the air terminals, where available.

a. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.

b. Adjust patterns of adjustable outlets for proper distribution without drafts.

c. Where pressure gradients are required between spaces, provide adjustment of supply and return / exhaust air such that the supply vs return / exhaust rate shown on the plan is maintained.

d. Record final air volume and air flow pattern for each inlet and outlet.

3.5 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5%.

B. Verify that systems are prepared for hydronic systems testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check flow control valves for specified sequence of operation and set at design flow.

3. Set differential pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive displacement type, unless several terminal valves are kept open.

C. Hydronic System Balancing Procedures:

1. Set calibrated balancing valves, if installed, at calculated pre-settings.

2. Measure flow at all stations and adjust, where necessary, to obtain first balance.

a. System components that have C_V rating or an accurately cataloged flow pressure drop relationship may be used as a flow indicating device.

3. Measure flow at main balancing station and set main balancing device to achieve flow that is 5% greater than design flow. Where pump selection provides a firm operating point, pump flow may be derived from the pump curve in lieu of the balancing device.

4. Adjust balancing stations to within specified tolerances of design flow rate as follows:

   a. Determine the balancing station with the highest percentage over design flow.

   b. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.

   c. Record settings and mark balancing devices.

5. Measure the differential pressure control valve settings existing at the conclusion of balancing.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data as it applies.

1. Manufacturer, model, frame and serial numbers.

2. Complete nameplate data.

3. Efficiency rating if high efficiency motor.

4. Measured voltage and amperage, each phase

5. Starter thermal protection element rating.

3.7 HEAT TRANSFER COILS

A. Hydronic: Measure the following data for each coil.

1. System identification.

2. Location.

3. Coil Type and nameplate data

4. Dry-bulb temperatures of entering and leaving air.

5. For cooling coils – record entering %RH or wet bulb data.

6. For primary coils (Air Handlers, etc.) – Record face velocity and air pressure drop.

7. Record airflow rate

8. Adjust water flow rate as scheduled

9. Adjust bypass water flow on three-way circuits for 50% of total coil water flow scheduled.

3.8 TEMPERATURE CONTROL VERIFICATION

A. Verify that all control devices are calibrated and fully operational.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify free travel and proper operation of control devices such as damper and valve operators.

3.9 TOLERANCES

A. Unless noted to the contrary in other portions of the contract documents, set HVAC system airflow and waterflow rates within the following tolerances.

1. Supply, Return, and Exhaust, Air Inlets and Outlets: +/- 10%, maintaining required pressure balance between adjacent spaces / zones.

2. Fans at +/- 5% of delivery requirements.

3. Water-Flow Rates: +/- 5%.

3.10 FINAL REPORT

A. General: Computer printout in letter quality font, on standard bond paper. Provide 1 hard copy in 3-ring binder, tabulated and divided into sections by tested and balanced systems. Provide PDF copy for project record.

B. A certification sheet in front of binder signed and sealed by the certified testing and balancing agent. All reports shall bear the seal of the certifying agent for the balancing contractor. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: Final report shall consolidate data from all segments of phased project. In addition to the certified field report data, include the following:

1. Fan curves.

2. Pump Curves

3. Manufacturers' test data.

4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance; do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page including:

   a. Name and address of testing, adjusting, and balancing contractor.

   b. Project name.

   c. Project location.

   d. Architect's name and address.

   e. Engineer's name and address.

   f. Contractor's name and address.

   g. Report date

2. Signature of testing, adjusting, and balancing agent who certifies the report.

3. Summary of contents, including the following:

   a. Design versus final performance.

   b. Notable characteristics of systems.

   c. Description of system operation sequence if it varies from the Contract Documents.

4. Nomenclature sheets for each item of equipment.

5. Data for terminal units, including manufacturer, type, size, and fittings.

6. Report shall document all information items requested within this specification section.

E. System Diagrams: On complete set of reproducible contract drawings provide single line sketch of system (designer – one or the other) marked up with terminal unit numbers, room numbers, test locations, register, grill, and diffuser numbers to correlate with test sheet. Include the following:

1. Quantities of outside, supply, return, and relief/exhaust airflow.

2. Water flow rates.

3. Pipe and valve sizes and locations.

4. Terminal units.

5. Balancing stations.

F. Fan Test Reports: In addition to other requirements for supply, return, and exhaust fans, include the following:

1. Fan Data: Include the following:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangements and class.

g. Fan and motor sheave make, size in inches, bore, and key size.

h. Fan and motor sheave dimensions, center-to-center and amount of adjustment in inches.

i. Number of belts, manufacturer, and size

2. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

f. Motor data.

G. Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record and report the following data as a minimum:

1. System and air handling unit number.

2. Location and zone.

3. Traverse air temperature in °F.

4. Duct static pressure in inches wg.

5. Duct size in inches.

6. Duct area in sq. ft.

7. Design airflow rate in cfm.

8. Design velocity in fpm.

9. Actual airflow rate in cfm.

10. Actual average velocity in fpm.

H. Air Terminal Unit Reports: In addition to other requirements for terminal units, include the following:

1. Unit Data: Include the following:

a. System and air handling unit identification.

b. Location and zone.

c. Test apparatus used.

d. Area served.

e. Air terminal make.

f. Air terminal number from system diagram.

g. Air terminal type and model number.

h. Air terminal size.

2. Test Data: Include design and actual values for the following:

a. Airflow rate in cfm (minimum and maximum).

b. Preliminary airflow rate as needed in cfm.

c. Final airflow rate in cfm.

d. Space temperature in °F.

e. Duct Supply Air Temperature in °F.

I. Instrument Calibration Reports: For instrument calibration, include the following data in report, as a minimum:

1. Instrument type and make.

2. Serial number.

3. Application.

4. Dates of use.

5. Date of calibration.

3.11 ADDITIONAL TESTS

A. Balance Contractor shall be prepared to verify the balance of select devices in the presence of the Engineer and / or Commissioning Authority at their discretion. This typically will require only a few hours to a day of labor, depending on the project scope. If, in the opinion of the Engineer or Commissioning Authority these verifications contain adequate discrepancies to provide doubt to the accuracy of the balance procedures performed, the Engineer or Commissioning Authority may order additional re-balancing or re-verification until such time as these discrepancies are eliminated throughout the systems; this verification shall be at the Contractor's expense.

B. Seasonal Periods: Initial testing, adjusting, and balancing procedures at start-up will not provide a good representative sample of system performance due to seasonal conditions. Therefore the Contractor shall return at a later time to perform the required balancing work, up to 8 hours of balancing work, to address seasonal conditions. This shall not delay the submittal of the certified balance reports for all work otherwise performed.

3.12 SUBMISSION OF CERTIFIED BALANCE REPORTS

A. Time is of the essence in the completion of this portion of the contract. It is expected that the certified balance reports will be submitted in a timely manner, within thirty (30) days of the work performed. At the completion of the project, it shall be the responsibility of this Contractor to assemble a single certified report and submit 1 printed copy to the Engineer as closeout documentation, along with electronic copy in PDF format.

END OF SECTION 230593

SECTION 230700 - INSULATION

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. All work shall comply with the requirements of the 2020 Energy Construction Conservation Code of New York State, manufacturer's requirements for installation and these specifications. In the event of conflicts between these documents, the more stringent requirements shall govern.

B. Provide labor, materials, equipment and services to perform operations required for the complete installation and related work as required in the Contract Documents. The extent of insulation work is indicated on the drawings and by the requirements of this section.

C. Repair all insulation at points of piping and ductwork system tie in to existing and at locations where existing systems are cut, patched or capped.

D. Insulate all existing piping systems, ductwork systems and equipment after removal of existing insulation whether by this contractor or another, including but not limited to removal of asbestos products.

E. Remove existing insulation where indicated on the drawings or specified here-in.

1.2 SUBMITTALS

A. Manufacturers' Data. Submit manufacturer's data and installation instructions.

B. Schedule of insulation applications.

C. Certification: Provide certifications as necessary to show compliance with these specifications and governing regulations. Include proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 232000 – Piping Systems and Accessories.

B. Section 232133 – Water Systems Specialties.

C. Section 233000 – Sheet Metal and Ductwork Accessories.

2.0 PART 2 – PRODUCTS

2.1 GENERAL

A. Insulation, Jackets, Adhesives, and Coatings, shall comply with the following:

1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments are not permitted.

2. Insulation, including finishes and adhesives on the exterior surfaces of ducts, pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, as tested by ASTM E84 (NFPA 255) and UL 723 methods, using the specimen preparation and mounting procedures of ASTM E2231.

3. Insulation within plenums, duct coverings and duct linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F. Pipe and duct insulation shall be listed and labeled.

4. All adhesives, coatings and sealants used for the insulation shall comply with the maximum Volatile Organic Compound (VOM) limits as called for in the current version of U.S. Green Building Council LEED Credits.

5. Provide materials which are standard insulation products of manufacturers for piping, ductwork and equipment systems.

6. Provide insulation in accordance of MICA and NAIMA standards.

7. Asbestos or asbestos bearing materials are prohibited.

8. Ducts operating at temperatures above 120 degrees shall have sufficient thermal insulation to limit the exposed surface temperature to 75 degrees.

9. The insulation shall be clearly labelled by the manufacturer with the installed thermal “R” values in accordance to the Energy Conservation Code.

10. UL GREENGUARD Gold Certification – all insulation materials shall be GREENGUARD certified, documentation for which shall be contained in the paragraph 1.2.c submittal information.

2.2 ACCEPTABLE MANUFACTURERS

A. Fiberglass: Knauf, Manville, Owen-Corning, Certainteed.

B. Polyisocyanurate: Dow Trymer 2000XP, HyTherm.

C. Flexible Elastomeric: Armstrong, Rubatex International, Armacell

D. Calcium Silicate: Industrial Insulation Group (IIG), Johns Manville, Owens-Corning.

E. Removable Thermal Blanket: Insultech, Shannon, Irwin.

F. Adhesives, Coatings, Mastics, Sealants: Childers, Foster, Armacell.

G. Aluminum and Stainless Steel Jacket Material: GIC, GLT, RPR.

H. Laminated Rubberized Bitumen Jacket: Alumaguard, VentureClad, Flex Clad.

I. Pre-Molded PVC Fitting Covers: Zeston, Proto System

2.3 PIPE INSULATION (RIGID FIBERGLASS TYPE)

A. Glass Fiber insulation meeting ASTM C 547, Type II, Class 2, ASTM C 585, ASTM C 795 and ASTM C 1136; rigid, molded, noncombustible.

B. Minimum 'K' Value: ASTM C 335, 0.23 at 75°F mean temperature installed value. Maximum Service Temperature: 1000°F.

C. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.

D. Field-Applied PVC 30 mil Fitting Covers with Flexible Fiberglass Insulation complying with ASTM C 450 and ASTM C 585: Proto Corporation LoSmoke, UV-resistant fittings and accessories, white or colored. Fitting cover system consists of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures to be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.

2.4 PIPE INSULATION (FLEXIBLE ELASTOMERIC FOAM)

A. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC's, HFC's, HCFC's, formaldehyde, fibers and dust, with low VOC's. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft²•hr.• F/in. at 75ºF mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2" material thickness. Furnish with self-sealing reinforced lap seal.

B. Pipe Insulation: ASTM C534, Type I.

C. Sheet Insulation for Ductwork and Equipment: ASTM C534, Type II, smooth skin one side.

2.5 PIPE INSULATION TAPES

A. ASJ Tape: White vapor retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 4 inches.

2. Thickness Total: 14.3 mil.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

B. FSK Tape: Foil face, vapor retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 4 inches.

2. Thickness Total: 13.3 mil.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

2.6 DUCT INSULATION

A. Duct Liner – Refer to Specification Section 233000.

B. Flexible Fiber Glass Blanket:

1. Insulation Blanket meeting ASTM C 553, Type II, ASTM C 1290, Type III, and ASTM C 1138.

2. 'K' Value of 0.27 at 75°F mean temperature. Maximum Service Temperature (Faced): 250°F.

3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, II, III, IV, VIII or FSK conforming to ASTM C 1136 Type II, IV. Provide ASJ jacket for ductwork to be painted.

4. Installation: Maximum allowable compression is 25%.

5. Density: Minimum 1.0 PCF.

6. For duct wrap, the installed thickness shall be assumed to be 75 percent (25% compression) of nominal thickness.

C. Rigid Fiber Glass Board

1. Insulation Board meeting ASTM C 612 Type IA, IB and II, ASTM C 795 and ASTM C 1138.

2. 'K' Value of 0.23 at 75°F mean temperature. Maximum Service Temperature: 450º F.

3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or conforming to ASTM C 1136 Type II, IV. Provide ASJ jacket for ductwork to be painted.

4. Concealed Areas: Minimum 3 lb./ft.^{3}.

5. Exposed Areas: 6 lb./ft.^{3} minimum density for duct less than 8 ft. - 0 in. above finished floor or where indicated in these specifications or on the drawings.

D. Rigid Polyisocyanurate Insulation:

1. Cellular foam complying with ASTM C591, rigid molded, non-combustible. 2 lb./ft^3 nominal density. Maximum thermal conductivity (k) shall be 0.19 BTU-in/ft^2 hr. °F at 75°F mean temperature. Maximum Service Temperature; 300°F.

E. Duct Insulation Tapes:

1. ASJ (All Service Jacket) Tape: White vapor retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

a. Width: 4 inches.

b. Thickness Total: 0.19mm

c. Adhesion: Exceeds strength of tape back.

d. Elongation: 2 percent.

e. Tensile Strength: 40 lbf/inch in width.

f. Make: 3M Venture Tape 1540CW, Owens Corning ASJ Max or approved equal

2. FSK (Foil. Scrim and Kraft Laminate) Tape: Foil face, vapor retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

a. Width: 4 inches.

b. Thickness Total: 5.5 mil.

c. Adhesion: 66 ounces force/inch in width.

d. Elongation: 2 percent.

e. Ambient Limits: -40 to 240 deg F

f. Tensile Strength: 39 lbf/inch in width.

g. Make: Owens Corning Thermafiber. 3M Venture Tape 1525CW, or approved equal.

2.7 EQUIPMENT INSULATION

A. Segmented board, sheets, blocks, size, shape, and material as called for.

B. Rigid Fiber Glass Board

1. Insulation Board meeting ASTM C 1393, Type I, II, IIIA, III B and Category 2, ASTM C 795 ASTM and C 1138.

2. 'K' Value of 0.27 at 75°F mean temperature. Maximum Service Temperature: 650º F.

3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, II, III, IV or FSK conforming to ASTM C 1136 Type II. Provide ASJ jacket for ductwork to be painted.

4. Concealed Areas: Minimum 3 lb./ft.^{3}.

5. Exposed Areas: 6 lb./ft.^{3} minimum density for equipment less than 8 ft. - 0 in. above finished floor or where indicated in these specifications or on the drawings.

C. Flexible Elastimeric Foam:

1. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC's, HFC's, HCFC's, formaldehyde, fibers and dust, with low VOC's. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft²•hr.• F/in. at 75ºF mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2" material thickness.

2. Pipe Insulation: ASTM C534, Type I.

3. Sheet Insulation for equipment: ASTM C534, Type II, smooth skin one side.

2.8 PIPE, DUCT AND EQUIPMENT JACKETING

A. Metal Jacketing Material:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14. Sheet and roll stock ready for shop or field sizing. Stucco Embossed: 0.020 inch thickness.

a. Moisture Barrier for Indoor Applications: Minimum 1mil thick, heat bonded polyethylene and kraft paper.

b. Moisture Barrier for Outdoor Applications:Minimum 2.5 mil thick polysurlyn.

2. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.

b. Preformed 2 piece or gore, 45 and 90 degree, short and long radius elbows covers.

c. Flange and union covers.

d. Tee end caps.

e. Beveled collars.

f. Valve covers.

g. Field-fabricate fitting covers only if factory-fabricated fitting covers are not available. Valve covers.

3. Banding: Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316 equal to the jacketing material, ½ and ¾ inch wide with wing seal. Banding. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14, 0.020 inch thick, ½ and ¾ inch wide with wing seal.

B. PVC 30 mil Jacket: High impact resistant, UV resistant PVC complying with ASTM D 1784, Class 16354-C. Roll stock ready for shop or field cutting and forming.

1. Color: White

C. Self-Adhesive, Laminated Rubberized Jacket:

1. Multi-ply laminated rubberized bitumen compound system. UV-resistant aluminum foil/polymer or polyester/foil system with acrylic adhesive.

2. 55-60 mil thickness with a low-pressure sensitive adhering system.

3. Stucco-embossed aluminum finish.

2.9 THERMAL BLANKET

A. Thermal Barrier with a maximum service temperature of 450°F.

B. Outer and Inner Jacket, 17 oz./sq. yd. Silicone impregnated Fiberglass cloth.

C. Insulation Material, 11 PCF Fiberglass Needled Mat-Type "E" Fiber.

D. Mat encapsulated by the silicone impregnated Fiberglass cloth and sewn together, producing a self-contained blanket system.

E. Blanket system fasteners for easy install and removal.

F. The insulation cover shall be 2 in. thickness with a K factor of 0.26 at 100°F.

G. Blanket construction shall be double sewn lock stitch with a minimum 7 stitches per inch. All raw jacket edges shall have a tri-fold Silicone Cloth binding. No raw cut jacket edge shall be exposed. Stitching shall be done with PTFE coated fiberglass thread or PTFE Teflon coated Nomex thread.

H. The blanket shall extend beyond mating flanges unto existing insulation for a minimum of 2 in. Where blanket cannot fit over existing oversized insulation, blanket shall butt up to existing insulation with a friction fit closing seam. All sections of pipes shall be insulated, and open gaps are not acceptable. Blanket diameters which are 2 in. or larger than existing insulation must be end capped to eliminate open air void.

I. The blankets shall have a low point stainless steel drain grommet or incorporate a mating seam at the lowest point of the blanket.

J. For large equipment where a multi-piece construction is necessary, the total number of pieces shall be minimized. Any one piece shall not exceed 40 lbs. in weight.

K. Provide an aluminum or 304 type stainless steel nameplate tag riveted to each blanket piece. 1/8 in. embossed lettering shall identify the equipment it is serving, size and pressure rating of the system. Each blanket requires an I.D. Plate.

L. 14-gauge type 304 stainless steel quilting pins shall be placed at random locations no greater than 18 in. apart to prevent shifting of the insulation, 14 gauge type 304 Stainless Steel speed washers shall secure the quilting pin stem in place.

M. Equipment and equipment heads shall be a multi-piece design installed in tag number sequence. Heat exchanger heads, large vessel flanges and pump housings will be designed in two half sections. Blanket design shall conform to the equipment with minimized air void. All valve covers shall be a two-piece design with a separate body and bonnet.

N. A 21-gauge type 304 stainless steel wire shall be doubled up and twisted in a spiral fashion, with a minimum of 4 to 5 twists per inch. Wire twist length shall be 16 in. or longer. The wire twist shall be secured to the lacing pin at the pin stem. Lacing pin stems shall be 14-gauge type 304 stainless steel. Pins shall be held in place with 1 in. diameter type 304 stainless steel speed washers. Wire twists shall be spaced 6 in. on center along closing seams with matching lacing pins to lace and secure to.

O. Alternate fastening systems such as Metal "D" ring strap with Velcro tab, or side release buckles may be utilized.

2.10 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass Fiber Fabric: Approximately 6 oz. /sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts and equipment. Childers CHIL-GLAS #5 or equal.

2.11 COATINGS, MASTICS, ADHESIVES AND SEALANTS

A. Vapor Barrier Coatings: Used in conjunction with reinforcing mesh to coat insulation on below ambient services temperatures. Permeance shall be no greater than 0.08 perms at 37 mils dry as tested by ASTM D5590 meeting zero growth rate for mold. Foster 30-80 or approved equal, or approved equal.

B. Lagging Adhesives: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 AF meeting ASTM D 5590 with zero mold growth rating, or approved equal.

C. Weather Barrier Mastic: Used outdoors to protect above ambient insulation from weather. Foster 46-50 Weatherite; Childers CP-10 Vi Cryl, or approved equal.

D. Fiberglass Adhesive: Used bond low density fibrous insulation to metal surfaces. Shall meet ASTM C916 Type II. Foster 85-60; Childers CP-127, or approved equal.

E. Elastomeric Insulation Adhesive: Used to bond elastomeric insulation. Foster 85-75; Childers CP-82, or approved equal.

F. Elastomeric Insulation Coating: Water based coating used to protect outside of elastomeric insulation. Foster 30-65, Armacell WB Coating or approved equal.

G. Insulation Joint Sealant: Vapor sealant for below ambient piping with polyisocyanurate and cellular glass insulation. Foster 95-50; Childers CP-76, or approved equal.

H. Metal Jacketing Sealant: Used as a sealant on metal jacketing seams to prevent water entry. Foster 95-44; Childers CP-76, or approved equal.

3.0 PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide Thermal Insulation:

1. Insulation is required on ductwork, piping and equipment in compliance with these specifications and referenced codes and standards.

2. Continuous through openings, sleeves and hangers.

3. Install only on clean, dry surfaces and after ductwork has been tested.

4. On cold surfaces provide continuous unbroken vapor seal. Exceptions - Do not cover inspection stampings, nameplate data, openings, petcocks, hand-holes, manholes, access doors, plugged outlets, air vents, plugged openings or petcocks. Provide continuity of insulation system and vapor barrier though partitions, floors, casings, plenums, etc.

5. Piping insulation exposed to the weather shall be protected from damage, including that due to sunlight, moister, equipment maintenance and wind, and shall be provided with a jacketing material as specified in these specifications.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed, with the following exceptions:

1. Factory-installed piping within the HVAC equipment tested and rated in accordance with the 2020 ECCCNYS

2. Factory installed piping within room fan coil Units and unit ventilators tested and rated according to AHRI 440 and AHRI 840, respectively.

3. Piping that conveys fluids that have a design operating temperature range between 60 and 105 degrees.

4. Piping that conveys fluids that have not been heated or cooled through use of fossil fuels or electric power, the surface temperature of which does not risk condensation or occupant / service hazard (between 60°F and 105°F).

5. Strainers, control valves and balance valves associated with piping 1 inch or less in diameter and conveying fluids over 60 degrees.

B. Piping in exterior walls, spaces, overhangs, attics, or where subject to freezing, double the thickness of the insulation. Piping in wall chases adjacent to an exterior wall shall be packed with type glass fiber batting type insulation.

C. Hanger Shields: Refer to Section "Piping Systems and Accessories."

1. Pre-insulated type: Butt insulation to hanger shields and apply a wet coat of vapor barrier cement to the joints and seal with 3 in. wide vapor barrier tape.

D. Joints in sections of pipe insulation shall be made as follows:

1. Standard: Longitudinal laps and butt joint shall be fully sealed. Factory applied pressure sensitive adhesive lap seal is acceptable.

2. Vapor barrier: For cold services, all service jacket (ASJ) longitudinal laps and 4 in. vapor barrier strip at butt joints shall be sealed with vapor barrier coating. Seal ends of pipe insulation at valves, flanges, and fittings with vapor barrier coating and reinforcing mesh.

E. Fittings, Valves and Flanges:

1. Hot services: Pre-molded fitting insulation of the same material and insulation value as the adjacent pipe insulation.

2. Hot water shall be coated with weather barrier mastic and reinforcing mesh.

3. Provide PVC fitting covers on all fittings.

F. Flexible Elastomeric Foam Pipe Insulation:

1. Split longitudinal joint and seal with contact adhesive. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.

2. Fittings made from miter-cut pieces properly sealed with adhesive, or ells may be continuous. Use templates provided by the manufacturer and assemble the cut section in accordance with the manufacturer’s printed instructions.

3. Where exposed outdoors, apply water-based UV resistant coating and/or reinforcing membrane as recommended by manufacturer. Follow manufacturer’s installation instructions.

3.3 JACKETING ON PIPING

A. Secure jacketing to insulated piping with preformed aluminum band straps or stainless-steel band straps.

B. Jacket exposed insulated fittings, valves and flanges with mitered sections of aluminum or stainless-steel jacketing or factory fabricated, preformed, sectional aluminum or stainless-steel fitting covers shall be fully sealed water tight

C. Provide PVC, aluminum jacket and fitting covers on exposed insulated piping installed in finished rooms including Mechanical Equipment Rooms, Penthouses, and Machine Rooms within eight feet of the finished floor.

D. Lap all joints a minimum of 2 inches.

E. Secure jacketing in place with a continuous longitudinal friction type joint to provide a positive weatherproof seal. Circumferential joints shall be weatherproof sealed with 2 inch x 0.016 inch thick aluminum straps lined with metal jacketing sealant.

F. Install jacketing to avoid trapping condensation and precipitation.

3.4 DUCTWORK INSULATION

A. External thermal insulation for duct. Not required where ducts have internal acoustical insulation, are located inside the conditioned space and lining meets the insulation value of these specifications and the 2020 ECCCNYS. Make special provisions at dampers, damper motors, thermometers, instruments, and access doors. Apply as Follows:

1. Rigid board type: Impale board over mechanical fasteners, welded pins or adhered clips, 12 in. to 18 in. centers; minimum of two rows per side. Secure insulation with washers on clips. Seal breaks and joints in vapor barrier with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating. Apply tape over corner beading where exposed. Flexible blanket type: Joints and seams made with 2 in. lap of vapor barrier. Round ducts: Apply Foster 85-20 adhesive to ducts in 6 in. brush widths at 1 ft. intervals and at each facing edge. Square ducts: Over 18” duct face width, fasten by impaling insulation on adhered or welded clips. Secure insulation with washers on clips. Seal joints and breaks with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating. Cooling ducts shall be covered with a vapor retarder having a maximum permeance of 0.05perm or an aluminum foil jacket with a minimum thickness of 2 mils. All joints and seams shall be sealed to maintain the continuity of the vapor retarder.

2. Flexible blanket type: Joints and seams made with 2 in. lap of vapor barrier. Round ducts: Apply Foster 85-20 adhesive to ducts in 6 in. brush widths at 1 ft. intervals and at each facing edge. Square ducts: Over 18” duct face width, fasten by impaling insulation on adhered or welded clips. Secure insulation with washers on clips. Seal joints and breaks with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating.

3. Insulate the tube bends and all exposed surfaces of duct coils operating in excess of 10 degrees differential from ambient conditions.

4. Ductwork installed outdoors, exposed to weather.

a. All duct insulation on ductwork installed outdoors shall be adhered 100 percent using Approved Contact Adhesive.

b. Apply self-adhesive, laminated rubberized jacket per manufacturer's requirements. Apply to each side, starting with the bottom surface, then the sides, and finally the top. Provide minimum 3" overlap of material at each joint.

c. Application:

1) Flat ducts in a horizontal plane must be sloped to shed water. There must be no areas of ponding water.

2) Install system over only clean, dry insulation base. Any insulation which becomes damp or damaged shall be removed and replaced prior to installation.

B. Service and access openings shall not be concealed by duct coverings unless the exact location of the opening is properly identified.

C. Continuous vapor barriers shall be provided on all ductwork subject to condensation. No gaps or methods for air to permeate the insulation materials below the vapor barrier shall be permitted.

3.5 EQUIPMENT INSULATION

A. Equipment insulation surfaces shall be a hard, smooth, uniform finish. Install Work ready for painting.

3.6 RECOVERING

A. Field apply glass cloth and applied over standard insulation jacket with lagging adhesive. Properly cut at fittings to avoid wrinkles and coat with lagging adhesive. Leave ready for painting.

3.7 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

B. Report any deficiencies in existing insulation systems to the Owner's Representative for further action.

3.8 EXISTING WORK

A. Insulate existing piping, ductwork and equipment where called for.

EXHIBIT "I" - PIPE INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
Hot water (200°F and lower)	Glass fiber	1-1/2 in. and Larger: 2 in. 1-1/4 in. and Smaller: 1-1/2 in.	
Chilled water	Glass fiber	1-1/2 in. and Larger: 1 in. 1-1/4 in. and Smaller: 1/2 in.	
Refrigeration Piping (Suction and liquid lines)	Elastomeric Foam	1 in. and Larger: 1 in. 3/4 in. and Smaller: 1/2 in.	
Outdoor Refrigeration Piping (Suction and liquid lines)	Elastomeric Foam	1 in. and Larger: 1 in. 3/4 in. and Smaller: 1/2 in.	Insulation shall be provided with Aluminum Jacket
Domestic cold water	Glass fiber,	4 in. and Larger: 1 in. 3 in. and Smaller: 1/2 in.	
Outdoor Piping	Elastomeric Foam	Insulate pipe with double the thickness called for above	Cover with Self-Adhesive, Laminated Rubberized Jacket Aluminum Jacket
Piping in exterior walls, spaces, overhangs, attics, exterior, or where subject to freezing.		Insulate pipe with double the thickness called for above	

EXHIBIT "II" - DUCT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
HVAC Supply Note – use duct liner only where specified or called for on drawings to R values to right. Where 1" is called for as acoustic measure, provide external insulation to balance of specified R value.	Exposed: Rigid fiberglass Concealed: Flexible fiberglass	1-1/2 in. 2 in.	Min. installed R value of 6 Min. installed R value of 6
Supply or Return ducts in cold attic spaces or other un-conditioned spaces	Flexible fiberglass	5 in	Min. installed R value of 12
Exhaust ducts in cold attic spaces or other un-heated spaces	Flexible fiberglass	3 in	Min. installed R value of 8

Supply ducts, exposed within the conditioned space served where space and supply air are within 15 degrees of ambient.		NOT INSULATED	Does not include the associated supply ductwork within the Mechanical Room or supply duct to the conditioned space.
Interior ductwork indicated to be lined		NOT INSULATED	
Return-air ducts within heated building envelope		NOT INSULATED	
Air conditioning supply (insulated double wall)		1-1/2 in.	Total insulation value provided to meet R value of 8 where ductwork air stream is more than 15 degrees from ambient.
Outside air ducts and plenums, connections and mixing boxes	Rigid fiberglass	2 in.	Min. installed R value of 8 Provide neat fit at intake plenum
Exhaust, relief or vent ducts and plenums	Exposed: Rigid fiberglass Concealed: Flexible fiberglass	1-1/2 in. 2 in.	Min. installed R value of 8 Insulate 15 ft. from exterior opening and plenums
Outdoor Ductwork	Polyisocyanurate board	2 - 2-1/2 in. layers	Supply, return duct and energy recovery exhaust ducts min, installed R value of 12. Cover with Self-Adhesive, Laminated Rubberized Jacket
Duct mounted reheat coils	Rigid fiberglass	2 in.	Min. installed R value of 6 Exterior surface shall be paintable.

EXHIBIT "III" - EQUIPMENT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
Plate and frame heat exchangers and brazed plate heat exchangers	Thermal blanket	2 in.	Thermal blanket shall be full removable and custom fitted for heat exchanger size.
Air removal assemblies, air and dirt removal assemblies, side stream filter system and filter assemblies		SAME AS WATER PIPING	

Heating system expansion tanks and chemical feed tanks		NOT INSULATED	
Cooling system expansion tanks, chilled water buffer tanks and chemical feed tanks		SAME AS WATER PIPING	
Chilled water pumps and cold heat exchangers	Flexible sheets of Elastomeric foam	1 in.	Arrange for easy removal. Coat with white finish.
Chilled water pumps and cold heat exchangers	Polyisocyanurate	1 in.	Construct a "box-style" to cover with removable access sections where required. Seal all joints with manufacturer's recommended vapor barrier.

END OF SECTION 230700

SECTION 230923 – TEMPERATURE CONTROL SYSTEMS

1.0 PART 1 - GENERAL

1.1 FUNCTIONAL INTENT

A. Accessibility: As much as practical, design the system to keep the BACS equipment out of, and above user areas. The maintenance staff must have quick and ready access with sufficient room for operation and maintenance.

B. Reliability: Controls are integral to maintaining reliable conditions throughout the building and as such need to be designed and installed with an appropriate degree of robustness and reliability.

C. Digital Terminal Unit Control - This intent of this standard is to require digital electronic control down to the terminal level. Terminal level controls will typically be cost-effective controllers designed for the specific application. Stand-alone local controls may only be used when specifically approved by the Engineer.

D. Expandability - When configuring the BACS equipment, provision must be made for expansion that may be required in the future. Hardware and software required to implement expansion must be provided via system sizing, configuration, and appropriate license agreements

E. When a portion of an existing building is to be renovated, the new control system shall match or integrate seamlessly with the existing control system.

F. Unless stated to the contrary, all hardware points (AI, AO, BI and BO) shall be hardwired to controllers. Data points / BACNet Objects are only to be accessed through equipment integration where specifically called for.

1.2 RELATED SECTIONS

A. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 230593 – Testing and Balancing

2. Section 019113 – Commissioning Requirements

3. Section 230514 – Electric Wiring

4. Section 262923 – Adjustable Speed Drives

1.3 DEFINITIONS

Binary Input (BI)	An on/off indication that has a maximum cycle rate of 1 Hz. This is typically sensing a contact closure
Binary Output (BO)	A contact closure on the controller that will cause inaction in the system
Binary Value (BV)	A network-visible binary point whose value is determined by a controller computation
Analog Input (AI)	A continuously varying voltage or amperage signal that is varied by a sensor in relation to a sensed variable. This signal is processed in the controller after an analog-to-digital converter on the controller that converts the analog signal to a digital value
Analog Output (AO)	A continuously varying voltage or amperage signal that is generated from the controller after digital-to-analog conversion. The voltage or amperage signal will be used, for instance, to drive a modulating actuator or reset a hardwired set point on a packaged device. 6. Analog Value (AV): A network-visible analog point whose value is determined by a controller computation
Analog Variable / Value (AV)	A network-visible analog point such as a setpoint or calculation result whose value is determined by a controller computation or user input
Building Management System (BMS)	Integrated DDC Temperature control system used both for system operation and troubleshooting meeting the requirements of this specification.

1.4 WORK INCLUDED

A. Provide labor, materials, equipment, services and warranty for a complete installation, startup and commissioning of motor control wiring and temperature control wiring as required in Contract Documents.

B. Provide wiring and conduit required to connect devices furnished as a part of, or integral to the automatic temperature control system, and for motor control and interlocks regardless of the source of supply.

1. Control wiring includes, as required, 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 24VAC in general, and no more than120 VAC where required.

2. Provide wiring in accordance with the requirements specified in Division 26, "Electrical", Section 230514 and the National Electrical Code.

3. Provide all devices required for proper system operation including electrical switches, transformers, disconnect switches, relays, device controllers and control modules, hubs, routers, temporary servers, actuators, transducers, sensors, safety devices, power supplies, mode selecting switches, enclosures, and circuit breakers.

4. Provide complete wiring and terminations. Provide all assembly, programming and test of all items as necessary to create a coherent system, encompassing all combined intents of design, drawings, specifications, addenda, and professional quality of work.

5. Assembly of all damper linkages and shafts, including extension through duct walls where applicable and mounting of actuators shall be by the Temperature Controls Contractor.

6. Mounting of all actuators and sensing devices shall be by the Temperature Controls Contractor.

C. The temperature controls contractor shall be responsible for extending 120vac power from designated power panels / circuit breakers to all temperature control panels.

D. Contractor shall provide calibration testing and required adjustment to CO2 space and ductwork sensors one year after system is commissioned. Refer to paragraph 2.2 of this section, Table 1 for CO2 sensor accuracy and "Common Elements" of the contract documents. If sensor is not within tolerance, device shall be replaced at contractors' expense.

E. Provide support requirements for Commissioning as described in Section 019113. The DDC temperature control system is a primary tool for HVAC Commissioning.

F. Coordinate all work with factory provided equipment controllers.

G. Coordination: Work with the Engineer, Commissioning Agent, air-balancing contractor, ventilation contractor, piping contractor and electrical contractor to provide proper and obstruction free component location, and system commissioning.

1.5 WORK NOT INCLUDED

A. Power wiring for motors, motor starters, adjustable speed drives, as well as the motors, motor starters, and adjustable speed drives (except in the case of equipment specified to have packaged controls/starters) are included in Division 26, "Electrical," unless otherwise called for.

B. Electrical wiring, interlocks or components specifically called out in the electrical specifications or drawings shall be included in the Division 26 scope of work.

1.6 ACCEPTABLE MANUFACTURERS

A. Maine-Endwell Central School District's existing Building Management System is Automated Logic, provided by Air Temp Heating & Air Conditioning, Inc. This project is designed around an extension of this system.

B. All control systems provided shall seamlessly integrate with the existing system without the use of integrator panels, routers, or any other hardware or software. The control system manufacturer shall guarantee that all new controls operate with the existing Automated Logic Controls System.

C. All temperature control equipment for this project shall be purchased by the school district (Maine-Endwell CSD) via state contract with the district's temperature controls contractor, Air Temp Heating & Air Conditioning, Inc. and turned over to the Mechanical (HVAC) contractor for installation. The Mechanical contractor shall be responsible to provide the services to develop the direct digital temperature controls such that the project has a complete and workable direct digital temperature controls system compliant with the requirements of Section 230923.

D. Basis of Design: Automated Logic

1.7 WORK INCIDENTAL TO TEMPERATURE CONTROL CONTRACTOR

A. The temperature control contractor shall furnish the following materials, for installation by the contractor responsible for HVAC piping and sheet metal (Sections 232000 and 233000) scope of work.

B. For piping work - Section 232000 Contractor shall install:

1. Control valves in piping.

2. Immersion sensing wells in piping systems.

3. Valved pressure taps (typically for pressure switches or sensors)

C. For sheet metal work - Section 233000 Contractor shall install:

1. Automatic Control Dampers:

a. Control dampers, at the direction of the Temperature Controls Contractor.

2. The Mechanical Contractor shall provide access doors or other means of access through ducts or ceilings and walls for service and adjustment of controllers, valves, and dampers.

D. Control system manufacturer or their authorized representative shall furnish written details, instructions and supervision for the above trades to ensure proper installation, size, and location of any equipment furnished for installation by others.

1.8 QUALITY ASSURANCE

A. Acceptable Products: All products shall be proven to be functional and suitable in accordance with this specification for a period of warranty commencing on the day of transfer of completed project to the Owner. Demonstration of such warranty may be required prior to the submittal approval.

B. Contractor Qualifications: The Temperature Controls Contractor shall be factory-authorized by the respective manufacturer to provide pertinent installation and service.

C. Any subcontractors in employ of the Temperature Controls Contractor on this project must receive prior approval to be permitted work on this project.

D. Field Representation: The Temperature Controls Contractor shall staff the project with a field representative that has been factory-trained in the installation, programming and commissioning of the equipment specified. This representative must be in the direct employ of the Temperature Controls Contractor.

E. Coordination of Work During Construction – this contractor shall:

1. Protect work installed by other trades

2. Coordinate its work with other trades

3. Repair any damage caused by his work

4. Promptly correct all work that Engineer finds as defective or failing to conform to Contract Documents

5. Bear all cost of correcting of work found defective as described above.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. Product Data: Submit for approval the manufacturer's technical product data for each component furnished as part of the control system. Data shall include dimensions, capacities, performance characteristics, electrical requirements, and material finishes. Data shall also include installation and start-up requirements.

B. Shop Drawings: Submit for approval control drawings detailing the following:

1. Network Block Diagrams and System Riser Diagrams: These diagrams shall depict all DDC components that make up the network. They shall provide specific detail on network terminations, and panel power requirements, including breaker allocation. Each DDC panel within the diagram shall list the equipment that it is controlling.

2. Point-to-point Termination Detail: These drawings shall be created for each unique control application type. Drawings that are typical for similar application shall state the application and quantity of that they represent, and the specifics for each. All wiring and piping required to install and operate the system shall be represented in these details. For terminations that are unknown at the time of submittal, or introduced over the course of project, properly designate these as “Field determined terminations,” and include in the As-built Drawings after completion. All wiring and piping shall be number coded on the drawings. These tag numbers shall be used during the installation, and shall appear at both ends of all conductors, including within any junction boxes.

3. Provide individual details for each control type, as described in the Sequence of Operation.

4. Provide spreadsheets of schedules for dampers, valves, wiring, fans and other miscellaneous components if they are part of this control contract showing sizes, characteristics, model numbers and specific locations.

5. For prefabricated control panels, provide panel's interior and exterior layout details. These details shall depict the equipment layout and shall detail the panel wiring and piping.

C. Product Data: The BACS vendor shall submit manufacturer's technical product data for each control device, panel, controller, and accessory furnished indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also, include installation, start-up, calibration, and maintenance instructions as well as all cable and tubing requirements.

D. Database Information: The submittal package shall contain detailed information on the point naming convention that is to be used.

E. Provide documentation for all sequences of operation that cannot be performed by stand-alone controllers and require non-controller-resident programs, or programs requiring retransmission to be effective on the controller's output. Wherever possible, sequences of operation and associated inputs and outputs shall be contained on a single controller.

F. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface. All controllers and operator interface shall fully conform to ANSI/ASHRAE 135: Data Communication Protocol for Building Automation and Control Systems (BACNET).

1.10 OPERATION AND MAINTENANCE MANUALS FOR COMPLETE PROJECT

A. Upon completion of installation and prior to the training, provide manuals containing the following information:

1. Installation and Service Manuals for all products and components

2. Calibration and Troubleshooting Procedures for all installed equipment and components.

3. List of location of all enclosures, controllers, sensors, transformers and other components as specified above

4. As-built Control Drawings with all modifications, changes and wiring details that depict actual installation. These shall include all final controller and device names, locations for concealed components (pressure sensors, etc.),wire tags, etc.

5. Sequence of operation – Describing in detail the operation of every piece of equipment subject to control by the DDC system. Each section of the sequence should contain the following:

a. Overview – describes what the intent is, what components are involved and provides a concise description of the piece of equipment to be described.

b. Occupied Mode – Describes the operation of this system during occupied periods.

c. Unoccupied Mode – Describes the operation of this system during unoccupied periods.

d. Alarm Mode - Describes operation of the system in the event of alarm condition and steps to restore system to normal operation. List all anticipated alarm conditions.

e. Each Component's individual Sequence - Describes the detailed operation of each component and how it interacts with the entire system.

6. Listing of the entire DDC controllers with database, software and programs and program locations.

7. Provide spreadsheets of schedules for enclosures, control modules, dampers, valves, wiring, fans, well, tap and other miscellaneous components if they are part of this control contract showing sizes, characteristics, model numbers and specific locations.

B. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.

C. Backup database information in electronic format (other than resident on computer hard drive) to be left on-site that will allow the Owner to fully download the entire DDC System software, including programming point database, configuration, graphic screens and all library of typically composed objects, and details supporting navigation, screens and graphics.

D. Within five working days from the time of the final system commissioning, one (1) hard copy and one (1) electronic copy in PDF format of Operation and Maintenance Manuals shall be turned directly to the Engineer.

E. A Programmers Manual shall be provided with graphic and text descriptions of all functions required for software modifications and developments. The use and installation of high-level programming language shall be included in this manual. The manual shall include ASCII text (or block diagram printouts for graphical programming language based systems) of all DDC programs with the spreadsheet inventorying the name and location of each program. Each file shall be accompanied by a "plain English" description of the program operation by subroutine to assure that future programmers can easily modify the existing database. The manual shall contain computerized printouts of all data file construction including all point information, physical terminal relationships, scales and offsets, alarm limits, messages, schedules, etc. The manual should also contain:

1. System overview

2. Networking concepts

3. Launching browsers from log in

4. Schedule manipulation

5. Software upload and download instruction, including field devices

6. Trend and alarm creation and maintenance

7. Report generation

8. Backup procedure for entire system and modular controllers

9. Sequence of Operation

F. Section for each Major Piece of equipment – Contains the cutsheets for the controllers, custom programs, and relevant information pertaining to that piece of equipment. (IE: schedules for AHUs showing Equipment Tag, Controller address, serial #, airflow, and pertinent engineering units like MBH, GPM, etc…).

G. Wiring Details – Contains 8-1/2" x 11" drawings of all the wiring details shown throughout the set of drawings.

H. Instrumentation Cut sheets – Contains the Manufacturer's original cut sheets for all the instrumentation used on the job. (IE: Well sensor, transformers, enclosures, pressure sensors, etc.).

I. AutoCAD Drawings – All drawings shall be provided in Auto CAD format (i.e. each file format should have the ".dwg" extension), made as set of both, a set 11"x17" black and white and a set of 24"x36" (1 color set and 3 black and white sets). Drawing Sets consists of the following:

1. System Description Drawing – Shows the overview of the job and what is being controlled.

2. Network Riser Drawings – Shows how the network is connected between all the devices on the job

3. Detail drawing(s) – Shows all the wiring and piping details for the entire job – all other drawings refer to these drawings.

4. Individual Control panel drawings & Schematics (1 or 2 drawings per piece of equipment) Shows the EXACT wiring and layout of each control panel. Also shows the schematic representation of the system that is being controlled. (IE: AHU, HW Plant, Fan Coil, Etc.)

5. Controls Floor plans (at least 1 for each floor) – Shows the approximate location of the control panels, thermostats, equipment, network wiring, thermostat wiring and any specific controls required for the job. All this information is overlaid on top of the mechanical floor plan showing the architectural layout (Wall and room #'s).

J. All above shall be copied to a CD (or another approved electronic format) and released to the Owner.

1.11 SYSTEM PRE-COMMISSIONING

A. In addition to responsibilities described within section 019113, and prior to formal project commissioning contractor shall complete the following Pre-Commissioning requirements to assure operational readiness of equipment prior to conducting commissioning.

B. Equipment Start-up: Upon completion of installation, all equipment being controlled shall be initially started and tested on site using a workstation configured identically to that to be presented for permanent use by the Owner, including graphical user interface. Upon completion of all system pre-commissioning (and 019113 commissioning) the entire contents of the workstation, including all changes and corrections performed during these phases, shall be re-loaded to the permanent operator workstation.

C. System Pre-Commissioning shall document the following:

1. Measure, calibrate and adjust all analog inputs. This is to be performed in a manner that verifies that sensors meet the accuracy requirements as specified for the device. All measurements shall be taken using an instrument certified for accuracy within a 12 month period.

   a. Where multiple sensors are “in line” within an air handling system – such as VAV leaving air temperature sensors vs an AHU leaving air temperature, or return / mixed / coil discharge sensors (with economizer correctly positioned) within an air handler, only one of the sensors need be directly measured, and the balance may be validated against the reference sensor.

   b. Where multiple sensors are “in line” within a piping system, the system may be manipulated such that only one sensor need be directly measured, and the balance may be validated against the reference sensor.

2. Stroke all analog outputs from 0% to 100%

   a. Visually verify that all linkage adjustments are set properly.

   b. Verify and record range of operation for ASD commands

   c. Verify and calibrate ASD feedback signals to correspond with command signal and actual operating speed in either RPM or HZ.

3. Valves and Dampers shall fully close and provide tight shut-off.

   a. Hydronic coils – verify that no temperature rise / drop occurs with the valve commanded fully closed

   b. Economizers – Verify return air temperature =mixed air temperature at 100% return air position, mixed air temperature = outdoor air temperature at 100% outdoor air position

4. Verify that all binary outputs are properly energizing the controlled device.

5. Verify that all binary inputs are properly calibrated to accurately reflect status of monitored equipment

6. Adjust setpoints so that equipment operates properly. Tune all PID control loops to avoid unnecessary cycling of control equipment, overheating, sub-cooling, tripping of freezestats or other limit switches and safeties. Create trends for review by the Engineer and Commissioning Agent.

7. Provide control and operational assistance to the balancing personnel during testing and balancing procedures.

D. Communication Network Start-up: Verify from a host computer that all configured controllers are engaged in proper communication passing all configured points to viewing stations. Verify communication speed and level of transactions until it is acceptable and meets the requirements of this specification.

E. Software Verification: All programs and software functions shall be verified to be in compliance with the contract documents for proper sequence of operation.

F. Pre-Commissioning Report: A report shall be provided to the Engineer detailing the dates, times and person(s) performing each phase of the specified system pre-commissioning. This report shall detail when and who performed the individual processes described in this section, and documents the results of all testing procedures. Coordinate phasing of work such that this can be completed PRIOR to formal system commissioning.

G. Project commissioning is considered complete only once the following are completed:

1. All points connected to the BMS shall operate in full compliance with this specification before project substantial completion is acknowledged.

2. The project formal commissioning as outlined under section 019113 is performed, including completion of all remedial work to correct Issues log items,

3. A physical walk-though of the project, conducted by the Engineer or Commissioning Agent and attended by the Temperature Controls Contractor and Owner or their authorized representative is concluded

4. The complete set of required closeout documentation is provided by the contractors. The Owner has no right to refuse or delay a reasonably scheduled walk through. The Owner and Engineer shall determine the level of detail required for the walk-through, and may take this to a component level inspection, at their discretion.

1.12 TRAINING

A. Provide BMS training for up to four (4) Owner selected personnel.

B. After Section 019113 Commissioning is complete as specified, the Temperature Controls Contractor shall provide an on-site session detailing the layout of the BMS. This shall include network wiring routes, control panel locations, transformer locations, etc.

C. The Temperature Controls Contractor shall then provide an on-site session to review the entire Operations and Maintenance manual(s) with the Owner. This session shall also include but not be limited to:

1. Fundamental operation of the system

2. Training on setpoint adjustment and scheduling modifications

3. Operation and sequencing of control loops for all mechanical equipment being controlled

D. Provide telephone support and answer system relevant questions throughout the warranty period.

1.13 WARRANTY

A. Warranty for the entire control system shall commence upon completion and acceptance by the Engineer of the system commissioning as specified. The warranty includes fine-tuning of all dynamic elements of control system to achieve reasonable, efficient end equipment protective mode of operation.

B. Provide a one-year warranty on all DDC controllers.

C. Provide a one-year warranty on all other components.

D. Disclose to Owner and accommodate longer warranty periods if provided by components manufactured at the time of purchasing.

E. The Contractor shall provide all OEM recommended preventative maintenance of the installed work as described in the operating and maintenance manuals during the warranty period. In addition, the Contractor shall provide two (2) semi-annual service visits (i.e., one visit during the peak cooling season and one visit during the peak heating season) to test and evaluate the performance of the installed work. The Contractor shall provide a written report of the test and evaluation results. The service visits shall include, but not be limited to:

1. Checking and, if necessary, correcting the calibration of the sensors, transducers, and transmitters for airflow, liquid flow, pressure, and temperature.

2. Checking and, if necessary, correcting the operation of the dampers and damper actuators.

3. Checking and, if necessary, correcting the operation (i.e., monitoring and command) of the system points, graphics, and display functions.

F. Software and Hardware Updates: At the end of the first six months after acceptance, and during the subsequent six-month period, the BACS contractor shall update the equipment and any controllers, servers, workstations and HMI web servers with the latest modification and improvements in software, firmware, and hardware that the manufacturer may have incorporated in the furnished equipment.

G. Contractor shall, during the ensuing four seasons (one year), conduct periodic inspections and fine-tune all dynamic elements of the system with all costs of testing to be included in this scope of work.

2.0 PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General Requirements

1. A distributed logic control system, complete with Direct Digital Control (DDC) software shall be provided. This system is to control all mechanical equipment, as described on the project drawings and these specifications.

2. All BMS controllers, including (but not limited to) those for terminal units, air handlers, central mechanical equipment and systems shall be as manufactured by a single manufacturer, the hardware from which has been represented by this contractor for no less than a 10 year period.

3. All controllers for terminal units, air handlers, central mechanical equipment and the Microsoft Windows-based operator's terminal(s) shall communicate and share data.

4. All controllers shall be fully programmable.

5. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

6. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall also be able to send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device.

7. All control points associated with a single piece of equipment (air handler, VAV air terminal, heat exchanger, pump control, etc.,) shall be wired to the local controller. Network sharing of data via the network, for example, remote monitoring of a temperature sensor to control a valve or other devices, shall not be permitted without advance permission from the Engineer.

8. The Temperature Controls Contractor shall assume complete responsibility for the entire controls system as a single source, providing installation, program debugging and service of all portions of logic control system. This shall include designated server, operator’s terminal, global controllers, routers, terminal unit controllers, sensors and all other sections of the system.

9. During construction, at least one operator's terminal shall be equipped to act as a system server / operator interface. This system server shall store copies of all installed software for all field components and shall be capable of automatic or manual reloading of such software into the field components as required. The system server shall also gather and archive system-operating data, such as trends, energy logs, and other historical operating data. Complete energy management firmware, including self-adjusting optimum start, demand limiting, global control strategies and logging routines for use with total control systems shall be supplied. All energy management firmware shall be resident in field hardware and shall not be dependent on the operator's terminal for operation. Operator's terminal software is to be used for access to field-based energy management control firmware only. All schedules shall be module resident and shall not be affected in case of interruption network transport between the module and the host station.

B. Basic System Features

1. Direct digital logic control of temperature, scheduling, optimum start, equipment alarm reporting and override devices for unoccupied mode of operation.

2. Operator's terminal software (Graphical User Interface or GUI) shall run under Microsoft Windows operating system. Software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Operation of the terminal software shall be simple and intuitive.

3. Operator's terminal software shall contain graphical user interface software, allowing configuration of system-wide controllers.

4. Provide all communication media, connectors, repeaters, bridges, switches, and routers necessary for network communications and interface to the internet as required to allow for remote access to system operations.

5. The system shall meet peer-to-peer communication services such that the connection of any operator interface to any one controller shall allow the operator to interface with all other controllers. The software shall provide transparent viewing and editing of all data, control programs, schedules, trends, alarms from any one controller through connection to any other controller on the internet work, regardless of subnetwork routers.

6. Priority password security systems shall prevent unauthorized use. Each user shall have an individual password. The user shall only be given access to the system functions required for individual job performance.

7. Equipment monitoring and alarm functions, including information for diagnosing equipment problems shall be included with the system.

8. The complete system, including, but not limited to terminal unit controllers, higher level controllers and operator's terminals shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in any controller's memory shall reside error free for a minimum of 30 days. Logic controllers for all air handlers and all unitary equipment shall utilize EEPROM or battery backup for all variable data storage.

9. System design shall be modular.

10. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal shall be provided.

11. System shall be capable of equipment runtime totalization of fans, heaters, boilers, etc. And capable of alarm generation and alarm dial out.

12. All hardware shall be listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916 in both the US and Canada, with integral labels showing rating.

13. All hardware shall be in compliance with FCC Part 15, Subpart J, Class A.

2.2 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation.

1. Graphic Display. A graphic with a minimum of 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec.

3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.

5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.

6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 1 sec. Select execution times consistent with the mechanical process under control.

7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.

9. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 1.

Table 1 - Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Water Flow	±2% of full scale	
Dew Point (note 1)	±1.5ºF	
Water Temperature	±1.2 ºF	
Air Pressure (note 2)	±0.05 in. w.g.	1-6 in. w.g.
Air Pressure (note 2)	±0.03 in. w.g.	±0.25-1 in. w.g.
Air Pressure (note 2)	±0.005 in. w.g.	±0-0.25 in. w.g.
Airflow	±5% of full scale	
Space Temperature	±1.0ºF	
Duct Temperature	±1.2ºF	
Fluid Pressure (note 2)	±0.5 psi	
CO2 Sensors	50ppm	400-2000ppm

NOTE 1: Accuracy applies to 10% - 90% of scale
NOTE 2: For both absolute and differential pressure
GENERAL NOTE - Sensors to be selected such that measured media is near middle third of sensor range

2.3 TEMPERATURE SENSORS

A. General

1. Sensors shall have a limited lifetime warranty.

2. All devices shall use precision thermistors unless stated to the contrary in this section.

3. Provide NEMA 1 termination box unless otherwise specified

B. Sensor Specifications

1. Space Sensors:

a) Standard Space sensor shall be available in an off-white enclosure for mounting in a standard electrical box. Mount at 48” height.

b) Sensors in public areas shall be provided without local temperature indication, setpoint adjustment or setback override.

c) Sensors in private / staff only areas shall be provided with local temperature indication, setpoint adjustment and setback override functions.

d) Where potentially subject to damage (stairwells, gyms, corridors) or as directed by the Owner or Engineer, provide bushed stainless steel blank wall plate type sensors.

e) Where space sensors are connected to dedicated terminal unit controllers, they shall be equipped with local communication interface for troubleshooting and balancing purposes. Provide all required wiring from the terminal controller to the space sensor to allow for interface to a local laptop interface device.

f) Wall Plate Sensors - Blank wall plate style sensors, Kele KTP3 Stainless Steel Flush Mounted Thermistor and RTD Sensors or approved equal. Provide only where specified or called out on project drawings

2. Duct Sensors:

a) Single point duct mounted sensors shall have a minimum 8" rigid probe and be used when the duct size is less than 24"or where duct stratification is not present, such as downstream of fans.

b) Averaging duct-mounted sensors shall have a minimum 8’ long averaging element and be used when the duct size is greater than 24". All averaging sensors shall use true averaging elements such as platinum (or equivalent) or balco. Averaging bridges [multi-point sensors] are specifically not permitted. Provide averaging sensors in all locations where specified or where temperature stratification can occur. Minimum element to be provided, 1 ft. per 2. sq ft of area. Securely support all elements to avoid movement in air stream or long term damage at stress / mounting locations. Supports shall provide radius bend support and insulation to avoid thermal bridging.

c) Averaging duct-mounted sensors shall have a minimum 8’ long averaging element and be used when the duct size is greater than 24". Where multi-point thermistor averaging sensors are to be used, sensing element spacing not to exceed 16”. Provide averaging sensors in all locations where specified or where temperature stratification can occur. Minimum element to be provided, 1 ft. per 2. sq ft of area. Securely support all elements to avoid movement in air stream or long term damage at stress / mounting locations. Supports shall provide radius bend support and insulation to avoid thermal bridging.

3. Well Sensors:

a) Liquid immersion sensors shall have a stainless-steel probe and a stainless steel or brass well. Length of the sensor well shall be selected based on the diameter of the pipe to provide accurate, reliable sensing of the liquid temperature.

4. Outside Sensors:

a) The sensing element shall mounted inside a ventilated, treated, sun shield to minimize the radiant energy and wind effects. Sensor location shall be selected to minimize effects from sunlight, building heat, exhaust systems, etc. Temperature Controls Contractor shall be responsible for selection of an appropriate location. Where sensor location is determined to be adversely affected by outdoor conditions, this contractor shall relocate the sensing devices to a more reliable position.

2.4 THERMOSTATS

A. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

B. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

2.5 HUMIDITY SENSORS

A. Duct and room sensors shall have a sensing range of 20%-80%, minimum accuracy of +/-2% over this span.

B. Outdoor air humidity sensors shall have a sensing range of 20%-95% RH, minimum accuracy of 2% over this span, and shall be suitable for ambient conditions of 0°F-140°F.

C. Humidity sensors shall not drift more than 1% of full scale annually.

D. Temperature compensation of RH reading.

E. Two-year warranty from date of installation.

2.6 FLOW SWITCHES.

A. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service). Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

B. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

C. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.7 RELAYS

A. Control Relays. Control relays shall be UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

B. Time Delay Relays. Time delay relays shall be solid-state, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

2.8 OVERRIDE TIMERS

A. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

2.9 CURRENT TRANSMITTERS

A. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500-ohm maximum burden.

B. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

C. Unit shall be split-core type for clamp-on installation on existing wiring.

2.10 CURRENT TRANSFORMERS

A. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

B. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

C. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

2.11 VOLTAGE TRANSMITTERS

A. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

B. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500-ohm maximum burden.

C. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

2.12 VOLTAGE TRANSFORMERS

A. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

B. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

C. Windings (except for terminals) shall be completely enclosed with metal or plastic.

2.13 POWER MONITORS

A. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

B. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

2.14 CURRENT TRANSDUCER / EQUIPMENT INTERFACE RELAY

A. Low voltage, single phase:

1. Combined status sensor, command relay, and hand-off-auto switch.

2. Sized for monitor and control of small motors.

3. Field selectable relay output.

4. High and low voltage isolation.

5. Industrial grade load switching relay.

6. Mountable on single or double gang boxes, flush on starter enclosures, or stand-alone.

7. Approved for installation in the following environmental conditions:

a) 0-95% RELATIVE HUMIDITY, NON-CONDENSING.

b) –15° TO 60° C

8. Design equipment: Veris Hawkeye H500.

9. Alternative components combining the total functionality of the specified device may be submitted for approval.

2.15 PRESSURE TRANSMITTERS

A. Pressure transmitters shall be of 2-wire, 4-20 mA / 0-10vdc output type with a capacitance element having an accuracy of +/- 1% over the entire range. Transmitter shall include protection against reverse polarity and supply voltage transients. Accuracy and zero span adjustment shall be provided with each transmitter to allow for recalibration as necessary.

1. Liquid Pressure

a) The operating range shall be -40.0 to 176.0 F.

b) Safe overpressure shall be a minimum of 150% of the rated pressure.

c) Sensor range to be selected so anticipated control setpoint resides in the middle third of the sensor span.

d) Use of two discrete pressure sensors and mathematical determination of system differential pressure is acceptable.

e) Differential pressure sensor shall use a five-valve manifold to allow proper service and removal of air from the sensing lines without damage. Locate such that the lines from the primary piping can be properly drained and vented. Provide isolation at the mains to allow service to the assembly.

f) Shall be contained in an aluminum NEMA-1 enclosure.

2. Air Pressure

a) The operating range shall be 0 to 150.0 F.

b) Safe overpressure of 10psi.

c) Sensor shall be equipped with reverse polarity protection.

d) Accurate to within 1% over full scale

e) Sensor shall have ability for field zero of reading and output.

f) Bi-directional ranges available by application

g) Shall be contained in a NEMA-1 enclosure.

h) Not to be provided when Space Pressure Monitor (SPM) / Room Pressure Monitor (RPM) is specified or called out on the drawings.

i) Sensor warranty shall be 3 years.

j) Design Make – Setra 264 or approved equal

2.16 DIFFERENTIAL PRESSURE SWITCHES

A. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.17 PRESSURE-ELECTRIC (PE) SWITCHES.

A. PE switches shall be UL listed, pilot duty rated (125 VA minimum) or motor control rated, metal or neoprene diaphragm actuated, operating pressure rated for 0-175 kPa (0-25 psig), with calibrated scale minimum setpoint range of 14-125 kPa (2-18 psig).

B. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required by application.

C. Switches shall be open type (panel-mounted). Exception: switches shall be enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.

D. Each pneumatic signal line to PE switches shall have permanent indicating gauge.

2.18 FLOW TRANSMITTERS

A. Airflow – Velocity over 1000 fpm

1. Acceptable for use only in applications where duct velocity will be maintained over 1000fpm over entire operating range of equipment.

2. Air flow monitoring stations requiring the use of "air straighteners" are specifically prohibited.

3. Constructed of 16-gauge galvanized steel casing, extruded aluminum sensors and copper collectors. Measured velocity pressure converted to air flow shall have accuracy within + 2% of the full scale from 700 to 4000 fpm. Sized by manufacture, rectangular, round or oval for application. Provide with volume meter with actual flow display, mounted on adjacent wall. Interface with DDC controllers.

4. Acceptable Makes: Cambridge, Air Monitor, Paragon

B. Airflow – Acceptable for all applications

1. Duct mounted airflow measuring station shall consist of one or more airflow/temperature measuring devices based on size of duct and all required electronics. The complete system shall be factory tested prior to shipment. The airflow measuring station shall not require calibration over the life of the equipment.

2. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans without prior approval by the Engineer.

3. Each sensing point shall measure both airflow and temperature using a pair of instrument grade, hermitically sealed, glass encapsulated thermistors, one self-heated and one ambient temperature. Airflow rate sensing device shall utilize thermal dispersion technology. Individual sensor notes shall be individually calibrated at 16 points to NIST calibration standards. Sensors will read and system will compensate for air temperature and impact on velocity or CFM. Provide copy of NIST calibration report for the reference standard to calibration the production tunnels used to calibrate individual sensor nodes. Devices claiming AMCA certification are not acceptable.

4. Provide air flow measuring station transmitter including any 24 VAC transformer to interface with the BAS. Each measurement location shall produce a single, separate linear analog output signal for airflow and temperature where indicated, both of which can be directly interfaced to the BMS.

5. The system shall have the ability to perform self-diagnostics and produce an alarm, which can identify the source of malfunction. In the event of a sensor failure, the system shall ignore failed sensor(s), average remaining sensors and shall continue to operate.

6. Sensor range shall be minimum and maximum system airflow rates with an accuracy of ±2%. Sensors and electronics shall operate over a temperature range of -20° F to 120° F, acceptable for use over a range of 5-95% RH, non-condensing. Size for 125% of anticipated range of air flow. The number of independent sensing points shall be per manufacturer's recommendations for the specified application as shown on drawings.

7. Remote transmitters to be mounted in a location protected from moisture. Provide weatherproof enclosure and mount away from direct sunlight when outdoor mounting is required.

8. The probe body shall be constructed of extruded anodized aluminum alloy.

9. Provide a Bluetooth and Android/IOS software that allows real time airflow and temperature monitoring.

10. Provide required length of cable to location of adjacent transmitter station to be mounted in an accessible, convenient location for operator use. Prior to start-up, a factory trained representative shall visit the site to inspect installation of air flow measuring devices and wiring. A written report shall be submitted to the engineer for the start-up services.

11. Acceptable Make: Ebtron, Air Monitor

C. Fan Array and Single Fan Measurement.

1. For use only where specifically called for or approved in advance by the Engineer

2. Each AMD shall be suitable for installation in fan inlets to determine the airflow rate and velocity weighted temperature of the airstream. Piezo rings are not acceptable.

3. Each sensing point shall measure both airflow and temperature using a pair of instrument grade, hermitically sealed, glass encapsulated thermistors, one self-heated and one ambient temperature. Airflow rate sensing device shall utilize thermal dispersion technology. Individual sensor notes shall be individually calibrated at 16 points to NIST calibration standards. Sensors will read and system will compensate for air temperature and impact on velocity or CFM. Provide copy of NIST calibration report for the reference standard to calibration the production tunnels used to calibrate individual sensor nodes. Devices claiming AMCA certification are not acceptable.

4. Provide face, forward mount adjustable brackets for each sensor node. Mount styles shall not affect the airflow or sound performance of plenum fans.

5. Provide air flow measuring station transmitter including any 24 VAC transformer to interface with the BAS. Each measurement location shall produce a single, separate linear analog output signal for airflow and temperature where indicated, both of which can be directly interfaced to the BMS.

6. Provide the following number of sensor nodes based on fan type. All sensors shall be connected to a single, remote transmitter. Fan array models shall calculate the airflow of each fan individually prior to outputting the total airflow rate and have a built-in alarm capable of removing a failed fan from the total airflow calculation.

   a) SWSI fans – Two

   b) DWDI Fans – Two per inlet

   c) Fan Arrays – One per inlet

D. Liquid Flow

1. Insertion Type - Onicon F3500 or approved equivalent only

2. Install in compliance with all manufacturers requirements.

3. Provide type as specified on the contract drawings.

E. Remote Readout Unit:

1. Provide only where specified or shown on the drawings.

2. Able to accept signals from meter, temperature transmitter and pressure transducer.

3. Shall provide local display of actual flow rate, totalized flow (counter), and percent of full flow.

4. Shall provide a 4-20 mA DC analog signal to read actual flow and totalized flow at DDC controller.

5. 115V or 230V AC operation (+ 15%).

6. Provide in NEMA 4 enclosure. Mount on adjacent wall.

2.19 VOC SENSORS

A. Provide where specified or shown on the drawings

B. Contains calibration algorithm for correlation to CO2 concentration levels

C. Available as combination VOC / Temperature / Humidity sensor – coordinate with zone requirements.

D. Provide digital reading of VOC level and optional temperature and humidity.

E. Eighteen-month warranty from installation date

2.20 CO2 SENSORS

A. Space

a. Provide only where specified or shown on the drawings.

b. Dual Channel optical system for reference calibration

c. Optional temperature sensing – coordinate with zone requirements

d. 90% response time inside of 45 seconds at 25°C.

e. Local LCD display of CO2 concentration

f. Temperature and altitude compensation

g. 0-10v or 4-20 ma output

h. Accurate to within 50ppm between 400 and 2000ppm

i. Drift not to exceed 20ppm / year.

j. Eighteen-month warranty from installation date

B. CO2 Sensors – Duct

1. Provide only where specified or shown on the drawings.

2. Dual Channel optical system for reference calibration

3. 90% response time inside of 45 seconds at 25°C.

4. Temperature and altitude compensation

5. 0-10v or 4-20 ma output

6. Accurate to within 50ppm between 400 and 2000ppm

7. Drift not to exceed 20ppm / year.

8. Eighteen-month warranty from installation date

2.21 ENCLOSURES

A. Enclosures shall be NEMA-1 rated steel, finished to control oxidation in a highly humid atmosphere.

B. Each enclosure shall have a hinged door with handle and keyed lock

C. Shall provide 40% of free space for future expansion of the system.

2.22 DAMPER MOTORS

A. Electronic:

1. Electronic actuators shall be driven directly by 0-10 VDC, supply power: 24 VAC or 30VDC, as acceptable to its controller, and provide adequate torque to meet the application.

2. Where actuators over 30vdc requirement are supplied, coordinate with furnishing contractor for all wiring requirements in compliance with NEC and these specifications.

3. Electronic actuators shall be direct-coupled type.

4. For all actuators, assure execution of the fail-safe position in case of the Freezestat trip or power loss.

5. Actuators to be sized for smooth operation over entire range and a minimum of 150% of required torque for connected components.

6. Design Make: Belimo, Neptronic.

2.23 CONTROL DAMPERS

A. Rectangular;

1. Blades are extruded aluminum profiles. Aluminum end caps are press fitted to blade ends in order to seal hollow interior and reduce air leakage rates.

2. Blade and frame seals are extruded silicone and are secured in an integral slot within the aluminum extrusions.

3. Bearings are composed of a Celcon inner bearing fixed to a 7/16" (11.11mm) aluminum hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.

4. Linkage hardware is installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

5. Dampers are designed for operation in temperatures ranging between -40°F (-40°C) and 212°F (100°C).

6. Dampers are available with either opposed blade action or parallel blade action.

7. Leakage class 1A at 1" w.g. Static pressure differential. Standard air leakage data is certified under the AMCA Certified Ratings Program.

8. Two position dampers - Pressure drop not to exceed 0.2"wc as installed. If frame is fully within the duct, the pressure drop calculations shall account for this installation method.

9. Modulating Control Dampers shall be sized by the temperature control manufacturer. Maximum velocity shall be 1500 fpm and maximum pressure drop shall be 0.15 in w.g, not to exceed 0.2"wc. Dampers shall be of adequate authority and sized and positioned to allow for smooth modulation of controlled air streams.

10. Damper pressure drops shall take into account the as-installed position and be certified for pressure drop per AMCA standard 500-d.

11. Dampers are available in two mounting types: i.e., "Installed in Duct" or "Flanged to Duct".

12. Provide thermally broken frame design where use of standard frame could cause condensation or operational issues.

13. Installation of dampers shall be in accordance with current manufacturer's installation instructions.

14. Dampers over 48 in. In length and height shall be made into multiple sections.

15. Automatic dampers are required at all exterior walls and roof openings. Dampers to open when respective fan starts. Dampers at exterior walls and roof openings shall be insulated blade, thermal break design.

16. Design make: Tamco 1500 series (standard), Tamco 9000 series (outdoor air intake and exhaust / relief locations)

B. Round

1. Temperature Rating: Withstand maximum of 250 degrees F.

2. Minimum diameter 4 inches. Maximum 48 inch.

3. Capacity: Damper shall withstand HVAC system operating conditions:

4. Closed Position: Maximum pressure of 10 inches w.g @ a 6 inch diameter.

5. Open Position: Maximum air velocity of 4,000 feet per minute.

6. Leakage: Provide with damper blade seals. Maximum 10 cfm at 4 inches w.g. for 48 inch diameter damper.

7. Pressure Drop: Maximum 0.1 inch w.g at 1,000 feet per minute

8. Frame: Under 6 inch diameter; 2 inch x 12 gauge steel tube. 6 thru 12 inch, 2 inch x 0.5 inch x 14 gauge steel channel. Above 12 inch thru 24 inch, 2 x 0.5 x 1/8 inch steel channel. Above 24 inch; 2 x 1 x 3/16 inch steel channel.

9. Blade Style: Single skin round blade.

10. Material: Diameter 18 inch or under; 12 gauge steel. Diameter over 18 inch; 10 gauge steel (3.5 mm). Stiffeners as required.

11. Bearings: Stainless steel pressed into frame.

12. Seals: Neoprene ring.

13. Axles: Diameter 24 inch or under; 0.5 inch diameter plated steel. Diameter over 24 inch); 0.75 inch plated steel.

14. Actuation: Refer to Damper Actuators paragraph. Provide actuator mounting plate and extended shaft where required to allow proper insulation of duct insulation and damper actuator. Direct mount of actuator anti-rotation pin to the ductwork is not permitted.

15. Design Make: Ruskin CDR25

C. Oval

1. Temperature Rating: Withstand maximum of 250 degrees F.

2. Minimum diameter 6 inches. Maximum without center mullion is 36 inch x 24 inch. Maximum with center mullion is 72 inch x 24 inch. Capacity: Damper shall withstand HVAC system operating conditions:

3. Closed Position: Maximum pressure of 10 inches w.g @ a 6 inch diameter.

4. Open Position: Maximum air velocity of 4,000 feet per minute.

5. Leakage: Provide with damper blade seals. Maximum 8.5 cfm (2.7 l/s) at 4 inches w.g. (1 kPa) for 36 inch wide damper

6. Pressure Drop: Maximum 0.1 inch w.g at 1,000 feet per minute

7. Frame: Under 6 inch diameter; 2 inch x 12 gauge steel tube. 6 thru 12 inch, 2 inch x 0.5 inch x 14 gauge steel channel. Above 12 inch thru 24 inch, 2 x 0.5 x 1/8 inch steel channel. Above 24 inch; 2 x 1 x 3/16 inch steel channel.

8. Blade Style: Single skin round oval blade.

9. Material: Diameter 18 inch width or under; 12 gauge steel. Diameter over 18 inch; 10 gauge steel (3.5 mm). Stiffeners as required.

10. Bearings: Stainless steel pressed into frame.

11. Seals: Polyethylene Foam.

12. Axles: Diameter 24 inch or under; 0.5 inch diameter plated steel. Diameter over 24 inch); 0.75 inch plated steel.

13. Actuation: Refer to Damper Actuators paragraph. Provide actuator mounting plate and extended shaft where required to allow proper insulation of duct insulation and damper actuator. Direct mount of actuator anti-rotation pin to the ductwork is not permitted.

14. Design Make: Ruskin CDO25

2.24 CONTROL VALVES

A. General:

1. Valves shall be applicable for the rated pressure and temperature service. Close off pressures must be determined in concert with the actuators and valves shall be provided to close off against extreme anticipated conditions. Valves shall be selected such that they are not, as a practice, “oversized.”

2. Modulating valves shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. “Split ranging” of heating and cooling valves controlled by the BMS is not acceptable. A separate output from the BMS shall be provided for all control valves. When the selection criteria indicated below are not met, flow characteristic analyses shall be submitted to demonstrate reasonable correlation between stroke and flow.

3. Modulating actuators shall be selected for smooth actuation over the entire operating range, use a 24vac power supply, and respond to an electronic input of: 4-20 mA or 0-10 VDC.

B. Provide factory fabricated control valves with operators as required by this specification. Provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with specified maximum pressure drop across control valve. Equipment control valves with heavy duty actuators, with proper shut off rating for each individual application.

C. Valves shall be selected to perform as specified taking into account inlet and outlet piping geometry correction factors. Temperature control contractor shall instruct mechanical contractor on correct installation technique and verify that installation matches manufacturer's requirements for proper performance.

D. Design Pressure Drop –

1. Water Service Valves - Unless specified to the contrary, valves shall be selected for a pressure drop approximately equal to that of the connected equipment, but no greater than 5 psi or less than 3 psi at design water flow.

E. Ball Valves:

1. Modulating water valves shall be ball valves with an equal percentage characteristic.

2. Type: Two or three-way as called for, V-port ball valve with characterizing disk, 1/4 turn.

3. Packing: EPDM O-rings, lubricated.

4. Ball & Stem: Stainless steel.

5. Seat: Fiberglass reinforced Teflon.

6. Actuator: Electric, one motor only; valves 4 inches and larger shall have single operator.

7. Flow Characteristic: Equal percentage.

F. Actuator: Electric, one motor only

1. Failure positions shall generally be as follows, contact owner for special circumstances requiring deviation from these requirements:

a) Unit cooling coils: normally closed spring return

b) Unit heating coils: normally open spring return

2. Input signal: 0-10 VDC, equipped with spring failure position return all heating applications. "Floating point" actuation allowed only where specifically noted elsewhere in the contract documents.

3. The Back-to-back electronic actuations, i.e., where two identical actuators are engaged in operating the rising or rotation of valve stem are not permitted.

4. Valve Closeoff:

a) Water – 120% of total system (pump) head.

b) Steam – 200% of system operating (inlet) pressure.

c) Valves to be used on this project shall be suitable for complete closeoff to the levels stated under modulating duty. In the event that manufacturer's data provides a separate maximum differential pressure under modulating duty, both criteria shall exceed the above requirements.

2.25 SAFETY/STATUS DEVICES

A. Low Limit Detector ("freezestat"): Electric type, with manual reset and auxiliary contacts to the DDC, set for 37°F for "freeze" protection and 55°F for fan discharge application. Provide a 20' long element for every 25 sq. Ft. Of coil face area or fraction thereof. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

B. High Limit Detector ("firestat"): Electric type, with manual reset and auxiliary contacts to the DDC, UL Listed for fire, set for 180°F.

C. Pump status through adjustable range current sensing element on pump motor. Calibrate to actual conditions.

D. Fan status through adjustable range current sensing element on the fan motor. Calibrate to actual conditions.

2.26 COMMUNICATIONS

A. Install new wiring and network devices as required to provide a complete and workable control network.

B. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

C. Internet operator interface and value passing shall be transparent to network architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

D. System shall automatically synchronize system clocks daily from an operator-designated controller via the network. If applicable, system shall automatically adjust for daylight saving and standard time.

E. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.27 OPERATOR INTERFACE

A. All operator workstation functions shall be provided / updated on the existing operator workstation(s) to reflect the new equipment and systems installed under this project.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135-2016, BACnet.

C. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.

2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, pid gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.

8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.

9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

D. System Software

1. Operating System. Workstation server shall operate on Microsoft Windows 10.

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

a) Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.

b) Animation. Graphics shall be able to animate by displaying different image files for changed object status.

c) Alarm indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

d) Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

e) Provide a link from each piece of graphically represented equipment to the associated wiring diagram and sequence of operation.

E. System tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. Operators shall be able to configure the system.

4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

5. Security. System shall require a user name and password to view, edit, add, or delete data.

    a) Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.

    b) Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

    c) Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

11. Trend Configuration. Operator shall be able to configure trend sample or change of value interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk.

12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

14. Standard Reports. Furnish the following standard system reports:

    a) Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

    b) Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.

    c) Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        (1) Alarm History.

        (2) Trend Data. Operator shall be able to select trends to be logged.

        (3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

16. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

17. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language (or block language equivalent) shall have the following features:

    a) Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.

b) Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

c) Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

d) Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

e) Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

(1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

(2) System Variables. Operator shall be able to use predefined variables to represent status and results of controller software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

2.28 CONTROLLER SOFTWARE

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. Scheduling. System shall provide the following schedule options as a minimum:

1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule, has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.

3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

C. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

D. Alarm Reporting.

E. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms.

F. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits.

G. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

H. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

I. Startup Optimization – All equipment noted in the sequences of operation to have scheduled operation shall be started on an optimized basis which attempts to reach occupied conditions just prior to the scheduled occupancy time.

J. Pressure control optimization – All equipment noted in the sequences of operation (fans and pumps) shall have reset of pressure control setpoint initiated in the sequence. Typically, for pumps this would cause the software to examine all connected control valves for position, determine the critical valve (defined as the valve at the highest demand position), and reset the pressure setpoint up or down to maintain the critical valve between 80 and 90% open. For fans serving zone air valves / VAV boxes, this would similarly reset the duct pressure setpoint to maintain the critical zone damper between 80 and 90% open.

K. Heating Water Pump Control – Whenever heating demand reaches a minimum controllable threshold; the heating pumps shall be disabled and the heating water system shut down until demand for heating / reheat reaches a controllable level. This shall apply only in non-critical environment, exclusions apply to medical and laboratory application.

L. Energy Calculations.

1. System shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.

2. System shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.

M. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

N. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

O. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified.

2.29 CONTROLLERS

A. General. Provide controllers and accessory devices as required to achieve performance specified.

B. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

6. BACnet Communication.

a) Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

b) BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.

c) Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

d) Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

e) Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

f) Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2. Signal Management – Master or Global Controller operating systems shall manage input and output communication signals to allow distributed controllers (lower level networks) to share real and virtual object information and to allow for central monitoring and alarms.

3. Data Sharing. Each Master or Global Controller shall share data as required to allow the specified performance and sequence of operation.

4. Stand-Alone Operation. Each piece of equipment specified shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

F. Serviceability

1. Controllers shall have diagnostic LEDs for power, communication, and processor.

2. Wires shall be connected to a field-removable modular terminal strip or to a termination card to allow service without rewiring the controller.

3. Each controller shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

G. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 hz and from keyed radios up to 5 W at 1 m (3 ft).

H. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.30 INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to all controller hardware.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.31 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

a) Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

b) Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

a) Dielectric strength of 1000 V minimum

b) Response time of 10 nanoseconds or less

c) Transverse mode noise attenuation of 65 dB or greater

d) Common mode noise attenuation of 150 dB or greater at 40-100 Hz

3.0 PART 3 - EXECUTION

3.1 WIRING

A. All wiring shall comply with these specifications, Specification Section 230514, and the NEC. Deviations are only permitted where manufacturer's requirements specifically conflict with gauge and wiring type specified within this section.

B. Communication wiring shall be installed using the particular system recommended, plenum rated, jacket shielded cable. The communication network wiring shall be clearly marked with a specific color code. Communication wiring shall not be installed near noise producing equipment, such as ballasts, magnetic starters, etc. Communication wiring shall comply with the optimum requirements necessary to assure communication integrity and speed.

C. All analog inputs and analog outputs shall be wired using 18 gauge stranded shielded cable. All Analog inputs and analog outputs wiring shall not be installed near noise producing equipment, such as ballasts, magnetic starters, etc.

D. All digital outputs shall be wired using 18 gauge stranded wire.

E. All wiring in mechanical rooms, walls shall be installed in EMT conduit. Concealed conduit and wiring is required in all finished spaces.

F. Power Supplies

1. Transformers – Each w/ low voltage fuse holder/disconnect

2. Actuators and relays shall use separate transformers from those powering microprocessor control panels.

3. Transformers shall be sized for a minimum of 150% of the connected load.

4. Convenience Outlet –

   a. 110vac combination outlet w/ switch to kill 110vac to panel

5. Switched 110vac to panel is fused before transformers (after outlet).

6. Provide at all control panels excepting those for terminal equipment (exclude reheats, cabinet heaters, fan coils, etc.)

7. Wiring Panduit

   a. Wire ducts around exterior of panel for cables entering panel

   b. Wire ducts as necessary to route hookup wires from terminals to controllers and other devices

8. Panel Construction (sized to provide 25% future expansion w/ removable back panel)

   a. Indoors – Johnson M8100 series

   b. Outdoors – Hoffman fiberglass Nema 4x

9. Wire Labeling

   a. All DDC system wiring shall be individually labeled and permanently tagged at both ends of the conductors, including within all junction boxes between panels.

   b. All submittal and as-built drawings shall reflect the field installed wire tag numbers.

   c. All wire numbers shall be unique throughout the system installation.

3.2 DDC EQUIPMENT

A. All components shall be installed in protective enclosures. All wiring within the DDC enclosure shall be number coded. Both the enclosure and the controller shall be properly grounded in accordance with manufacturer's recommendation. Documentation shall be firmly attached to the enclosure within a plastic envelope. Documentation shall state point-to-point termination detail, description of each individual point, location of power source for the controller and ID number or address within the network.

B. All DDC Controllers shall be mounted on walls within equipment rooms, custodial closets or electrical rooms. Only application-specific controllers for rooftop units or package units may be mounted on the equipment.

3.3 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate work of others. Temperature Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.4 PROTECTION

A. Temperature Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. Temperature Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.5 COORDINATION

A. Site.

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Test and Balance.

1. Furnish Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing for the duration of TAB activity

2. Train Test and Balance Contractor to use control system interface tools.

3. Provide a qualified technician to assist with testing and balancing of all air handling equipment and terminal units.

4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

C. Life Safety.

1. Duct smoke detectors required for air handler shutdown are furnished and installed by others. Interlock smoke detectors to air handlers for shutdown as specified Sequence of Operations for HVAC Controls.

2. Smoke dampers and actuators required for duct smoke isolation are furnished and installed by others. Interlock smoke dampers to air handlers as specified in Sequence of Operations for HVAC Controls.

D. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.

1. Each supplier of a controls product shall configure, program, start up, and test that product to meet the required sequences of operation regardless of where within the contract documents those products are described.

2. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.

3. Temperature Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.6 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

B. Independently support all temperature control wiring from other systems. Do NOT support from conduits, piping or hangers for equipment.

C. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

D. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.

E. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.

F. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.7 FIELD QUALITY CONTROL

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances.

B. Continually monitor field installation for code compliance and workmanship quality.

C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.8 COMMUNICATION WIRING

A. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

B. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

C. Verify entire network's integrity following cable installation using appropriate tests for each cable.

D. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

E. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

F. Label communication wiring to indicate origination and destination.

3.9 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing. Where sensor locations can be effected by wall surface temperature, pack junction box with insulation and provide insulated back plate for sensor. Install all space sensors so they are not affected by direct sunlight, appliances / equipment, or air currents. Consult with the Engineer prior to installing device if the location shown on the project drawings does not meet these criteria.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas. Use of Silicon or similar sealant is prohibited. Use Fiberglass or poly fill in the junction boxes.

E. Use averaging sensors in mixing plenums and hot and cold decks, and all duct locations which may be subject to stratification. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a mechanically fastened capillary clip. "Stick on" type fasteners are specifically prohibited.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a mechanically fastened capillary clip. "Stick on" type fasteners are specifically prohibited.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells. Sensors and wells shall be installed to assure that the entire sensing element is completely immersed in the measured media with minimal pressure drop. Provide oversized pipe section, oversized elbow, or other recognized method to achieve this result in compliance with this specification and manufacturer's recommendations.

H. Install outdoor air temperature sensors on north wall with sun shield. Sensor to be located where thermal characteristics of the building and solar load do not effect readings.

I. All sensors to be mounted on externally insulated ductwork or plenums shall be provided with standoff brackets. Insulation and vapor barriers shall be carried continuously beneath the sensor enclosure. Coordinate installation with mechanical and insulation contractors.

J. Differential Air Static Pressure.

1. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

2. Air Pressure Transducers – Mount in a vibration free location accessible for service without use of ladders or special equipment.

3. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

K. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status. Interlock shall be provided such that the unit cannot be restarted in either hand or auto modes without manual reset of the safety device.

3.10 FLOW SWITCH INSTALLATION

A. Use correct paddle for pipe diameter.

B. Adjust flow switch according to manufacturer's instructions.

3.11 FLOW TRANSMITTER INSTALLATION

A. Airflow and Liquid Flow

1. Provide meter probe size, type and arrangement per manufacturers recommendations to obtain accuracy and performance specified.

2. Verify calibration of Remote Readout Unit (where specified to be provided) over operating range in conjunction with TAB contractor. Perform all necessary field calibration to obtain readout accuracy within specified limits.

3. Provide specified interface to DDC system.

4. Verify accuracy of DDC system reading against Remote Readout Unit (where specified) and balancer readings over operating range of device.

5. Provide installation in strict compliance with manufacturer’s requirements.

3.12 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.

1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.

2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.

3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

4. Provide necessary mounting hardware and linkages for actuator installation.

C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer.

D. Where actuators are mounted to the side of insulated ductwork or equipment, provide insulation standoffs and repair insulation and vapor barrier.

3.13 WARNING LABELS

A. Affix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.14 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 2 in. of termination.

B. Permanently label or code each point of field terminal strips to show instrument or item served.

C. Label control panels with minimum ½ in. letters on laminated plastic nameplates.

D. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

E. Label room sensors related to terminal boxes or valves with nameplates.

F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

G. Label identifiers shall match record documents.

H. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.

3.15 OPERATOR INTERFACE

A. Standard Graphics. Provide graphics as specified. Show on each equipment graphic input and output points and relevant calculated points such as indicated on the applicable Points List / diagram. Point information on graphics shall dynamically update.

B. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation).

C. Provide logical descriptions and engineering units on all data displays. Example: percentage position shall be easily discernable as percent open or closed.

D. Provide logical linking between graphics. For example, direct penetration from building to floor to air handler to air terminal and back is to be provided without need to resort to a menu tree to navigate the building.

E. Graphical user interface shall be reviewed by the Owner and / or Engineer. If in their sole opinion the graphics are inaccurate, incomplete, or improperly represent the systems, the graphics shall be updated as no additional cost to the project.

3.16 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Prior to demonstration and acceptance, the contractor shall:

1. Complete all Pre-Commissioning requirements as described in paragraph 1.11 of this section.

2. Complete system commissioning requirements per section 019113.

3. Correct all deficiencies in control system hardware and software noted in engineer's punchlists, field observations, and commissioning issues logs / reports.

B. Demonstration. Prior to acceptance, perform the following to demonstrate system operation and compliance.

1. Engineer and / or Owner's representative will be present to observe and review system demonstration. Notify Engineer at least 10 days before system demonstration begins.

2. Demonstrate actual field operation of sequence of operation. Provide at least two persons equipped with two-way communication (if required). Demonstrate calibration and response of any input and output points requested by Engineer. Provide and operate test equipment required to prove proper system operation. Engineer may, at their discretion, perform these tests on a "spot check" basis.

3. Demonstrate complete operation of operator interface.

4. Demonstrate each of the following.

a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Engineer will require further tuning of each loop that displays unreasonably under- or over-damped control.

b. Demand limiting (where applicable). Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand-limiting setpoint, and status of setpoints and other affected equipment parameters.

c. Building fire alarm system interface.

d. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation.. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.

5. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

C. Acceptance.

1. After tests described in these specifications are performed to the satisfaction of both Engineer and Owner, Engineer will accept control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control, such as seasonal requirements or construction progress issues. Engineer will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

3.17 CLEANING

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

END OF SECTION 230923

SECTION 232000 - PIPING SYSTEMS AND ACCESSORIES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

B. Provide all chemical treatment required for piping systems each time an individual system is drained and then refilled as a result of work performed under this contract.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit a schedule of pipe materials, fittings and connections by piping system.

B. Submit refrigerant piping diagram.

C. Submit anchors, sleeves, hanger shields, and guides.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide domestically manufactured pipe, fittings and accessories.

B. All pipe, tubing and fittings shall be either tested by an approved third party testing agency or certified by an approved third party certification agency.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products in factory-fabricated containers. Deliver pipe and tube with factory-applied plastic end-caps on each length.

B. Store products in original wrapping and protect from dirt and damage. Store piping and tube inside. Where necessary to store outside, evaluate well above grade and enclose with waterproof wrapping.

C. Handle products carefully to avoid damage. Do not install damaged products.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Each length of pipe and each pipe fitting shall be new and marked with manufacturer's name; complying with the following Standards where applicable:

1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

2. American Society of Mechanical Engineers (ASME)

3. American Society of Testing and Materials (ASTM)

4. American National Standards Institute (ANSI)

5. American Water Works Association (AWWA)

6. American Petroleum Institute (API)

7. American Standards Association (ASA)

B. Refer to the MCNYS section 1202 for additional compliance standards for piping and fittings.

C. Refer to the MCNYS section 1210 for piping requirements specific to ground source Heat Pump Loops.

2.2 STEEL PIPING AND FITTINGS

A. Pipe: ASTM A53, ASTM A106, Schedule 40 weight as specified as Exhibit “A”; black or galvanized finish as specified in Exhibit ‘A’ or as noted on drawings; ends chamfered for welding mechanical connections. Galvanizing on piping shall be in compliance with ASTM A123.

B. Fittings: Same material and pressure class as adjoining pipe.

1. Welded fittings: Same weight as adjoining piping, factory forged, seamless construction, butt weld type, chamfered ends, in compliance with ASTM A105, ANSI/ASME B16.9 and MSS SP-43. Socket weld, Class 3000, forged in compliance with ASTM A105 and ASME B16.11. Where branch connections are two or more sizes smaller than main size, "Weldolets", Class 3000, forged, in compliance with ASTM A105, ANSI/ASME B16.9 and MSS SP-97, "Threadolets", Class 3000, forged, in compliance with ASTM A105, ASME B16.11, ANSI/ASME B1.20.1 and MSS SP-97. Sockolet weld type, Class 3000, forged in compliance with ASTM A105, ASME B16.11 and MSS SP-97 where specified in Exhibit ‘A’.

2. Screwed fittings: Malleable iron, black or galvanized, as called for in Exhibit ‘A’ or as noted on the Drawings. Fittings shall be in compliance with ASTM A197, ANSI/ASME B1.20.1 and ASME B16.3. Galvanizing of fittings sha11 be in compliance with ASME A153.

3. Malleable iron fitting shall be Standard Class 150 unless otherwise specified in Exhibit ‘A’ to be Extra Heavy Class 300.

4. Mitered elbows, "shaped" nipples, and job fabricated reductions are not acceptable unless specifically called for.

C. Flanges, Unions and Couplings:

1. Unions: For sizes 2 in. and smaller - Malleable iron, bronze to iron seat, Class 300 in compliance with ASTM A197, ANSI/ASME B1.20.1 and ASME B16.39, or Class 3000 forged steel, steel to steel ground joint to ASTM A181, ANSI/ASME and B1.20.1. MSS SP-83 as called for in Exhibit ‘A’. Galvanizing on the unions sha11 be in compliance with ASME A153.

2. Flanges: For sizes 2-1/2 in. and larger pipe sizes - Welding neck type, forged, in compliance with ASTM A105 and ASME B16.5. Class 150 or Class 300 as called for in Exhibit ‘A’.

3. Flange Gaskets: All flange gaskets shall be Flexitallic Thermculite Type 835 Spiral Wound.

D. Cleanouts, gauge and instrument connections, nipples and plugs, for adapting gauges and instruments to piping system shall be IPS brass.

E. Base Elbows:

1. Cast iron or steel type, flange connections; Crane 500 or equivalent. Made from welding elbows, with welded pipe support and steel base. Reducing elbows where necessary.

Elbow Size	Support Size	Base Plate
To 3 in.	1-1/4 in.	6 in. x 6 in. x 1/4 in.
4 in. to 6 in.	2-1/2 in.	8 in. x 8 in. x 1/4 in.
6 in. and larger	6 in.	14 in. x 14 in. x 5/16 in.

2. Anchor bolt holes in each corner of base for securely bolting to floor or concrete base; minimum 3/4 in. bolts.

2.3 COPPER PIPE, SOLDER FITTINGS

A. Tubing (Type L or M “pipe”): Hard temper meeting in compliance with ASTM B75 and ASTM B88; Type L, M. as called for in Exhibit ‘A’ or as noted on the Drawings. Soft temper only as called for in Exhibit ‘A’ or as noted on the Drawings. Plans show copper tube sizes.

B. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast bronze as called for in Exhibit ‘A’ or as noted on the Drawings; solder end connections; shall meet applicable and applicable ASME B16.22 or ASME B16.18.

C. Fittings (Tees, Elbows, Reducers, etc.): Cast bronze, threaded end connections, in compliance with ASME B16.15 and ANSI/ASME B1.20.1.

D. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast copper alloy drainage fitting (DWV), solder end connections, in compliance with ASME B16.29 or ASTM B23.

E. Unions and Flanges: 2 in. and smaller use unions, solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, 150 lb. swp, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1. For piping 2-1/2 in. and over use flanges, cast copper alloy, companion type, Class 150, in compliance with ASME B16.24.

F. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. Make: Harris "Stay-Safe 50" and "Bright", Englehart "Silverbright 100", Willard Industries "Solder Safe (silver bearing), Canfield "Watersafe".

2.4 COPPER PIPE AND BRAZED FITTINGS

A. Tubing (Type L): Hard temper in compliance with ASTM B75 and ASTM B88. As called for in Exhibit ‘A’ or as noted on the Drawings.

B. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast bronze as called for in Exhibit ‘A’ or as noted on the Drawings; solder end connections; shall meet applicable and applicable ASME B16.22 or ASME B16.18.

C. Unions and Flanges: 2 in. and smaller use unions, solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, 150 lb. swp, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1. For piping 2-1/2 in. and over use flanges, cast copper alloy, companion type, Class 150, in compliance with ASME B16.24.

D. Brazing Materials: Silver Alloy, Airco Sil-4S or Sil-Fos as called for in Exhibit ‘A’ or as noted on the Drawings.

2.5 DIELECTRIC PIPE FITTINGS

A. Where dissimilar metals are encountered, provide brass valve between steel and copper connection points.

2.6 REFRIGERANT PIPING, VALVES, FITTINGS, AND RELATED PARTS

A. General. Refrigerant piping, valves, fittings, and related parts shall conform to the requirements of this section and tables 2-12-1 and 2-12-2.

B. Refrigerant piping, valves, fittings, and related parts having a maximum internal or external design pressure greater than 15 psig (103.4 kPa gage) shall be listed either individually or as part of an assembly or a system by a nationally recognized testing laboratory, or shall comply with ASME B31.5 where applicable.

C. Refrigerant Parts in Air Duct. All refrigerant-containing parts of a refrigerating system and joints located in an air duct carrying conditioned air to and from an occupied space shall be constructed to withstand a temperature of 700°F (371°C) without leaking into the airstream.

D. Reuse of Piping Materials on Existing Systems. Reused pipe, fittings, valves, or other materials on existing refrigerant systems being renovated or modified shall be clean and free of foreign materials and shall comply with the requirements of this section.

E. Piping Materials Standards. Pipe or tube utilized as refrigerant piping shall either be listed or demonstrate conformance to one or more of the standards in Table 2-12-1. The exterior of the piping shall be protected from corrosion and degradation.

F. Type F Steel Pipe Limitation. ASTM A53/A53M, Type F steel pipe shall only be permitted for discharge lines in pressure relief systems.

G. Pipe Fittings. Refrigerant pipe fittings shall be approved for installation with the piping materials to be installed and shall demonstrate conformance to one or more of the standards in Table 2-12-2 or shall be listed as complying with UL 207.

H. Copper Field Swaged. The minimum and maximum cup depth of field fabricated copper swaged fitting connections shall be constructed in compliance with table 9-10 of the 2022 Revision of ASHRAE Standard 15.

I. Flexible Connectors, Expansion and Vibration Compensators. Flexible connectors and expansion, vibration control devices or other similar components shall be listed to UL 207 or CSA C22.2 No.140.3 for the specific refrigerant of the refrigerating system for which the components are installed, and shall have design pressure in accordance with Section 9.2 of the 2022 Revision of ASHRAE Standard 15.

J. Joints and connections

1. Listed or approved type, limited to those permitted within table 9-11 of the 2022 Revision of ASHRAE Standard 15,

2. Tight for the pressure of the refrigerating system when tested in accordance with Section 9.13 of the 2022 Revision of ASHRAE Standard 15.

3. Joints Between Different Piping Materials. Joints between different piping materials shall be made with listed or approved adapter fittings. Joints between dissimilar metallic piping materials shall be designed to prevent galvanic action, which includes (but is not limited to) the use of a dielectric fitting or a dielectric union conforming to dielectric tests of ASSE 1079.

Table 2-12-1 Refrigerant Piping Materials

Piping Material	Standard
Aluminum tube	ASTM B210/B210M [22], ASTM B491/B491M[23]
Brass (copper alloy) pipe	ASTM B43 [24]
Copper pipe	ASTM B42 [25], ASTM B302 [26]
Copper tube	ASTM B68 [27], ASTM B75 [28], ASTM B88 [29], ASTM B280 [30], ASTM B819 [31]
Copper linesets	ASTM B1003 [32], ASTM B280 [30]
Stainless steel pipe	ASTM A312/A312M [33]
Stainless steel tube	ASTM A269/A269M [34], ASTM A632 [35]
Steel pipe	ASTM A53/A53M [18], ASTM A106/A106M [36], ASTM A333/A333M [37]
Steel tube	ASTM A254/A254M [38], ASTM A334/A334M [39]

Table 2-12-2 Refrigerant Pipe Fittings

Fitting Material	Standard
Aluminum	ASTM B361 [40], ASME B16.52 [41]
Brass (copper alloy)	ASME B16.15 [42], ASME B16.24 [43]
Copper	ASME B16.15 [42], ASME B16.18 [44], ASME B16.22 [45], ASME B16.26 [46], ASME B16.50 [47]
Stainless steel	ASTM A403/A403M [48], ASME B16.11 [49]
Steel	ASTM A105/A105M [50], ASTM A181/A181M [51], ASTM A193/A193M [52], ASTM A234/A234M [53], ASTM A420/A420M [54], ASTM A707/A707M [55]

K. Refrigerant Piping Hangers:

1. Provide pre-insulated type hangers and clamps. Provide a crush restiant pre-insualted pipe clamp hanger for all refrigerant piping called to be insulated in specification section 230700.

2. Clamp shall be a complete assembly including a rigid closed cell foam insulation with rubber vapor barrier and clamp assembly to support from Unistrut.

3. Acceptable makes: Cush-A-Therm, Aerofix Insulated Pipe Support, Armafix B-Line

2.7 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: Carpenter and Patterson, Central Iron, Fee and Mason, ITT Gruvlok.

B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated or PVC coated where in contact with copper piping. Cadmium plated or galvanized for exterior.

2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.

3. Adjustable steel clevis type for piping 4 in. and larger, and where insulation passes through hanger.

4. Hangers sized to permit passage of continuous insulation through the hanger.

5. Nuts and rods with electroplated zinc or cadmium (0.005 in. minimum) finish.

C. Hanger Shields:

1. Pre-insulated type:

a) To be used where direct firm support and / or load restraint of piping system required while insulation system maintained. Includes, but not limited to riser clamps, pipe guides and seismic restraint points. May be used for general support at hanger or trapeze locations at contractor option.

b) To be used where anticipated pipe surface temperatures may exceed 800 degrees on a consistent basis.

c) Insulated pipes shall be protected at point of support by a 360^{o} insert of high density, 100 psi waterproofed calcium silicate, encased in a 360^{o} sheet metal shield. Insulation insert to be same thickness as adjoining pipe insulation and extend 1 in. beyond sheet metal shield

2. Field-insulated type:

a) #18 USSG, galvanized steel shields, minimum 120^{o} arc. Provide temporary blocking between pipe and hanger to maintain proper spacing for insulation. Provide at all support points.

3. Shield Sizing:

Pipe Size	Shield ID (1 ½" insulation)	Shield Length	Minimum Gauge
Up to 3-1/2"	Up to 6.5"	12 in.	18
4"	7"	12 in.	16
5" and 6"	8" and 9"	12 in.	14
8" to 14"	11" to 17"	24 in.	12
16" to 24"	19" to 27"	24 in.	10

a) Hanger shield gauges listed are for use with band type hangers only. For point loading (roller support), increase shield thickness by one gauge, and length by 50%.

D. Spacing Schedule: Hanger spacing shall be per the following tables. For alternate materials and sizes not listed herein, refer to the MCNYS, Section 305

Pipe Size	Steel	Copper	PVC Plastic	Rod Size
½ to 1 in.	8 ft.	6 ft.	3 ft.	3/8 in.
1 ¼ to 2 in.	10 ft.	6 ft.	3 ft.	3/8 in.
2 ½ to 4 in.	12 ft.	10 ft.	4 ft.	1/2 in.
5 and 6 in.	12 ft.	10 ft.	4 ft.	5/8 in.
8 in.	12 ft.	10 ft.	4 ft.	3/4 in.
Over 8 in.	To suit loading conditions			

E. Inserts: Provide high density fiberglass or calcium silicate piping inserts to eliminate compression of pipe insulation system, full length of specified piping shield, by pipe size.

1. Make: "H-Block" by ICA, Inc., TPS / TPSX by SPI, or approved equal.

F. Supports:

1. For weights under 1000 lbs.: "Drill-In" inserts equivalent to Phillips "Red Head," "U-Channel," "Unistrut," beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.

2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs. The factor of safety shall be at least four.

3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.

2.8 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves.

B. Pipe Guides: Cylindrical steel guide sleeve, proper length for travel, integral bottom base anchor; top half removable. Split steel spider to bolt to pipe, copper plated spider for copper pipe. Space between sleeve and spider to allow for insulation where required. Make: Anaconda, Flexonics, Pipe Shields, Keflex, or equal.

C. Anchors: Same material as pipe. Make: Keflex, Flexonics, Pipe Shields, or field constructed.

D. Pipe Roll Stand: Cast iron roll stand. Make: Advanced Thermal Systems, Carpenter and Patterson, ITT Gruvlok, Pipe Shields.

2.9 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces (bearing walls, structural slabs, beams and other structural surfaces) and where called for.

2. Sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18 gauge minimum and braced to prevent collapsing.

B. Pre-Insulated Type:

1. Adjustable or fixed length metal cans, 24 gauge minimum, sized for 1 in. spacing between insulation and can. Insulation shall consist of a 360° waterproofed calcium silicate insert sized to extend 1 in. beyond wall or floor penetration. Calcium silicate insert shall be same thickness as adjoining pipe insulation. Spacing between shield and can packed at each end with double neoprene coated rope positively fastened.

2.10 SEALING ELEMENTS

A. Waterproof Type:

1. Exterior walls, below grade, above floor: Synthetic rubber material with zinc plated bolts.

2. Acceptable Make: "Link-Seal" Series 200, 300 or 400, Pyropac, Calipco.

2.11 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping passes through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.12 FLEXIBLE "U" EXPANSION LOOPS

A. Copper Piping Systems 2" and Under (Soldered End Connection):

1. Hose and Braid: Bronze.

2. Elbows and Spool: Copper.

3. End Connections: Copper female soldered ends.

4. Minimum Travel: +/- 4"

5. Minimum operating pressure of 150 psi at operating temperature of 250°F.

6. Provide drain connection and support bracket at 180° return bend.

7. Provide guides and anchors in strict compliance with manufacturer's requirements.

8. Design Equipment: Metraflex Model MLS8.

9. Acceptable Makes: Metraflex Model MLS8, Flex Hose "Tri-Flex Loop" Model TFL BSW, Flexicraft Model ML, Kinetics Model EUS.

B. Steel Piping Systems 10" and Under (Threaded, Flanged, Butt Welded End Connections):

1. Hose and Braid: Type 304 stainless steel.

2. Elbows: Sch. 40 carbon steel.

3. End Connections: Sch. 40 carbon steel flanged, butt welded.

4. Travel: ±4".

5. Provide drain connection and support bracket at 180° return bend.

6. Minimum operating pressure of 150 psi at operating temperature of 200°F.

7. Provide guides and anchors in strict compliance with manufacturer's requirements.

8. Design Equipment: Metraflex Model MLT8 (threaded), Model MLF8 (flanged), Model MLW8 (welded).

9. Acceptable Makes: Metraflex Model MLT8 (threaded), Model MLF8 (flanged), Model MLW8 (welded), Flexicraft Model ML, Kinetics Model EUT (threaded), Model EUF (flanged), Model EUW (welded), Flex Hose "Tri-Flex Loop" TFLSMN (threaded), Flex Hose "Tri-Flex Loop" TFLSMP (Flanged)

2.13 PIPING MATERIALS AND SCHEDULE

A. See Exhibit "A," "Schedule of Piping Materials" at end of this Section for (HVAC) piping.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently leak proof piping systems, capable of performing each indicated service without piping failure. Install each run with a minimum of joints and couplings, but with adequate accessible unions and flanges for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, with 1/16" misalignment tolerance.

B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as indicated or described by diagrams, details and notations or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 1.0" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Wherever possible, in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

C. Space pipe supports, arrange reducers, and pitch piping to allow air to be vented to system high points and to allow the system to be drained at the low points, and wherever required to permit complete draining of all lines.

D. Make all changes in size and direction of piping with fittings, except for soft copper tubing, use tubing bender.

E. Install piping to valves, strainers, pumps and other equipment at full line size. Where reduction or increase in size is required, make it with a fitting at the equipment connection.

F. Air Vents: Provide manual air vents at high points in piping system and where indicated on the drawings.

G. Drain Valves: Provide manual drain valves at low points in piping system and where indicated on the drawings.

H. All piping located in chases, soffits or other elements of construction which is not accessible by access doors or ceiling tile removal shall be welded, brazed or soldered. Mechanical coupling are not permitted.

3.2 EQUIPMENT AND SYSTEMS

A. Equipment and systems in accordance with laws, codes, and provisions of each applicable section of these specifications. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring. Arrange piping at equipment with necessary offsets, unions, flanges, valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required for coordination with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Provide trap seal of adequate depth on drain pans.

3.3 WATER SYSTEMS

A. Top connection for upfeed, bottom or side connection for downfeed. Grade off-level; up in direction of flow and down toward drain.

3.4 REFRIGERATION PIPING AND TESTING

A. Refrigerating systems fabricated, assembled, or erected on the premises shall be tested to the applicable requirements of section 9.11 of the 2022 revision of ASHRAE Standard 15. System components that are strength tested prior to field assembly include (but are not limited to), compressors, condensers, precharged linesets, pressure vessels, evaporators, refrigerant bulk storage tanks, safety devices, pressure gages, and control mechanisms.

B. Refrigerant piping and joints installed on the premises shall be exposed for visual inspection and testing prior to being covered or enclosed.

C. Piping System Strength Testing - Refrigerating system components and refrigerant piping shall be tested in accordance with ASME B31.5 or section 9.11 of the 2022 revision of ASHRAE Standard 15. Separate tests for isolated portions of the system are permitted, provided that all required portions are tested at least once.

1. Pressurize with test gas for a minimum of ten (10) minutes to not less than the lower of (a) the lowest design pressure for any system component or (b) the lowest value of set pressure for any pressure relief devices in the system.

2. Remove pressure relief devices and replace with plugs during the strength testing procedures.

3. The design pressures for determination of test pressure shall be the pressure identified on the label nameplate of the condensing unit, compressor, compressor unit, pressure vessel, or other system component with a nameplate. A passing test result shall have no rupture or structural failure of any system component or refrigerant piping.

D. Piping System Leakage Test. The leak test *shall* be in accordance with ASHRAE Standard 147, ASME B31.5, or 5 or section 9.11 of the 2022 revision of ASHRAE Standard 15

1. After the time to complete the strength test, continue to pressure test in accordance with Section 9.13.5 of the 2022 revision of ASHRAE Standard 15 for a minimum period as *specified* in Table 3-5-1.
2. The system *shall* show no loss in pressure on the pressure measuring device during the pressure test. Calculation of the pressure differential based on a change in ambient temperature *shall* be permitted.
3. A vacuum of 0.0097 psi (67 Pa) absolute or lower *shall* be achieved (0.0197. in Hg [32°F]; 500 microns Hg [0°C]; 500 microns). After achieving a vacuum, the system *shall* be isolated from the vacuum pump. The system pressure *shall not* rise above 0.029 psi (200 Pa) absolute (0.059 in. Hg [32°F]; 1500 microns Hg [0°C]; 1500 microns) for a minimum period as *specified* in Table 3-5-1.

Table 3-5-1 Duration of Leak Test

	Pipe Length, *L*		Maximum Nominal Pipe Size		Minimum Period of Test
Leak Test	**ft**	**m**	**NPS, in.**	**DN, mm**	**hours**
Pressure test	$L \leq 100$	$L \leq 30$	NPS ≤ 3/4	DN ≤ 20	0.25
			3/4 < NPS ≤ 3	20 < DN ≤ 75	1.0
			3 < NPS	75 < DN	24
	$100 < L \leq 200$	$30 < L \leq 61$	NPS ≤ 3	DN ≤ 75	1.0
			3 < NPS	75 < DN	24
	$200 < L$	$61 < L$	Any	Any	24
Vacuum test	$L \leq 100$	$L \leq 30$	NPS ≤ 3/4	DN ≤ 20	1.0
			3/4 < NPS ≤ 3	20 < DN ≤ 75	8.0
			3 < NPS	75 < DN	24
	$100 < L \leq 200$	$30 < L \leq 61$	NPS ≤ 3	DN ≤ 75	8.0
			3 < NPS	75 < DN	24
	$200 < L$	$61 < L$	Any	Any	24

E. Contractor Declaration. The installing contractor shall issue a certification of testing to the AHJ verifying strength test and leakage test completion in accordance with the requirements of the 2022 revision of ASHRAE Standard for all systems containing 55 lb (25 kg) or more of refrigerant. The certificate shall give the test date, photograph of the pressure gage at the test pressure, refrigerant designation, test medium, and the field test pressure applied to the high side and the low side of the system. The certification of test shall be signed by the installing contractor and shall be made part of the public record.

3.5 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, vertical expansion bolts or from other piping. Support each pipe with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location. Trapeze hangers are acceptable for racking of multiple pipes of 1-1/2" or less in size. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size as called for, using four nuts per rod. Provide additional rust proofed structural steel members, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible on joists; "C" type not permitted on joists. Provide riser clamps for each riser at each floor.

3.6 PIPE CONNECTIONS

A. Solder Connections: Utilize non-acid flux and clean off excess flux and solder. Flux conforming to ASTM B813 shall be used in conjunction with solder conforming to ASTM B32.

B. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat. "Walseal" fittings may be used; if insufficient alloy is showing, face braze such joints. Filler material shall conform to AWS A5.8

C. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specific for each application. Threads shall conform to ASTM B.1.20.1.

D. Dielectric Pipe Fittings: Provide Ball valve BV-01 (Refer to specification 230523) where dielectric unions would be required at all equipment connections where dissimilar metals meet. Provide reducers and increasers as required of the same material being connected, each side of the valve. In addition, provide dielectric unions in all open type piping systems (condensing water, domestic water, etc.) where dissimilar metals are to be joined.

3.7 WELDING

A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded piping shall be fabricated by certified welder. Contractor shall submit proof of current certification of each welder, if requested by Owner. Use full length pipe where possible; minimum distance between welds shall be 18 in. on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe**.** When welding galvanized pipe, apply cold galvanizing on joint after welding.

3.8 HANGER SHIELDS

A. Pre-insulated type or field-insulated type at Contractor's option.

B. Provide for all chilled water and all "non-direct" connection supports.

3.9 SLEEVES

A. Provide for pipes passing through floors, roofs/decks, walls or ceilings.

B. Pre-insulated type: Required for chilled water and refrigerant piping.

C. Standard type: Provide for piping as noted above. Extend 1/8 in. above finished floor in finished areas. In above grade mechanical rooms and other areas with floor drains; use steel pipe sleeves projecting 2 in. above floor. Sleeves shall be as small as practical, consistent with insulation, to preserve fire rating. Fill abandoned sleeves with concrete. Where necessary for pipes to pass through ducts, air chambers or built-up housings and approved by Engineer, provide rubber grommet seals.

D. Roof/deck penetrations: Provide sleeve and deck sealing for watertight installation per detail on Contract Documents.

E. Provide a 0.16 inch thick smooth aluminum jacket over insulated pipes where they pass through sleeves.

3.10 ANCHORS AND GUIDES

A. Provide piping system anchors and guides as shown on the plans, and as recommended by the expansion joint/loop manufacturer. Where an anchor is shown at a change in piping direction, it shall fully control movement in all three axes. In lieu of a single anchor fabricated for two directional pipes, two (2) individual anchors may be provided.

3.11 SLEEVE PACKING

A. Seal void space at sleeves as follows:

B. Interior locations: Firmly pack with fiberglass and caulk.

C. Exterior walls and below grade cored holes: Use sealing element.

D. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.

E. Vapor Barriers – provide continuity of vapor barriers through sleeves.

F. Waterproofed floors: Use waterproof sealing element, device, or compound.

3.12 ESCUTCHEON PLATES

A. Provide polished chrome escutcheon plates for exposed piping passing through floors, walls or ceilings, except in Boiler, Fan and Mechanical Rooms.

3.13 CLEANING HOT AND CHILLED WATER SYSTEMS

A. Provide temporary bypasses and/or pumps and pump connections as required to circulate the new piping system or segment without cross contamination of other existing or already cleaned systems.

B. Provide circulating pumps with “startup” fine mesh (1/8” or less) strainer screens during cleaning process.

C. After each closed system has been tested and thoroughly flushed, introduce Sodium Carbonate (one lb. for each 30 gallons).

D. Provide chemical feed tank similar to Calgon #20 Micromet and connect across pump outlet valve, or as called for, with three-valve bypass. Provide temporary meter or other means of determining amount of water in system.

E. Operate pumps and arrange control system so that all control valves are open. Fill, vent and circulate system with this solution, while raising to design temperature.

F. Remove, clean and/or replace air vents, strainers, and check valves, which do not function properly.

G. After cleaning strainers, circulate for additional time, then clean strainers again; repeat until strainers are found clean and system runs visibly clear without any signs of sediment. Drain and refill system.

H. Notify Owner’s Representative before starting Work. Pumps shall not be operated continuously until system is flushed and strainers cleaned.

I. Water Treatment:

1. After system cleaning, furnish report of water test to determine quality.

2. Provide complete water treatment facilities to Owner, including water analysis, feed equipment, metering equipment, pumps, and chemical, obtained from Calgon, Vulcan, Bird Archer, Heating Economy Service, Inc., Mogul, Garratt-Callahan Company, Metropolitan, or Allen-Murray.

3. Recommendations for water treatment shall be reviewed by Owner's Representative before systems are placed into service.

4. Add water treatment as necessary to prevent deterioration of piping system and equipment due to oxygen, acid, scaling.

5. Water treatment shall be deemed complete when circulation has been established throughout, and water runs clear and clean from deposits and discoloration. Submit typewritten letter to inform Owner's Representative upon completion of the Work.

3.14 TESTS

A. Test piping and accessories before insulation, connecting to existing piping, and concealment. Repeat as many times as necessary to prove tight system. Notify Owner's Representative at least seven days in advance of each test. Isolate valves and equipment not capable of withstanding test pressures. Make leaks tight; no caulking permitted. Remove and replace defective fittings, pipe or connections. Furnish necessary pumps, gauges, equipment, piping, valving, power and labor for testing. Certify that test have been successfully completed.

B. Schedule of Test Requirements:

1. Hot, chilled, and domestic water: Hydrostatic, 100 psig at high point of system; two hours duration.

2. Vent, drain, overflow and condensate drain: Hydrostatic, maintain 10 feet head of water above highest point of section being tested for six hours.

3. Refrigeration: Refer to section for Refrigerant Piping and Testing.

4. Tests: No change in pressure under stable temperature conditions.

5. Equipment: Test at working pressures.

3.15 PIPE LINE SIZING

A. Pipe sizes called for shall be maintained. Pipe size changes shall be made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT 'A' – PIPING MATERIALS (HVAC)

Notes are at the end of Exhibit 'A'

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Hot water heating	Schedule 40, black steel	Malleable iron and butt weld	2 in. and smaller screwed 2-1/2 in. and larger welded SEE NOTE 1
Hot water heating (Optional)	Type L copper	Wrought copper or cast bronze, solder end	2 in. and smaller: No-lead solder
Chilled water	Schedule 40, black steel	Butt weld and malleable iron	2-1/2 in. and larger welded or flanged 2 in. and smaller screwed SEE NOTE 1
Chilled water (Optional)	Type L copper	Wrought copper or cast bronze solder end	2 in. and smaller: No-lead solder

Refrigerant	Type L refrigerant grade hard temper, deoxidized copper	Wrought copper, solder end	Sil-Flo "5" silver brazing
Refrigerant (optional)	ACR Copper	Wrought copper, solder end	Sil-Flo "5" silver brazing
Vent, Drain, Overflow, Coil Condensate Coil condensate drain (optional)	Schedule 40, galvanized steel or Type M copper	Malleable iron drainage type or wrought copper	Threaded or solder Socket weld cement
Domestic water	Type L copper	Solder end	2 in. and smaller: No-lead solder

NOTES FOR EXHIBIT "A":

NOTE 1: Screwed piping permitted in Crawl Spaces, Mechanical Rooms and Boiler Rooms.

END OF SECTION 232000

SECTION 232023 - PUMPS

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required, for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Shop drawings and performance curves, on pumps and pump accessories. Clearly indicate which equipment is being submitted.

2.0 PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Pumps shall be non-overloading over their entire performance range with motors capable of running continuously without undue noise, heating, or sparking. Impellers statically and dynamically balanced. Mechanical seals for closed systems, shall be constructed of carbon rings with ceramic mating seat up to 220°F. Packing type seals for open systems only. Materials suitable for water pressures, temperature and conditions for each application. Tapped discharges and suction connections for gauges, vent and drain. With trimmed impeller if required to meet initial delivery requirements. Factory service engineer or machinist must check each pump alignment before pump is started. Include the cost of checking and start-up in pump quotation.

2.2 BASE MOUNTED, END SUCTION TYPE

A. Designed for continuous operation between 40° and 225°F. Single stage, end suction, stainless steel fitted, with cast iron volute for service to 175 psi wp. Enclosed, stainless steel impeller mounted on a hardened, solid alloy steel shaft with regreasible ball bearings.

B. Pump shall be direct connected to the drive motor by means of a rubber insert, flexible coupling with guard.

C. Pump and motor shall be mounted on a groutable structural steel main-frame with welded cross members.

D. Design equipment: B&G e-1510

E. Acceptable Make: Armstrong, Bell & Gossett, Taco.

2.3 AUTOMATIC CONDENSATE REMOVAL PUMPS

A. Oil resistant tank and quarter turn check valve. External overflow safety switch and test/run lever. External tank anti-sweat sleeve. 6” plug in power cord. Thermal overload protection.

B. Product shall be provided with 2-year warranty.

C. Design Equipment: Little Giant VCMX-20

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Adjust flow rate (gpm) of each pump to capacity called for on schedule, re-adjust during balancing. Install in-line pumps in locations shown, supported independently of piping, using hangers on both pump flanges.

B. Level base so that pump and pump casing are not strained. Align pumps as directed by the manufacturer. After pumps have been aligned, install dowels to prevent shifting. Fill base with concrete through grouting holes provided in baseplate. Contractor responsible for accurate size of base and exact location of mounting bolts. Contractor responsible for trouble resulting from poor pump alignment. Provide concrete base pad for each base mounted pump.

C. Base mounted end suction pumps shall be provided with inlet suction diffusers. Pipe suction diffuser blow-off (full line size with ball valve) to nearest floor drain. Provide start-up strainers for first 48 hours of operation. Replace after completion of start-up period. Base mounted, double suction type pumps shall have piping arranged so that there is a minimum of eight pipe diameters of straight pipe at the pump suction connections. Where this cannot be maintained due to field conditions, the Contractor shall notify the Engineer immediately, before beginning piping work. Provide inertia bases as called for, determine exact height of bases required for base mounted elbows; shim to match mounting height of base elbow with inlet and outlet of pump. Provide vibration absorber between pump outlet and inlet and base-mounted elbow.

END OF SECTION 232023

SECTION 232133 - WATER SYSTEMS SPECIALTIES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit shop drawings on all water system specialties.

1.4 GENERAL REQUIREMENTS

A. Equipment and accessories shall be rated for a minimum of 125 psi wwp, and 250^{o}F temperatures. Manufacturer's written installation procedures shall become a part of these specifications.

B. Provide equipment, piping, valves, fittings, switches, and miscellaneous equipment necessary and required for the complete installation.

2.0 PART 2 – PRODUCTS

2.1 HEAT EXCHANGERS

A. Plate and Frame Type:

1. Frame and Pressure Plates: Carbon Steel SA 516 grade 70

2. Thermal Plates: Minimum Thickness 0.02 in., Type 316 Stainless Steel ASTM A240.

3. Connections: Type 316L Stainless Steel ASTM A240.

4. Standard Design: Minimum design pressure 150.0 psi and minimum design temperature 300.0 °F.

5. Gasket Material: EPDM-HT, Nitrile.

6. Carry and Guide Bars: Stainless steel.

7. Fasteners: Cadmium plated bolts and nuts ASTM ASA194 grade B7 and ASTM SA194 grade 2H.

8. Connections: Provide carbon steel or stainless steel threaded or flanged connections.

9. Splash Guard: Provide aluminum splash shield on sides and top of heat exchanger.

10. Finish: Carbon steel components, excluding threaded hardware, shall be provided with epoxy coating, minimum 4 mils dry film thickness.

11. Insulation Jacket: Provide custom fabricated thermal blanket insulation jacket per Specification Section 230700, 2.12.

12. ASME Section VIII, Div. 1 with U stamp.

13. Design Equipment: Bell & Gossett Model GPX.

14. Makes: Bell & Gossett, Armstrong, Sondex, Alfa Laval.

2.2 EXPANSION TANK AND ACCESSORIES

A. Shell and Head: Carbon Steel, welded construction.

B. Design Pressure and Temperature: 125 psi at 240°F.

C. Bladder: Replaceable heavy-duty butyl rubber.

D. ASME Section VIII, Div. 1 with U Stamp.

E. Finish: Red oxide prime coat; factory applied.

F. The tank shall be capable of full acceptance of the tank volume when tank is void of air.

G. Provide lifting rings and supports for floor mounting.

H. Design Equipment: Bell & Gossett Series B.

I. Make: Armstrong, Bell & Gossett, Wessels Company, John Wood Company.

2.3 CHILLED WATER BUFFER TANK

A. Shell and Head: Carbon Steel, welded construction (flanged or threaded connections). Grooved if allowed in Specification Section 232000.

B. Design Pressure and Temperature: 125 psi at 450°F.

C. Provide internal baffle to eliminate stratification of fluid within tank.

D. Provide drain connection at bottom of tank and air bleed connection at top of tank.

E. ASME Section VIII, Div. 1 with U stamp.

F. Finish: Red oxide prime coat; factory applied.

G. Provide lifting rings and supports for floor mounting.

H. Design Equipment: Wessels CBT

I. Make: Wessels Series CBT, Amtrol Series CWBT, John Wood Company Series JBTR, Lockinvar CVL.

2.4 AIR REMOVAL ASSEMBLY

A. Centrifugal type air separator.

B. Shell and Head: Carbon Steel, welded construction (flanged or threaded connections). Grooved if allowed in Specification Section 232000.

C. Design Pressure and Temperature: 125 psi at 350°F.

D. Stainer: Removable Type 304 stainless steel with maximum 3/16”” perforations and 51% free open area.

E. Designed to collect air to an air removal fitting at the top of the separator.

F. Provide bottom blowdown connection to facilitate routine cleaning.

G. ASME Section VIII, Div. 1 with U stamp.

H. Size: Minimum full size of system piping but shall be oversized for a maximum pressure drop 4.0 ft.

I. Design Equipment: Bell & Gossett Rolairtrol

J. Make: Armstrong, Bell & Gossett, Wessels Company, John Wood Company.

2.5 MAKE-UP WATER VALVE

A. Body and Accessories: Lead free brass with built-in strainer and anti-siphon check valve.

B. Connection. Female ¾” threaded.

C. Design: Bell & Gossett No.7

D. Make: Bell & Gossett or equal.

2.6 SUCTION DIFFUSER

A. Body and Strainer Cover: Angle pattern type, cast iron ASTM A126, Class B.

B. Connection Type: Flanged. Grooved if allowed in Specification Section 232000.

C. Inlet Vanes: Stainless steel.

D. Design Pressure and Temperature: 175 psi at 250°F.

E. Unit shall be provided with integrated flow cone, combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. Orifice cylinder shall have a free area five times the cross-sectional area of the pump suction opening.

F. Unit shall be provided with blowdown connection with full size ball valve with hose connection.

G. Provide disposable bronze16 mesh start-up strainer.

H. Unit shall be provided with adjustable support to carry weight of suction piping and piping accessories.

I. Maximum pressure drop of 3.0 ft. or less.

J. Design Equipment: Bell & Gossett "Suction Diffuser Plus".

K. Make: Armstrong, Bell & Gossett.

2.7 STRAINERS – HVAC WATER AND GLYCOL SYSTEMS (NON-POTABLE WATER SYSTEMS):

A. Wye Type Strainer:

1. Bronze 2" and Under (Threaded End or Soldered Connections):

a. Strainer shall be suitable for 150 psi @ 350°F WOG (threaded ASTM B16.15) and 150 psi @ 350 °F WOG (soldered ASTM B16.18).

b. Body: Lead free bronze (NSF/ANSI 372, ASTM B584, C87800, C89833).

c. Cap and Plug: Lead free bronze (NSF/ANSI 372, ASTM B584, C87800, C89833).

d. Screen: Type 304 or 316 stainless steel, 20 mesh.

e. Gasket: Metal filled graphite, PTFE, or copper.

f. Threaded blowdown connection.

g. Makes: Mueller Model LF351 (threaded) or Model LF358 (soldered); Keckley Style F7 (threaded) or Style E7 (soldered); Apollo 59LF-000 series (threaded) or 59LF-300 series (soldered).

2. Cast Steel 2 ½" and Larger (Flanged End Connection):

a. Strainer shall be suitable for Class 150, 285 psi @ 100°F WOG (2½" to 12") and 150 psi @ 150 °F WOG (14" and larger) or Class 300, 500 psi @ 150°F WOG (2½" to 12") and 300 psi @ 150 °F WOG (14" and larger).

b. Body and Cover: Lead free cast steel (NSF/ANSI 372, ASTM A216, Grade WCB).

c. Screen: Type 304 stainless steel, 0.062 perforation (2½" to 4") and 0.125 perforations (5" and larger").

d. Gasket: Spiral wound Type 304 stainless steel with graphite filler.

e. Threaded blowdown connection.

f. Makes: Mueller Model 781 (Class 150) or Model 782 (Class 300), Keckley Style SA-7 (Class 150 and Class 300).

2.8 MULTI-PURPOSE VALVE

A. To serve as system balancing device, shutoff valve and soft seat non-slam check valve constructed with linear contoured disc and calibrated adjustment feature. Designed for installation in vertical position.

B. Body: Angle or straight pattern type, cast iron ASTM A126, Class B with bronze seat.

C. Connection Type: Flanged. Grooved if allowed in Specification Section 232000.

D. Disc: Brass with EPDM seat insert (2" – 8" in size) and stainless steel with brass bushing and EPDM insert (10" and 12" in size).

E. Stem and Spring: Stainless steel.

F. Packing: Teflon-Graphite.

G. Readout Valve: Brass with EPT insert, check valve and gasket.

H. Design Pressure and Temperature: 175 psi at 250°F.

I. Maximum pressure drop of 5.0 ft. or less.

J. Design Equipment: Bell & Gossett Model 3DS (straight pattern) or 3D (angle pattern).

K. Make: Armstrong, Bell & Gossett.

2.9 AUTOMATIC AIR VENTS

A. High Capacity Automatic Air Vent:

1. Float type design to remove contained air or non-condensible gases from liquid piping systems with ¾" threaded connections.

2. Body: Cast iron ASTM A126, Class B.

3. Trim: Stainless steel.

4. Valve and valve Seat: Stainless steel and EPDM.

5. Design Pressure and Temperature: 150 psi at 250°F.

6. Make: Sarco Model 13WS, Bell & Gossett Model 107A, Armstrong Model 1-AV.

B. General Purpose Automatic Air Vent:

1. Float type design to remove contained air or non-condensible gases from liquid piping systems with ¾" threaded connections.

2. Body: Brass.

3. Trim: Stainless steel.

4. Valve and Valve Seat: Stainless steel and EPDM.

5. Design Pressure and Temperature: 150 psi at 240°F.

6. Make: Bell & Gossett Model 87, Taco Model 409 or approved equal.

2.10 BYPASS CHEMICAL FEEDER

A. Cast iron quarter turn closure with Buna-N O-ring. Body shall be carbon steel. Designed for temperatures up to 200°F and pressures up to 200 PSI. Fill capacity shall be greater than 5 gallons.

B. Design Equipment: Calgon #20 Micromet

C. Makes: Calgon, JL Wingert Co. or approved equal.

2.11 PUMP AND COIL FLEXIBLE CONNECTORS

A. Bronze Braid and Hose 2" and Under (Soldered End Connection):

1. Hose and Braid Bands: Bronze.

2. End Connections: Copper female soldered ends.

3. Minimum operating pressure of 150 psi at operating temperature of 200°F.

4. Design Equipment: Metraflex Model BBSC.

5. Makes: Metraflex, Mason Industries, Inc., Flex-Hose Co. Inc.

B. Stainless Steel Braid and Hose 2" and Under (Threaded) and 2½ and Larger (Flanged and Grooved Connections):

1. Hose and Braid Bands: Series 300 stainless-steel.

2. End Connections: Carbon steel Class 150 flanged, Sch. 40 carbon steel male threaded or Sch. 40 carbon steel grooved.

3. Minimum operating pressure of 125 psi at operating temperature of 200°F.

4. Design Equipment: Metraflex Model MLPC and RMF (flange to flange), Model GFC (flange to groove), Model GGC (groove to groove), Metraflex Model SSTC (male thread to male thread).

5. Makes: Metraflex, Mason Industries, Inc., Flex-Hose Co. Inc.

2.12 PRESSURE RELIEF VALVE

A. Bronze ¾" to 2" (Threaded End Connection) for Heating Hot Water, Chilled Water and Heating Glycol or Cooling Glycol Systems:

1. ASME Section IV capacity certified for protection of heating hot water systems, pre-set minimum pressure range from 30 psi to 125 psi at 250°F.

2. Body and Cap: Bronze ASTM B584, or cast-iron ASTM A126, Class A/B.

3. Spring: Stainless Steel ASTM A313-631.

4. Seat: Bronze ASTM B584 alloy 84400.

5. Corrosion resistant construction.

6. .High Capacity. Sized to relieve full heating capacity of system protecting. Provide multiple valves as required to meet capacity requirements.

7. Makes: Kunkle Model 537, McDonnel Miller Series 250, Watts Series 174A, Apollo Model RVW60.

2.13 GLYCOL MAKE-UP UNIT

A. Packaged, simplex, automatic glycol solution make up unit. The package shall consist of a steel frame/base, polyethylene reservoir with removable lid, visible solution level scale in gallons and liters, y-strainer, isolation valve(s), pump(s), open drip-proof motor(s), pump isolation, check and balance valve(s), expansion tank, discharge pressure gage, motor contactor and control circuit in a NEMA 4 panel with a single point power connection, and necessary interconnecting piping.

B. System shall require a 3/4" NPT system piping connection.

C. Interconnecting piping shall be steel pipe and fittings.

D. System shall require a 115/1/60 single power connection.

E. Pump shall start based on falling pressure. Glycol make-up unit shall provide 5 GPM and maintain a fill pressure of 60 PSI. Pressure switch furnished by manufacturer for field installation.

F. Package shall be UL listed.

H. Unit shall include low level cutout with indicator light and contact for alarm indication, to stop the pump during low level condition and notify personnel either via local alarm and interface to the BMS. Provide protective skirt.

I. Provide application specific pressure reducing valve with packaged glycol make-up system for installation between glycol make-up unit and connection to the system piping.

J. Design Equipment: Wessels GMP-15050

K. Make: Armstrong, Bell & Gossett, Taco, Wessels.

2.14 COIL PIPING PACKAGES ("TERMINATION KITS")

A. General

1. Combines various functions, such as coil isolation, dirt protection strainer, union connections, etc., as shown in project coil termination details into a single packaged device(s).

2. Where any specific components are not addressed within this paragraph, they shall comply with related requirements within this Section or Division 23 of the project manual.

3. Where balance valves are incorporated into the piping packages, a separate isolation valve shall be provided. Balance valves shall not be used for isolation duty.

4. Permitted for use on coils with connection sizes from ½" through 2 ½".

5. ASTM B283, B36 Brass body, rated for minimum of 250psig at 200 deg F.

6. Ball valves shall match ball valve construction in specification 230523.

7. Strainers shall match construction in specification section 2.7.

8. Hose Kits shall match construction in specification section 2.5.

9. Balance Valves – Manual Type

a. May be provided as part of the termination kit and shall match balance valve specification information in 230523, or provided separately as specified within section 230523.

B. Basis of Design: Griswold Speedset CPP

C. Make: Nexus, Griswold, Bell and Gossett

3.0 PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Obtain detailed instructions from each manufacturer for proper method of installation.

B. Equipment and systems shall be installed in accordance with manufacturer's installation requirements.

3.2 EXPANSION TANKS

A. For compression tanks pitch connection to heating system 1" in 5 ft. minimum up toward tank. Provide shutoff valve in piping connection to system and 3/4" hose end drain valve on tank. Provide supporting steelwork, hangers, and suspension racks. Provide water make-up connection, site glass, petcocks and tank fitting.

B. For expansion tanks, provide housekeeping pad with length and width greater than 1.2 times the maximum diameter of the tank for floor mounted tanks. Provide supporting steelwork, hangers, and suspension racks for wall or ceiling hung expansion tanks. Provide pitch connection to heating system 1" in 5 ft. minimum up toward system. Provide automatic air vent at high point. Provide shutoff valve in piping connection to system and 3/4" hose end drain valve on tank. Provide water make-up connection to air separator or system piping before pump suction. Air separator or air/dirt separator shall have automatic high capacity air vent.

3.3 CHILLED WATER BUFFER TANK

A. Provide housekeeping pad with length and width greater than 1.2 times the maximum diameter of the tank. Provide bypass piping to isolate tank full size of system piping. Provide isolation valves on inlet tank connection, outlet tank connection and bypass piping. Provide drain valve at tank full size of drain connection. Pipe drain valve to floor drain. Provide full size manual air vent valve at tank air vent connection.

3.4 SYSTEM FILLING

A. After cleaning, fill each system from low point:

1. With pumps off, vent mains, risers, runouts, and units, working consecutively from low to high point in building. Obtain approximately 2 psi at highest point. Obtain proper air cushion in compression tanks.
2. Fill system with a 35% mixture (by weight) of propylene glycol and water. Propylene glycol, Dow Chemical "Dowfrost HD".

3.5 AIR VENTING

A. Provide one of the following vents at points in piping system where air may collect.

1. Manual vent assembly consisting of: 1-1/4" x 6" air collection chamber, 1/2" ball valve in accessible location, install hose connection on valve outlet.

2. Automatic vent with air chamber. Automatic air vents are only allowed in mechanical spaces.

B. Air vents located within the chiller mechanical room shall be routed to the glycol make-up unit.

C. Equipment Vents:

1. When equipment is above mains: Connect runouts or risers to upper quadrant or top of mains. Install vent assembly concealed within enclosure, consisting of 1" diameter by 4" to 6" long air collection chamber with 1/4" soft copper tube to manual valve. Mount securely near bottom of enclosure, but not fastened to enclosure. For individual units such as, radiators, fan convectors and units with return grilles: Provide screwdriver operated manual valve, operated from discharge grille or access door. Drill enclosure and position valve for operating without removing enclosure.

2. When equipment is below mains: Connect piping runouts or risers to bottom or lower quadrant of mains. Vent assembly not required in unit. Provide means of purging and draining each unit if required. Use tees instead of ells at low point of runouts.

3.6 AIR REMOVAL ASSEMBLY

A. Provide supports and provide blowdown with hose end drain valve full size of opening.

B. When utilizing bladder type expansion tanks, provide automatic high capacity air vent valve. Air vents shall be piped, full size, 12" above finish floor. For glycol systems, the vent shall be piped, full size of equipment connection, to the glycol make-up unit.

3.7 MAKE-UP WATER VALVES

A. Provide for each system, with 3/4 in. ball valve, bypass connection and isolation ball valve at inlet and outlet of make-up valve and check valve downstream of bypass valve. Set valves to provide 2 psi at high point of system. Provide pressure gauge assembly.

3.8 STRAINERS

A. Provide where called for. Provide blowdown connection for strainers with valves. Provide valve type as specified in Specification Section 230523. All blowdown valves shall be provided with cap or plug. Open ended valves are not allowed.

3.9 SUCTION DIFFUSERS

A. Provide at inlet to base mounted pump.

B. Pipe suction diffuser blowdown connection (full line size with ball valve) to nearest floor drain.

C. Provide support under suction diffuser. Suction diffuser shall not be supported by the pump casing. If inertia base is provided to support pump, suction diffuser support shall be supported off inertia base.

3.10 PUMP AND COIL FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in accordance with manufacturer's installation requirements.

B. Where pump discharge or suction size is smaller than system pipe size, provide concentric type reducing flexible connector.

C. Install flexible connectors within manufacturer's parallel offset tolerances. Flexible connectors shall not be subjected to the weight of equipment or piping causing deformation of connector.

3.11 PRESSURE RELIEF VALVES

A. Heating Hot Water, Chilled Water: Pipe discharge, full size of valve outlet connection, to floor drain and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

B. Heating Glycol or Cooling Glycol Systems: Pipe discharge, full size of valve outlet connection, to glycol make-up unit tank and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

C. Heat Exchangers: Provide pressure relief valve on heated fluid discharge side of heat exchanger between heat exchanger and isolation valve. The pressure relief valve shall be sized greater than the maximum capacity output of heat exchanger, and not to exceed the maximum working pressure of the heat exchanger or connected piping system, whichever is lower. Pipe discharge, full size of the valve outlet connection, to floor drain and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

END OF SECTION 232133

SECTION 233000 - SHEETMETAL AND DUCTWORK ACCESSORIES

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 QUALITY ASSURANCE

A. Ductwork shall be fabricated and installed in compliance with latest edition of the following standards:

1. SMACNA Duct Construction Standards - Metal and Flexible Ductwork.

2. SMACNA Duct Liner Application Standard.

3. NFPA Standards, Bulletin 90A, 96, 101.

4. 2020 New York State Mechanical Code

5. Plans and Specifications which exceed the requirements in any of the referenced standards.

B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of Work.

C. All ductwork shall be maintained to the following cleanliness standards throughout the project:

1. All ductwork is to be shipped to the job site with ends covered in plastic or capped, and fully shrink or poly sheet plastic wrapped. On arrival to the project site, all ductwork shall be manually inspected and anywhere protective plastic or caps that have been damaged shall be cleaned inside and out and re-wrapped prior to storage.

2. Ductwork protective coverings shall be removed only immediately prior to installation.

3. All adhesive labels or part identification markings shall be on the exterior of the ductwork only.

4. Ductwork shall be stored in an area specifically maintained for that purpose which shall remain clean, dry and have minimum exposure to dust.

5. All open ends are to be maintained covered through the progress of construction with self-adhesive poly sheeting.

6. Duct contaminated due to failure to maintain these standards shall be cleaned to the satisfaction of the Owner and Engineer at the cost of this contractor.

1.3 SUBMITTALS

A. Provide a complete shop standard construction manual including construction details for all shop fabricated materials, fittings, and accessories.

B. Provide coordinated sheetmetal shop drawings. Refer to DUCTWORK SHOP DRAWINGS in this specification section for further requirements.

C. Ductwork detail drawings.

D. Exhaust and kitchen hood details.

1.4 DUCTWORK CLASSIFICATION

A. Duct systems are classified and constructed per the SMACNA pressure classification as follows:

1. All ductwork shall be constructed for a minimum pressure class of 2 in. w.g. unless stated otherwise.

2. Supply duct upstream of air terminal units (supply or return) shall be constructed for a minimum pressure class of 3 in. w.g.

3. Exhaust duct between exhaust air valves and exhaust fans shall be constructed for a minimum of 3 in. w.g.

4. Pressure classes above 3 in. w.g. as called for.

1.5 DUCTWORK SHOP DRAWINGS

A. Prepare minimum 1/4 in. scale drawings:

1. Constructed from actual field inspections and measurements so as to assure a complete job.

2. Incorporating dimensions of actual equipment proposed for use on the project.

3. Showing adequate sections, elevations, and plan views and indicating the bottom of ductwork elevations from the finished floor.

4. Indicating all volume dampers, damper access doors, air balance test plugs, and other accessories required for a complete project.

B. Immediately call to the attention of the Engineers any major deviations from the Contract Drawings which must be made. All deviations shall be documented in writing.

C. Submit roof, wall and floor opening dimensions and locations shown on shop drawings.

D. Submit prints to each Contractor of other trades for review for interferences and coordination with their work.

E. Refer to 230010.3.2 for further information related to Sheet Metal Shop and Coordination Drawings

2.0 PART 2 – PRODUCTS

2.1 DUCTWORK MATERIALS

A. Unless otherwise called for, provide materials in accordance with Exhibit I.

2.2 SQUARE AND RECTANGULAR DUCTWORK

A. Transverse and longitudinal duct seams reinforcement shall conform to appropriate tables and figures per SMACNA Pressure Classification for duct construction.

1. “Ductmate" or "Nexus" 4-bolt corner connection systems may be used in lieu of standard construction. Provide all corner brackets, corner bolts, transverse clips, and seals between flange to flange connections

B. Corner closures shall be required as described and illustrated by SMACNA Duct Construction Standards.

C. Throat radius on all elbows shall not be less than dimension of duct in plane of radius. Where this cannot be maintained, use shorter radius with internal guide / splitter vanes per SMACNA guidelines, or square elbow with turning vanes.

D. Bracing and hanging of ductwork shall be per SMACNA Standards for size and pressure class of ductwork being used.

E. Any transformations shall not reduce the ductwork cross-sectional area. Maximum angle in straight duct, 20^{o} for diverging flow and 30^{o} for contraction flow. Transformation from square to round or flat oval seams welded or brazed.

F. Provide 45 degree shoe-taps or 45 degree laterals for square and rectangular branch ductwork. Unless noted otherwise or shown on the contract drawings, 90 degree straight taps or “A” collars are prohibited.

2.3 ROUND AND FLAT-OVAL DUCTWORK

A. Round Ductwork:

1. Manufactured of galvanized steel ASTM A527, gauges per SMACNA Duct Construction Standards, spiral lock-seam or longitudinal fusion-welded, as called for in Exhibit I.

2. All spiral duct shall have locked seams so made as to eliminate leakage under pressure for which this system has been designed.

3. No longitudinal seam duct (“stovepipe”) will be allowed.

4. Round ductwork fittings:

   a. All fittings fabricated Per SMACNA Standards for round and flat-oval ductwork.

   b. Fittings shall have continuous, welded seams.

   c. 90° tees shall be conical type. 90° tees and 45° laterals up to and including 12 in. diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of any restrictions.

   d. Round taps off the bottom of rectangular ducts down to diffusers shall be made with a 45° square to round shoe-tap.

   e. Spin-in, dovetail, and adjustable take-offs are prohibited unless noted otherwise.

5. Elbows:

   a. Diameters 3" through 12": Two-section stamped and continuously welded elbows.

   b. Over 12": Gored construction with seams continuous welded. Less than 35° - two gores, 36° to 71° - three gores, over 71° - five gores.

   c. Fabricated to a centerline radius of 1.5 times the cross-section diameter.

   d. Adjustable elbows, minimum 26 gauge, maybe used for round duct up to 12" diameter in Velocity-Pressure Classes 2" w.g. and below. Secure and seal adjustable joints air tight after installation.

6. Joints:

   a. Pipe-to-pipe joints in diameters up to 60" shall be by the use of sleeve couplings, reinforced by rolled beads.

   b. Insertion length of sleeve coupling and fitting collar shall be 2" up to 36" diameter and 4" above 36" diameter.

   c. Provide intermediate reinforcing angle rings per SMACNA requirements for pressure class indicated.

   d. Round metallic ducts shall be fastened by a minimum of three sheet metal screws or rivets spaced equally around the joint. Provide sufficient fasteners that duct sections are securely fastened. This requirement does not apply to round duct used for dryer vent.

   e. Clothes dryer exhaust shall be provided in compliance with Section 504 of the MCNYS.

B. Flat-Oval Ductwork:

1. Manufactured of galvanized steel ASTM A527. Within the available sizes, flat-oval duct shall all be spiral wound type ductwork. Gauges per SMACNA Duct Construction Standards.

2. Flat-oval duct shall be adequately reinforced by the installing Contractor to limit the amplitude of wall vibration to ± .008" and the maximum wall deflection to 1/4".

3. Elbows:

a. Gored construction with seams continuously welded. Less than 35° - two gores, 36° to 71° - three gores, over 71° - five gores.

b. Fabricated to a centerline radius of 1.5 times the cross section diameter.

4. Joints:

a. Pipe-to-pipe joints in oval ducts up to 42" the major axis shall be made using sleeve couplings, reinforced by rolled beads.

b. Pipe-to-fitting joints in oval ducts up to 42" major axis shall be made using slip-fit of projecting collar fitting into the pipe.

c. The insertion length of sleeve coupling and fitting collar shall be 2" up to 42" major axis, and 4" above 42" major axis.

d. Pipe-to-pipe and pipe-to-fitting connections for ducts above 42" major axis shall be made by angle ring flanges. Flanges on ducts shall be 1-1/2" x 1-1/2" x 3/16" up to 25" minor axis and 2" x 2" x 3/16" above 25" minor axis.

e. If longitudinal seam duct greater than 42" major axis is supplied in lengths greater than 4 ft., one angle ring must be welded to duct on 4 ft. centers. Welding can be an intermittent weld of 1". in 12".

f. Bolt hole spacing for angle rings shall be 6 in. center.

5. Flat-Oval fittings:

a. Matching flat-oval fittings shall be manufactured from galvanized steel with continuous -welded seams per SMACNA Duct Construction Standards.

b. 90° tees, shoe taps and laterals shall be conical type.

C. Make: Semco, United Sheet Metal.

2.4 DUCTWORK SEALING

A. Ductwork sealing shall comply with paragraphs 403.11 of the ECCCNYS.

B. SMACNA duct sealing classification shall be used for duct systems using the following criteria:

1. Seal Class A, shall include transverse and longitudinal joints and duct wall penetrations, grommets at damper shafts for all ductwork to be provided.

C. Approved ductwork sealing materials shall include the following Hardcast products or approved equivalents when and where applied per manufacturer's recommendations and requirements:

1. Water Based Sealants - Versa-grip 181

D. Tapes and mastics used to seal metallic and flexible air connectors shall comply with UL 181B and be marked 181 B-FX for pressure sensitive tape or 181-B-M for mastic.

2.5 TURNING VANES

A. Standard Type:

1. Provided in square elbows as shown on contract drawings. Vanes for ducts with areas greater than 100 sq. in. shall be "double" type having dimensions and spacing as detailed.

2. Make: Elgen, or contractor fabricated.

2.6 DAMPERS IN DUCTWORK

A. Volume Dampers:

1. Provide single blade type volume dampers where duct sizes in both dimensions are under 12". Constructed per SMACNA standards, one gauge heavier than duct material. For round ducts, Rossi RD series blades securely fastened to 3/8 in. sq., cold rolled steel operator rod and B300/B330 end bushings. For rectangular ducts use Greenheck MBD-10M with 3/8 in. sq., cold rolled steel operator rod. Provide quadrant locking handle on standoff for ductwork to be externally insulated. Wing nut friction screw type are specifically prohibited. Shop fabricated or alternate damper manufacturers meeting these specifications are to be submitted for approval.

2. Provide volume dampers at all air outlets, diffusers, grilles. Dampers to be located at branch takeoff collar or as close as practical. Use of register dampers in return or exhaust inlets shall be strictly limited and approved by the Engineer in advance.

3. Provide multi-blade dampers above 12 in. duct dimension in width or depth. Where multi-blade dampers are required, they shall be equal to Ruskin Model CD35. Provide quadrant locking handle on air volume dampers, wing nut friction screw type are specifically prohibited. Provide quadrant locking handle on standoff for ductwork to be externally insulated.

B. Fire and Smoke Dampers:

1. See "Fire and Smoke Dampers" Section 233316.

C. Automatic Air Dampers:

1. Furnished as part of "Control Systems" Section 230923 installed by this Contractor.

2.7 FLEXIBLE DUCTWORK

A. Shall be constructed in compliance with NFPA Bulletin 90A, and UL Standard 181, Class I Air Duct:

1. Consisting of corrosion resistant galvanized steel helix mechanically locked to fabric. Fabric to be a trilaminate of aluminum foil, fiberglass and aluminized polyester.

2. Factory applied, fiberglass exterior insulation, sheathed in a seamless reinforced exterior vapor barrier jacket. Refer to Specification 230700 Insulation for required R-Value and insulation thickness.

3. Flexible ductwork shall be rated for 20" w.g. positive pressure, 10" w.g. negative pressure thru 12" dia.; 5" w.g. negative pressure, 14-16" dia.; 1" w.g. negative pressure 18"-20" dia., 5500 fpm, operating temperature range -20°F to 250°F.

B. Design Equipment: Flexmaster Type 3B (insulated), Flexmaster Type N1-35 (uninsulated).

C. Make: Clevaflex, Flexmaster, Genflex, Thermaflex.

2.8 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

A. Materials for flexible connections shall be fire retardant, water and mildew resistant, and comply with UL Standard 214:

1. Systems up to 2" w.g. s.p.: approximately 20 oz. of fabric per sq. yd. Ventfabrics, Inc., "Ventfab".

2. Systems greater than 2" w.g. s.p., and watertight systems: Of heavy glass fabric, double neoprene coated, approximately 30 oz. per sq. yd. Ventfabrics Inc., "Ventglas".

3. Flexible connections for grease duct system fans shall be listed and labeled for the application per NYSMC 506.3.2.4

2.9 ACCESS DOORS

A. In Ductwork: Shall be double panel construction, 1" rigid insulation when in insulated ducts; SMACNA construction, hinged type. Double cam type only acceptable where hinged type will not fit and if approved by engineer. Same metal as duct, or factory fabricated. Doors airtight to fit system static pressure, minimum size 16" x 12" or as practical based on the specified location. Refer to section 233316, "Fire and Smoke Dampers", for additional requirements.

B. When installed in intake or exhaust plenums, access doors will be sized to allow for full access to plenum.

C. Where plenums are greater than 4 feet wide or deep, the access door is to be at least 2 ft. wide by 4 ft. tall to allow for personnel entry.

D. Door Hardware:

1. Hinges: Minimum of two per door, at least 1-1/2" long by 1/8" thick, spaced no more than 2 ft. apart and no more than 1/4 of the door size from top to bottom of door. Maximum 4" length, 6 ft. door, for larger doors, length equal to 1/12 door height.

2. Latches: As manufactured by Ventfabrics, Inc. or equivalent. Metal window sash latch not acceptable.

a. Access doors up to 2" w.g.: Ventlok #100/#102.

b. Walk-in doors up to 2" w.g.: Ventlok #260.

c. Access or walk-in above 2" w.g.: Ventlok #310.

E. Make: Air Balance, Ruskin, Ventlok, Elgen.

2.10 ACOUSTIC-THERMAL DUCT LINING IN DUCTWORK

A. Duct Liner (Fiberglass):

1. General: Comply with NFPA Standard 90 and NAIMA Standard AHC-101.

2. Materials: ASTM C 1071, Type I. Acrylic coated glass fiber insulation coated with an anti-microbial EPA registered coating that seals the airstream surface fibers into a smooth, low-friction surface acoustic ductliner shall be of thickness shown in the table. Maximum "K" value to be 0.16 btu/in./sq. ft./degrees F./hr. when tested in accordance to ASTM C518. Absolute roughness per foot not to exceed 0.004 ft. Acoustic duct liner to be suitable for use up to 6000 feet per minute air velocity and temperatures up to 250 degrees F. The acoustic duct liner shall not contribute to the corrosion of steel, copper or aluminum. The liner shall not absorb greater than 0.5% moisture by volume when exposed to air of 120 degrees F., 96% RH. Acoustic duct liner shall provide the minimum sound absorption coefficients shown below when tested per ASTM C423-90 and ASTM E795, Mounting Type A.

OCTAVE BAND FREQUENCIES HZ							
Thickness	125	250	500	1000	2000	4000	NRC
1-1/2 in.	.16	.51	.90	1.05	1.06	1.01	.90
2 in.	.23	.73	1.05	1.13	1.06	1.07	1.00

3. Thickness: Refer to section 230700 for ductwork insulation requirements. Where insulation is provided solely for acoustic purposes, minimum insulation thickness shall be 1 ½ inches.

4. Fire Hazard Classification: Flame spread rating of not more than 25 without evidence of continued progressive combustion and a smoke developed rating of no higher than 50, when tested in accordance with ASTM E84 and UL 723.

5. Liner Adhesive: Comply with NFPA Standard 90A and ASTM C916.

6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer, that do not cause leakage in the duct, and will indefinitely sustain a 50 pound tensile dead load test perpendicular to the duct wall.

7. Fastener Pin Length: As required for thickness of insulation, and without projecting more than 1/8 inch into the airstream.

8. Adhesive for attachment of mechanical fasteners: Comply with the "Fire Hazard Classification" of duct liner system.

9. All ductwork that is lined shall be provided with double wall. Refer to "DOUBLE WALL DUCTWORK".

2.11 DOUBLE WALL DUCTWORK

A. Refer to separate requirements for grease duct systems.

B. Rectangular duct and fittings shall be of Pittsburgh-lock longitudinal seam construction with TDC transverse duct connectors conforming with the latest edition of the SMACNA Duct Construction Standards, Metal and Flexible.

C. Double wall round and flat oval connections shall be performed using slip couplings with sealant and screws up to 36 inch diameter, flanged over 36", joined in a manner meeting all manufacturer's requirements.

D. Duct shall be of a minimum G90 galvanized steel (ASTMA653 and A924), uncoated steel (ASTMA366), stainless steel (ASTMA167 and A480) or aluminum (ASTM B209) as called for.

E. Square throat elbows and tees shall be provided with factory installed double wall turning vanes in accordance with SMACNA recommendations.

F. Insulation shall be fiberglass meeting the values specified within section 230700 unless specifically noted to the contrary on the project drawings.

G. The inner liner shall be perforated to an overall open area of approximately 23 percent. Solid liners shall be provided where noted on the project drawings.

2.12 INSTRUMENT TEST HOLES

A. Suitable for insertion pitot tubes and other test instruments:

B. Fabricated with heavy screw cap and gasket.

C. With sufficient extension to accommodate exterior insulation where required.

D. Make: Ventlok #699.

3.0 PART 3 – EXECUTION

3.1 REQUIREMENTS

A. Equipment and systems shall be installed in accordance with local and state codes and regulations having jurisdiction.

B. Install all ductwork concealed and tight to the structure above unless noted otherwise on shop drawings. Fabricate only after the approval of shop drawings, and in locations to avoid interference. Ductwork installed without approved shop drawings, which requires removal/modification and/or reinstallation due to conflicts or improper installation shall be corrected at no cost to the Owner.

C. Sizes given on contract drawings are inside dimensions. Keep openings closed with protective caps or blanks during construction to prevent entrance of dirt and debris.

D. Extend access openings, damper rods and levers, to outside of external insulation make systems airtight.

E. No piping, conduit or other obstruction to airflow is permitted in ductwork. Where shown on the drawings or permitted through approved shop drawings, provide with airtight streamlined sleeve, soldered or brazed joint between sleeve and ductwork. Increase size of ductwork to maintain proper cross-sectional area.

F. Provide necessary openings, sleeves, hanger inserts, framing, chases, and recesses, not provided by other trades.

G. Exposed exhaust or return registers and grilles shall be flush with face of duct; exposed supply registers and grilles shall be mounted outside airstream with 45^{o} shoe-tap extension collars.

H. Provide sleeves for ducts passing through walls or floors. Use 14 gauge sleeve with framing through structural surfaces; 18 gauge sheet metal for other cases. Set sleeves 4” above finished floor in Mechanical Rooms, seal watertight to floor.

3.2 FLEXIBLE CONNECTIONS

A. Provide flexible connections for the intake and discharge connections of duct connected to fans and air handling equipment:

1. Round connections made with adhesive and metal drawbands with ends tightly bolted.

2. Rectangular connections made with material securely held in grooved seam between flanges, tightly clipped or riveted on 6" centers.

B. Connections made with a minimum of 2" space between duct and equipment collars, installed in line, and with 1" excess material folded so as not to interfere with airflow through connection.

3.3 FLEXIBLE DUCTWORK

A. Install flexible duct systems, including connections and joints, in accordance with manufacturer's installation instructions, ADC Flexible Duct Performance and Installation Standards Chapter 4 "Installation Requirements", and with UL 181, Class 1 Air Duct.

B. Flexible ductwork shall not pass through any wall, floor or ceiling.

C. Duct slide on depth minimum of 2" and secured with ½" stainless steel worm gear clamp or non-metallic band clamp meeting UL 181B-C. Connections to conform with all manufacturer's requirements. Maintain insulation value and vapor barrier without gaps from branch main to diffuser / grille / register connection.

D. For round-to-oval connections, provide round-oval flexible adapter.

E. Maximum length 48", not to penetrate any wall, ceiling or floor.

F. Maximum one 90^{o} angle wide radius bend from ductwork to outlet. Provide molded flexible elbow support secured to structure to support bend radius. Thermaflex flexflow or approved equal. Use of Panduit straps unapproved means of bend support are specifically prohibited. Where a wide radius cannot be maintained, provide hard duct elbow at outlet.

3.4 TURNING VANES

A. Install fixed turning vanes in square elbows of equal dimensions only.

1. Provide turning vanes in compliance with SMACNA duct construction standards figures 2.3 and 2.4

2. Use large size vanes, 2-1/4" spacing when ducts are 20" or wider.

3. Secure vane runners to duct with spot welding, riveting or sheet metal screws.

4. Seal all penetrations for attachment of vane runners.

B. For unequal dimension elbows:

1. Provide Aero Dyne HEP turning vanes and rail assembly or approved equal

2. Turning valves to be installed in compliance with all manufacturer requirements to obtain intended performance.

3. Adjust vanes for angle of attack per manufacturer instructions

4. Seal all penetrations for attachment of vane runners.

C. When installing in ductwork with internal insulation:

1. Install runners in ductwork inside insulation and bolt through insulation and duct sides, welding bolts to insure rigid installation. Provide build-outs for duct Velocity-Pressure classes above 2" w.g.

3.5 INSTRUMENT TEST HOLES

A. Locate in the following locations:

1. Downstream of fan discharge

2. Downstream of fume hood

3. Downstream of exhaust duct

4. Downstream of fan inlet.

3.6 CLEANING DUCTWORK AFTER INSTALLATION

A. Clean rubbish and dirt from system before fans are turned on.

B. Keep openings closed during this construction period.

C. Pay damages resulting from dirt blown on painted or other finished surfaces.

D. Repair or replace damaged fan wheels, dampers, or other system parts damaged as a result of dirt.

E. Clean system as many times as required until the entire system is dirt-free.

3.7 INSTALLATION ROUND AND FLAT-OVAL DUCTWORK

A. Use factory fabricated couplings for joints.

B. After the joint is slipped together, sheet metal screws are placed ½" from the joint bead for mechanical strength.

C. Sealer is applied to the outside of the joint and covering the screw heads.

D. Flanged joints shall be made with neoprene rubber gaskets.

3.8 LEAKAGE TEST OF DUCTWORK

A. Where indicated on the drawings or these specifications, and for ALL duct systems designed to operate at 3" wc or higher, conduct duct leakage tests per SMACNA "HVAC Air Duct Leakage Test Manual", latest edition.

1. Documentation shall be furnished to the Engineer demonstrating that representative sections totaling lot less than 25% of the duct area have been tested and all sections are in compliance with this section.

2. Ductwork shall be shown to have a rate of air leakage (CL) less than 4.0 as determined in accordance with equation 4-8, paragraph C403.11.2.3 of the ECCCNYS

B. Ductwork designated to operate below 3" wc shall be checked and guaranteed to meet standards of SMACNA Seal and Leakage Classifications, seal Class A. Air balancing and testing shall be used to determine satisfactory operation of duct systems.

C. When leakage above stated limits occurs, ascertain location of leaks and repair as required. Repeat tests as required to document allowable leakage rates have been achieved. Prepare a report similar to that suggested by SMACNA and submit for review. Duct testing shall be conducted in the presence of the Owner's Representative.

3.9 DAMPERS AND AIR CONTROL DEVICES

A. Provide dampers necessary to permit proper balancing of air quantities. Comply with code requirements for smoke and fire control. Prevent introduction of uncontrolled outside air into building through roof and wall openings.

B. When dampers are installed in acoustically lined ductwork, install with insulated "build-outs" per SMACNA.

C. Install fire and smoke dampers in accordance with "Fire and Smoke Dampers" Section and applicable codes.

D. Install all dampers furnished as part of "Control Systems" Section.

3.10 ACCESS DOORS

A. Provide as required for maintenance and service access at:

1. Control dampers

2. Damper motors

3. Smoke, fire and combination smoke / fire dampers for inspection and services as required under NFPA 80 and NFPA 105.

4. Smoke detectors

5. Control instruments

6. Fan bearings

7. Both inlet and outlet of terminal heating and/or cooling coils

8. Intake or exhaust plenums

9. Any other equipment requiring periodic inspection or service, complete with angle iron frame.

10. Duct mounted heating/cooling coils

3.11 DUCT SUPPORTS

A. Provide per SMACNA, same material as duct. Hanger bands to extend down sides and turn under bottom 2". Minimum two metal screws per hanger. Steel angle or "unistrut" on larger duct. Spaced per building structural system but not greater than 8 ft or the maximum allowable by SMACNA guidelines. Provide extra support angles as required.

B. Provide supports per manufacturers requirements for factory fabricated duct systems

C. Refer to section 230550 for wind restraint of exterior ductwork systems.

3.12 AIR AND WATERTIGHT METAL WORK

A. Where water or snow may accumulate and ductwork or where odors or corrosive gasses may collect, ductwork and plenums shall be made watertight by soldering, brazing or welding of joints. Grade ducts down toward waste points and/or toward louvers. Provide valve and drain piping from low point to waste point. The following ductwork shall be constructed air and watertight:

1. Intake and exhaust plenums.

2. Dryer exhaust ductwork.

B. Test for water-tightness: Before concealment, apply water by hose to check for leaks, witnessed by Owner's Representative.

C. Where ductwork is sufficiently large to allow personnel access, light testing similar to that required for grease duct may be used in lieu of water hose testing prior to installation of any exterior insulation systems.

3.13 ACOUSTIC-THERMAL DUCT LINING

A. Duct area on project drawings are clear areas. Increase metal duct dimensions to accommodate lining.

B. Adhere lining to interior side of duct; minimum 90% coverage of Benjamin Foster 85-20 fire retardant adhesive, UL approved. Stapling method of attaching will not be permitted. Mechanical fasteners shall not pierce the sheet metal. Installing fasteners with spacing as per SMACNA Standards. Multiple layers of liner to achieve indicated thickness is prohibited.

C. Butting edges of acoustic linings shall be sealed with a fire-resistant neoprene coating, and exposed edges of acoustic linings shall be installed with sheet metal nosing to prevent erosion.

D. Lining shall not impart odor to the air, delaminate or be loosened by the airstream under normal operating conditions. Lining which is damaged during fabrication or shipment shall not be installed.

E. Linings shall be interrupted at the area of operation of a fire damper and at not less than 6 inches upstream and downstream of electric-resistance and fuel burning heaters in duct systems.

F. Metal nosings or sleeves shall be installed over exposed duct liner edges that face the opposite direction of the air flow.

G. Where a duct liner has been interrupted, a duct covering of equal thermal performance shall be installed.

H. Thermal acoustic duct liner shall not be used to line ducts or plenums from the exit of a cooling coil to the downstream end of the drain pan.

3.14 DOUBLE WALL DUCTWORK SYSTEMS

A. Duct dimensions shown on project drawings are clear inside dimensions.

B. All ductwork is to be installed in strict compliance with the Mechanical Code of the State of New York, SMACNA guidelines and manufacturer’s requirements.

C. Where insulation values of the ductwork do not meet the requirements stated in section 230700, exterior ductwork insulation shall be provided to meet those requirements.

E. Insulation values shall be maintained at all transitions between duct systems and types. Insulation ends shall be provided at all locations where internally insulated double wall duct connects to single wall duct or any non-insulated component. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single wall size.

3.15 SMOKE DETECTION

A. Smoke detectors shall be furnished by Division 26 "Electrical". This Contractor shall install detectors located in ductwork. Clearly indicate locations of smoke detectors on the sheet metal shop drawings.

B. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size required with Division 26 "Electrical".

EXHIBIT I - DUCTWORK MATERIALS
(Notes are at the end of Exhibit "I")

SERVICE	MATERIAL	SPECIAL REQUIREMENTS
Supply, return, vent, relief, and exhaust	Lock forming quality, galvanized steel ASTM 525	Joints and features as called for SEE NOTE 1
Laundry equipment exhaust	Type 302 stainless steel Aluminum	Joints welded, flanged and gasketed at connections. Inside surfaces smooth
Accessories, dampers and air turns	Same or better as parent duct	------
Field constructed apparatus casings	Galvanized steel ASTM 525	

NOTES FOR EXHIBIT I:

NOTE 1: Supply ductwork downstream of air terminal units and fan coil units shall be acoustically lined for a minimum of 8 ft.

END OF SECTION 233000

SECTION 233316 - FIRE AND SMOKE DAMPERS

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Documents.

1.2 SUBMITTALS

A. Types, schedule of sizes, locations, and installation arrangements of all dampers.

B. Manufacturers UL listed installation details for each mounting arrangement.

C. Installation certification per paragraph 3.3 of this section.

D. Identification chart for dampers per paragraph 3.4 of this section.

E. Size, location and construction detail of all fire rated access doors.

1.3 QUALIFICATIONS

A. Provide work in accordance with latest requirements of the New York State Building Code, NFPA 90A, NFPA 101 and UL 555 (Seventh Edition), UL 555S (Fifth Edition). Fire dampers shall be Underwriter's Laboratories classified.

B. All Dampers shall be rated for protection at 350°F and shall be Leakage Class I.

C. Smoke dampers and operator assemblies shall be Underwriter's Laboratories classified as an assembly.

D. All fire rated access doors shall be in accordance with NFPA 80 and 104.

2.0 PART 2 – PRODUCTS

2.1 FIRE DAMPERS

A. Rectangular - Curtain type damper of galvanized construction with fusible link, roll formed frame and stainless steel closure spring. UL listed and labeled.

B. Round – 20 gauge galvanized steel sleeve / frame, with 14 gauge galvanized blades. Stainless steel bearings pressed into frame. UL listed and labeled.

C. Dampers are to be selected for no more than 0.1”wc pressure drop in the as-installed conditions, but in no case shall be smaller than the ductwork size stated on the project drawings. Provide necessary duct transitions, sleeves and supports to maintain assembly rating and these free area requirements.

D. Provide duct transitions where duct sizes must be increased to maintain maximum allowable pressure drop or for transition between round / oval / rectangular ductwork

systems.

E. 1-1/2 hour rated dampers for assemblies with rating under three hours. Three-hour rated dampers for assemblies with rating of 3 hours or greater.

F. Provide with “break away” duct connections which comply with rated assembly construction details.

G. Fusible link temperature rating of 165°F

H. Type B or C as called for on the contract drawings or as required to meet installed pressure drop and performance requirements.

I. Stainless steel or all aluminum construction where required based on application.

J. Design Equipment:

1. Rectangular:

a. Static, 1 ½ hour, Ruskin Model IBD2

b. Static, 3 hour, Ruskin Model IBD23

c. Dynamic, 1 ½ hour, up to 4000fpm and 4”wc, Ruskin DIBD2

d. Dynamic, 3 hour, up to 4000fpm and 4”wc, Ruskin DIBD23

2. Round – Ruskin FDR25, Static or Dynamic up to 2000fpm.

K. Make: Air Balance, Greenheck, National Controlled Air, Prefco, Ruskin, Safe Air, Inc., Venco.

2.2 COMBINATION FIRE/SMOKE DAMPERS

A. Rectangular - Airfoil multi-blade type damper of aluminum construction suitable for installation in high velocity air systems up to 4000 fpm and 8 in. s.p. UL listed fusible link. Frame thickness 16 gauge minimum. Silicone edge blade seals, and stainless steel jamb seals.

B. Round – two piece, 14ga equivalent galvanized steel blades. Stainless steel bearings pressed into frame. Suitable for installation in systems up to 3000fpm and 4 in. s.p. UL listed fusible link. 20 ga frame / sleeve.

C. UL listed 120 volt electric motor operator as scheduled or called out on the contract drawings. Operator to be mounted outside of the airstream. Power to open spring to close.

D. Class I leak rating of 4.0 cfm/ft^2 at 1” w.g.

E. Stainless steel or all aluminum construction where required based on application.

F. Design Equipment:

1. Rectangular: Ruskin FSD-60.

2. Round: Ruskin FSDR-25

G. Make: Greenheck, Air Balance, Prefco, Ruskin.

2.3 FIRE RATED ACCESS DOORS

A. Fire rated access doors shall be designed specifically for application rated wall openings and shall bear an Underwriters' Laboratories fire door label for a two or three-hour rating to match adjacent construction.

B. Design Equipment:

1. Two hour rated for walls – Activar FD Series

2. Three hour rated for walls – Activar FD3 Series

C. Make: Air Balance, Duro, Prefco, Cesco.

3.0 PART 3 – EXECUTION

3.1 LOCATIONS

A. Provide where called for on the contract drawings and as required per Section 607 of the New York State Mechanical Code.

3.2 INSTALLATION

A. Provide sleeves, angles, and access doors for installation in accordance requirements of NFPA, UL and damper manufacturer. Provide sheet metal access doors in ductwork for dampers and accessories. Provide ceiling or wall access doors for dampers and accessories. Provide rated access doors where required in shafts and other rated assemblies.

B. All fire, smoke and combination dampers to be selected and fully coordinated with access requirements, including required service access and inspection doors. Final selection details, including upstream vs downstream positioning of access doors and damper actuators shall be determined during development of project coordination drawings as described under 230010.3.2.

C. Division 26 "Electric" will provide signal wiring and power wiring for smoke dampers. Refer to Sections 230923 and / or 230993 for additional requirements. Smoke detectors shall be furnished by Division 26 "Electric". Install detectors located in ductwork. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size and length required with Division 26 "Electric". Provide insulation end seal fittings for double wall ductwork where same connects to damper assembly.

E. Fire doors in fire wall openings and shall be installed on both sides of a fire wall. Install in accordance with UL and the manufacturer's instructions. Provide thermal blanket in accordance to NFPA requirements at diffusers, register and grille penetrations of fire rated ceilings where fire dampers are required.

F. Provide access door or removable ductwork section for inspection and repair in compliance with NFPA 80 and NFPA 104 for all assemblies. Minimum allowable access door size shall be 12”x12”, minimum allowable length for removable duct section shall be 24 inches.

3.3 CERTIFICATION

A. Contractor shall certify that dampers are accessible for servicing, are installed properly, and are operational. Submit three copies of signed certification to the Owner's Representative for review.

3.4 IDENTIFICATION

A. Provide damper tags and chart. Fasten tag to ductwork adjacent to the dampers. Number each damper and make chart listing.

1. Number

2. Location

3. Air system in which they are installed.

B. Submit three copies of chart to the Owner's Representative for review.

END OF SECTION 233316

SECTION 233400 - FANS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Drawings.

1.2 SUBMITTALS

A. Submittals shall include all fans, motors, drives, and accessories. Include all fan curves and fan operating point.

1.3 QUALITY ASSURANCE

A. Capacity, size and arrangement, static pressure, brake horsepower, component parts and accessories shall be provided as called for or scheduled. All ratings shall be made in accordance with AMCA Standard 210. Guaranteed full capacity delivery through duct systems finally installed and under conditions listed. The manufacturer shall guarantee sound-power level ratings not exceeding those of the design equipment. All equipment shall be statically and dynamically balanced to acceptable tolerances with weights permanently fastened. Fan wheels shall be rebalanced in the field, if necessary.

B. Fans shall be selected such that the rotational speed does not exceed 80% of that allowable for the fan class to be provided.

C. Motors:

1. Motors shall be furnished with each fan of sizes scheduled. Refer to specification Section 230513 for acceptable motor manufacturers. All belt-driven fan motors shall be mounted on either an adjustable slide base or a pivoting base.

2. Fans specified either through model number or motor type to contain ECM motors shall be provided with either local speed adjustment modules or controllers allowing interface to the BMS as required for specified sequences of operation.

D. Drive Systems:

1. Provide fans with belt or direct drive systems as scheduled. V-belt drives as recommended by drive manufacturer, unless otherwise specified or scheduled.

a. Below 10 hp: Size 150% of motor rating.

b. 10hp & up: Size drive for 200% of motor rating.

c. Motors 5 hp and larger shall be provided with a minimum of two matched belts. All belt sets shall be matched.

d. Cast iron or cast steel pulleys.

e. Provide a belt and shaft guards for each driven device. Provide openings in both the motor and fan sections of the guard so that the motor and fan speeds can be checked without removing the belt guard.

f. For belt driven devices, provide factory installed automatic belt tensioner to maintain proper belt tension.

E. Motor Pulleys:

1. Adjustable type to produce 15% speed change above and below scheduled fan speed permitted for 5 hp and smaller.

2. Fixed drive pulleys for all motors over 5 hp. Provide replacement pulleys as required to obtain system balance.

3. 7-1/2 hp - 20 hp: "B" section, 4.6 in. minimum pitch diameter.

4. 25 hp & larger: "C" section, 7.0 in. minimum pitch diameter.

5. Drive ratio not over 4:1.

6. Vibration isolation for units shall be furnished by fan manufacturer unless otherwise noted. Where spring vibration isolators are used, they shall be guided spring type.

2.0 PART 2 - PRODUCTS

2.1 CENTRIFUGAL FANS

A. Centrifugal type fan wheel with backward inclined curved blades. Spun heavy gauge leak proof aluminum housing. Fan enclosure with removable dome for access to motor, drive, bearings and fan wheel. Hinged at curb so that entire fan can be tilted upward for maintenance access to automatic dampers and damper motor.

B. For belt driven units, the motor and drive shall be isolated from the airstream. The motor shall be mounted on an adjustable base. Permanently lubricated sealed motor bearings.

C. Factory mounted and wired disconnect switch.

D. Fan Bearings: 50,000 B-10 life hours per AFBMA.

E. 1/2” x 1/2” aluminum mesh bird screen. Factory mounted and wired disconnect switch. Factory mounted and wired variable speed controller for all direct drive fans. Factory constructed roof curb in accordance with Section 230509.

F. Direct drive fans shall be provide with ECM Motor. Variable volume fans shall be provided to accept a 0-10V DDC command. Constant volume fans shall be provided with built in fan speed adjustment.

G. Design Equipment: Greenheck G-Series/GB-Series

H. Make: Cook, Greenheck, Twin City.

2.2 CENTRIFUGAL FANS

A. All fan wheels shall be aluminum, backwardly curved of a non-overloading blade design. Blades, double thickness airfoil design, single thickness airfoil design. Bearings mounting adjustable and self-aligning, 50,000 B-10 life hours rated in accordance with AFBMA. Equipped with overflow pipe and overflow reservoirs. Factory mounted and wired disconnect switch.

B. Direct drive fans shall be provide with ECM Motor. Variable volume fans shall be provided to accept a 0-10V DDC command. Constant volume fans shall be provided with built in fan speed adjustment.

C. On belt driven units, motor and adjustable drive isolated from airstream. Permanently lubricated motor bearings. Fan motor shall be VFD rated were noted for use with VFD.

D. Supply fan configurations shall be provided with factory filter box with MERV 8 filters.

E. Design Equipment: Greenheck BSQ/SQ-VG Series.

F. Acceptable Make: Cook, Greenheck, Twin City.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Provide equipment in accordance with manufacturer's instructions. All fans shall meet the intent of the system performance requirements. Provide rubber in-shear vibration isolation for all fans unless otherwise called for differently. Provide necessary supporting ironwork and platforms for equipment as detailed on the contract drawings. Provide guards for all exposed belts, shafts and fan wheels. Change pulley sizes or adjust sheaves as required to make systems deliver specified quantities of air as listed on the Contract Drawings.

B. Provide fan control equipment as specified or scheduled on the Contract Drawings. Coordinate location of fan control equipment with all contractors.

END OF SECTION 233400

SECTION 233713 - REGISTERS AND DIFFUSERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Registers/Grilles/Diffusers. Submit room schedule listing size, throw, direction of throw, accessories, finish, noise criteria levels, material type and color chart.

1.3 GENERAL REQUIREMENTS

A. Each manufacturer shall check noise level ratings for registers and diffusers to insure that the sizes selected will not produce noise to exceed 30 db, "A" scale, measured at occupant level; notify Owner's Representative of problems prior to shop drawing submittal.

B. Pressure drop, air flow and noise criteria selection are based on design equipment. Manufacturers not submitting design equipment must provide written certification in the front of submittal that equipment submitted has been checked against and performs equal to the design equipment.

1.4 REQUIREMENTS FOR REGISTERS

A. General:

1. A register is defined as a grille plus a volume damper.

2. Registers shall be installed "sight-proof" where possible, i.e., high wall register with horizontal blades inclined up, or along a wall with blades facing the wall.

3. Borders and frames shall be of same material as register face unless specified otherwise.

4. Maximum N.C. permitted shall be 25. Registers exceeding this value shall be increased to reduce N.C. Level below 25.

5. All RGD plenums interiors shall be painted flat black.

B. Mounting Frames:

1. Provide with screw holes in register face punched and countersunk at factory, and mounting frame drilled and tapped to suit. Sponge rubber gasket between frame and wall or ceiling for all surface mounted frames.

2. Frame shall be overlap type and shall be suitable for type of ceiling where register is to be installed.

C. Finishes:

1. Custom color/finish to be selected by the architect during the submittal process.

D. Design Equipment: Krueger unless otherwise noted.

E. Make: Krueger, Titus, Price

1.5 REQUIREMENTS FOR DIFFUSERS

A. General:

1. Provide four way blow unless otherwise noted.

2. Where manufacturer's size recommendations require duct sizes or connections differing from design Contractor shall provide at no change in Contract price.

3. Provide square to round neck transitions as required.

4. Provide sponge rubber gasket for all surface mounted frames.

5. Maximum N.C. permitted shall be 25. Registers exceeding this value shall be increased to reduce N.C. Level below 25.

6. All RGD plenums interiors shall be painted flat black.

B. Finishes:

1. Custom color/finish to be selected by the architect during the submittal process.

C. Design Equipment: Krueger unless otherwise noted.

D. Make: Krueger, Titus, Price

2.0 PART 2 - PRODUCTS

2.1 REGISTER TYPES

A. Type A - (exhaust and return grille):

1. Steel construction with 22 gauge frame and blades, with horizontal bars on a 1/2" spacing set at 35^{o} fixed deflection.

2. 1-1/4” wide flange.

3. Provide with 12” square backbox equal to the diffuser neck dimensions.

4. The blades shall be parallel to long dimension.

5. Model: Krueger S85

B. Type A - (perforated exhaust and return grille):

1. Grille shall have 3/16” holes on 1/4” staggered centers resulting in a 51% free area face made of steel.

2. The frame of the grille must be constructed of 22 gage steel with countersunk screw holes. This frame must also produce a border of 1 1/4” around all sides of the grille with mitered corners.

3. Model: Krueger S80P

2.2 DIFFUSER TYPES

A. Type 1 - (induction nozzle type):

1. 22 gauge steel construction, with face panel finished flush with ceiling system. With optional directional air flow pattern controllers that are concealed behind the face.

2. Core shall be removable and securely held in place to the back pan without noise or vibration.

3. Horizontal air flow pattern.

4. With equalizing grid.

5. Induction nozzles welded to each wing of the inner core. Nozzles shall be oriented at 45 degree angles in split opposite directions.

6. Panel size: 24" x 24", with square inlet as integral part of assembly. Provide with transition piece for attachment of duct dimensions as noted on plans.

7. Provide with 12” square backbox equal to the diffuser neck dimensions.

8. Model: Krueger SHV.

B. Type 2 – (Linear Bar Grille)

1. Two (2) 1” slots and lengths as specified on plans.

2. The linear slot supply diffuser shall be provided with two (2) 1” slot width of the sizes and frame styles shown on the drawings or job schedule.

3. Shall be constructed of extruded aluminum with the maximum single length of 72”. Units longer than 72” shall be provided in multiple sections and assembled with alignment strips or pins provided by the manufacturer yielding a continuous linear appearance.

4. The pattern controllers for the linear diffuser shall be extruded aluminum and have an “inverted T” appearance after installation into the slot diffuser. The pattern deflectors shall be held in place by a spring clip constructed of spring steel and be removable from the linear diffuser without the use of special tools. The maximum length of the pattern controllers is 36”. For any unit longer than 36”, the pattern controllers shall be in multiple sections.

5. PROVIDE CONTINUOUS APPEARANCE FOR SOFFIT LINEAR DIFFUSERS ACROSS THE ENTIRE SOFFIT FACE.

6. Design Make: Krueger 1900

C. Type 3 - (supply register type):

1. Aluminum 22 gauge frame construction with double deflection capability and the front blades shall be parallel to the long dimension. Solid extruded aluminum air foil blades mounted in friction pivots for individual blade adjustment, spaced on 3/4" centers.

2. Key operated opposed blade damper which shall assure even air distribution of air across the grille face as well as volume control.

3. 1-1/4” wide flange with sponge rubber gasket.

4. Provide with 12” square backbox equal to the diffuser neck dimensions.

5. The blades shall be parallel to long dimension.

6. Model: Krueger S880H

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in strict accordance with manufacturer's instructions. Rough-in or install per reflected ceiling plan or in locations instructed by Owner's Representative.

B. Provide approved air extractors behind all duct mounted supply registers in exposed ductwork.

C. When the final connection to an exhaust or return grille is made, a 12” minimum height plenum box must be supplied to all grilles. Plenum dimensions shall match grille size.

END OF SECTION 233713

SECTION 233726 - LOUVERS AND PENTHOUSES

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Louvers including all blade types, finishes and arrangements.

B. Penthouses including materials, finishes and accessories.

C. Provide original color charts for selection of finish.

D. Insulated panels including materials and finishes.

2.0 PART 2 - PRODUCTS

2.1 LOUVERS – 2”

A. Factory constructed aluminum louvers.

B. Provide mullions where blade lengths exceed 60 in.

C. With 1/2 " x 1/2" mesh, 14 gauge wire, aluminum birdscreen secured in removable frame, secured to back of louver.

D. Extruded sections 6063-T5 alloy, 0.063” minimum thickness, 2” deep, Double Drainable unless otherwise called for.

E. Sill extension and sill style as required by job conditions.

F. Kynar 500 70% finish color as selected at review of submittal. Custom color selection by architect.

G. Size, type and free areas indicated in location as called for on the Contract Documents.

H. "Stormproof" design with special curb to trap rain.

I. One-piece structural head, sill, and jambs.

J. All stainless steel fasteners.

K. Provide custom colors selected by the Architect.

L. Design Equipment: Greenheck ESD-202 (4") Double Drainable Blade.

M. Acceptable Make: Construction Specialties, Inc., Greenheck, Ruskin.

2.2 PENTHOUSES NON-LOUVERED TYPE

A. Housing shall have heavy gauge extruded aluminum with hinged hoods designed for intake or relief.

B. Hood Constructed of precision formed, arched panels with interlocking seams

C. Vertical end panels are fully locked into hood end panels

D. Provide unit with mill finish.

E. Provide insulated, double wall curb.

F. Provide aluminum bird screen.

G. Provide custom colors selected by the Architect.

H. Design Equipment: Greenheck FGI/FGR.

I. Acceptable Make: Penn Ventilator, Carnes, Greenheck, Arrow, Cook.

2.3 INSULATED BLANK OFF PANELS

A. General: Fabricate blank-off panels from materials and to sizes indicated and comply with the following requirements:

1. Outside Finish: Same as finish applied to louvers.

2. Inside Finish: Same as finish applied to louvers, but black in color.

3. Attach blank-off panels to back of louver frames with clips.

4. Attach blank-off panels to back of louver frames with stainless-steel sheet-metal screws.

B. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets, complying with the following requirements:

1. Thickness: 2 inches (50 mm).

2. Metal Facing Sheets: Aluminum sheet, 0.032 inch (0.8mm) thick.

3. Insulating Core: Unfaced, rigid, glass-fiberboard complying with ASTM C 612, Class 1 and 2.

4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum channel frames 0.081 inch (2.06mm) thick, with corners mitered and with same finish as panels.

5. Seal perimeter joints between panel faces and louver frames with 1/8-by-1-inch (3.2-by-25mm) PVC compression gaskets.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Install louvers and penthouses as per manufacturer's recommendations.

3.2 LOUVERS

A. Size called for is approximate wall/or masonry opening size. Adjust slightly to suit construction or coursing (review architectural drawings or field conditions for rough opening sizes). Louvers will be installed by General Contractor, assisted by this Contractor. Deliver in ample time. Slope ductwork and plenum to louver weephole or provide drain.

END OF SECTION 233726

SECTION 234000 - AIR FILTERS AND ACCESSORIES

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents. Install equipment in strict accordance with manufacturer's instructions, and as detailed on the Contract Documents.

1.2 SUBMITTALS

A. Filter product data including certification date, pressure drops at the scheduled airflow, schedule of filter sizes for each system. All filter accessories, including framing systems, fastening clips, manometers, and differential pressure gauges.

1.3 QUALITY ASSURANCE

A. Filters shall comply with the requirements of ASHRAE Standard 52-76, and UL Standard 586 - Class II requirements. Filters shall also comply with requirements of applicable State and federal agencies. Filters shall not exceed a flame spread rating of 25 and smoke development rating of 50. The scheduled efficiencies refer to ASHRAE Standard 52-76 average efficiency.

1.4 CERTIFICATION

A. Submit with submittal, a test report prepared by an independent testing laboratory certifying compliance with above standards.

2.0 PART 2 - PRODUCTS

2.1 MEDIUM EFFICIENCY AIR FILTERS (MERV-8 - PLEATED TYPE)

A. The filter shall have a Minimum Efficiency Reporting Value of MERV 8 when evaluated under the guidelines of ASHRAE Standard 52.2-1999. It shall have an average dust spot efficiency of 25-30% and a minimum arrestance of 91% when evaluated under ASHRAE Standard 52.1-1992. The media shall maintain or increase in efficiency over the life of the filter. The filter shall be classified by Underwriters Laboratories as UL Class 2.

B. Filter media shall be a cotton and synthetic blend, lofted to a uniform depth of 0.18 in., and formed into a uniform radial pleats. There shall be at least 15 pleats per linear foot for the 2 in. deep filter. A welded wire grid, spot-welded on one-inch centers, treated for corrorion resistance, shall be bonded to the downstream side of the media to maintain the radial pleat and prevent media oscillation. An enclosing frame, of no less than 28 point high wet-strength beverage board shall provide a rigid and durable enclosure. The frame shall be bonded to the media to prevent air bypass, and include integral diagonal support members on the air entering and air exiting side to maintain uniform pleat spacing in varying airflows.

C. For the 2 in. filter, initial resistance to airflow shall not exceed 0.28” w.g. at an airflow of 500 fpm.

D. Design Equipment: Camfill-Farr 30/30.

E. Make: AAF, Camfill-Farr, Flanders.

2.2 FIBERGLASS (MERV-13)

A. Unless specifically noted otherwise, all coils and heat transfer devices shall be protected with 1” "throwaway" type fiberglass filters. The initial resistance at 300 fpm; shall not exceed .10” w.g.

B. Provide at least one filter for each system. Provide an additional set of filters to be used during the construction phase of the project.

C. Design Equipment: AAF.

D. Acceptable Makes: AAF, Camfill-Farr, Flanders.

2.3 LOW PRESSURE DROP CARTRIDGE TYPE FINAL FILTERS

A. Air Filters shall be high-efficiency ASHRAE pleat-in-pleat V-bank disposable type assembled in a compact and secure enclosing frame.

B. Filter media shall be of microfine glass formed into uniformly spaced pleats separated by fiberglass thread separators and formed into a minpleat pack design. Each minipleat pack shall be assembled into a V-bank configuration with an appropriate number of packs to obtain required pressure drop. The media packs shall be bonded to the inside periphery of the enclosing frame with a fire-retardant phosphorus-free sealant. The enclosing frame shall include galvanized steel channels bonded to the media pack to prevent air bypass. Extruded aluminum supports shall be placed on the air entering and air exiting sides to promote uniform airflow and assist in structural support. Rigid plastic end caps shall be mechanically fastened to the top and bottom of the enclosing structure to ensure a rigid and durable filter.

C. Filter shall include an integral header for installation in a standard 1 in. nominal filter track.

D. The filter shall have a Minimum Efficiency Reporting Value (MERV) 15, when evaluated under the guidelines of ASHRAE Standard 52.2-1999.

E. Initial resistance to airflow shall not exceed 0.22” w.g. at an airflow of 500 fpm.

F. Filter shall be rated by Underwriters Labratories as UL Class 2.

G. Design Equipment: Camfill-Farr Durafil MERV 15.

H. Acceptable Makes: AAF, Camfill-Farr, Flanders.

2.4 METAL FILTERS AT AIR INTAKES

A. Filters shall be cleanable with galvanized steel or aluminum frames. Filter media shall be aluminum. Install in galvanized steel rack with removable clips. Initial resistance shall not be more than .06" w.g. at 350 fpm. Provide filters of size and pressure dorp as scheduled at the required airflow.

B. Design Equipment: Airsan.

C. Acceptable Makes: AAF, Airsan, Farr.

2.5 MAGNEHELIC GAUGE

A. 3-7/8" diameter white dial diaphragm actuated air filter gauge. Guaranteed accurate to ± 2% of full scale. Pointer zero adjustment. Provide all accessories including adaptors, mounting panel, pressure tips, fittings, tubing, vent valves.

B. Design Equipment: Dwyer.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide one set of spare filters of each type for each system requiring a filter. Install first set of filters when units are initially installed (as opposed to started). Change filters as required during construction period to maintain systems in a clean manner throughout the construction period. Remove dirty set and install one clean set prior to Owner occupancy. If original filters do not require replacement, as determined by Owner's Representative, then deliver final set to Owner and obtain receipt. Seal between filter frames to prevent leakage. Install on frames without racking to eliminate air bypass.

3.2 MANOMETERS

A. Provide for each filter set.

3.3 MAGHEHELIC GAUGES

A. Provide for each filter set.

END OF SECTION 234000

SECTION 236429 – AIR COOLED CHILLER

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

B. Compliance with Mechanical Refrigeration Safety Code, ANSI B9.1, latest edition.

C. Manufacturer's installation booklets, written instructions, and diagrams are hereby made part of this Contract.

1.2 SUBMITTALS

A. Water chilling units and accessories.

B. Component to the chiller submittal, provide complete BacNet objects list for review by the Engineer.

C. Auxiliaries and accessories.

1.3 START-UP AND INSTALLATION DATA

A. Arrange For Manufacturer of Refrigeration Machine To:

1. Furnish complete installation drawings, templates, wiring diagrams, refrigerant piping diagrams, and instruction manuals for the equipment. Manufacturer's "Installation Instructions," "Initial Start-Up Instructions" and "Service Instructions" plus catalog indicating wiring and piping shall become a part of the Contract Documents.

2. Two additional copies of above data for Owner's Representative.

3. Submitting drawings, either made especially for this job or distinctly modified for same; errors resulting from use of standard factory drawings, responsibility of this Contractor.

4. Supervising and checking installation for compliance with manufacturer's recommendations.

5. Checking out machines and actual start-up of same.

6. Advising and assisting Contractor in making final adjustments:

7. Regulating flow of chilled water.

B. Provide for proper balance and most economical operation, such as setting operating controls and setting and checking safety valves.

1. Providing one year free service and guarantee, from date of final acceptance.

2. Furnish log of results, balancing and adjusting for various load conditions, including pressures, temperatures and flow quantities.

3. Furnish exact location and arrangement of all piping thermostats, flow switches, gauges, thermometers, and insertion wells.

4. Thoroughly instructing Owner's Representative in proper operation of equipment.

1.4 QUALITY ASSURANCE

A. The products described in this catalog are designed, manufactured and tested in accordance with the approved system requirements described in the manufacturer quality manual.

1.5 WARRANTY

A. Provide a full parts and labor warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. A 5-year motor/transmission/compressor warranty shall be provided based upon the RPM of the compressors as follows:

1.

Compressor RPM	Warranty Term
0 - 5000	1 year from start-up
5001 - 10,000	5 years from start-up
10,001 and above	5 years plus annual oil analysis

2.0 PART 2 - PRODUCTS

2.1 GENERAL UNIT DESCRIPTION

A. Provide self-contained, packaged, factory-assembled, and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, subcooling circuits, and controls.

B. Performance as scheduled.

C. Unit shall utilize R-454B refrigerant.

2.2 CABINET

A. Frame shall be heavy-gage, with a powder coated paint finish for both aesthetic appeal and to offer more resistance to corrosion.

B. Units shall be constructed with galvanized steel panels and access doors. Exterior component surfaces shall be finished with a powder-coated paint. The coating or paint system shall withstand a 500-consecutive-hour salt spray application in accordance with standard ASTMB117.

C. Acoustics:

1. Sound power levels for the unit shall not exceed the following specified levels. The manufacturer shall provide compressor sound reduction material and sound treatment to meet these levels. Measured in accordance with AHRI Standard 370.

Sound Power Levels (L_w) dBre10^{-12} W Octave Band Center Frequency (Hz)							
63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Sound Pressure							
92	100	95	95	93	89	82	79

2.3 COMPRESSORS

A. Fully hermetic digital scroll type compressors with R-454B optimized and dedicated scroll profile.

B. Direct drive motor cooled by suction gas with only three major moving parts and a completely enclosed compression chamber which leads to increased efficiency.

C. Each compressor shall have overload protection internal to the compressor

D. Each compressor shall include: centrifugal oil pump, oil level sight glass and oil charging valve

E. Each compressor will have crankcase heaters installed and properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

2.4 EVAPORATOR

A. The evaporator shall be a high efficiency, brazed plate-to-plate type heat exchanger consisting of parallel plates. Braze plates shall be stainless steel with copper braze material.

B. The evaporator shall be protected with an etched foil heater and covered with insulation. This combination shall provide freeze protection down to -20F ambient temperatures while the heater is powered. Contractor shall provide separate power to energize heater and protect evaporator while chiller is disconnected.

C. The water side working pressure shall be rated at 150 psig (10.3 bar) and tested at 1.5 times maximum allowable water side working pressure.

D. The refrigerant side working pressure shall be rated at 650 psig (29.6 bars) and tested at 1.1 maximum allowable refrigerant side working pressure.

E. Provide unit with hot gas bypass on each circuit.

2.5 CONDENSER

A. Construct condenser coils of microchannel all aluminum brazed fin construction. The condenser coils shall have an integral sub-cooling circuit and shall be designed for at least 650 psig working pressure. Leak tested at 650 psig. Coils can be cleaned with high pressure water.

B. The maximum allowable working pressure of the condenser shall be 650 psig. The condensers shall be factory proof and leak tested at 650 psig.

C. Low Sound Fans shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades molded into a low noise fan blade.

D. Low speed fan motors shall be three-phase with permanently lubricated ball bearings and individually protected by circuit breakers.

E. Unit shall be capable of starting and operating at outdoor ambient temperatures from -20F to 125F.

F. Provide factory mounted, louvered panels. Panel louvers shall cover the condenser coils and protect from hail.

2.6 ENCLOSURES

A. Mount starters in a UL1995 rated panel for outdoor use.

B. The starter shall be across-the-line configuration, factory-mounted and fully pre-wired to the compressor motor(s) and control panel.

C. Unit shall have a single point power connection.

D. A control power transformer shall be factory-installed and factory-wired to provide unit control power.

E. Control panel shall be dead front construction for enhanced service technician safety.

F. A molded case standard interrupting capacity circuit breaker shall be factory pre-wired with terminal block power connections and equipped with a lockable external operator handle, making it available to disconnect the chiller from main power. The unit shall have a high fault rated control panel with 65,000 amp short circuit current rating

G. Unit wiring shall run in liquid-tight conduit.

H. Provide unit with factory disconnect.

2.7 REFRIGERATION COMPONENTS

A. Each refrigerant circuit shall include a filter drier, electronic expansion valve with site glass, liquid line service valves and a complete operating charge of both refrigerant HFC-454B and compressor oil.

B. Each refrigerant circuit shall include a discharge line service valve to allow the refrigerant to be isolated in the condenser.

2.8 CONTROLS, SAFETIES AND DIAGNOSTICS

A. The microprocessor-based unit controller shall be factory-installed and factory-tested. Chiller microprocessor shall be integrated into the building management system.

B. The unit display shall provide the following data:

1. Water and air temperatures

2. Refrigerant levels and temperatures

3. Flow switch status

4. Compressor starts and run times

5. Display diagnostics.

C. Chilled water temperature control shall be microprocessor-based, proportional and integral controller to show water and refrigerant temperature, refrigerant pressure, and diagnostics. This microprocessor-based controller is to be supplied with each chiller by the chiller manufacturer. Controls shall include the following readouts and diagnostics:

1. Low evaporator refrigerant temperature and/or pressure

2. High condenser refrigerant pressure

3. Low oil flow

4. Motor current overload

5. High compressor discharge temperature

6. Electronic distribution faults: phase loss, phase imbalance, or phase reversal

D. Unit shall be shipped with factory control and power wiring installed.

E. On chiller, mount weatherproof control panel, containing starters, power and control wiring, factory wired with terminal block power connection. Provide primary and secondary fused control power transformer and a single 115 volt 60 Hz single phase connection for evaporator freeze protection heaters.

F. The unit controller shall utilize the following components to automatically take action to prevent unit shutdown due to abnormal operating conditions which will perform as follows:

1. High pressure switch that is set 20 PSIG lower to automatically shut off a compressor to help prevent a high pressure condenser control trip. One switch is required for each compressor and indicating light shall also be provided.

2. Motor surge protector that is set at 95% of compressor RLA that will automatically shut off a compressor to help prevent an over current trip. One protector is required for each compressor and indicating light shall also be provided.

3. Low pressure switch that is set at 5 PSIG (0.34 bar) above the factory low pressure switch that will automatically shut off a compressor to help prevent a low evaporator temperature trip. One switch is required for each compressor and indicating light shall also be provided.

G. Provide the following safety controls with indicating lights or diagnostic readouts.

1. Low chilled water temperature protection.

2. High refrigerant pressure.

3. Low oil flow protection.

4. Loss of chilled water flow.

5. Contact for remote emergency shutdown.

6. Motor current overload.

7. Phase reversal/unbalance/single phasing.

8. Over/under voltage.

9. Failure of water temperature sensor used by controller.

10. Compressor status (on or off).

H. Provide the following operating controls:

1. Chilled water pump output relay that closes when the chiller is given a signal to start.

2. High ambient pressure controller that shuts off a compressor to keep head pressure under control and help prevent high pressure nuisance trip outs on days when outside ambient is above design.

3. Compressor current sensing limit that shuts off a compressor to help prevent current overload nuisance trips.

4. Auto lead-lag functions that constantly even out run hours and compressor starts automatically. If contractor cannot provide this function then cycle counter and hour meter shall be provided for each compressor so owner can be instructed by the contractor on how to manually change lead-lag on compressors and even out compressor starts and running hours.

5. Low ambient lockout control with adjustable setpoint.

I. Provide user interface on the front of the panel. If display is on the inside of the panel, then a control display access door shall be provided to allow access to the display without removal of panels. Provide user interface with a minimum of the following features:

1. Leaving chilled water setpoint adjustment from LCD input
2. Entering and leaving chilled water temperature output
3. Percent RLA output for each compressor
4. Pressure output of condenser for circuits one and two
5. Pressure output of evaporator for circuits one and two
6. Ambient temperature output
7. Voltage output
8. Current limit setpoint adjustment from LCD input.

J. Digital Communications to BAS system shall consist of a BACnet MS/TP interface via a single twisted pair wiring.

K. The chiller control panel shall provide input for leaving chilled water temperature setpoint based upon a 2-10VDC or 4-20mA signal from a building automation system.

L. The chiller control panel shall provide an output for chiller Percent Capacity via a 2-10VDC or 4-20mA signal to a building automation system.

2.9 CHILLER NOISE REDUCTION SYSTEM:

A. Provide unit with BRD Hush Cover on all compressors.

1. Outer Jacket: 16 oz./yd.2 PTFE silicone impregnated fiberglass cloth.
2. Acoustic Barrier: Barium sulfate loaded vinyl (2 lb. density)
3. Insulation: Fiberglass needle mat (11lbs./ft.3 density)
4. Inner Jacket: 16 oz./yd.2 PTFE silicone impregnated fiberglass cloth
5. Performance Data:

Test Frequency (in Hz)	Noise Reduction (in dB)
315	1
400	6
500	10
630	12
800	12
1000	21

1250	23
1600	25
200	26
2500	26
3150	26

B. Provide Kinetics FLSS-2 spring isolators to prevent vibration transmission to support structure. Vibration isolation location and quantity shall be per manufacturer.

C. Design make: Trane ASCA

D. Acceptable makes: Trane, Daikin, Aaon

3.0 PART 3 - EXECUTION

3.1 CHILLER INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Contractor Shall:

1. Obtain installation and wiring diagrams, piping diagrams from manufacturer.

2. Install separate factory furnished vibration isolation for chiller and compressors. Install precisely according to vibration isolator manufacturer's installation details.

3. Providing certain piping, valves and accessories to connect flow switches, oil piping, and other miscellaneous special devices or piping required for actual machine selected; obtain exact requirements from manufacturer.

4. Install thermometers, flexible connectors, drain valves and pressure gauges at inlets and outlets.

5. Coordinate Work in area adjacent to machine to insure adequate clearances for operating and service, as well as tube pulling space.

6. Guarantee system, including refrigerant charge for one year from date of acceptance.

7. Prevent freeze-up from any cause.

8. Insulate completely as recommended by manufacturer those areas of unit not factory insulated.

9. Install power and control wiring, not installed by Division 26 "Electric".

C. Piping Connections:

1. Use flexible connectors at chilled water connections.

2. Extend relief valve discharge to "out-of-doors" as approved, using two pipe sizes larger than relief valve. Use galvanized or copper pipe.

3. Verify chilled water IN and OUT, before piping.

4. Install thermostat-thermometer wells, flow switches, pressure gauges, as directed by manufacturer.

5. Install thermometers in entering and leaving water piping.

6. Install necessary air vents, drain valves, controls, and auxiliary piping or accessories.

3.2 ELECTRIC WIRING

A. Division 26 "Electric" shall provide power wiring to chiller and condensers.

B. Provide control wiring at chiller, interlocks to condenser units, chilled water pumps, connections to thermostats, flow switches, pressure switches, control circuit transformer (with circuit breaker), oil heater and oil pump.

C. Provide transformers, switches, relays or other electrical equipment for operation.

3.3 START-UP AND TESTING

A. Arrange for manufacturer to supervise installation, testing, wiring, start-up, and instructions. Submit test and start-up reports.

B. Four (4) working days minimum.

C. Provide parts list and provide written maintenance procedure.

3.4 ACCESSORIES

A. Install accessories that are not factory assembled.

END OF SECTION 236429

SECTION 237313 - AIR HANDLING UNIT

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Documents.

1.2 RELATED SECTIONS

A. Section 230010 - Basic Mechanical Requirements

B. Section 230513 – Motors

C. Section 230514 – Electric Wiring

D. Section 230923 – Temperature Controls

E. Section 23400 – Air Filters and Accessories

F. Section 262923 - Adjustable Speed Drives

1.3 REFERENCES

A. AMCA Publication 99 – Standards Handbook.

B. AMCA Publication 611 – Certified Ratings Program – Airflow Measurement Performance

C. AMCA Standard 500-D – Laboratory Methods of Testing Dampers for Rating.

D. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.

E. ANSI/AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.

F. ANSI/AHRI Standard 410 - Forced Circulation Air-Cooling and Air-Heating Coils.

G. ANSI/AHRI Standard 430 - Central Station Air Handling Units.

H. ANSI/NEMA MG 1 – Motors and Generators.

I. ANSI/UL 900 – Standard for Safety Air Filter Units.

J. AHRI Standard 260 – Sound rating of Ducted Air Moving and Conditioning Equipment.

K. ASHRAE Standard 111 – Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

L. ASTM C1071 – Thermal and Acoustic Insulation (Mineral Fiber, Duct Lining Material).

M. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Material and Facings.

N. NFPA 70 – National Electrical Code®.

O. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilation Systems.

P. UL 1995 – Standard for Safety Heating and Cooling Equipment

1.4 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Air handling units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard 430.

C. Air handling units with fan sections utilizing multiple fans shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.

D. ISO 9001 Certification.

1.5 SUBMITTALS

A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Engineer.

B. AHU manufacturer shall provide the following information with each shop drawing/product data submission:

1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.

2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.

3. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.

4. All performance data, including capacities and airside and waterside pressure drops, for components.

5. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.

6. For units with multiple fans, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Finally, a fan curve shall be provide showing the performance of the bank of fans when one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

7. A filter schedule that complies with Section 234000 must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.

8. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.

9. An electrical MCA – MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).

10. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hz.

11. The AHU manufacturer shall list any exceptions to the specification.

C. Unit shall conform in all respects to the 2022 revision of ASHRAE Standard 15, independent of whether specific details are enumerated within this specification.

1.6 REGULATORY REQUIREMENTS

A. Agency Listings/Certifications

1. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.

2. Certify air handling units in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified in accordance with AHRI Standard 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.

3. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.

4. Certify airflow monitoring stations are tested for differential pressure in accordance with AMCA 611 in an AMCA registered laboratory and comply with the requirements of the AMCA Certified Ratings Program. Factory furnished air flow stations shall comply with the requirements of section 230923.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging and final placement of AHU sections. Indoor AHUs less than 100 inches wide shall allow for forklift transport for maneuverability on jobsite.

C. Deliver units to jobsite with fan motor(s), sheave(s), and belt(s) completely assembled and mounted in units.

D. Indoor air handling units shall be shipped in a clear shrink-wrap or stretch-wrap to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.

E. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.9 WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of five (5) years from unit start-up or sixty-six (66) months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

2.0 PART 2 - PRODUCTS

2.1 INDOOR AIR HANDLING UNITS:

2.2 GENERAL

A. Unit layout and configuration shall be as defined in project plans and schedule.Unit manufacturer to provide an integral base frame to support all sections of unit and raise unit for proper trapping. Contractor will be responsible for providing additional height of the housekeeping pad when indoor air handling unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel.

B. Indoor Units shall have 4.0-inch integral base frames.

C. Ceiling hung units shall be provided with vibration isolation.

2.3 UNIT CASING

A. Unit manufacturer shall ship separate segments so unit can be broken down for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Indoor air handling unit casing finish to meet ASTM B117 250-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.

B. Casing performance – Casing air leakage shall not exceed 2% of design airflow at the specified casing pressure.

C. Air leakage shall be determined at a casing static pressure of 6 inches w.g. Specified air leakage shall be accomplished without the use of caulk. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.

D. Under 55°F supply air temperature and design conditions on the exterior of the unit of 81°F dry bulb and 73°F wet bulb, condensation shall not form on the casing exterior. The AHU manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychrometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU manufacturer shall provide, in writing to the Engineer and Owner, a guarantee against condensation forming on the unit exterior at the stated design conditions above. The guarantee shall note that the AHU manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. In lieu of AHU manufacturer providing a written guarantee, the installing contractor must provide additional external insulation on AHU to prevent condensation.

E. Unit casing (wall/floor/pressure bulkhead roof panels and doors) shall be able to withstand up to 1.5 times design static pressure up to +8" w.g. in all positive pressure sections and -8" w.g. in all negative pressure sections, whichever is less, and shall not exceed 0.0042" per inch of panel span (L/240).

F. Floor panels shall be double-wall construction and designed to support a 300-lb load during maintenance activities and shall deflect no more than 0.0042" per inch of panel span.

G. Unit casing panels shall be 2" double-wall construction, with solid galvanized exterior and solid Interior Liner galvanized interior, to facilitate cleaning of unit interior.

H. Unit casing panels (pressure bulkhead roof panels, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 $Hr*Ft^2*°F/BTU$.

I. Unit casing panels (pressure bulkhead roof panels, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.

J. Structural frame must not extend from air-handling unit interior to exterior. All component and panel support structure must be internal to AHU. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.

K. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.

L. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.

M. Treadplate shall be applied to the unit floor to improve the walking surface in those unit sections where the floor is fully accessible, and not impeded by internal structural or functional features. Treadplate shall be included in units that are 60-inches tall or larger.

2.4 SOUND PERFORMANCE

A. The AHU manufacturer shall provide sound power levels for AHUs/RTU's at the octave bands indicated below. Sound power levels at each octave band shall not exceed listed criteria by more than 3 dB. In the event that the required levels are not met, the manufacturer shall provide corrective measures to achieve the levels specified in the schedules below, at no additional cost to the Owner.

Sound Power Levels (L_w) dBre10^{-12} W								
D-AHU-01	**Octave Band Center Frequency (Hz)**							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Discharge	75	77	73	75	71	68	61	54
Ducted Inlet	65	59	63	55	52	53	45	39
Casing	74	69	68	76	66	55	51	45

2.5 ACCESS DOORS

A. Access doors shall be 2" double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.

B. All doors downstream of cooling coils shall be provided with a thermal break construction of door panel and door frame.

C. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.

D. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.

E. Handle hardware shall be designed to prevent unintended closure.

F. Access doors shall be hinged and removable without the use of specialized tools to allow.

G. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.

H. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section.

I. All doors shall be a minimum 60" high when sufficient height is available, or the maximum height allowed by the unit height.

J. A single door handle shall be provided for each door linking multiple latching points necessary to maintain the specified air leakage integrity of the unit.

2.6 PRIMARY DRAIN PANS

A. All cooling coil sections shall be provided with an insulated, double-wall, stainless steel drain pan.

B. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements.

C. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

D. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

E. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2” beyond the base to ensure adequate room for field piping of condensate traps.

F. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

G. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.

H. Drain pans shall be provided for heating coils, access sections, and mixing sections as indicated in the plans.

2.7 FANS

A. Fan sections shall have a minimum of one access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components.

B. Provide fans of type and class as specified on the schedule. Fan shafts shall be solid steel, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans controlled by variable frequency drives shall be statically and dynamically tested for vibration and alignment at speeds between 25% and 100% of design RPM. If fans are not factory-tested for vibration and alignment, the contractor shall be responsible for cost and labor associated with field balancing and certified vibration performance. Fan wheels shall be keyed to fan shafts to prevent slipping.

C. All direct-drive plenum fans, shall be mounted on spring isolation bases. Internally-mounted motor shall be on the same isolation base. Fan and motor shall be internally isolated with spring isolators. Unit sizes up to nominal 4,000 cfm shall have 1-inch springs. Unit sizes larger than nominal 4,000 cfm shall have 2-inch spring isolators. A flexible connection (e.g. canvas duct) shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

D. Supply air fan section shall include a third wall acoustical liner to meet acoustical requirements. The liner shall be fabricated from a perforated material to prevent corrosion and designed to completely encapsulate fiberglass insulation. The perforation spacing and hole size shall be such as to prevent insulation breakaway, flake off, or delamination when tested at 9000 fpm, in accordance with UL 181 or ASTM C1071. Insulation material must be resistant to fungi in accordance with ASTM C1338.

2.8 MOTORS AND DRIVES

A. Motors shall meet or exceed all NEMA Standards Publication MG 1 – 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.

B. Fan Motors shall be heavy duty, NEMA Premium efficient, all motors shall be provided per Section 230513

C. Direct-driven fan sections shall use 2-pole (3600 rpm), 4-pole (1800 rpm), or 6-pole (1200 rpm) motors, NEMA Design B, with Class B insulation to operate continuously at 104°F (40°C) ambient without tripping of overloads. Multiple fan selections utilizing 8-pole (900 rpm) motors are unacceptable due to motor inefficiency, cost, and replacement lead times.

D. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

E. Manufacturer shall provide for each fan a nameplate with the following information to assist air balance contractor in start up and service personnel in maintenance:

1. Fan and motor part number

2. Fan and motor bushing part number

3. Fan design RPM and motor HP

F. Overload Panel: Overload panel is a factory mounted NEMA Type 1 enclosure for indoor units, and NEMA Type 4 enclosure for outdoor units. The panel will take one field VFD power input and distribute to 2, 4 or 6 fans. These fans will be protected by manual motor protectors and over-current protection (fuse or IEC style circuit breaker), one per fan. Auxiliary contacts are wired in series to terminal blocks for generic trip signaling. Panel is rated for WYE power systems up to 600V. For air handlers configured with both supply and return fan sections, a factory mounted enclosure shall be provided for each section.

G. For single fan motors not supplied with a factory mounted and wired starter or VFD, the unit manufacturer shall supply a 4x4 NEMA 4 junction box on the exterior of the fan section(s) with wiring, prewired to the fan motor, to allow for ease of field installation of a starter or VFD.

2.9 HYDRONIC COILS

A. Coils section side panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.

B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

D. Construct coil casings of galvanized steel for heating coils and stainless steel for cooling coils. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.

E. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle shall be degreased and cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.

F. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the primary drain pan.

G. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.

H. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

I. Hydronic Coils (Heating Hot Water)

1. Non-ferrous heating coils, 125 psi working pressure, designed to relieve expansion and contraction strains.

2. Aluminum fins, helically wound, or plate type with expanded tube. Completely drainable and able to be vented.

3. Minimum 16 gauge galvanized casing, 5/8” O.D. 0.035” thick copper tubes with 0.035” thick "U" bends, aluminum fins, for coils.

4. Coils tested at 300 psig then leak tested at 200 psig with air pressure under water.

5. Hot water heating coils, serpentine type, number rows and arrangement as called for; same end connections with vent chamber on return end.

6. Provide with turbulators.

7. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.

8. Hydronic coils shall be supplied with factory installed extended drain and vent piping to the unit exterior with a 3/8 black steel pipe and cap.

J. Hydronic Coils (Chilled Water)

1. Non-ferrous heating coils, 125 psi working pressure, designed to relieve expansion and contraction strains.

2. Aluminum fins, helically wound, or plate type with expanded tube. Completely drainable and able to be vented.

3. Minimum 16 gauge stainless steel casing, 5/8” O.D. 0.035” thick copper tubes with 0.035” thick "U" bends, aluminum fins, for coils.

4. Coils tested at 300 psig then leak tested at 200 psig with air pressure under water.

5. Chilled water coils, serpentine type, number rows and arrangement as called for; same end connections with vent chamber on return end.

6. Provide with turbulators.

7. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.

8. Hydronic coils shall be supplied with factory installed extended drain and vent piping to the unit exterior with a 3/8 black steel pipe and cap.

9. Insulated stainless steel drip pan with corrosion resistant mastic coating with drain connections on both sides.

2.10 FILTERS

A. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size and quantity required to maximize filter face area for each air handling unit.

B. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule. Filter type shall be per Section 234000. All air handling units shall be provided with Medium Efficiency MERV-8 and High Efficiency MERV-15 filters.

C. Manufacturer shall provide one set of startup filters. Provide a complete replacement set to the Owner.

D. Each filter section shall be provided with a factory-installed, flush-mounted Dwyer 3-7/8" diaphragm actuated, dial-type differential pressure gauge piped to both sides of the filter to indicate status. Gauge shall maintain a +/- 2 percent accuracy within operating temperature limits of -20°F to 120°F. Filter sections consisting of pre- and post-filters shall have a gauge for each. Provide all accessories including adaptors, mounting panel, pressure tips, fittings, tubing, vent valves.

2.11 DAMPERS

A. All dampers shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

2.12 ACCESS SECTIONS

A. Access sections shall be provided where indicated in the schedule and plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer's maintenance manual.

2.13 RETURN/DISCHARGE PLENUM SECTIONS

A. Plenums shall be provided as indicated in the schedule and plans to efficiently turn air and provide acoustical attenuation. Discharge plenum opening types and sizes shall be scaled to meet pressure drop requirements scheduled and align with duct takeoffs.

B. Discharge plenum panels shall include an acoustical liner to meet acoustical requirements. The liner shall be fabricated from stainless steel perforated material to prevent corrosion and designed to completely encapsulate fiberglass insulation. The perforation spacing and hole size shall be such as to prevent insulation breakaway, flake off, or delamination when tested at 9000 fpm, in accordance with UL 181 or ASTM C1071. Insulation material must be resistant to fungi in accordance with ASTM C1338.

2.14 EQUIPMENT PARAMETERS

A. Design: Trane Performance Climate Changer CSAA

B. Acceptable Makes: Trane, York, Daikin

3.0 PART 3 – EXECUTION

3.1 SHIPPING

A. Paper copies of the IOM shall also be shipped with each AHU.

B. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

C. To protect equipment during shipment and delivery, all indoor units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.

D. After loading the equipment for shipment, the AHU manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.2 ON-SITE STORAGE

A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.3 FIELD EXAMINATION

A. The Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

B. The Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.4 INSTALLATION

A. The Contractor shall be responsible to coordinate ALL installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.

B. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

C. The Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:

1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.

2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

3. All water piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.

4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.

5. All power wiring, including motor starters and disconnects, serving the unit has been completed.

6. All automatic temperature and safety controls have been completed.

7. All dampers are fully operational.

8. All shipping materials have been removed.

9. All (clean) filter media has been installed in the units.

10. Provide external manual vent and drain lines with hose bibb and cap at all coils.

3.5 LEVELING

A. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer's instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

3.6 FINAL INSPECTION AND START UP SERVICE

A. After the Mechanical Contractor has provided all water and steam piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start up.

C. The Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:

1. Record date, time, and person(s) performing service.

2. Lubricate all moving parts.

3. Check all motor and starter power lugs and tighten as required.

4. Verify all electrical power connections.

5. Conduct a start up inspection per the AHU manufacturer's recommendations.

6. Record fan motor voltage and amperage readings.

7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.

8. Check fan for excessive vibration.

9. Check coupling for proper alignment.

10. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.

11. Disengage all shipping fasteners on vibration isolation equipment.

12. Check safety guards to insure they are properly secured.

13. Secure all access doors to the fan, the unit and the ductwork.

14. Switch electrical supply "on" and allow fan to reach full speed.

15. Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.

16. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.

17. Check all control sequences.

END OF SECTION 237313

SECTION 237413 - PACKAGED ROOFTOP UNIT

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Documents.

1.2 RELATED SECTIONS

A. Section 230020 - Basic Mechanical Requirements

B. Section 230513 – Motors

C. Section 230514 – Electric Wiring

D. Section 230923 – Temperature Controls

E. Section 23400 – Air Filters and Accessories

F. Section 262923 – Adjustable Speed Drives

1.3 REFERENCES

A. AMCA Publication 99 – Standards Handbook.

B. AMCA Publication 611 – Certified Ratings Program – Airflow Measurement Performance

C. AMCA Standard 500-D – Laboratory Methods of Testing Dampers for Rating.

D. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.

E. ANSI/AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.

F. ANSI/AHRI Standard 410 - Forced Circulation Air-Cooling and Air-Heating Coils.

G. ANSI/AHRI Standard 430 - Central Station Air Handling Units.

H. ANSI/ASHRAE Standard 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

I. ANSI/ASHARE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality, ANSI/ASHARE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.

J. ANSI/NEMA MG 1 – Motors and Generators.

K. ANSI/UL 900 – Standard for Safety Air Filter Units.

L. AHRI Standard 260 – Sound rating of Ducted Air Moving and Conditioning Equipment.

M. ASHRAE Standard 111 – Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

N. ASTM C1071 – Thermal and Acoustic Insulation (Mineral Fiber, Duct Lining Material).

O. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Material and Facings.

P. NFPA 70 – National Electrical Code®.

Q. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilation Systems.

R. UL 1995 – Standard for Safety Heating and Cooling Equipment

1.4 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Air handling units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard 430.

C. Air handling units with fan sections utilizing multiple fans shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance. Refer to specification 230923 for airflow monitoring station requirements.

D. Airflow monitoring station: Certify airflow measurement station performance in accordance with AMCA 611.

E. ISO 9001 Certification.

F. Unit shall be tested in compliance with ASNU Z21.40.1 or ANSI Z21.40.2.

1.5 SUBMITTALS

A. Packaged rooftop unit and accessories. Installation details. Complete installation drawings, installation and start-up instructions, wiring diagrams, and instruction manuals from manufacturer of equipment.

B. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Engineer.

C. Wind Restraint submittal data per specification 230550.

D. AHU manufacturer shall provide the following information with each shop drawing/product data submission:

1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.

2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.

3. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.

4. All performance data, including capacities and airside and waterside pressure drops, for components.

5. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.

6. For units with multiple fans, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Finally, a fan curve shall be provide showing the performance of the bank of fans when one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

7. A filter schedule that complies with Section 234000 must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.

8. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.

9. An electrical MCA – MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).

10. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hz.

11. The AHU manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.

12. The AHU manufacturer shall list any exceptions to the specification.

E. Unit shall conform in all respects to the 2022 revision of ASHRAE Standard 15, independent of whether specific details are enumerated within this specification.

1.6 QUALIFICATIONS

A. Complete unit and accessories shall comply with the New York State Energy Conservation Construction Code. Unit shall have UL and AGA label.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging and final placement of AHU sections. Indoor AHUs less than 100 inches wide shall allow for forklift transport for maneuverability on jobsite.

C. Indoor air handling units shall be shipped in a clear shrink-wrap or stretch-wrap to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.

D. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.9 MANUFACTURER'S WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of five (5) years from unit start-up or sixty-six (66) months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

B. Provide a 60 months extended warranty for refrigerant system.

2.0 PART 2 – PRODUCTS

2.1 PACKAGED ROOFTOP UNIT

A. General:

1. Unit shall be a complete packaged, fully assembled at the factory rooftop unit and consist of an insulated metal cabinet, downturn outdoor air intake hood with 2” aluminum mesh filter assembly, exhaust air blower, evaporator coil, condensate drain pan, enthalpic Core heat exchanger, hot gas reheat coil, packaged DX system, phase and brownout protection, motorized dampers, motorized recirculating damper, service receptacle, filter assembly for intake air, supply air blower assembly exhaust/relief blower assembly filter assembly for exhaust air and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection.

2. Roof Curb: Refer to 230509 - Roof Curbs and Equipment Supports for roof curb requirements.

B. Cabinet:

1. Materials: Formed, 2 inch double wall closed cell foam insulated metal panels and 2” double wall closed cell foam insulated metal door construction, fabricated to permit access to internal components for maintenance.

2. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.. Unit’s exterior shall be supplied from the manufacturer using G60 galvaneal steel with proprietary pre-painted material in the following finish color; Concrete Gray-RAL 7023. This has been subjected to a salt spray test per ASTM-B117 and evaluated using ASTM-D714 and ASTM-D610 showing no observable signs of rust or blistering until reaching 2,500 hours.

3. Internal assemblies: 22 gauge, galvanized (G90) steel, except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

4. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

   a. Materials: Rigid urethane foam

      1) Thickness: 2 inch (50.8 mm)

      2) Thermal Resistance: R13

      3) Meets UL94HF-1 flame requirements

      4) Location and application: Full coverage of entire exterior to include walls, roof of unit, unit base and doors

C. Access panels / doors:

1. Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel with 2 inch closed cell foam insulation.

D. Supply Air blower assemblies:

1. Blower assembly shall consist of an electric direct-drive fan(s). Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor(s) shall be capable of continuous speed modulation and controlled by a factory provided VFD. Fans are to be selected at no more than 80% maximum rotational speed for class.

E. Return/Exhaust/Relief Air blower assemblies:

1. Blower assembly shall consist of an electric motor, with an ODP enclosure and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a factory provided VFD. Fans are to be selected at no more than 80% maximum rotational speed for class.

2. Exhaust/Relief Air blower shall be capable of full economizer relief airflow rate.

F. Evaporator Coil:

1. Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of “interlaced” configuration, permitting independent operation of either compressor without conflict with the other compressor. Cooling coil leaving air temperature shall be directly measured via temperature sensor within supply airstream to ensure accurate dew point measurement

G. Control panel / connections:

1. Rooftop units shall have an electrical control panel where all electrical connections are made. Control panel shall be provided with a unit disconnect switch

H. Condensate drain pan:

1. Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a drain connection at the front (access side) for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall

I. P trap:

1. If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap.

J. Hot Gas Reheat

1. Coil shall be factory installed with modulating hot gas reheat valve, piping and controls. Reheat coil shall have a minimum of 6 inches between leaving edge of cooling coil fin and entering edge of reheat coil edge.

K. Packaged DX System:

1. Unit shall have an integral scroll compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Unit condenser fans shall feature swept owlet blade design resulting in reduced sound levels. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. All condenser fans will have electronically commutated (EC) motors and modulate at the same frequency to maintain head pressure. Lead condenser fan shall be VFD controlled and modulate to maintain a head pressure set point. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be inverter hermetic scroll-type and shall be equipped with liquid line filter drier, electronic expansion valves (EXV), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-454B refrigerant.

2. Provide inverter scroll compressors as noted on scheduled for unit low cooling capacity turndown.

L. Hail Guards:

1. Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.

M. Packaged DX Control and Diagnostics:

1. Unit to be shipped with factory mounted end devices wired to terminal strip.

2. The temperature controls contractor shall provide field install unit controllers and additional control devices to control the following: supply and exhaust airflow, cooling operation selection, heating operation selection, dehumidification enable, hot gas reheat modulation and enable, temperature setpoints, and emergency shutdown.

N. Motorized dampers:

1. Damper shall be insulated low leakage AMCA Class 1A certified construction. Leakage rate shall not exceed 3 CFM/ft2 @ 1 in. wg. and shall be factory installed.

O. Gas Heating Section:

1. Indirect fired, 4-pass tubular 409 stainless steel heat exchanger with integral combustion gas blower. Capacity as scheduled on Contract Drawings.

2. Gas train with pressure reducing valve, main gas shut-off valves, redundant gas valve, intermittent pilot ignition, remote flame sensor, fan relay limit switch.

3. Gas train in compliance with FM requirements. Suitable for 6 in. w.c. gas pressure upstream of the regulator.

4. Burner shall be of a low no emissions type.

5. Heat exchanger shall have a 25 year extended warranty.

6. Turndown and modulation as noted on plans

2.2 BLOWER

A. Blower section construction Supply Air: direct drive motor(s) and blower(s) shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.

B. Blower assemblies shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Fan: Direct drive, airfoil plenum fan with aluminum wheels statically and dynamically balanced and AMCA certified for air and sound performance.

D. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”

2.3 MOTORS

A. Refer to 230513.

2.4 FILTERS

A. Unit shall have hood filter shall be of 1 inch aluminum type, supply final air filter shall be of type 2” or 4” MERV 13 with a 2 inch MERV 8 pre-filter disposable pleated type.

2.5 A2L REFRIGERANT LEAK DETECTION/SAFETY CONTROLS:

A. The unit shall be provided with factory mounted refrigerant leak detection/safety controls in compliance with 2022 ASHRAE 15, Standard for Refrigeration Systems.

2.6 SOUND PERFORMANCE:

A. The AHU manufacturer shall provide sound power levels for AHUs at the octave bands indicated below. Sound power levels shall be rated in accordance with AHRI standards. Sound power levels at each octave band shall not exceed listed criteria by more than 3 db. In the event that the required levels are not met, the manufacturer shall provide corrective measures to achieve the levels specified in the schedules below, at no additional cost to the Owner.

Sound Power Levels (L_w) dB re10^{-12} W								
D-RTU-15H	**Octave Band Center Frequency (Hz)**							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Supply Fan								
Exhaust Fan								
Sound Power Levels (L_w) dB re10^{-12} W								
D-RTU-21H	**Octave Band Center Frequency (Hz)**							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Supply Fan								
Exhaust Fan								

B. Design Make: Valent VX

C. Acceptable Makes: Trane, Valent, Daikin

3.0 PART 3 - EXECUTION

3.1 PACKAGED ROOFTOP UNIT

A. Install automatic changeover electronic thermostat and associated wiring. Location per plans.

B. Provide for roof openings and framing as called for. Refer to 230509 - Roof Curbs and Equipment Supports for roof curb requirements. Pipe coil drains to spill to roof, provide "P" trap of proper depth. Install unit in strict accordance with manufacturer's instructions. Coordinate installation with work as part of "Control Systems" Section. Start-Up:

1. Arrange to have equipment manufacturer's technician to verify installation for compliance with manufacturer's recommendations.

2. Arrange to have equipment manufacturer's technician perform start-up of equipment, instruct Owner's Representative in the proper operation of the equipment.

END OF SECTION 237413

SECTION 238116 - SPLIT SYSTEM AIR CONDITIONER

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Split system air conditioner.

B. Manufacturer’s wiring diagrams.

C. Refrigerant piping schematics showing accessories.

1.3 GENERAL REQUIREMENTS

A. Provide units to fit intended use and location as indicated:

1. Capacity, size and arrangement, static pressure, brake horsepower, component parts and accessories as scheduled and/or as necessary to obtain required results and allow for proper maintenance.

2. Unit capacities to be ARI, ASHRAE and AMCA rated.

3. Each size fan to be supplied shall be tested in the manufacturer's laboratory under simulated installation conditions. Ratings based on test, not on interpolated or extrapolated calculation.

4. Guaranteed sound-power level ratings not exceeding those of design equipment.

B. Motors:

1. Furnished by equipment manufacturer.

2. Horsepower as scheduled and type as required for each location and service.

3. Motors shall comply with requirements of Section 230513, "Motors".

2.0 PART 2 – PRODUCTS

2.1 SPLIT SYSTEM – WALL MOUNTED:

2.2 EVAPORATOR UNIT

A. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired wall-mounted controller, wireless wall-mounted controller or wireless handheld controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

1. Unit Cabinet: The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

2. Fan: The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

3. Vane: There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

4. Filter: Return air shall be filtered by means of an easily removable washable filter.

5. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.

6. Electrical: The electrical power of the unit shall be 208 volts 1 phase, 60 hertz. The power to the indoor unit shall be supplied from the outdoor unit.

7. System Control: The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single two-wire cable.

   a. Wired Remote Controller

      1) The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Auto/Fan/Dry mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) and Temperature changes shall be by increments of 1°F

      2) The control voltage from the wired controller to the indoor unit.

      3) Provide with BACnet integration.

2.3 CONDENSING UNIT

A. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.

B. The outdoor unit shall be capable of full cooling capacity operation down to -20F and up to 115. Provide any additional Wind Baffles or equivalent to obtain.

C. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.

D. System shall operate at up to a maximum refrigerant tubing length of 100 feet between indoor and outdoor units without the need for line size changes, traps or additional oil. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

E. The cabinet casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability. Easy access shall be afforded to all serviceable parts by means of removable panel sections. The fan grill shall be of ABS plastic. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions.

F. The fan shall be furnished with a single DC fan motor. The blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts

G. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be controlled by a microprocessor controlled step motor.

H. The compressor shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.

I. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

J. Power for the indoor unit shall be supplied from the outdoor unit. The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

1. Unit shall utilize R-454B refrigerant.

2.4 ACCESSORIES:

A. Provide low ambient control.

B. Provide with condensate pump and required accessories.

C. Provide with BACnet integration into existing BMS.

D. Design Equipment: Mitsubishi TRUZ/TPKA

E. Acceptable Make: Mitsubishi, Trane, Daikin

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in strict accordance with manufacturer's instructions and so as to be compatible with intent of the respective system performance requirements.

B. Hang unit from spring type vibration isolators in strict accordance with manufacturer's instruction.

C. Provide refrigerant piping and accessories to air cooled condensing unit as recommended by equipment manufacturer and in accordance with Section 232000 - Piping Systems and Accessories.

END OF SECTION 238116

SECTION 238129 - VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS

1.0 PART 1 – GENERAL

1.1 SYSTEM DESCRIPTION

A. The variable capacity heat recovery air conditioning system shall be a LG VRF (Variable Refrigerant Flow) zoning system.

B. The system shall consist of simultaneous heating and cooling outdoor units, BC (Branch Circuit) controllers, multiple indoor units, and M-NET DDC (Direct Digital Controls), per equipment schedules. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure Owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8°F from setpoint for ten (10) minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

C. The replacement air cooled condensing unit and associated branch selector and ceiling cassette shall be compatible with the existing branch selector and associated ceiling cassettes. Provide all revisions required to the central control panel, including programming and graphic upgrades/revisions to reflect the revised system as shown on plans.

D. Basis of Design: LG

1. Alternate Manufacturer: LG, Daikin, Trane. Mitsubishi.

E. The basis of design system is a three-pipe system. If an alternate manufacturer is selected, any additional material, cost, and labor to install additional refrigerant lines, branch controllers, fittings, or other required components shall be incurred by the installing contractor. The installing contractor shall be responsible for additional costs incurred by other contractors and subcontractors as a result of installing an alternate manufacturer’s system. The installing contractor must provide complete drawings and documentation identifying all differences between the alternate manufacturer and the basis-of-design system, subject to Engineer’s approval. All costs associated with reviewing and approving these drawings and documentation shall be incurred by the installing contractor at the Engineer’s hourly rate.

F. This is a performance specification. Other manufacturers are named as acceptable in quality and services, providing the other named manufacturers comply fully with all construction details, scheduled performance requirements, and the full intent of these specifications. This does not necessarily mean that the other named manufacturers equipment will fit the available space or the dimensional or design requirements. It shall be the responsibility of this contractor to be sure that the system provided fully meets or exceeds the specified requirements, and should any changes or additional apparatus be required for other named manufacturers, this contractor shall be fully responsible for the material and installation cost, to complete the installation to comply fully with the systems as outlined in the plans and specifications.

G. The engineer shall determine compliance with the specification and whether or not the proposed manufacturer's equipment is acceptable for bid submission. Any deviation from this procedure is not acceptable and shall disqualify the proposed manufacturer. Acceptance and approval of any proposed equipment by the engineer for bid submission shall not be interpreted to imply that the proposed equipment will fit the available space or the dimensional or design requirements. If acceptance of the proposed equipment is granted by the engineer, an addendum will be issued adding that manufacturer's name. If not added by addendum, that manufacturer's equipment shall not be allowed.

H. It shall be the responsibility of this contractor to be sure that the system provided fully meets all the specified requirements, and should any changes or additional apparatus be required, this contractor is fully responsible for the material and installation cost, and to complete the installation to fully conform to the specifications. A request for a substitution shall constitute a representation that the contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.

2. Will provide the same warranties or bonds for the substitution as for the product specified.

3. Will coordinate the installation of an accepted substitution in the work, and make such other changes in the work as may be required for installation to make the work complete and equal in all respects.

4. Will be responsible for all additional costs including all claims by associated trades, which may subsequently become apparent.

I. The engineer will review requests for substitutions with reasonable promptness, and notify the contractor, in writing, of the decision to accept or reject the requested substitution. The engineer may request additional information, such as local area installation sites, which can be visited, and names and phone numbers of prior users who can be contacted.

J. The judgement of the engineer shall be final. Any attempts to circumvent this substitution procedure, or to implement changes without the written authorization of the engineer is a violation of Section 7209, Provision 2 of the New York State Education Law.

1.2 QUALITY ASSURANCE

A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (NEC).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. All units must meet or exceed the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

E. Manufacturer shall have a minimum of ten (10) years of VRF experience in the U.S. market and must have a minimum of ten (10) installed heat recovery VRF systems within 25 miles of the project site. Alternate manufacturers must provide a reference list of ten (10) installed heat recovery systems within 25 miles of the project site, including Owner contact information.

F. At Owner and Engineer discretion, manufacturer shall provide factory witness testing to confirm unit operation and performance at conditions stated in this specification. Testing shall be provided in a controlled environment. Manufacturer shall cover all expenses associated with the factory witness testing.

1.3 SUBMITTALS AND SHOP DRAWINGS

A. Product Data: Submit for approval the manufacturer's technical product data for each component furnished as part of the VRF system(s). Data shall include dimensions, capacities, performance characteristics, electrical (wiring and controls) requirements, and material finishes. Data shall also include installation and start-up requirements. Electrical diagrams shall clearly denote field versus factory provided.

B. Shop Drawings: Before commencing any work or ordering any materials, submit for approval drawings detailing the following:

1. Complete shop drawings of the VRF system(s) for electrical services; including equipment cuts, schematic diagrams, layout drawings; a written sequence of operation indicating the function of each device; and connections to equipment furnished by others. Submittal shall indicate each item by its nomenclature, as used in the schematic diagrams, and the sequence of operation shall clearly indicate its function.

2. Schematics shall not be "typicals" but shall show the specific equipment for the application.

3. Submittal to include BacNet Conformance Statement and Objects List for BMS Integration

1.4 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendation.

B. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

1.5 WARRANTY AND REQUIRED TRAINING

A. The entire system shall be covered by an extended manufacturer's limited parts warranty for a period of ten (10) years from date of installation. In addition, the compressor shall have a manufacturer's limited parts warranty for a period of ten (10) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. A manufacturer's written warranty statement must be provided prior to system approval.

B. The VRF system shall be installed by a contractor with extensive VRF installation and service training. The mandatory contractor service and install training must be performed by the manufacturer prior to submittal approval. Training must be a minimum of three (3) days at a manufacturer's approved training facility with equipment present. The Contractor shall submit a copy of successful training certification in compliance with these requirements. All travel and training expenses are the responsibility of the Contractor. At the Owner's request, a visit to the training center shall be required. All expenses for this visit are the responsibility of the Contractor.

C. Manufacturer must provide controls-integration training to the temperature controls subcontractor. Training must be a minimum of one (1) day at a manufacturer's approved training facility with equipment present. All travel and training expenses are the responsibility of the installing contractor.

D. Manufacturer must provide startup assistance, controls-integration assistance, system commissioning assistance, and a minimum of eight (8) hours of Owner's training.

E. Manufacturer must provide VRF service, maintenance, and diagnostic tool and all software for the owner and installing contractor. The tool shall allow service and maintenance personnel to monitor and record real-time operating data. The tool shall allow monitoring and recording of operating data by connecting at the control board of any VRF system component, indoor or outdoor.

2.0 PART 2 - PRODUCTS

2.1 OUTDOOR UNIT

A. General:

1. The outdoor units shall be used specifically with VRF components and shall be compatible with the existing to remain indoor ceiling and wall mounted cassettes. The outdoor units shall be equipped with multiple circuit boards that interface to the VRF controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired, and run tested at the factory.

    a. All units requiring factory-supplied twinning kits shall be piped together in the field without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the Contractor.

    b. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor-rated capacity.

    c. Outdoor unit shall be capable of up to 150% connected capacity for future expansion.

    d. Outdoor unit shall have a sound rating no higher than 58 dB(A) individually or 61 dB(A) twinned. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the Contractor.

    e. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) controllers shall be insulated.

    f. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.

    g. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.

    h. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

    i. The outdoor unit shall have the ability to operate with a maximum height difference of 164 ft. and have total refrigerant tubing length of 1,804 to 2,625 ft. The greatest length is not to exceed 541 ft. between outdoor unit and the indoor units without the need for line size changes or traps.

j. The outdoor unit shall have rated performance of heating operation at ----13°F ambient temperatures and cooling mode down to 23°F ambient temperatures, without additional low ambient controls. The unit shall maintain 100% heat output at 0°F and 85% heat output at -13°F without a supplemental heat source or a second compressor to boost low ambient heating performance. Systems shall be capable of providing indoor unit high fan speed supply air temperatures as indicated on the equipment schedules. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the Contractor and subject to Owner and Engineer approval.

k. The outdoor unit shall be capable of simultaneous cooling and heating operation down to -22°F.

l. The outdoor unit shall be provided with Intelligent Heat Mode in order to reduce power consumption and peak kW draw. During Intelligent Heat Mode compressor inverter driven speed will be at a reduced speed compared to maximum inverter thresholds. This will allow full load power input savings at low outdoor air temperatures. The user shall have the capability of switching between Intelligent Heat Mode and standard operation.

m. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

n. The outdoor unit shall be provided with a manufacturer-supplied 20 gauge hot-dipped galvanized snow/hail guard and snow hood. The snow/hail guard and snow hood protect the outdoor coil surfaces from hail damage and snow build-up in severe climates.

o. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost, which may extend "no or reduced heating" periods, shall not be allowed.

B. Outdoor Unit Sizing

1. The outdoor units must be sized to match the nominal heating and cooling capacities as scheduled and shall meet or exceed the scheduled performance values. Upsizing of the outdoor units, which will affect system performance and operation, shall not be acceptable.

C. Heat Interchanger Circuit:

1. The outdoor unit shall contain a heat interchanger circuit for sub-cooling liquid prior to entering the outdoor coil during the heating mode.

2. The interchanger shall be of a copper tube within a tube construction.

3. The interchanger circuit refrigerant flow shall be controlled by an electronic expansion valve.

D. Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

E. Fan:

1. Each outdoor unit module shall be furnished with one (1) direct drive, variable speed propeller-type fan. The fan shall be factory set for operation under 0 in. WG external static pressure but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.

2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

F. Refrigerant:

1. R410A refrigerant shall be required.

2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two (2) weeks prior to bidding.

G. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil fins shall have a factory applied, corrosion resistant blue-fin finish.

3. The coil shall be protected with an integral metal guard.

4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter-driven compressor.

5. The outdoor coil shall include four (4) circuits with two-position valves for each circuit, except for the last stage.

H. Basepan Heater:

1. Each outdoor unit module shall be equipped with a basepan heater. Basepan heater shall activate only when compressor is operating in heating mode at an outdoor ambient temperature of 39°F or below. If an alternate manufacturer is selected, any additional material, cost, and labor to meet basepan heater condition and performance shall be incurred by the Contractor.

2. Basepan heaters shall be installed in the unit base pan, on both the inside and outside of the outdoor unit heat exchanger coil.

I. Compressor:

1. Each outdoor unit module shall be equipped with one (1) inverter-driven scroll hermetic compressor. Non-inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.

2. A crankcase heater(s) shall be factory mounted on the compressor(s).

3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 6% of rated capacity.

4. The compressor will be equipped with an internal thermal overload.

5. The compressor shall be mounted to avoid the transmission of vibration.

6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

J. Controls:

1. The outdoor unit shall have the capability of up to eight (8) levels of demand control for each refrigerant system.

K. Electrical:

1. The outdoor unit electrical power shall be as scheduled.

2. The outdoor unit shall be controlled by integral microprocessors.

3. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a two-conductor, twisted-pair shielded cable to provide total integration of the system.

L. Basis of Design: LG ARUM Series

2.2 BRANCH CONTROLLERS (BRANCH DEVICES) "BS"

A. General:

1. The branch controller shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or sub-cooled liquid refrigerant to flow to indoor unit(s) for cooling.

2. The units shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The branch controllers shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. The units shall be mounted indoors, with access and service clearance provided for each controller.

3. Each branch device, regardless of manufacturer, must be installed in the designated areas as indicated on the project drawings. Installation of branch devices outside of these areas is not allowed.

4. Each branch device shall include a minimum of one (1) unused branch for future use. If the manufacturer does not offer spare branches, one (1) additional branch device must be provided and installed for each refrigeration system. Branches shall be fully installed and wired in designated areas with capped service shutoff valve and service port.

5. Each port on the branch devices shall be provided with a ball valve.

B. Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.

2. Each cabinet shall house a liquid-gas separator, multiple refrigeration control valves, and tube-in-tube heat exchanger(s).

C. Refrigerant Valves:

1. The unit shall be furnished with multiple two-position refrigerant valves.

2. When connecting a 54,000 BTU/h or larger indoor unit section, two (2) branch circuits shall be joined together at the branch controller to deliver an appropriate amount of refrigerant. The two (2) refrigerant valves shall operate simultaneously.

3. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

D. Integral Drain Pan:

1. An integral condensate pan and drain connection shall be provided.

E. Electrical:

1. The unit electrical power shall be 208/230 volts, one-phase, 60 Hz.

2. The unit shall be capable of satisfactory operation within voltage limits of 187 to 228 volts (208V/60 Hz).

3. The unit shall be controlled by integral microprocessors.

F. Basis of Design: LG PRH Series

2.3 (4-WAY CEILING-RECESSED CASSETTE) INDOOR UNIT

A. General

1. The unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.

2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

3. Branch ducting shall be allowed from cabinet.

4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

5. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space

C. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

3. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

4. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

5. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

6. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.

7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

8. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.

9. If specified, the grille shall have an optional i-see sensor that will measure room temperature variations and adjust the airflow accordingly to evenly condition the space.

D. Filter:

1. Return air shall be filtered by means of a long-life washable filter

E. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.

2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.

4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.

7. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.

8. Unit shall be provided with integral condensate pump.

9. Provide unit with drain panel level sensor.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls:

1. This unit shall use controls provided by unit manufacturer to perform functions necessary to operate the system.

2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

H. Basis of Design: LG ARNU Series

3.0 PART 3 - CONTROLS

3.1 OVERVIEW

A. General:

1. The VRF Control System shall be capable of supporting remote controllers, centralized controllers, an integrated web-based interface, graphical user workstation, and system integration to Building Management Systems via BACnet.

3.2 ELECTRICAL CHARACTERISTICS

A. General:

1. The control system shall operate at 30VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Wiring:

1. Control wiring shall be installed in a daisy-chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

2. Control wiring for the Simple MA remote controllers shall be from the remote controller (receiver) to the first associated indoor unit (TB-15) then to the remaining associated indoor units (TB-15) in a daisy-chain configuration.

3. Control wiring for centralized controllers shall be installed in a daisy-chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web-based interface), to the power supply.

4. The centralized controller shall be capable of being networked with other centralized controllers.

C. Wiring Type:

1. Wiring shall be two-conductor (#16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.

2. Network wiring shall be CAT-5 with RJ-45 connection.

3.3 REMOTE CONTROLLER

A. Remote Controller (Non-Programmable):

1. The Backlit Simple MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as one (1) group). The Backlit Simple MA Remote Controller shall be compact in size, approximately 3 in. x 5 in. and have limited user functionality. The Backlit Simple MA supports temperature display selection of Fahrenheit or Celsius. The Backlit Simple MA Remote Controller shall allow the user to change on/off, mode (cool, heat, auto, dry, setback (R2/WR2-Series only) and fan), temperature setting, and fan speed setting and airflow direction. The Backlit Simple MA Remote Controller shall be able to limit the set temperature range from the Backlit Simple MA. The Backlit Simple MA Remote controller shall be capable of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Backlit Simple MA Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit Simple MA Remote Controller shall display a four-digit error code in the event of system abnormality/error. The Backlit Simple MA Remote Controller shall be capable of up to two (2) remote controllers per group. The Backlit Simple MA Remote Controller shall require no addressing. The Backlit Simple MA Remote Controller shall connect using two-wire, stranded, non-polar control wire to the connection terminal on the indoor unit. The Simple MA Remote Controller shall require cross-over wiring for grouping across indoor units.

Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit.	Each Group	Each Group
Temperature Setting	Sets the temperature from 40°F to 95°F depending on operation mode and indoor unit. Separate COOL and HEAT mode setpoints available depending on central controller and connected mechanical equipment.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group
Airflow Direction Setting	Airflow direction settings vary depending on the indoor unit model.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Display Backlight	Pressing the button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)	N/A	Each Unit
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit
Test Run	Operates air conditioner units in test run mode. *2 The display for test run mode will be the same as for normal start/stop (does not display "test run").	Each Group	Each Group *2
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one (1) LOSSNAY unit.	Each Group	N/A
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group

B. Touch-Screen Centralized Controller (Web-enabled):

1. The Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. The Centralized Controller shall be approximately 8-1/2 in. x 10 in. in size and shall be powered from the external power supply. Multiple centralized controllers shall be provided as indicated on the drawings for future system expansion. The Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The Centralized Controller shall have five (5) basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Centralized Controller shall include on/off, operation mode selection (cool, heat, auto, dry, setback and fan), temperature setting, fan speed setting, and airflow direction setting. Since the controller provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, airflow (vane) direction, fan speed, and permit/prohibit of remote controllers.

Centralized Controller			
Item	**Description**	**Operation**	**Display**
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Indoor unit modes: COOL/DRY/FAN/AUTO/HEAT/SETBACK. Lossnay unit modes: HEAT RECOVERY/BYPASS/AUTO *Operation modes vary depending on the unit model connected.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 40°F to 95°F depending on operation mode and indoor unit model. Separate COOL and HEAT mode setpoints available depending on remote controller and connected mechanical equipment.	Each Block, Group or Collective	Each Group
Set Temperature Range Limit	The range of room temperature setting can be limited by the initial setting depending on the indoor unit connected.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depend on indoor unit model.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	*Airflow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group

Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *2. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four (24) events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five (5) types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group
Hold	Disables scheduled functions for indoor unit groups and their associated remote controller timers. *not available for general equipment	Each Block, Group or Collective	Each Group
Optimized Start	Unit starts 5 to 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Fan Speed, Air Direction and Reset filter). *3. Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group.	N/A	Each Group
Room Humidity	Displays the percent relative humidity in the space as sensed by the Smart ME Remote Controller	N/A	Each Group
Occupancy Sensor	Displays the occupancy icon on the group icon in the condition list page when the room is occupied (blue) or vacant (gray). *The Smart ME Remote Controller Occupancy sensor is required.	N/A	Each Group
Brightness Sensor	Displays the brightness icon on the group icon in the condition list when the space is determined to be bright (yellow) or dark (gray). *The Smart ME Remote Controller Brightness sensor is required.	N/A	Each Group

Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection	N/A	*4 Each Unit or Collective
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation".	Each Group	Each Group
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, German, Italian, Russian, Chinese, and Portuguese are available.	N/A	N/A
External Input / Output	By using accessory cables you can set and monitor the following. Input: By level: "Batch start/stop", "Batch emergency stop"; By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" *5. Requires the external I/O cables (PAC-YG10HA-E)	*5 Collective	*5 Collective
M-Net	The "M-NET" LED lights, when AC power supply is turned ON. The LED blinks while M-NET is communicating.	N/A	Each Group (LED)
Collective ON/OFF	All the units can be operated/stopped with a dipswitch.	Collective	N/A
Measurement	Displays the Temperature and Humidity inputs of the AI Board. Supports graph display and data export.	N/A	Each Unit
AHC Status	Displays the status of the of the inputs and outputs of each Advanced HVAC Controller (DC-A2IO)	N/A	Each Unit
Free Contact Status	Displays the input/output status of the Free Contacts on the indoor units	N/A	Each Unit
Free Contact Interlock Control	Operation of indoor groups, general equipment or free contact outputs based on group(s) conditions or free contact(s) input states.	Each Group, Output or Collective	N/A
Data Back-up (PC)	Initial setting data can be exported to a PC.	Collective	N/A

2. All Centralized Controllers shall be equipped with one (1) RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN).The Centralized Controller shall be capable of performing initial settings via a PC using the Centralized Controller's initial setting browser. Standard software functions shall be available so that the building manager can securely log into each centralized controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Standard software functions shall not expire. Additional optional software functions of personal browser for PCs and MACs and Tenant Billing shall be available.

3.4 BUILDING MANAGEMENT SYSTEM INTEGRATION

A. The interface shall be compliant with BACnet Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet Testing Laboratories. The BACnet interface shall support BACnet Broadcast Management (BBMD). The BACnet interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.

END OF SECTION 238129

SECTION 238210 - HYDRONIC GRAVITY HEATING EQUIPMENT

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawings on gravity heating equipment with color selection chart. Custom color selection by architect shall be accepted. Clearly indicate which equipment is being submitted.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment shall be free from expansion, noises and strains. Exposed parts to be cleaned and phosphate coated before prime coating or baked enameling. Finish colors as selected by architect, custom color during the submittal process. Factory-boxed and tagged by room numbers. Access doors shall be provided in cabinet at locations of valves, flow balancers and air vents. Verify at site, the space available for each piece of equipment. Top of heating unit enclosures shall be at least 1 in. below top of windowsill. Bottom of heating unit enclosures, unless otherwise called for, approximately 6 in. above floor and above the base molding. Refer to Owner's representative at once, any correction, discrepancy or suggested change in size or location. This Contractor responsible for proper location and size of recesses. Coordinate dimensions from floor to bottom of recess with other trades. Provide framing in recess and shims, if required.

B. All capacities shall be IBR approved ratings. Units shall be IBR approved as a complete assembly including element and cover.

2.2 FIN RADIATION

A. General Requirements:

1. Complete enclosure, continuous supporting channel full backplate, heating element, hangers and accessories, as specified and shown on the Contract Drawings.

2. Enclosures to run from wall-to-wall unless otherwise called. Provide necessary corner pieces, end caps, column enclosures, butt trims, wall sleeves, with access doors. Do not leave any enclosure installed without an end trim piece.

B. Heating Element:

1. Hot Water System: Seamless copper tube with non ferrous aluminum fins, 125 lbs. minimum hydrostatic test pressure. .020" tube wall thickness, minimum. .016" fin thickness, fin dimensions as scheduled.

2. Tube mechanically expanded to fin collars for permanent metal to metal contact.

3. Properly support with pitch adjustment. Silent element and pipe support. Locate a maximum of 2'-0" apart. Support shall allow for lateral movement for expansion and contraction of heating equipment.

4. Number of rows as indicated on equipment schedules.

C. Enclosures:

1. Enclosure fronts 16 gauge furniture steel.

a. Sloping top with aluminum discharge grille and shall run the continuous length of the enclosure.

b. Edges and corners rounded. Individual sections not over 6 ft. No exposed areas shall have sharp edges.

c. Mechanically fastened to wall bracket.

d. Continuous interlocking slip joint fit between adjoining covers. Finish shall match enclosure fronts along entire male and female sides.

e. Enclosure accessories shall fit tight to wall at sides, in full back plate at top and extend back and mechanically screw to wall at bottom.

f. Custom color selection by architect.

2. Support channel full backplate with top wall gasket and supports:

a. 20 gauge securely fasten to wall.

b. Enclosure front braced by internal channel braces. Minimum on either side of joint seam.

c. No sheet metal screws or other fastening devices shall be visible.

d. Provide wall brackets or stiffening supports adjacent to each joint and at least every 16 in., maximum 24" O.C.

3. Top of cover rest on backplate only and not between wall and backplate.

D. Design Equipment: Sterling JVB-T

E. Make: Sterling, Vulcan, Rittling.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Each unit isolated with shut-off ball valves to permit servicing. Provide flow balancer for each unit as detailed. Provide trap for each unit as detailed. Contractor responsible for correct end connections and arrangements. Arrange piping accessories and valving fully accessible for servicing. Enclosures fastened to structure with screws or bolts, no nailing allowed. Fasten at 6 in. O.C.

END OF SECTION 238210

SECTION 238216 - COILS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawing on coils.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide coils of proper size and rows to fit intended use and capacity as scheduled and specified. Location as shown on Plans. Designed for 125 psi. Same end or opposite end connections as required to fit installation shown on Plans. Vertical mounted coils shall have bottom drain headers. Duct mounted coils shall be equipped with flanges. Tag each coil at factory giving number and location. Coils completely drainable with auxiliary drain headers, if necessary. Minimum 1/2 in. drain and vent connections. Aluminum fins shall be a minimum of .0075 in. thick unless otherwise noted. Coils shall have brazed return "U" bends, bent tubes are not acceptable. Performance certified in accordance with ARI Standard 410.

2.2 DUCT MOUNTED HOT WATER HEATING COIL

A. Non-ferrous heating coils, 125 psi working pressure, designed to relieve expansion and contraction strains. Minimum 16 gauge galvanized casing, non-ferrous or cast iron headers, 0.035” thick copper tubes with 0.035” thick "U" bends, aluminum fins, for coils. Coils tested at 300 psig then leak tested at 200 psig with air pressure under water. Hot water heating coils, serpentine type, number rows and arrangement as called for; same end connections with vent chamber on return end and completely drainable. Provide with turbulators.

B. Refer to section below for heating hot water coils associated with a chilled water cooling coil for additional requirements.

C. Design Equipment: Trane

D. Make: Daikin, Trane, Heatcraft.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in strict accordance with manufacturer's instructions and so as to be compatible with intent of the respective system performance requirements. Provide supporting ironwork and sheet metal safing to assure proper installation without any bypass air around coil.

B. Provide a stainless steel drip pan under each cooling coil section extended a minimum of 12” beyond downstream side of coil. Provide with 1-1/4” tapped drain connection pipe to nearest floor drain.

C. Provide ample space during installation to allow for the removal of the coil. Provide all necessary unions, isolation valves, flexible connectors and accessories to allow for the removal and service of the coil.

D. Provide an access door upstream of all coils for inspection. Access door shall be minimum 16 x 12.

END OF SECTION 238216

SECTION 238219 - FAN COIL UNITS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Drawings.

1.2 SUBMITTALS

A. Room fan coil units and accessories including coil capacities, grille type and filters.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Baked enamel finish of color selected from manufacturers standard colors. Each piece of equipment boxed separately and tagged by room number.

2.2 ROOM FAN COIL UNITS

A. Cabinets/Consoles:

1. 18 gauge steel removable front enclosure so that internal operating parts are accessible for service or replacement.

2. Tamperproof Cam type locks.

3. Directed flow four-way adjustable discharge grilles.

4. Isolated valve compartment.

5. Access to motor, fan assembly and filters.

6. Type as required for job conditions.

7. Return air grilles.

8. Factory installed air vent tapping.

9. Factory supplied outside air damper/fresh air inlet.

10. Insulated drip pan for coil and valve sections.

11. Insulated cabinet with material in compliance with NFPA 90A requirements.

12. Provide unit with Maxiblue Condensate Pump, 110V/1Phase. Provide with White Fascia Kit to conceal all exposed pump accessories and tubing.

B. Heating Coils:

1. Copper tubes and headers, nonferrous fins.

C. Cooling Coils:

1. Copper tubes and headers, nonferrous fins.

2. Stainless steel, insulated drain pan.

D. Motors:

1. High Static ECM Motors.

2. Built-in overload protection.

3. Resilient mountings to dissipate noise and magnetic vibration.

4. Unit mounted and wired multi-speed switch.

5. Quick detachable motor cords.

E. Filters: Provide 1" thick throwaway type, MERV 13.

F. Shall not to exceed 35 decibels, 5 ft from units.

G. Design Equipment: Trane FCD

H. Make: Carrier, Daikin, Trane.

2.3 LOW PROFILE - RECESSED TYPE

A. Arrangement:

1. Base unit designed for fully recessed wall installation.

2. Features and accessories shall be the same as room type, except for the following:

a. Base casing shall be provided in lieu of finished cabinet.

b. Remote flush mounted speed switch shall be provided.

c. Maximum unit height 10”.

d. Ducted supply and return air connections.

e. Condensate overflow detection device.

f. Factory installed condensate pump.

g. Provide unit with Maxiblue Condensate Pump, 110V/1Phase. Provide with White Fascia Kit to conceal all exposed pump accessories and tubing.

h. Condensate overflow switch.

i. Maxiblue condensate pump as noted on schedule.

B. Design Equipment: Trane FCC – Concealed above ceiling

C. Make: Carrier, Daikin, Trane.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Left hand or right hand piping connections for supply and return. Obtain complete instructions from unit manufacturer regarding each item and proper installation of same. Adjust motor speed.

3.2 INSTALLATION

A. In accordance with manufacturer's recommendations. Install piping within valve compartment to allow for pipe insulation. Provide drain piping. Vacuum clean inside of unit prior to operating units. Provide flexible duct connections at supply and return connections to ceiling units. Install remote speed switch for recess and ceiling units. Provide wiring.

END OF SECTION 238219

SECTION 238223 - UNIT VENTILATORS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Unit ventilators.

1.3 ARRANGE FOR UNIT VENTILATOR MANUFACTURER TO

A. Provide Detailed Drawings of Unit Ventilator for Each Typical Room.

B. Thoroughly instruct Heating Contractor in installation of intake boxes, unit ventilator cabinets, metal shelving, etc. Upon completion, examine complete installation and certify in writing that installation is in accordance with manufacturers instructions.

C. Complete testing and start-up for each unit shall be performed by the manufacturers authorized representative.

D. Instruct Owner Representative in operation and care of unit ventilator system.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment of one manufacturer. Each system shall include complete field installed temperature control system. Surfaces baked enamel finish, color as selected from manufacturers standard colors. Equipment boxed separately and tagged by room number.

2.2 UNIT VENTILATORS

A. CABINET

1. Cabinet Construction

a. VUD1200

1) The unit cabinet shall be 14ga, formed unibody construction for superior rigidity with dimensions of 28” wide by 93” high by 23” deep. The finish shall be a durable powder coat – textured finish, color chosen by the Architect from manufacturer standard colors. The cabinet shall be fully lined with 1” closed cell insulation. The return air grille shall be removable heavy duty steel. The unit shall have a draw through configuration with either an “L”-type outdoor air/return air damper assembly. For easy maintenance, access to the internal components shall be through the front of the unit.

b. VUD1600

1) The unit cabinet shall be 14ga, formed unibody construction for superior rigidity with dimensions of 44” wide by 93” high by 23” deep. The finish shall be a durable powder coat – textured finish, color chosen by the Architect from manufacturer standard colors. The cabinet shall be fully lined with 1” closed cell insulation. The return air grille shall be removable heavy duty steel. The unit shall have a draw through configuration with either an “L”-type outdoor air/return air damper assembly. For easy maintenance, access to the internal components shall be through the front of the unit.

c. VUD2000

1) The unit cabinet shall be 14ga, formed unibody construction for superior rigidity with dimensions of 33” wide by 93” high by 23” deep. The finish shall be a durable powder coat – textured finish, color chosen by the Architect from manufacturer standard colors. The cabinet shall be fully lined with 1” closed cell insulation. The return air grille shall be removable heavy duty steel. The unit shall have a draw through configuration with either an “L”-type outdoor air/return air damper assembly. For easy maintenance, access to the internal components shall be through the front of the unit.

2. Filter

a. The filters shall be of the manufacturer’s 2” and shall have a MERV 13 filters. One spare set of filters shall be provided and shipped loose for each unit.

3. Access Panels

   a. Internal components shall be easily accessible through front access panels which shall be side hinged. The hinge shall not protrude beyond the front surface of the unit and the hinged panel shall be securely closed with two fast lead captive fasteners. The fast lead captive fasteners shall ensure a tight air seal for the access panels.

4. Drain Pan

   a. For all units with cooling coils, an stainless steel; double sloped drain pan shall be provided. The drain pan shall be insulated on the underside with ½" closed cell insulation. A 5/8" vinyl condensate line shall be provided. A running or field provided "P" trap shall be provided by the installing contractor.

5. Outdoor / Return Air Mixing Dampers

   a. The outdoor air (OA) and return air (RA) dampers shall have airfoil section extruded aluminum blades with flexible seal blade tips and jamb seals. Leakage shall not exceed 4 c.f.m. per sq. ft. at 3" W.G. differential pressure as determined by a recognized testing laboratory. A Belimo spring return damper actuator shall be supplied and installed by the unit manufacturer.

6. Line Voltage

   a. All internal line voltage wiring shall be by the unit manufacturer with a single power connection point. A single suitably rated unfused service disconnect switch shall be factory installed within the unit. Voltages include 115V/60 Hz 1 phase, 208-230 V/60Hz 1 or 3 phase, 277V/60Hz 1 phase or 480 V/60Hz/3 phase + Neutral. A suitably rated remote circuit breaker shall be provided and installed by the electrical contractor.

7. Control Panel

   a. A control panel (without the controller) shall be factory provided and installed. It shall be located behind the front access panel for easy maintenance and service and shall include a 40 VA control transformer with the required contactors, relays and circuit protection.

B. Motors

1. Supply Air Fans

a. The internal supply fan assembly shall include one (two for VUD2000) direct drive electronically commutated motors (ECM) and blowers mounted on rubber isolation grommets. The ECM motors shall be programmed for high efficiency and low audible sound. The motors shall consist of a brushless, permanently lubricated ball bearing construction for maintenance free operation.

C. Coils

1. Hot Water Heating Coil

a. A hot water heating coil shall be installed inside of the unit. The coil shall have 1/2" OD copper tubes of minimum thickness 0.016" and shall have aluminum fins. The coil supply and return headers shall be copper pipe sized to suit water flow, no larger than 1" OD and stubbed out for sweat connection. The coil shall be factory pressure tested at not less than 350 p.s.i. A manual air vent and drain cock shall be factory installed. The coil capacity shall be as shown in the equipment schedule. The coil shall be installed in Preheat position.

2. Face and Bypass:

a. The unit ventilator shall be equipped with face and bypass dampers. The dampers shall have airfoil section extruded aluminum blades with flexible seal blade tips and jamb seals. Leakage shall not exceed 4 c.f.m. per sq. ft. at 3" W.G. differential pressure as determined by a recognized testing laboratory. The dampers shall be provided with a fully modulating Belimo non-spring return actuator.

3. Chilled Water Cooling Coil

a. A chilled water cooling coil shall be installed inside of the unit. The coil shall have 1/2" OD copper tubes of minimum thickness 0.016" and shall have aluminum fins. The coil supply and return headers shall be copper pipe sized to suit water flow, no larger than 1" OD and stubbed out for sweat connection. The coil shall be factory pressure tested at not less than 350 p.s.i. A manual air vent and drain cock shall be factory installed. The coil capacity shall be as shown in the equipment schedule.

D. Piping Options

1. Piping options shall be fitted inside the unit by the factory and insulated to prevent sweating. All piping components should be accessible from the front of the unit.

2. Water control valves shall be supplied and installed by mechanical contractor in the field, External Of The Unit.

E. Controls

1. DDC Control:

a. The contractor shall supply and install in field the unit controller, temperature sensors, current sensor, and all other control components as described in the sequence of operation. All factory installed wiring shall be connected to a terminal strip within the unit.

F. Unit Accessories

1. Outdoor Air Rear Plenum

a. Where shown on the plans the unit manufacturer shall provide an outdoor air plenum assembly and shall be color matched to the unit. The plenum shall be lined with glass fiber insulation and shall be sized to suit ceiling height. Refer to schedule for plenum depth.

2. Top Extension

a. The unit manufacturer shall provide a color matched 18” top extension for the cabinet, size to suit the ceiling height. The top extension shall be custom made at the factory to allow for a two inch protrusion through the suspended ceiling. Exposed screws on the exterior face of the top extension are not acceptable.

3. Condensate Pump

a. A condensate pump shall be factory installed within the unit as noted on schedule.

b. Provided with a Little Giant VCMX-20 condensate pump. Pump shall be installed internal to the unit ventilator as not to interfere with unit performance, operation or air flow. The condensate pump shall plug into the unit ventilator control enclosure for a power source.

G. Design Equipment: Temspec

H. Make: School Air, System Air, Temspec

3.0 PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITY

A. This contractor responsible to:

1. Order correct end connections for supply, return, electric and dampers.

2. Obtain complete instructions from unit manufacturer regarding each item and proper installation of same.

3. Make certain and guarantee that airtight sealing is made between air opening and unit back. Skim coat wall with plaster to provide a smooth surface for airtight seal.

4. Make installation water and weathertight; guarantee same.

5. Check building construction to see that same will allow proper installation. If not satisfactory, notify Architects.

6. Obtain correct end roughing for electric. Coordinate with Division 26, Electric.

7. Establish exact location of intake boxes.

3.2 INSTALLATION

A. Fasten securely to wall and floor with expansion bolts.

1. With tight fitting neoprene gasket around air intake.

2. Provide felt or sponge rubber pad between unit and floor.

3. Shim and align unit ventilators.

4. Arrange valving and piping and accessories accessible for servicing.

5. Provide extra thick compressible insulation on back of unit to insure no leakage of outside air beyond unit intake.

B. This Contractor responsible for proper setting and location of units and intake boxes, grilles and sleeves.

1. Correct, as part of Contract, any misplaced or improperly set units or intake boxes.

C. Protect units from damage until final acceptance:

1. Restore or replace any damaged part.

END OF SECTION 238223

SECTION 260010 - BASIC ELECTRICAL REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Section 019113 Commissioning Requirements, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 26, 27, & 28.

1.2 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies.

B. The following is a list of codes and standards that will apply to this project:

1. 2020 Building Code of New York State
2. 2020 Existing Building Code of New York State
3. 2020 Fire Code of New York State
4. 2020 Energy Conservation Construction Code of New York State
5. New York State Department of Labor Rules and Regulations
6. 2017 National Electrical Code, NFPA 70
7. Electrical Safety Requirements, NFPA 70E
8. 2016 National Fire Alarm Code, NFPA 72
9. New York State Education Department
10. 2018 Life Safety Code, NFPA 101
11. Local Codes and Ordinances for Maine, New York
12. Federal Occupational Safety and Health Act - OSHA.
13. Factory Mutual or other Insurance Carrier.

1.3 LICENSING & PERMITS

A. Provide certificate of inspection from Commonwealth Electrical Inspection Services Inc. for all electrical work prior to acceptance of each phase.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid. Provide third party inspection of all electrical work by a certified inspection agency or approved professional.

C. Refer to General Conditions of the Contract for additional requirements.

1.4 GLOSSARY

ACI	American Concrete Institute
ADA	American Disabilities Act
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
FM	Factory Mutual Insurance Company
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
NYBFU	New York Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
UFPO	Underground Facilities Protective Organization
UL	Underwriter's Laboratories, Inc.

1.5 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN.
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.

Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional
Prime Professional	Architect or Engineer having a contract directly with the Owner for professional services.
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Rough-in	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.6 BASIS OF DESIGN

A. The contract documents are prepared on basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Make required changes in the work of other trades, at no increase in any contract. Provide larger electrical feeders, circuit breakers, equipment, additional control devices and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of rough-in and connections by other trades. Remove and replace door frames, access doors, walls ceilings or floors required to install other than design make equipment. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.7 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, fixtures, panelboards, conduits, and wiring devices. Exact locations are subject to the approval of the Owner's Representative. The general run of electrical feeders, branch circuits, and conduits, indicated on the drawings, is not intended to be the exact routing. Circuit designations, in the form of "Home Runs" on branches, indicate the designation of the branch circuit, the size and the quantity of branch circuit conductors, and the panelboard or interconnection box from which the branch circuit is served.

1.8 QUALITY ASSURANCE

A. Manufactures of equipment shall be firms regularly engaged in the production of factory fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

2.0 PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. The Materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are not acceptable.

C. Refer to Division 1 specifications for additional information on Substitutions and associated procedures.

D. Proposed substitutions must be submitted to the Architect/Engineer a minimum of ten (10) days prior to the date for receipt of Bids. Each request shall include the name of the proposed material equipment being substituted, cut sheets, installation drawings, performance and test data and warranties. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders.

2.2 MATERIALS

A. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

B. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems conform to the Specifications.

2.3 U.L. LISTING

A. Equipment shall bear the Underwriter’s Laboratories (UL), or other approved agency listing label. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with the National Electric Code and listed by U.L.

2.4 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed.

B. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections. Refer to applicable Division 01 Section(s) for additional information and requirements.

C. All products specified in an individual Division 26, 27, and 28 specification sections shall be submitted at the same time and each Division Specification section shall have its own submittal. Number each submittal and do not combine multiple specification sections into a single submittal.

D. Shop Drawings Shall Be Dated and Contain:

1. Name of project

2. Name of prime professional;

3. Name of prime contractor;

4. Associated Specification Section, description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.

5. Incomplete submittals will not be accepted.

6. Indicate deviations from contract requirements on Letter of Transmittal.

E. Corrections or comments made on the Shop Drawings during the review do not relieve Contractor from compliance with requirements of the drawings and specifications.

F. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

3.0 PART 3 - EXECUTION

3.1 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of reproducible transparencies drawn at not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings As Follows:

1. HVAC Contract will prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be sepias of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, lighting fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Reposition proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of Base Bid Contracts. Minor revisions need not be redrawn.

2. HVAC Contract will provide sepia transparencies and/or prints and submit the base plan to all major trades' Contractors.

3. Electrical, Plumbing and Fire Protection Contracts will draft location of piping, raceways, cable trays, light fixtures and equipment on the base plan, indicating areas of conflict and suggested resolutions.

3.2 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation .dgn format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. A request must be made in writing to the engineer with the requested individual files. The contractor will then be sent a CAD Release Form and must sign the form to obtain electronic drawings.

3.3 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough-in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the owners representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.

2. Before rough-in for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved rough-in drawings giving exact location for each piece of equipment. Do not "rough-in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owners representative or other contractor for any “rough-ins” that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the electrical contractor at no expense to the Owner.

3. For equipment and connections provided in this contract, prepare rough-in drawings as follows:

   a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.

   b. New equipment: Obtain equipment rough-in drawings and dimensions, then prepare rough-in drawings.

   c. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Prior to beginning work inspect and test all existing electrical systems that will be affected by the work in this contract. Provide a report to the Owner indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.

B. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the owner prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, that is determined to have been caused by the work in this contract.

3.5 ELECTRICAL INSTALLATIONS

A. All installations shall comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.

2. The architect shall control the placement of all wall and ceiling mounted electrical equipment and devices in all rooms with the exception of mechanical and electrical equipment rooms. When drawing details are not available, consult with the Architects representative for actual location.

3. Verify all dimensions with field measurements.

4. Arrange for all chases, slots and openings in other building components that are not indicated on drawings, to allow for electrical installations.

5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

6. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule. Pay close attention to equipment that must be installed prior to building enclosure.

7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

8. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer the conflict to the Architect.

9. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

10. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

11. All tolerances in alignment and leveling, and the quality of workmanship for each stage of work shall be as required by the manufacturer and subject to approval by the owners representative.

12. All finished equipment surfaces damaged during construction shall be brought to "as new" condition by touch up or repainting. Any rust shall be removed and primed prior to repainting.

13. Workmanship shall be as called for in the "Standard of Installation" published by the National Electrical Contractors Association (NECA).

14. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

15. No electrical equipment shall be hidden or covered up prior to inspection by the owners representative. All work that is determined to be unsatisfactory shall be corrected immediately.

16. All electrical work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

17. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his approval. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

18. Install access panel or door where units are concealed behind finished surfaces.

3.6 PAINTING

A. This Contract Includes the following :

1. Painting for all cut and patch work performed as part of Division 26, 27, and 28 contract.

2. Painting required for touch-up of surfaces damaged due to the installation of electrical work.

3. Painting as required to repair finish of equipment furnished.

4. Painting of all surface mounted raceways in finished areas.

3.7 ELECTRICAL EQUIPMENT CONNECTIONS

A. Provide complete power connections to all electrical equipment. Provide control connections to equipment where indicated on the drawings. Provide a disconnect switch ahead of each piece of equipment receiving an electrical connection in accordance with the latest version of the National Electrical Code . Ground all equipment in accordance with the latest version of the National Electrical Code.

B. Provide all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required for proper equipment operation of Owner-Furnished Equipment and Equipment furnished by other contracts,

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to rough-in.

3.8 CLEANING

A. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

3.9 TEMPORARY FACILITIES

A. Refer to Division 0 and 1 specifications for temporary facility requirements of this contract.

3.10 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary mechanical and electrical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing mechanical/electrical facilities or services.

3.11 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owners designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed prior to acceptance repeat the instructions if asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide, operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer’s certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e., variable frequency drive and air handling unit) both manufacturer’s shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up including problems that occurred and their method of resolution.

C. Refer to Section 019113 – Commissioning Requirements for additional startup and Contract Closeout requirements.

3.12 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items. Bind above items in a three ring binder with name of project on the cover. Provide required number of hard copies and disk(s) containing pdf files of all documents and deliver to Owner's Representative before request for acceptance.

3.13 RECORD DOCUMENTS

A. Prepare record or as-built documents in accordance with Division 01 Specifications. In addition to those requirements provide the following:

1. Document the routing major raceway systems, location of control devices, branch circuit numbers for all devices and equipment and fuse and circuit breaker sizes for major equipment and branch circuit home runs.

2. Provide stamp on each drawings including: Company Name, Date and “Record Drawings”

3. Refer to each Division 26, 27 and 28 section for additional items to be included in the record drawings.

4. Provide required number of hard copies and disk(s) containing pdf files of all documents.

3.14 REMOVALS

A. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that Owner wishes to retain that do not contain asbestos or PCB Material shall be delivered to location directed by Owner. Items that Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos and/or PCB's shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated. Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, lighting, ductwork, tubing, supports, fixtures, etc. Visit each room, crawl spaces and roofs to determine total Scope of Work.

B. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all equipment, conduit, junction boxes, devices, panels, and all hangers, including the top connection and any fastenings to building structural systems. Patch, paint and seal all removals, openings and other penetrations in roof, walls, ceilings, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

3.15 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the owners asbestos management plan. Prior to performing such work identify areas containing asbestos. Notify the Owner so that they may make arrangements for abatement and/or containment prior to work proceeding. The contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to division 2 sections for further requirements.

END OF SECTION 260010

SECTION 260100 - BASIC MATERIALS AND METHODS

1.0 PART 1 - GENERAL

1.1 SCOPE

A. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports
2. Access Doors and Panels
3. Fire Stopping
4. Boxes and Cabinets
5. Equipment Pads, Bases and Supporting Devices
6. Identification
7. Arc Flash Hazard Warning Labels

1.2 SUBMITTALS

A. Product data for:

1. Boxes and Cabinets
2. Fire Stopping Materials
3. Arc Flash Hazard Warning Labels

1.3 QUALITY ASSURANCE

A. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, and cutting and patching.

B. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

C. Materials specified herein shall comply with the applicable requirements of :

1. The following Articles of the National Electric Code (NFPA 70)

a. 314 - Outlet, Device, Pull and Junction Boxes, Conduit bodies and fittings

b. 312 - Cabinets, Cutout Boxes and Meter socket Enclosures

2.0 PART 2 - PRODUCTS

2.1 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36

2. Cold-Formed Steel Tubing - ASTM A 500

3. Hot - Rolled Steel Tubing - ASTM A 501

4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.2 ACCESS DOORS AND PANELS

A. Steel access doors and frames shall be factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.

B. Construction:

1. Frames:

a. 16 gage steel with 1 inch wide exposed perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast in place concrete, ceramic tile.

b. 16-gage steel, perforated flanges with bead for gypsum or plaster wall board.

c. 16-gage steel with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame for full bed plaster applications.

2. Access Doors:

a. Provide 14 gage sheet steel flush panel doors with concealed continuous piano hinge factory installed, primed and painted, set to open 175 degrees.

b. Provide fire rated, insulated flush panel doors, with continuous piano hinge and self-closing mechanism rated for 1 ½ hour “B” labeled, in fire rated partitions.

C. Provide flush, screwdriver operated cam locks on all access doors.

2.3 FIRE STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants

2. Nelson Electric Fire-Stop System Putty, CLK and WRP

3. Thomas & Betts - S-100 FS500/600

4. Specified Technologies Inc. (STI)

5. Hilti Firestop Systems

2.4 BOXES AND CABINETS

A. Outlet Boxes and Covers

1. General Use Boxes shall be galvanized steel, not less than 1-1/2" deep, 4" square or octagonal, with knockouts. Outlet boxes exposed to moisture, exterior, wet or damp locations shall be cadmium cast alloy complete with threaded hubs and gasketed screw fastened covers. Minimum box size shall be as indicated in Article 314 of the National Electrical Code for the conductors and devices installed. Boxes shall be approved for the environmental condition of the location where they will be installed.

2. Boxes installed in damp or wet locations shall be of rain tight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.

3. Acceptable manufacturers:

a. Steel City

b. RACO

c. Appleton

d. Crouse Hinds

B. Pull and Junction Boxes

1. Shall be constructed of not less than 14 gauge galvanized steel with trim for flush or surface mounting in accordance with the location to be installed. Provide screw-on type covers. Boxes installed in damp or wet locations shall be of rain tight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.

2. Acceptable manufacturers:

a. Hoffman

b. Keystone

c. Cooper B-Line

d. Custom fabricated per. NEC and UL guidelines

C. Terminal and Equipment Cabinets:

1. Terminal and Equipment Cabinets shall be code gauge galvanized steel with removable endwalls. Fronts shall be of code gauge steel, flush or surface type (as indicated) with concealed trim clamps, concealed hinges, flush lock, and grey baked enamel finish. Boxes and front shall be U.L. listed and shall be minimum 35"H x 24"W x 6"D. Provide removable insulated plywood terminal board mounted on inside back wall of cabinet.

2. Acceptable manufacturer:

a. Square D "Mono-Flat"

b. Approved equal

2.5 EQUIPMENT BASES, PADS AND SUPPORTING DEVICES

A. Supports, support hardware and fasteners shall be protected with zinc coating or treatment of equivalent corrosion resistance using approved alternative treatment, finish or inherent material characteristic. Products used for outdoor applications shall be hot dipped galvanized.

B. Provide clevis hangers, riser clamps, conduit straps, threaded c clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps as applicable.

C. 14 gauge U-Channel systems with 9/16 inch diameter holes at a minimum of 1 7/8 inches on center in the top surface. Provide fittings and accessories that match and mate channel.

D. Provide carbon steel or wedge or sleeve type expansion anchors, steel spring head toggle bolts and heat treated steel power driven threaded stud fastening equipment as required by construction types.

E. Provided field fabricated supporting devices such as angles, channels, pipe supports, etc. All fabricated supports shall be of metal construction.

F. Acceptable Manufacturers:

1. Allied Tube
2. American Electric
3. B-Line
4. Unistrut Diversified Products
5. Cooper Industries
6. Killark Electric Mfg. Co.
7. O/Z Gedney
8. Spring City Electrical Mfg. Co.
9. Thomas & Betts Corporation

2.6 ROOF PENETRATION FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, EDPM skirts, EDPM hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Design Equipment: RPS.

C. Acceptable Manufacturers: Pate, Shipman & Son.

2.7 IDENTIFICATION

A. Equipment Identification Nameplates

1. Machine engraved, plastic laminated labels, signs and instruction plates.
2. Material: Engraving stock melamine plastic laminate.

3. Thickness:

   a. 1/16-inch minimum thick for signs up to 20 square inches or 8 inches in length.

   b. 1/8-inch thick for larger sizes.

4. Color:

   a. Background: Black

   b. Lettering: White

5. Text:

   a. Equipment Designation: Helvetica 3/8" lettering.

   b. Supplementary Information (i.e. source, location, nominal voltage, etc.): Helvetica 3/16” lettering.

6. Identification nameplates shall be punched and permanently affixed to the equipment via stainless steel mechanical fasteners.

B. Wiring Device Labeling

1. 0.5” tall, plastic, tear resistant, printer tape label.

2. Color: Black text on clear tape.

C. Raceway & Cable Labeling

1. Adhesive marking labels for raceway and metal-clad cable. The labels shall indicate voltage and service, and be located above ceilings every 75 feet and on wall mounted conduit in mechanical and equipment rooms.

2. Colored self-adhesive vinyl tape, minimum 3 mils thick by 1 inch wide for all phase marking on cable.

D. Underground Conduit and Cabling Labeling

1. 6-inch wide, red colored, warning ribbon plastic tape compounded for direct-burial services. Ribbon shall have aluminum backing making it easy to locate using a non-ferrous locator. Ribbon shall include continuous lettering reading “CAUTION BURIED ELECTRIC LINE BELOW” or similar.

2.8 ARC-FLASH HAZARD WARNING LABELS

A. Standard Label for All Electrical Equipment:

1. Multi-colored self-adhesive vinyl label, minimum dimension 5” wide x 3” high.

2. Shall designate the arc flash hazard for equipment in accordance with NFPA 70E.

3. Label shall include the following information:

a. Text reading: "⚠WARNING ARC FLASH & SHOCK HAZARD APPROPRIATE PPE REQUIRED"

b. Nominal system voltage

c. Arc Flash Boundary

d. The arc flash PPE category in accordance with the Arc Flash PPE Categories Method described in NFPA 70E

B. Acceptable Manufacturers:

1. W.H. Brady Co.

2. Markal Corp.

3. National Band & Tag Company

4. Panduit Corporation

5. Cole-Flex Corporation

3.0 PART 3 - EXECUTION

3.1 ACCESS DOORS AND PANELS

A. Install access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.

B. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

3.2 FIRE STOPPING

A. Installation of Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be as follows:

1. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for dry wall construction.

2. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

3. The methods used shall incorporate qualities that permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

4. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.3 BOXES AND CABINETS

A. Consider location of outlets, wiring devices, motor control equipment and other electrical equipment shown on drawings as approximate only. Study architectural, process piping, mechanical, plumbing, structural, roughing-in, etc., drawings and note surrounding areas in which each outlet or equipment is to be located. Locate outlet and electrical equipment so that when fixtures, motors, cabinets, equipment, etc., are placed in position, outlet or electrical equipment will serve its desired purpose. Where conflicts are noted between drawings, contact Owner's Representative for decision prior to installation. Comply with Article 314 of National Electrical Code relative to position of outlet boxes in finished ceilings and walls.

B. Outlet boxes in separate rooms shall not be installed "back-to-back" without the approval of the Owner's Representative.

C. Outlet boxes shall be sized to accommodate the wiring device(s) to be installed.

D. Outlet boxes installed in plaster, gypsum board or wood paneled walls shall be installed with raised plaster covers or raised tile covers.

E. Outlet boxes installed in tile, brick or concrete block walls shall be installed with extra-deep type raised tile covers or shall be 3-1/2" deep boxes with square corners and dimensions to accommodate conductors installed.

F. Surface ceiling mounted outlet boxes shall be minimum 4" square, 1-1/2" deep, galvanized sheet metal.

G. Surface wall mounted outlet boxes shall be cast type boxes having threaded or compression type threadless hubs. Exterior boxes shall be cast type with threaded hubs and gasketed cover plates secured by non-ferrous screws.

H. Floor outlet boxes shall be installed flush with finished floor, adjust level and tilt as required. Where finished floor is terrazzo, provide boxes specifically designed for installation in terrazzo. Where floors are to receive carpet or tile, provide floor outlet with proper flange.

I. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junction or pull boxes required due to field conditions and size as required by the National Electrical Code.

3.4 OUTLET BOX ROUGH-IN HEIGHTS:

A. Unless otherwise noted, mount devices and equipment at heights measured from finished floor to device/equipment centerline, except fire alarm as follows:

1.	Light switches	46"
2.	Receptacle outlets	18"
3.	Receptacle outlets, above hot water or steam baseboard heaters. Do not install receptacle outlets above electric baseboard heaters.	30"
4.	Receptacle outlets, hazardous areas	48"
5.	Receptacle outlets, weatherproof, above-grade	24"
6.	Secondary Clock	90"
7.	Wall Mounted Public Address Speaker	90”
8.	Horn Type Public Address Speaker	Min. 180”
9.	Large Venue Fire Alarm Speaker	Min. 180”
10.	Data outlets	18"
11.	Telephone outlets, wall mounted	46"
12.	Fire alarm manual station	46"
13.	Fire alarm audio/visual (bottom of device)	80"
14.	Branch circuit panelboards, to top of backbox	72"
15.	Distribution panelboards, to top of backbox	72"
16.	Terminal cabinets, control cabinets	72"
17.	Disconnect switches, motor starters, enclosed circuit breakers	48"
18.	Roof mounted receptacles and disconnect switches	24”

19. Where structural or other interference’s prevent compliance with mounting heights listed above, consult Owner's Representative for approval to change location before installation.

3.5 EQUIPMENT PADS, BASES AND SUPPORTING DEVICES

A. Hangers and Supports:

1. Provide steel angles, channels and other materials necessary for the proper support and erection of motor starters, distribution panelboards, large disconnect switches, pendant-mounted lighting fixtures, etc.

2. Panelboards, cabinets, large pull boxes, cable support boxes and starters shall be secured to ceiling and floor slab and not supported from conduits. Small panelboards, etc., as approved by Owner's Representative, may be supported on walls. Racks for support of conduit and heavy electrical equipment shall be secured to building construction by substantial structural supports.

B. Concrete Pads for Floor Mounted Equipment:

1. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout.

2. Bases shall be 4" high (unless otherwise indicated); shape and size to accommodate equipment, to extend 4” beyond equipment footprint in all directions. Set anchor bolts in sleeves before pouring. After anchoring and leveling, fill equipment bases with grout.

3. For seismic rated installations provide a minimum of one ½” rebar dowel for every 2 sq. ft. of base area, anchored 2” into floor with non-shrink structural grout.

3.6 IDENTIFICATION

A. Provide equipment identification nameplates on the outside of the enclosure for all equipment indicating the following information:

1. Switchgear, Switchboards, Panelboards, Transformers, Motor Control Centers, Equipment Cabinets, Control Panels, Generators, Uninterruptable Power Supplies:

a. Equipment designation.

b. Source and location of the source.

c. Nominal system voltage.

2. Contactors, Disconnect Switches, Enclosed Circuit Breakers:

a. Equipment designation.

b. Source and location of the source.

c. Nominal system voltage.

d. Location of the load that the switch or breaker serves.

3. Motor Controllers:

a. Motor designation.

b. Type of service.

c. Source and location of the source.

d. Nominal system voltage.

e. Location of the motor.

4. Transfer Switches:

a. Equipment designation.

b. Equipment designation and location of the first downstream distribution device served.

c. Normal and standby/emergency sources and location of the sources.

d. Nominal system voltage.

B. Provide equipment identification nameplates for each circuit breaker in all switchgear, switchboards and distribution panelboards listing the panelboard or equipment load connected to each device.

C. Provide wiring devices labeling of all wiring devices. Labeling shall be attached to the outside of the device face plate. Label shall indicate the following information:

1. Panelboard designation and circuit number from which it originates.

D. Provide permanent black marker labeling on all pull boxes and junction boxes indicating the following information:

1. Power & Lighting:

a. Feeder, branch circuit, and circuit numbers on cover.

b. Source(s) and location(s) of the sources.

c. Load(s) and location(s) of the load(s) served.

d. Nominal system voltage.

2. Systems:

a. System type.

b. Panelboard designation and circuit number from which it originates, if applicable.

c. Equipment location(s) from which enclosed cables originate.

d. Equipment and location(s) of the equipment served.

e. Nominal system voltage.

E. Feeders Circuits, Branch Circuits, Control Circuits:

1. 600-volts and Below:

a. Provide cable tags, wire markers, and phase identification tape as appropriate.

b. Identify circuits in each junction box, pull box, outlet box, enclosure, wireway, manhole, handhole, lighting standard base, and at each termination.

c. Identify with source panelboard, circuit number, load, and location served.

d. Include the identification of the building from which it originates for exterior circuits.

2. Above 600-volts:

a. Cables shall be identified at each manhole, handhole, junction box, transformer, switch, and at each termination using cable tags.

b. Identify nominal voltage, circuit number, circuit size, load served, and equipment designation/location from which it originates.

c. Exposed conduit runs shall be identified continuously reading "DANGER – 4,160 VOLTS" or as appropriate.

F. Underground Conduits & Circuits

1. Provide warning ribbon above the underground electrical installation and 12-inches below finished grade or as appropriate.

G. Empty Conduit Runs and Conduits with Conductors for Future Use:

1. Provide cable tags.

2. Indicate proposed future use.

3. Label conduits and conductors at both ends, including location of another end.

H. Provide complete, typed directory for each panelboard listing the room number, function, etc., for each circuit. Provide updated, typed panelboard directories for all existing panelboards affected by this work.

3.7 ARC-FLASH HAZARD WARNING LABELS

A. Provide a standard arc-flash hazard warning label at all new electrical equipment including but not limited to switchboards, switchgear, panelboards, meter socket enclosures, and motor control centers.

3.8 FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, EDPM skirts, EDPM hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

3.9 CUTTING AND PATCHING

A. Provide all required Cutting and Patching as outlined in the Summary of Work Div. 1 specifications.

B. Provide priming and finish coat of paint on walls and surfaces at locations of removed raceways and equipment locations. The paint finish color and sheen shall match the existing surrounding finish.

C. All penetrations thru masonry walls and floors shall be patched with Sakrete FastSet Non-Shrink 3-hour 2,000 psi Grout or equal.

D. All penetrations thru drywall where electrical materials were removed shall be patched with cores or partial pieces of 5/8” minimum thickness drywall and Qty. (3) sanded coats of drywall compound. This shall be followed by priming and painting.

E. The following requirements apply:

1. Perform cutting, fitting and patching of electrical equipment in all following cases:

   a. To uncover work for installation of poorly coordinated or ill-timed electrical work.

   b. To remove and replace defective work.

   c. To remove and replace work not conforming to requirements of the Contract Documents.

2. Remove samples of installed work as specified for testing.

3. Install equipment and materials in existing structures.

4. Cut, remove and legally dispose of all electrical equipment, components, and materials as called for and all other items not indicated on plans but made obsolete by the installation of new work.

5. Protect the structure, furnishings, finishes and adjacent materials not being removed and maintain temporary

END OF SECTION 260100

SECTION 260519 - LOW-VOLTAGE CABLES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Low Voltage Conductors
2. Type MC Metal Clad Cable
3. Connectors and Terminations

1.3 SUBMITTALS

A. Provide product data for the following:

1. Low Voltage Conductors
2. Type MC Metal Clad Cable
3. Connectors and Terminations

1.4 QUALITY ASSURANCE

A. All conductors shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of :

1. The following Articles of the National Electric Code (NFPA 70)
   a. 300 - Wiring Methods
   b. 310 - Conductors for General Wiring
   c. 330 - Type MC Metal Clad Cable
   d. 332 – Mineral Insulated Type MI

e. 400 - Flexible Cords and Cables

f. 402 - Fixture Wires

2. The following U.L. Standards:

a. UL 83 Thermoplastic-Insulated Wires and Cables

b. UL 44 Thermoset-insulated Wires and Cables

c. UL 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.

d. UL 854 Service Entrance Cable

e. UL 1277 Electrical Power and Control Tray Cables

f. UL 6, 1981 Rigid Metal Electrical Conduit

g. All Other Applicable Standards

2.0 PART 2 - PRODUCTS

2.1 LOW VOLTAGE CONDUCTORS

A. General purpose feeder and branch circuit and control wiring:

1. Annealed Copper, 98% conductivity.

2. Minimum wire size:

a. #12 AWG for branch circuits

b. #14 AWG for control and signal circuits

3. Wire shall be stranded per ASTM B8.

4. 600 volt insulation for all wiring above 50 volts.

5. 300 volt insulation permitted for all wiring below 50 volts.

6. Thermal plastic with PVC insulation with nylon jacket.

7. Suitable for wet or dry locations, THHN/THWN-2 90 degree Celsius.

8. 90 degree C maximum operating temperature rating.

9. UL 83 Listed

B. Color Coding

1. Cable outer jackets shall be manufacturer color dyed the entire length for each phase and neutral conductor.

2. Equipment grounding conductors shall be green unless otherwise noted or approved.

3. All conductors shall be color coded according to the following schedule:

Voltage	A PHASE	B PHASE	C PHASE	NEUTRAL
208Y/120V, 3 Phase	Black	Red	Blue	White
480Y/277V, 3 Phase	Brown	Orange	Yellow	Gray
240/120V, 1 Phase	Black	Red		White

*ALL GROUNDING CONDUCTORS SHALL BE GREEN

4. Switched legs shall be identified with the same color insulation as the phase leg.

C. Acceptable Manufacturers:

1. General Cable

2. Southwire

3. Okonite

4. Encore Wire

5. Prysmian

2.2 TYPE MC METAL CLAD CABLE

A. Construction:

1. Stranded or solid copper conductors, each individually insulated, and enclosed in an armor of flexible metal tape.

2. Suitable for wet or dry locations.

3. Suitable for cable tray installations.

4. Do not install direct buried, in concrete, or in the presence of corrosive vapors.

5. Provide with separate integral grounding conductor.

6. Support every 6 feet.

7. MC cable listed for Health Care facilities use per. NEC Article 517.

8. Manufactured and installed in accordance with NEC Article 330.

9. Design Make: Same as building wire.

2.3 LOW VOLTAGE CONNECTORS AND TERMINATIONS

A. Straight Splices, #26 AWG To #10 AWG

1. Nylon Insulated compression butt-splices.

2. 600 volt, 90 degree C rated.

3. Make: Burndy “Insulink”, T&B “Sta-Kon”, or approved equal

B. Straight Splices, #8 AWG and Larger

1. Two way, long barrel, compression type, copper

2. Provide heat shrink tubing over splice.

3. 600 volt rated.

4. Make: Burndy “Hylink”, T&N 54800 Series, or approved equal.

C. Pigtail Splices, #26 AWG to #10 AWG

1. Twist type pressure connector.

2. 600 volt rated, 105 degree C.

3. Size as required for number and size of conductors used.

4. Make: T&B Scotchlock, or approved equal

D. Three Way Splices, #8 AWG and Larger

1. Three way, long barrel, compression type, copper.

2. Provide tape or heat shrink tubing over splice.

3. 600 volt rated.

4. Make: Burndy “Hylink”, T&B 54700 Series, or approved equal.

E. Lug Terminations for Control and Signal Wiring.

1. Nylon insulated fork with compression termination of #26 AWG to #10 AWG.

2. Nylon insulated ring with compression termination for #8 AWG and larger.

3. 300 volt rated.

4. Make: Burndy “Insulug”, T&B “Sta-Kon”, or approved equal.

F. Lug Terminations for Power Wiring

1. Long barrel, compression type, copper body, on hole for #8 AWG to #2/0 AWG.

2. Long barrel, compression type, copper body, two hole, for #3/0 AWG and larger.

3. 600 volt rated.

4. Make:

a. One-hole lug: Burndy “Hylug”, T&B 54900 Series, or approved equal.

b. Two-hole lug: Burndy “Hylug”, T&B 54800 Series, or approved equal.

3.0 PART 3 - EXECUTION

3.1 LOW VOLTAGE WIRE AND CABLE

A. General

1. Install cables in raceway as called for after the entire raceway system has been completed.

2. Install splices and connections in accessible outlet, pull, and junction boxes.

3. Insulate all splices and connections with UL Labeled plastic tape, heat shrink tubing, or plastic molded caps.

4. All wiring systems shall be properly grounded and continuously polarized throughout, following the color coding specified.

5. Provide insulated green jacket grounding conductor in each raceway.

6. Provide dedicated white jacket insulated neutral conductor for each individual branch circuit. Shared neutrals are not acceptable.

7. Adhere to NEC de-rating requirements for raceway fill.

8. Provide stranded wire to motors, transformers, equipment, and vibrating machinery.

9. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Owner's Representative and receive written approval for splicing prior to installation of feeder(s). Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For parallel sets of conductors, match lengths of conductors.

10. Where multiple conductors are installed in a common raceway they shall be pulled simultaneously. Use of pulling compound or lubricant shall be avoided unless absolutely necessary. Where pulling lubricant is required, use UL approved compounds approved for cable type. Lubricant shall meet all OSHA and Toxic Control Act standards.

Application	Cable Types	Design Make
General Purpose Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon	Ideal – Yellow 77
High Temperature Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Ideal – Yellow 190
Utility Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua – Gel II
Cold Weather Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua – Gel CW

11. Use pulling means including fish tape, cable, rope and basket type grips which will not damage cables or raceways. Use approved mechanical pullers for feeders and branch circuits as required for #6 AWG cable and larger. Do not use mechanical means to pull conductors No. 8 or smaller.

12. Branch circuit conductors installed in panelboards, and control conductors installed in control cabinets and panels shall be neatly bound together using "Ty-Raps" or equivalent.

13. Reconnect branch circuit wiring at panelboards as required to obtain a balanced three phase load on the feeders.

14. Provide conduit seals in explosion proof areas as called for on the plans and as required by the National Electrical Code.

3.2 TYPE MC METAL CLAD CABLE

A. MC cable shall only be permitted for use in 6-feet maximum whips from conduit connected junction boxes above accessible ceiling areas to individual recessed luminaires. Do not daisy chain luminaires with MC cable.

B. Type MC cable may not be used for home runs to panelboards.

C. Type MC cable may not be used for any connections to wiring devices.

D. Type MC cable may not be used for connections to equipment.

E. Type MC cable may not be used for and emergency branch circuits per. Article 517 in the NEC.

F. Support cable per the National Electrical Code. Secure the cable to fixture hangers using nylon or plastic ties.

G. Bending radius shall comply with Article 330.24 of the NEC.

H. Provide insulating bushing at all termination points between the metal sheath and luminaire or junction box.

I. Type MC cable shall not be installed exposed.

3.3 CONNECTORS AND TERMINATIONS

A. Cover un-insulated splices, joints, and free ends of conductor with rubber friction tape or PVC electrical tape. Plastic insulating caps may serve as insulation.

3.4 TESTS

A. Low Voltage Feeders

1. After low voltage feeders are pulled in, and before being connected, test feeders with a 1000 volt, 60 Hz insulation tester for one minute to determine that the conductor insulation to ground is greater than that recommended by the manufacturer.

END OF SECTION 260519

SECTION 260526 - GROUNDING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a complete grounding system meeting or exceeding the requirements of Article 250 of the latest National Electrical Code. Install all raceway systems, including metal conduit, wireways, pullboxes, junction boxes, bus ducts, enclosures, and motors, to provide a continuous ground path with the lowest possible impedance.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Conductors
2. Hardware
3. Ground Rods
4. Molded Fusion Welds

1.3 QUALITY ASSURANCE

A. All grounding systems shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The National Electrical Code, Article 250.

1.4 SUBMITTALS

A. None Required.

B. Provide product data for the following:

1. Ground Rods
2. Grounding System Test Reports.

2.0 PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Exposed grounding conductors such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper unless otherwise called for.

B. Conductors shall be copper, as called for in Specification Section 260519 - Low Voltage Cables.

C. Provide conductors with THHN/THWN insulation. Sizes #6 AWG and smaller shall have a continuous green jacket color. Conductor sizes #4 AWG and larger may have green taped bands at each end, and in all pullboxes.

D. Acceptable Manufacturers:

1. Same as for low-voltage conductors. Refer to Specification Section 260519 – Low Voltage Cables.

2.2 CONNECTORS, CLAMPS, TERMINALS

A. General: Connectors specified are part of a system. Furnish connectors and components, and use specific tools and methods as recommended by connector manufacturer to form complete connector system.

B. Splices:

1. Spring Type (for #10AWG conductors and smaller only):

a. Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s B-Cap, Electrical Products Div./3M's Scotchlok Type Y, R, G, B, O/B+, R/Y+, or B/G+, or Ideal Industries Inc.'s Wing Nuts or Wire Nuts.

2. Indent Type with Insulating Jacket:

a. Rated 150° C, 600V; Ideal Industries Inc.'s High Temperature Wire-Nut Model 73B, 59B.

b. Indent Type with Insulating Jacket: Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s Crimp Connectors, Ideal Industries Inc.'s Crimp Connectors, Penn-Union Corp.'s Penn-Crimps, or Thomas & Betts Corp.'s STA-KON.

c. Indent Type (Uninsulated): Anderson/Hubbell's Versa-Crimp, VERSAtile, Blackburn/T&B Corp.'s Color-Coded Compression Connectors, Electrical Products Div./3M's Scotchlok 10000, 11000 Series, Framatome Connectors/Burndy's Hydent, Penn-Union Corp.'s BCU, BBCU Series, or Thomas & Betts Corp.'s Compression Connectors.

3. Connector Blocks: NIS Industries Inc.'s Polaris System, or Thomas & Betts Corp.'s Blackburn AMT Series.

4. Resin Splice Kits: Electrical Products Div./3M's Scotchcast Brand Kit Nos. 82A Series, 82-B1 or 90-B1, or Scotchcast Brand Resin Pressure Splicing Method.

5. Heat Shrinkable Splices: Electrical Products Div./3M's ITCSN, Raychem Corp.'s Thermofit Type WCS, or Thomas & Betts Corp.'s SHRINK-KON Insulators.

6. Cold Shrink Splices: Electrical Products Div./3M's 8420 Series.

7. Gutter Taps: Anderson/Hubbell's GP/GT with GTC Series Covers, Blackburn/T&B Corp.'s H-Tap Type CF with Type C Covers, Framatome Connectors/Burndy's Polytap KPU-AC, H-Crimpit Type YH with CF-FR Series Covers, ILSCO's GTA Series with GTC Series Covers, Ideal Industries Inc.'s Power-Connect GP, GT Series with GIC covers, NSI Industries Inc.'s Polaris System, OZ/Gedney Co.'s PMX or PT with PMXC, PTC Covers, Penn-Union Corp.'s CDT Series, or Thomas & Betts Corp.'s Color-Keyed H Tap CHT with HTC Covers.

8. Lugs:

   a. Single Cable (Compression Type Lugs): Copper, one or 2 hole style (to suit conditions), long barrel; Anderson/Hubbell's VERSAtile VHCL, Blackburn/T&B Corp.'s Color-Coded CTL, LCN, Framatome Connectors/Burndy's Hylug YA, Electrical Products Div./3M Scotchlok 31036 or 31145 Series, Ideal Industries Inc.'s CCB or CCBL, NSI Industries Inc.'s L, LN Series, Penn-Union Corp.'s BBLU Series, or Thomas & Betts Corp.'s 54930BE or 54850BE Series.

   b. Single Cable (Mechanical Type Lugs): Copper, one or 2 hole style (to suit conditions); Blackburn/T&B Corp.'s Color-Keyed Locktite Series, Framatome Connectors/Burndy's Qiklug Series, NSI Industries Inc.'s Type TL, Penn-Union Corp.'s VI-TITE Terminal Lug Series, or Thomas & Betts Corp.'s Locktite Series.

9. Acceptable Manufacturers:

   a. Burndy

   b. T & B

   c. Erico

2.3 GROUND RODS

A. Solid copper or copper clad steel cylindrical rods, 5/8 in. minimum diameter, minimum 8 ft. long.

B. Acceptable Manufacturers:

   1. Erico or Approved Equal

2.4 MOLDED FUSION WELDS

A. Dies shall be utilized to exothermically fusion weld the following connections:

1. Cable to cable (Cu to Cu conductors and Cu to a Al and Al to Al)

2. Cable to solid ground rods

3. Cable to steel Rebar

4. Cable to Flat Steel Surface

B. Parallel splice connections for pass through applications.

C. The fusion weld material shall be alloy based material compatible with both surfaces for permanent connections using molten metal that has been heated by a chemical exothermic reaction of thermite.

D. Low-Temperature 900-degree F Solder prohibited for connections.

E. Acceptable Manufacturers:

a. ERICO Cadweld

b. Metalweld

c. Thermoweld

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Raceway Systems:

1. All metal supports, cable trays, frames, sleeves, brackets, braces, etc. for the raceway system, panelboards, switchboards, switches, enclosures, starters, controls, etc., which are not rigidly secured to and in contact with the raceway system, or which are subject to vibration and loosening, shall be bonded to the raceway system. Size the bonding conductor in accordance with NEC Article 250, Table 250.122.

2. Terminate rigid conduit at all boxes, cabinets, and enclosures tightly with two locknuts and a bushing.

3. Conduit which runs to or from all boxes, cabinets, or enclosures having concentric or eccentric knockouts which partially perforate the metal around the conduit and hence impair the continuity of system ground circuits shall be provided with bonding jumpers sized in accordance with NEC Article 250, Table 250.122. Connect the bonding jumper between a grounding type bushing on the conduit and a ground bus or stud inside the box, cabinet, or enclosure.

4. Provide bonding jumpers sized in accordance with NEC Article 250, Table 250.122 for all conduit expansion joints.

5. Provide a grounding conductor in all flexible metallic conduit and liquid-tight conduit, sized in accordance with NEC Article 250, Table 250.122.

6. Provide a grounding conductor in all nonmetallic runs of conduit and raceway, sized in accordance with NEC Article 250, Table 250.122.

7. Provide isolated ground conductors of systems as called for on the plans.

B. Emergency Generators with Three Pole Transfer Switches:

1. Do NOT ground the generator neutral conductor at the generator.

2. Circuit the generator neutral to the secondary electrical distribution system neutral.

3. Connect the generator neutral system neutral so as not to negate any ground fault protective equipment applied to distribution system.

4. Connect the generator frames to system ground with conductor as sized in accordance with NEC Table 250.122.

C. Emergency Generators with Four Pole Transfer Switches, Separately Derived System:

1. Provide a separate ground system for the generator as called for.

2. Ground the neutral of the generator to ground through a service entrance type ground link at the generator switchgear, according to NEC.

3. Provide a #4/0 ground conductor connection to cold water pipe, and a size #4/0 connection to the building normal switchgear ground field.

4. Connect generator equipment frame to ground field at two points, for each generator.

5. Provide a test report of the generator ground field resistance prior to interconnecting to other system grounds.

D. Transformer Derived Secondary:

1. Solidly ground all transformer neutral conductors and enclosures to building steel, or a cold water pipe 1” or larger in size as called for in Table 250.122 of the National Electrical Code.

2. Provide an equipment grounding conductor from the point of termination back to the ground bus of the serving panelboard, switchboard, or transformer. Do not splice equipment grounding conductors.

3. Provide an equipment grounding conductors from the point of termination back to the ground bus of the serving panelboard, switchboard, transformer, or switchgear.

4. The grounding conductors contained in the interstices of interlocked armor cable shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.

E. Service Entrance:

1. Solidly ground the electrical service at the service entrance. Provide a grounding electrode conductor from the service entrance ground bus to all of the following grounding electrodes:

   a. Metal water pipe, ahead of the meter.

   b. Building steel

   c. Made grounding electrode grid.

   d. Concrete encased electrode (steel rebar in foundation)

2. For a grounded electric service, solidly connect the grounded (neutral) conductor to the service entrance ground bus. Do NOT make any grounding connections to any grounded conductors on the load side of the service disconnecting means.

3. Provide a bare, copper, #4/0 bonding jumper across the water meter.

F. Made Ground Grid:

1. Provide 3 ground rods, 8 feet long, driven on 10 foot centers, with top of rod 12 inches below finished grade, and located as called for on plans.

2. Connect with size #4/0 AWG copper conductors as called for.

3. Connecting conductors shall be located within 6 inches of the top of the ground rod.

4. Provide two size #4/0 AWG grounding conductors from the ground grid to the service entrance ground bus.

5. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to the service side of nearest metallic cold water and/or sprinkler main.

6. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to building steel.

7. Provide molded fusion welds for all below grade connections. Molds shall be new, unused, and shall be replaced when worn or broken.

8. Required ground grid resistance to earth shall be 25 ohms maximum.

G. Power Company Requirements:

1. Grounding conductor from service entrance equipment to meter enclosure per. utility standards.

2. One 5/8” diameter by 8’ long ground rod and size #4/0 AWG grounding conductor at each riser pole.

3. Additional requirements per. latest power company published standards.

H. Primary Electrical Equipment:

1. Transformers:

a. Provide two bare #4/0 AWG conductors, one from each of two ground buses, to ground.

b. Provide one size #4/0 AWG conductor from each air terminal chamber to ground bus.

c. Provide a grounding conductor from the neutral bushing or bushings to system ground, sized as called for, or in accordance with NEC Table 250.102(C)(1), whichever is of greater capacity.

d. System ground conductors, usually run with phase conductors, shall be connected to the ground bus.

3.2 TESTS

A. Grounding:

1. Grounds and grounding systems shall have a resistance to solid earth ground not exceeding following values:

a. For grounding non-current carrying metal parts associated with secondary distribution system: 25 Ohms

b. For grounding of 5 KV equipment, enclosures,

and cable shields: 10 Ohms

c. For grounding secondary service neutral: 25 Ohms

2. Providing grounding tests to verify the above values. Add additional ground rods or connections in order to meet these values.

END OF SECTION 260526

SECTION 260533 – RACEWAYS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Galvanized Rigid Steel Conduit (GRS)

2. Electrical Metallic Tubing (EMT)

3. Flexible Metal Conduit

4. Liquidtight Metal Flexible Conduit

5. Rigid Non-Metallic Conduit

6. Fittings

7. Wireways

8. Cable Hangers

1.3 QUALITY ASSURANCE

A. All raceways shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

a. Wiring Methods

b. Cable Trays

c. Electrical Nonmetallic Tubing

d. Nonmetallic Underground Conduit With Conductors

e. Rigid Metal Conduit

f. Rigid Nonmetallic Conduit

g. Electrical Metallic Tubing

h. Flexible Metal Conduit

i. Liquidtight Flexible metal conduit and Liquidtight flexible nonmetallic conduit.

j. Surface Metal Raceways and Surface Nonmetallic Raceways

k. Metal wireways and nonmetallic Wireways

l. Outlet, Device, Pull and Junction Boxes, Conduit Bodies and Fittings

2. The following National Electrical Manufacturers Association (NEMA) Standards:

a.	NEMA, RN1	PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
b.	NEMA, TC 3	PVC fittings for use with Rigid PVC Conduit and tubing.
c.	NEMA, TC 6 & TC 8	PVC Plastic Utilities for Underground Installation.
d.	NEMA, TC 9 & TC 10	Fittings for PVC Plastic Utilities Duct for Underground Installation.

3. The following American National Standards Institute (ANSI) standards:

a.	ANSI-C80.1	Electric Rigid Steel Conduit
b.	ANSI-C80.3	Specification for Electrical Metallic Tubing, Steel

4. The following U.L. Standards:

a.	UL 1	Flexible Metal Electrical Conduit
b.	UL 3	Flexible Nonmetallic Tubing for Electric Wiring
c.	UL 5	Surface Metal Raceways and Fittings
d.	UL 6	Electrical Conduit Rigid Metal Conduit, Steel
e.	UL 360	Liquidtight Flexible Metal Conduit
f.	UL 514B	Conduit, Tubing and Cable Fittings

g. UL 651 Schedule 40, 80, Type EB and A Rigid PVC

h. UL 797 Electrical Metallic Tubing, Steel

i. UL 870 Wireways, Auxilliary Gutters and Associated

1.4 SUBMITTALS

A. Provide product data for the following:

1. Surface Raceway

2. Cable Hangers

2.0 PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit

1. Shall be hot-dipped galvanized steel, including threads.

2. Acceptable manufacturers:

a. LTV Steel

b. Triangle

c. Allied Tube

d. Steel Duct

e. Wheatland

B. Electrical Metallic Tubing

1. Electrical Metallic Tubing shall be electro-galvanized steel.

2. Acceptable manufacturers:

a. Triangle

b. Wheatland

c. Allied Tube

d. Steel Duct

e. LTV Steel

C. Flexible Metal Conduit

1. Flexible Metal Conduit shall be constructed of one continuous length of spirally wound, interlocked, zinc coated strip steel. Interior surface shall be free from burrs or sharp edges.

2. Acceptable manufacturers:

a. Anaconda

b. American Flexible Conduit Co.

c. O-Z/Gedney

d. Thomas and Betts

D. Liquidtight Flexible Metal Conduit

1. Flexible Metal Conduit shall be constructed of one continuous length of spirally wound, interlocking zinc coated strip steel. Interior surfaces shall be free from burrs and sharp edges. Provide with a liquid-tight jacket of flexible polyvinyl chloride (PVC).

2. Acceptable Manufacturers:

a. Allied

b. American Flexible Conduit

c. Carlon

d. Thomas and Betts

E. Rigid Non-Metallic PVC Conduit

1. Extra-Heavy wall conduit: Schedule 80, constructed of polyvinyl chloride, rated for use with 90°C conductors, and UL listed for direct burial and normal above ground use.

2. Acceptable manufacturers:

a. Carlon

b. Thomas & Betts

c. Certainteed

d. Condux

2.2 FITTINGS

A. Non-Hazardous Location Fittings:

1. Rigid galvanized steel fittings shall be fully threaded and shall be of the same material as the respective raceway system.

2. Fittings for PVC coated rigid galvanized steel conduit shall be threaded, hot dipped galvanized, and coated inside and outside with a urethane coating.

3. Fittings for electrical metallic tubing shall have plastic insulated throat type. Connection be single set screw indenter for conduits up to 2" and double set screw indenter for conduits 2" and larger.

4. Fittings for flexible metal conduit shall be center stopped, plastic insulated throat type, U.L. E-11852 listed.

5. Fittings for liquid tight flexible metal conduit shall have zinc plated steel ferrule, compression type with sealing ring.

6. Fittings for rigid non-metallic conduit shall be solvent cemented in accordance with the manufacturer's instructions.

7. Die-cast or pressure cast fittings are not permitted.

8. Provide conduit bodies types, shapes and sizes as required to suit application and NEC requirements. Conduit bodies for installation in conduit systems shall allow in-line pull outlets, make 90° bends, “T” take-offs, etc. Provide matching gasketed covers secured with corrosion-resistant screws.

9. Acceptable Manufacturers:

a. O.Z. Gedney

b. Steel City

c. Thomas & Betts

d. Crouse-Hinds

e. Carlon

B. Expansion Fittings

1. Galvanized steel expansion joints for RGS or EMT conduit, PVC for PVC conduit.

2. Minimum 4” movement in either direction.

3. Weatherproof for outdoor applications.

4. At expansion joints in concrete pours, provide Deflection/Expansion fittings capable of movement of ¾" in all directions from the normal**.**

5. Design Make: O.Z./Gedney, Type "AX" (exposed), "DX" (Concrete Pour)

6. Acceptable manufacturers:

   a. O.Z./Gedney

   b. Crouse-Hinds

   c. Appleton

C. Underground Ductbank Materials

1. Refer to Specification Section 260543 - Exterior Pathways for Underground Ductbank Materials.

2.3 WIREWAYS

A. Wireway shall be steel, enclosed type. Provide hinged, JIC sectional NEMA dust resistant, oil tight type where subjected to moisture, in Pump Rooms, Mechanical, Electric and Fan Rooms, exterior walls, Maintenance Shops, and similar locations. Size to meet NEC fill requirements or larger as noted on Contract Documents. Provide knockouts along runs. Provide all elbows, tees, pullboxes, fittings, hangers, reducers, supports, etc., to meet installation requirements.

B. Cover: Screw cover with full gasketing in outdoor installations.

C. Connector: Flanged.

D. Fittings: Lay-in type with removable front; captive screws drip shield in outdoor installations.

E. Finish: Electro-coated ASA-49 Gray Epoxy Paint over Phosphate Primer.

F. Acceptable manufacturers:

1. Square D "Square Duct"

2. General Electric

3. Hoffman

4. Keystone/Rees, Inc.

2.4 CABLE HANGERS

A. Provide prefabricated, zinc coated, carbon steel hangers UL listed to support category 5, 6, 6A, optical fiber cable, and innerduct installations.

B. Hangers shall have open top with spring loaded cable retainer clip.

C. 4” high with rolled vertical and horizontal edges and a 3” deep and 2” wide support flange.

D. Flat bottom profile to reduce cable crushing in center.

E. Stackable with same model hangers below.

F. Provide beam clamps, rod fasteners, flange clips and brackets as job conditions require.

G. Design Make: Mono-Systems H-433-S or Approved Equal

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Size raceways as indicated on the drawings. Where sizes are not indicated, raceways shall be sized as required by the National Electrical Code in accordance with the quantity, size, type and insulation of conductors to be installed.

B. Provide completely independent raceway systems for normal and emergency branch circuits and feeders as required by the National Electrical Code.

C. Paint all new junction and pull boxes on the emergency power branch in a yellow color identifying them as “EMERGENCY POWER” with the panel name that supplies thru them. Label all new emergency power branch raceways at 25-feet intervals with yellow tape and text “EMERGENCY POWER” where no junction or pull boxes are present.

D. Minimum 1/2" trade size for branch circuit and fire alarm wiring.

E. Minimum 3/4" trade size for voice/data outlets, television outlets, and branch circuit "Home Runs" to panelboards.

F. Where cable quantities are identified on drawings provide telecom conduit sleeves and raceways according to the below schedule (Note this table is an estimate and the actual quantity is dependent on the installed cable diameter):

Cat. 6 Cable Qty.	Conduit Trade Size
4 Cables	¾” Conduit
6 Cables	1” Conduit
10 Cables	1¼” Conduit
20 Cables	2” Conduit
70 Cables	4” Conduit

Cat. 6A Cable Qty.	Conduit Trade Size
2 Cables	¾” Conduit
4 Cables	1” Conduit
6 Cables	1¼” Conduit
10 Cables	1½” Conduit
20 Cables	2½” Conduit
70 Cables	4” Conduit

*Refer to specification section 271000 for maximum outside diameter of UTP cabling.

G. Support raceways from building structure and wall construction. Do not support raceways from ceiling systems ductwork, piping, or equipment hangers. Do not support raceways from pre-existing conduit runs, banks, racks, hangers, etc.

H. Support outlet, pull, and junction boxes independently from building structure and wall construction. Do not support from raceways.

I. Install raceways parallel or perpendicular to building walls, floors and ceilings.

J. Install raceways concealed except in the following areas:

1. Mechanical Rooms
2. Electric Rooms
3. Manufacturing areas
4. Garage or maintenance areas
5. Unfinished basements or crawl spaces

K. Provide a code compliant ground path between all outlets and the established electrical system ground.

L. Cut raceways square, ream ends to remove burrs, and bush where necessary.

M. Coordinate all raceway runs with other trades.

N. Do not install raceways adjacent to hot surfaces or in wet areas.

O. Provide expansion fittings with external grounding straps at building expansion joints.

P. Do not install conduit horizontally in concrete block or dry wall partitions.

Q. Arrange neatly to permit access to the raceway, outlet, pull, and junction boxes, and work installed by other trades.

R. If it is necessary to burn holes through webs of beams or girders, call such points to the attention of the Owner's Representative and receive written approval both as to location and size of hole before proceeding with work. All holes shall be burned no larger than absolutely necessary.

S. Core drill, sleeve, and fire stop all penetrations through existing floors.

T. Support all raceways with malleable iron pipe clamps or other approved method. In exterior or wet locations, provide minimum ¼" air space between raceway and wall. Secure raceway within 3 ft. of each outlet box, junction box, cabinet or fitting.

U. Provide conduit seals and explosion proof devices as indicated on the plans and as dictated by the National Electrical Code for all hazardous locations indicated on the drawings.

V. Provide green ground wire in all EMT, flexible conduit, and non-metallic conduit.

W. Do not install voice and data cabling in any surface metal raceway smaller than Wiremold V2400, except single voice outlets where cable runs straight down and no bends occur in raceway.

3.2 CONDUIT

A. EMT conduit is approved for installations in indoor dry locations only.

B. Install with a minimum of bends and offsets. Bends shall not kink or destroying the interior cross section of the raceway. Factory made bends shall be used for raceways 1" trade size and larger.

C. Provide at least one junction or pullbox for each 270 degrees of bends.

D. Plug the ends of each roughed-in raceway with an approved cap or disc to prevent the entrance of foreign materials during construction.

E. Provide UL approved rain-tight and concrete-tight couplings and connectors.

F. Secure within three feet of each outlet box, junction box, cabinet or fitting.

G. Provide a #14 AWG fish wire in all "Spare" or "Empty" conduit runs to facilitate future installation of conductors.

H. Install raceways in concrete floor slabs as follows:

1. All conduit in concrete floor slabs shall be rigid galvanized steel with concrete tight threaded fittings.

2. Provide expansion fittings where conduits cross building expansion joints.

3. Install conduit below the reinforcing mesh.

4. Locate conduits to provide a minimum of 1” of concrete around conduit.

5. Obtain approval from the Owner's Representative prior to installing conduit larger than 1" trade size in concrete slabs.

I. Wherever a cluster of four (4) or more conduits rise out of floor exposed, provide neatly formed 4 in. high concrete envelope, with chamfered edges, around raceways.

J. Provide conduit supports based on the following table:

Conduit Trade Size	Type of Run	Horizontal Spacing in Feet	Vertical Spacing in Feet
½", 3/4"	Concealed	7	10
1", 1-1/4"	Concealed	8	10
1-1/2" & larger	Concealed	10	10
½", 3/4"	Exposed	5	7
1", 1-1/4"	Exposed	7	8
1-1/2" & larger	Exposed	10	10

K. Where conduits puncture roof, install pitch pockets as required in order that the roof warranty is maintained.

L. Provide (5) five empty ¾" and (1) empty 1-1/2" raceways from each flush mounted panelboard or cabinet to an area above the nearest accessible ceiling space. Make 90° turn above the ceiling, arranged for further continuation of raceway, and cap.

3.3 RACEWAY SYSTEM INSTALLATION:

A. Wiring above and below 600 volts, exterior below grade locations:

1. Schedule 80 Rigid Nonmetallic Conduit direct buried in sand bed envelope w/ Rigid Galvanized Elbows for all grass areas and where indicated on drawings

2. Schedule 80 Rigid Nonmetallic Conduit encased in concrete w/ Rigid Galvanized Elbows in paved areas, areas subject to vehicular traffic and where indicated on drawings.

B. Wiring above 600 volts in interior or exterior, above grade locations:

1. Rigid Galvanized Steel

C. Wiring below 600 volts in exterior, above grade locations:

1. Rigid Galvanized Steel where exposed and for complete Roof Penetration

2. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

D. Wiring below 600 volts, interior above grade locations:

1. Electrical Metallic Tubing where concealed within walls, above ceilings and in unfinished or unoccupied areas.

2. Where unable to conceal in finished occupied areas: Surface Metal Raceway.

3. Electrical or Mechanical rooms where raceway is installed below 10' AFF or exposed to potential damage: Rigid Galvanized Steel

4. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

5. Final connections to luminaires: MC cable (6-foot maximum length from EMT conduit & junction box to individual luminaire)

E. Wiring below 600 volts, interior and exterior, above or below grade NEC Class I, II, III locations:

1. Rigid Galvanized Steel

2. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

3. Seal-off fittings matching the hazard category

END OF SECTION 260533

SECTION 260620 - WIRING DEVICES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Receptacles

2. Coverplates

1.3 QUALITY ASSURANCE

A. All wiring devices shall be installed neatly, and parallel with building lines. Recessed devices shall be flush with the face of the wall. Provide extension rings on outlet boxes as required. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.4 SUBMITTALS

A. Provide product data for all wiring devices and cover plates.

B. Indicate selected part numbers.

C. Indicated selected color selections.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Wiring devices shall be specification grade or heavy duty as a minimum. Standard commercial grade is not acceptable.

B. Wiring device color shall be white.

C. Suitable for installation in a 2-1/2” deep outlet box.

D. All receptacles and switches shall be from the same manufacturer.

E. Acceptable Manufacturers:

1. Hubbell
2. Pass & Seymour/Legrand
3. Arrow Hart
4. Eaton
5. Bryant

2.2 CONVENIENCE DUPLEX RECEPTACLES

A. 125 volt, 20 ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

B. Side and back wiring.

C. 0.32" thick brass three prong power contacts and #8 brass screws

D. Brass center rivet

E. All brass grounding system

F. Nylon face with glass reinforced nylon back

G. Dielectric Voltage withstands 2,000V minimum

H. Terminals Identified in accordance with UL 498

I. Tamper-Resistant

J. UL 94V-2 Flame rating

K. Design Make: Hubbell 5362TR Series

2.3 GFI RECEPTACLES

A. 125 volt, 20 ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

B. LED trip/test indication

C. Tamper Resistant

D. Side and back wiring.

E. Nylon face and back.

F. 2006 UL 943 revisions including "no power to the face when miswired" and "end of life indication" when unit is no longer capable of providing GFCI protection

G. Designed to trip at maximum 6mA leakage current to ground.

H. Suitable for feed through protection.

I. Design Make:

1. Hubbell GFR5362TR Series (Specification Grade)

2.4 SPECIAL RECEPTACLES

A. Terminals identified in accordance with UL 498 (X, Y, Z, white, green)

B. H and cord clamp housing material: Black Nylon.

C. Terminal material: Clear Polycarbonate.

D. Contact spring material: Brass.

E. Dielectric Voltage withstands 2,000V minimum

F. Include NEMA type as called for on drawings to match equipment. At a minimum the manufacturer shall have special purpose receptacles available to meet the following NEMA connection types:

1. 125 volt, 20 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L5-20R

2. 125 volt, 30 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L5-30R

3. 250 volt, 20 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L6-20R.

4. 250 volt, 50 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L6-30R.

5. 250 volt, 20 ampere, 2 pole, 3 wire, grounding, NEMA 6-20R

6. 250 volt, 30 ampere, 2 pole, 3 wire, grounding, NEMA 6-30R

7. 125/250 volt, 50 ampere, 3 pole, 3 wire, grounding, NEMA 10-50R

8. 125/250 volt, 30 ampere, 4 pole, 4 wire, grounding, NEMA L14-30R (Dryer Receptacle). Plug configuration to match equipment furnished by equipment supplier.

9. 125/250 volt, 50 ampere, 4 pole, 4 wire, grounding, NEMA L14-50R (Range Receptacle). Plug configuration to match equipment furnished by equipment supplier

G. Design Make: Hubbell

H. Acceptable Manufacturers: Pass & Seymour, Leviton

2.5 COVERPLATES

A. Provide type 302 stainless steel with satin finish coverplates for general purpose flush devices.

B. Provide utility cover plates for surface mounted devices in mechanical rooms.

C. Provide gasketed weatherproof cover plates with a hinged cover on a cast aluminum outlet box for all devices in wet areas designated “WP”.

2.6 WEATHERPROOF COVERS

A. Impact resistant polycarbonate, NEMA 3R construction.

B. Clear cover to view the connection of the device.

C. UL listed as a weatherproof enclosure with the receptacle in use.

D. Hinged, latching cover with an opening at the bottom for a cord to exit the device.

E. Padlockable

F. Suitable for installation of a GFI protected duplex receptacle.

G. Design Make: Hubbell Catalog No. WP26MP

H. Acceptable Manufacturers:

1. Hubbell
2. Leviton
3. Arrow Hart
4. Pass & Seymour
5. Bryant

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Install devices generally where called for.

B. Coordinate exact locations of all devices with equipment, millwork, counters, fin radiation, windows, etc. and adjust locations as required as part of this contract.

C. Provide steel box for all devices.

D. Install receptacles and switches vertical, with the grounding pin down, and the toggle up in the on position.

E. Install all switches on the strike side of the door, with the edge of the outlet box approximately 3” from the door frame.

F. Do not install devices “back to back” in the same stud cavity without prior approval of the Owner. Offset devices as required to maintain code required fire rated assemblies or provide fire-stopping assembly around adjacent devices.

G. Provide plaster rings on all outlet boxes to permit flush installation of devices.

H. In all wet or damp areas, provide a surface mounted cast aluminum outlet box with threaded connections, gasketed cover, and non-ferrous screws.

I. Prior to installation and as part of the contract, relocate any device a distance of 5 feet in any direction at the request of the Owner.

J. Size outlet boxes in accordance with the NEC, based on the number and size of wires in the box.

K. Provide a coverplate on all devices.

3.2 EQUIPMENT MOUNTING HEIGHTS:

A. Refer to Specification Section 260100 – Basic Materials and Methods for mounting heights.

3.3 LABELING

A. Provide tape labels indicating panelboard and circuit on the outside of all device coverplates.

3.4 TESTING

A. Test all receptacles for proper voltage, polarity, and grounding.

B. Test all GFI receptacles for proper voltage, polarity, grounding, and verify the receptacle trips at 6 milliamperes or less.

C. Rewire receptacles as required until receptacles test properly.

END OF SECTION 260620

SECTION 260923 – WIRED LIGHTING CONTROLS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete installation, including luminaires, standards, hangers, supports, fittings, lamps, wiring, connections and controls, as indicated in the Contract Documents. Types of luminaires in this project include LED.

B. Provide startup of all lighting control systems by a factory certified manufacturer's representative in order to maintain all warranties. The contractor shall complete all startup request forms and complete all pre-startup installations a minimum of 2-weeks in advance or as otherwise required by the manufacturer. Provide initial system settings and owner training.

C. Provide Lighting System Functional Testing as described in this section by a factory authorized manufacturer's representative hereby referred to as the Testing Agent.

D. Refer to the General and Supplementary Conditions, Division 1 Specifications Sections for proposed phasing of this project. Provide manufacturer certified startup of all lighting control systems and Lighting System Functional Testing in each phased project area as required to turn each area over independently. The appropriate number of site visits to accomplish this phased scope of work shall be included in the base bid.

E. Refer to Specification Section 019113 for commissioning requirements related to this project.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Room Controllers
2. Low-Voltage Switches
3. Occupancy Sensors
4. Dimmer Switches
5. Timer Switches
6. Photo Sensors
7. System Functional Testing

1.3 SUBMITTALS

A. Submit shop drawings as described in Section 260010. Shop drawings shall include photometric data for each luminaire utilizing the specified lens/louver type, lamp(s) and ballast(s). All luminaire types and lighting control system components shall be submitted in a single complete brochure which shall be in the form of a soft cover binder with each luminaire separated by an identified index tab.

1. Room Controllers and Wiring Diagrams

2. Low Voltage Switches

3. Occupancy Sensors

4. Dimmer Switches

5. Timer Switches

6. Photo Sensors

a. Include data that indicates where the sensor shall be installed.

B. Submit for approval information detailing startup of the lighting control systems and the individual(s) who will be performing this service. Include documentation from the lighting control systems manufacturer indicating that they certify said individual(s) to perform this work. Submittal will be rejected if this information is not included.

C. Submit for approval a testing plan for all lighting control systems. Testing plan shall, at a minimum, observe and record all items described in the "Lighting System Functional Testing" part of this section and the individual(s) who will be performing this service. Include documentation from the lighting control systems manufacturer indicating that they authorize said individual(s) to perform this work. Submittal will be rejected if this information is not included.

1. Lighting System Functional Testing

a. Submittal of Functional Testing company name

b. Light meter to be used

c. Functional Testing Report after final adjustments are made

D. Warranty Information

1.4 QUALITY ASSURANCE

A. Lighting controls shall be standard products of manufacturers regularly engaged in the manufacture of the specific type of controls specified and shall be the manufacturer's latest standard design that complies with specification requirements. Firms installing the lighting controls shall have a minimum of five (5) years of successful installation experience on projects with interior lighting and controls work similar to the requirements of this project.

B. Codes and Standards

1. NEC:

a. Shall comply with Articles 220, 410 and 510 as applicable to installation and construction.

2. NEMA:

a. Shall comply with Standard Publication Nos. LE 1 and LE 2 as applicable to lighting equipment.

3. UL:

a. All interior lighting components shall be UL listed and labeled.

b. Comply with all applicable UL standards including UL 486A and B.

4. All work shall comply with applicable local code requirements of the authority having jurisdiction.

1.5 SEQUENCE OF OPERATION

A. Configure set-points and provide necessary programming to the local Room Controller(s) or stand-alone line voltage or low-voltage controls devices to operate as listed below.

B. Initially Unoccupied Room with Multiple Luminaires:

1. Turn on manual switch for each lighting zone (single, multi-level, daylight) to initially turn on luminaires (Per NYS Energy Conservation Code).

2. Within a daylight zone, lighting output dims up/down via output from a photocell(s) to adjust and maintain a 40-footcandle minimum light level in the daylight zone.

3. Occupancy sensor utilizes infrared or dual-technology (infrared/ultrasonic) to detect occupants and keep luminaires on at 100% output level.

4. Upon occupants leaving room, occupancy sensor keeps luminaires on for a set time delay (20-minutes). If no occupants are detected over the course of the time delay, occupancy sensor turns all luminaires off.

5. Upon occupants re-entering room, light switch shall be manually used to turn the luminaires back on.

6. Sequence then repeats.

C. Initially Unoccupied Corridor, Restroom, or Stairwell:

1. Key switch per. plans for each lighting zone (single, multi-level, daylight) to initially turn on luminaires (Per International Energy Conservation Code).

2. Occupancy sensor utilizes passive infrared and ultrasonic technology to detect occupants to control dimming.

3. Upon occupants leaving the area, occupancy sensor keeps luminaires on for a set time delay (20-minutes). If no occupants are detected over the course of the time delay, the room controller shall maintain the light levels in paths of egress shall not be reduced more than 50%.

4. Upon occupancy sensor detection of occupants re-entering the area, luminaires output shall be automatically turned back up to 100%.

5. Sequence then repeats.

D. Exterior Lighting:

1. Luminaires shall automatically turn off when daylight is present and satisfies the lighting needs.

2. All other exterior lighting shall be controlled so that the total lighting is automatically reduced by not less than 30% by selectively switching off or dimming luminaires at one of the following times:

a. During any time where activity has not been detected for 15 minutes or more.

3. Luminaires serving outdoor parking areas having a rated input wattage of greater than 78W and a mounting height of 24ft or less above ground shall be controlled by automatically reducing the power of each luminaire by a minimum of 50% when no activity is detected in the area illuminated by the controlled luminaires.

2.0 PART 2 - PRODUCTS

2.1 ROOM CONTROLLERS

A. Modular, stand-alone one room lighting control system (0-10V dimming and switching) with control of multiple user presets and room occupancy and daylight sensing for daylight harvesting.

B. Concealed mounting, self-contained, multi-channel lighting controller designed to communicate with occupancy and photo sensor inputs without the use of external power packs.

C. Shall allow for on-site commissioning controls via an infrared handheld remote control.

D. Lighting loads: Refer to floor plans for quantity of lighting channels per room. Where any room exceeds three channels, provide multiple room controllers networked together for proper system operation.

E. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so the individual load numbers are sequentially assigned using each controller's device ID's from highest to lowest.

F. Each load shall at minimum be configurable to operate in the following sequences based on occupancy:

1. Auto-on/Auto-off

2. Manual-on/Auto-off

G. Manual override and LED indicated for each load.

H. Compatible with 120/277 VAC systems.

I. Maximum 20A combined 20A combined load per Room Controller.

J. All digital parameter data programmed into each room controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

K. Room controller shall include:

1. Real time current monitoring

2. Efficient 250 mA switching power supply

3. RJ-45 network ports with integral strain relief and dust covers

4. One dimming output per relay

a. The 0-10-volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting.

b. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected driver. The LED level indicators on connected dimmer switches shall utilize this new maximum and minimum trim.

c. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0—100% dimming range defined by the minimum and maximum calibration trim.

d. Calibration and trim levels must be set per output channel.

e. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

5. Fade rates for dimming loads shall be specific to connected switch buttons, and the load shall maintain a default value for any connected buttons that do not specify a unique value.

L. Class 2 dimming control signal: 0-10VDC, sinks up to 100mA per channel for control of compatible drivers.

M. UL 2043 Plenum rated.

N. IR window built-in to room controller for commissioning with remote control.

O. Provide (1) infrared remote control for startup, programming, and commissioning.

P. Provide with digital input/output interface that includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC.

Q. Five year warranty.

R. Design Make: Wattstopper LMRC-210 Series with LMIO-101 Digital I/O Interface

S. Approved Equivalents:

1. Crestron ZUM Series

2. Douglass Controls

3. Hubbell NX Series

2.2 LOW-VOLTAGE SWITCHES FOR ROOM CONTROLLERS:

A. Low-Voltage Switch

1. On/Raise & Off/Lower dimming control button with led status indicator

2. Dimming switch with seven bi-level LED’s to indicate load levels using 14 steps.

3. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

4. All digital parameter data programmed into each wall switch shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

5. Two RJ-45 ports for connection to the Room Controller network and other devices.

6. Multiple digital wall switches may be installed in a room by simply connecting the to the room controller network. No additional configuration shall be required to achieve multi-level switching.

7. Ramp rate may be adjusted for each dimmer switch.

8. Color by Architect.

9. Five year warranty.

10. Shall be of the same manufacturer as the room controller.

11. Design Make: Wattstopper LMDM-101 Series

12. Acceptable Manufacturer's:

    a. Crestron

    b. Douglass Controls

    c. Hubbell

B. Low-Voltage Key Switch

1. Three position, momentary contact, key switch

2. Ratings:

    a. 15 Amps

    b. 120/277 VAC

3. Provide with a digital input/output interface as required to connect to the room controller network.

4. Color by Architect.

5. Five-year warranty.

6. Shall be of the same manufacturer as the room controller.

7. Design Make: Pass & Seymour 1250L Momentary Key Switch with LMIO-101 Digital Input/Output Interface

8. Acceptable Manufacturer's:

    a. Crestron

    b. Douglass Controls

    c. Hubbell

2.3 OCCUPANCY SENSORS

A. General:

1. All occupancy sensor layouts have been done using the “design make” sensors. Contractor shall be responsible for providing additional sensors and all associated equipment required to provide coverage for required areas.

B. Wall Mounted Sensors

1. Switchbox type (single circuit):

a. 120-277 volt, 800/1200 watts

b. 600 sq. ft. of coverage, 180 degree viewing angle.

c. Passive infrared technology.

d. Adjustable time delay from 30 seconds to 30 minutes.

e. Adjustable sensitivity from 20% to 100%.

f. Manual on switch operation (vacancy mode).

g. Internal photocell.

h. Decorator style, ivory color.

i. Install in single gang switch box.

j. Design Make: Wattstopper CS-50 series.

k. Acceptable Manufacturers:

1) Crestron Steinel

2) Hubbell

3) Douglass Controls

2. Switchbox Dimming Type (single circuit):

a. 120-277 volt, 800/1200 watts

b. 900 sq. ft. of coverage, 180 degree viewing angle, passive infrared technology.

c. Adjustable time delay from 30 seconds to 30 minutes.

d. Adjustable sensitivity from 20% to 100%.

e. Manual on switch operation (vacancy mode).

f. Decorator style, white color.

g. Install in single gang switch box.

h. Internal photocell.

i. Include with PowPak dimming module with 0–10V control

j. Design Make: Lutron Maestro 0-10V dimming sensor

k. Acceptable Manufacturers:

1) Crestron Steinel

2) Hubbell

3) Douglass Controls

3. Switchbox type (two circuit):

a. 120-277 volt, 800/1200 watts

b. 600 sq. ft. of coverage, 180 degree viewing angle.

c. Passive infrared technology.

d. Adjustable time delay from 30 seconds to 30 minutes.

e. Adjustable sensitivity from 20% to 100%.

f. Two manual on switches for independent control of two separate circuits.

g. Decorator style, ivory color.

h. Install in single gang switch box.

i. Design Make: Wattstopper CS-350 Series

j. Acceptable Manufacturers:

1) Crestron Steinel

2) Hubbell

3) Douglass Controls

C. Ceiling Mounted Sensors

1. Type OS-A Ceiling Mounted Sensors

a. Minimum 450 square feet of coverage, 360 degree viewing angle.

b. Passive infrared technology. Adjustable sensitivity.

c. Adjustable time delay from 5 to 30 minutes.

d. Install semi-flush in single gang switch box above the ceiling.

e. Standalone Sensors:

1) Includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC

2) Provide with relay power packs compatible with manual on operation and day-light operation and multi-level switching as shown on drawings.

3) Compatible with optional low voltage switch for manual-on operation.

4) Design Make: Wattstopper CI-300

5) Approved Equivalents:

a) Crestron Steinel

b) Hubbell OMNIIRRP

c) Douglass Controls

f. Sensors connected to Room Controllers:

1) Two RJ-45 ports for connection to the Room Controller and other devices.

2) Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

3) Load parameters including automatic/manual-on, blink warning, and daylight enable/disable when photo sensors are also connected to the Room Controller.

4) Shall be of the same manufacturer as the Room Controller

5) Design Make: Wattstopper LMPC-100 Series

6) Acceptable Manufacturers:

a) Crestron Steinel

b) Hubbell

c) Douglass Controls

2. Type OS-B Ceiling Mounted Sensors

   a. Minimum 1,000 square feet of coverage, 360 degree viewing angle.

   b. Dual technology (Ultrasonic/PIR or Microphonic/PIR). Field selectable for either setting or both. Adjustable sensitivity.

   c. Adjustable time delay from 5 to 30 minutes.

   d. Installs surface mounted in 4" octagon J-box above the ceiling.

   e. Standalone Sensors:

      1) Includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC

      2) Provide with relay power packs compatible with manual on operation and day-light operation and multi-level switching as shown on drawings.

      3) Compatible with optional low voltage switch for manual-on operation.

      4) Design Make: Wattstopper DT-300

      5) Approved Equivalents:

         a) Crestron Steinel

         b) Hubbell OMNIDT1000RP

         c) Douglass Controls

   f. Sensors connected to Room Controllers:

      1) Two RJ-45 ports for connection to the Room Controller and other devices.

      2) Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

      3) Load parameters including automatic/manual-on, blink warning, and daylight enable/disable when photo sensors are also connected to the Room Controller.

      4) Shall be of the same manufacturer as the Room Controller

      5) Design Make: Wattstopper LMDC-100 Series

6) Acceptable Manufacturers:

a) Crestron Steinel

b) Hubbell

c) Douglass Controls

3. Type OS-C Ceiling Mounted Sensors

a. Nominal 10’ X 75’ of coverage for corridors.

b. Ultrasonic technology.

c. Adjustable time delay from 30 seconds to 15 minutes.

d. Adjustable sensitivity.

e. Manual sensor bypass.

f. Install surface mounted in single gang switch box above the ceiling.

g. Provide with relay power pack.

h. Design make: Wattstopper W-2000H

i. Acceptable Manufacturers:

1) Crestron Steinel

2) Hubbell

3) Douglass Controls

2.4 LOW VOLTAGE TIMER SWITCH

A. Switch designed to fit decorator style switch plate covers.

B. Ivory color.

C. LCD countdown display

D. Push button scroll adjustable solid state time setting up to 12 hour

1. 5-minute increments up to 1 hour, 15 minute increments up to 12 hours.

E. Integral on/off push button

F. Amperage Capacity: 12mA DC / 41maA AC

G. Power Specification: 24 Volt AC/VDC/VAC rectified.

H. Approvals: UL, CSA

I. Design Make: Watt Stopper TS-400-24 Digital Time Switch or Approved Equal

J. Approved Equivalents:

1. Tork SS410

2.5 LINE VOLTAGE TIMER SWITCH

A. Switch designed to fit decorator style switch plate covers.

B. Ivory color.

C. LCD countdown display

D. Push button scroll adjustable solid state time setting up to 12 hour

E. Integral on/off push button

F. Amperage Capacity: 800W at 120VAC, 1,200W at 277VAC

G. Power Specification: 120-277 Volt AC, 50/60 Hz

H. Approvals: UL, CSA

I. Design Make: Watt Stopper TS-400 Digital Time Switch or Approved Equal

J. Approved Equivalents:

1. Hubbell TD300

2. Philips OccuSwitch LTA24550C

3. Douglass Controls

2.6 DIMMER SWITCHES

A. 120V – 277V Line Voltage Fluorescent 3-Wire Dimmers:

1. Refer to drawings for 1-way or 3-way dimmers, provide applicable model.

2. Mechanical air-gap switch to disconnect load power

3. Vertical linear slider for dimming

4. Intended for 0–10V dimming for fluorescent and LED luminaires

5. Rated for 8 amps at 120 volts or 6 amps at 277 volts.

6. Contractor to verify dimmer is manufacturer certified with the dimmable fluorescent ballast.

7. Design Make: Lutron Diva DVF-103P Series or Approved Equal

B. 120V Line Voltage Dimmers for Lamps:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model.

2. Mechanical air-gap switch to disconnect load power

3. Vertical linear slider for dimming

4. Intended for 120V, 60Hz dimmer for LED, Halogen, Fluorescent. and Incandescent dimmable lamps.

5. Rated for 150W LED

6. Rated for 600W Incandescent/Halogen

7. Forward phase shift

8. Includes low-end trim adjustment slide

9. Design Make: Lutron DVCL Series or Approved Equal

C. 120V Line Voltage Dimmers for LED luminaires run off a driver:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model.

2. Mechanical air-gap switch to disconnect load power

3. Vertical linear slider for dimming.

4. Intended for 120V, 60Hz dimmer for ELV, LED, CFL, halogen and incandescent dimmable lamps.

5. Rated for 500W LED, 250W CFL

6. Reverse phase shift

7. Design Make: Lutron DVRP Series or Approved Equal

D. Magnetic Low-Voltage Dimmers:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model.

2. Mechanical air-gap switch to disconnect load power

3. Vertical linear slider for dimming

4. Dimmers shall not cause a magnetic low voltage transformer to operate above the transformers rated operating current or temperature.

5. Rated for 450W

6. Design Make: Lutron DVLV Series or Approved Equal

E. 0-10VDC Dimmers:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model with matching wallplate.

2. Provide accessory 120-277V input power pack to power accessory sensors as indicated and 10V control power for dimming switch

3. Vertical linear slider for dimming

4. Intended for 0–10V dimming for fluorescent and LED luminaires

5. Controls 120–277V without a power pack, 8 Amp 120-277V rated. Internal power supply generates 0-10V output.

6. Provides 3-way preset switching functionality

7. Design Make: Lutron Diva 0-10V DVTV Series w/ Lutron PP-DV Powerpack

F. Approved Equivalents:

1. Hubbell - Rocker Slide Dimmer Series

2. Sensor Switch – Contractor Select Series

3. Leviton – Decora Dimmer Series

2.7 PHOTO SENSOR

A. Digital daylighting sensor shall work with the Room Controllers describe in this section to provide automatic dimming daylight harvesting capabilities.

B. Continuously monitors daylight entering window or skylight to enable daylight harvesting applications to provide control of room lighting based on presence of daylight.

C. Shall provide the option, when daylight contribution is sufficient, of turning the lights off or dimming the lights to a field-selectable minimum level.

D. Shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.

E. Shall provide adjustable cut-off time. Cut –off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.

F. Wall switch override shall allow occupants to control lighting level with dimming wall switches.

G. Automatically establishes application specific set points following manual calibration using a wireless configuration tool or PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF set points for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

H. Install in location recommended by the manufacturer.

I. Field of View: 60 Degree cone.

J. Sensitivity: 1-6,553 foot-candles (10-70,536 lux).

K. LED status and configuration indicators.

L. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool.

M. One RJ-45 port.

N. Connects to room controller via Cat.5e patch cable without the need for external power packs.

O. Five year warranty.

P. Shall be of the same manufacturer as the room controller.

Q. Design Make: Wattstopper LMLS-500 Series

R. Acceptable Manufacturers:

1. Crestron

2. Hubbell

3. Douglass Controls

2.8 TIME SWITCHES (CLOCKS)

A. Astronomical time switch.

B. Time switch controls for exterior lighting shall comply with the following:

1. They shall have a clock capable of being programmed for not fewer than 7 days.

2. They shall be capable of being set of seven different day types per week.

3. They shall incorporate an automatic holiday setback feature.

4. They shall have program backup capabilities that prevent the loss of program and time setting for a period of not less than 10 hours in event that power is interrupted.

C. Input voltage shall be 120/277v.

D. Shall have (2) sets of contacts rated for 30A each.

E. Program backup capabilities to prevent loss of program for a period of not less than 10 hours when power is interrupted.

F. NEMA 3R Enclosure if mounted outdoors.

G. Design Make: Tork-nsi DZS series.

H. Acceptable Manufacturers:

1. Tork-NSI

2. Intermatic

2.9 LOW-VOLTAGE WIRING FOR LIGHTING CONTROLS

A. 0-10VDC Wiring

1. UL Type CMP plenum rated cable

2. 0-10VDC wiring shall be white outer jacket with 2-conductor purple and gray jacket insulation on the internal 18AWG solid copper conductors.

3. Design Make: Liberty AV Solutions 18-2C-LVBP-WHT or Approved Equal

B. Unshielded Twisted Pair (UTP) Wiring

1. UL Type CMP plenum rated cable

2. RJ-45 factory terminated RJ-45 connectors

3. ANSI/TIA-568-C.1 certified Cat. 6 Cable

4. Max. length 100-meters

5. Design Make: Belden, West Penn Wire, Hubbell, Leviton

3.0 PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions, under which luminaires are to be installed, and substrate for supporting luminaires. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation meeting after receipt of approved submittals to review the following:

1. Confirm the location and mounting of all digital lighting control devices, with special attention to placement of occupancy and photo sensors.

2. Review the requirements for low-voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

3.3 COORDINATION

A. Refer to respective reflected ceiling plan for each area. Reflected ceiling plans indicate proper luminaire location only. Locate occupancy sensors and photo sensors per the manufacturer's recommendations. Coordinate the proper arrangement with all other ceiling mounted items. Contract Documents indicate luminaire characteristics (type), quality, quantity, etc. Verify with the ceiling supplier design of actual ceiling installed in each area and coordinate compatible luminaire flange/trim type.

B. General

1. Install interior lighting controls at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's 'Standard of Installation", NEMA standards, and with recognized industry practices.

2. Make installation such that the lighting controls are free of finger marks, flaws, scratches, dents or other imperfections.

3.4 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and equipment shall be delivered with UL and manufacturer's labels intact and legible in factory fabricated containers.

B. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

C. Handle interior lighting luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged luminaires or components; replace with new.

3.5 SEQUENCING AND SCHEDULING

A. Coordinate with other work including ceiling type, wires/cables, electrical boxes, fittings, and raceways, to properly interface installation of interior luminaires with other trades.

B. The contractor shall provide the lighting control systems manufacturer with three weeks written notice of the system startup and adjustment date.

3.6 OCCUPANCY SENSORS

A. Provide all necessary mounting brackets, wiring, low voltage transformers and control relays required to provide control of areas indicated.

B. Provide initial time delay and sensitivity settings per owner's representative.

C. Install in location as recommended by the manufacturer.

D. Refer to "Lighting System Functional Testing" part of this section for additional information.

3.7 PHOTO SENSORS

A. Provide hand held digital light meter measuring device in the 0-200 foot-candle range. Provide adjustments to threshold on sensor to meet user requirements. Initial foot-candle threshold setting to automatically turn off lights shall be 50 foot-candles. Provide adjustments to meet owner requirements and space constraints.

B. Install in location as recommended by the manufacturer.

C. Refer to "Lighting System Functional Testing" part of this section for additional information.

3.8 CONTROL WIRING

A. Provide all required low-voltage control wiring for lighting control system components.

B. Provide RJ-45 factory terminated Cat. 6 or better Unshielded Twisted Pair (UTP) cable with RJ-45 connectors to connect switching, photo control, and occupancy sensing devices on the Room Controller network. Cables shall manufacturer approved for the connectivity solution.

C. Provide 0-10VDC wiring for dimming from Room Controller and dimming switches to the drivers.

D. Control Wiring Installation:

1. All interior cabling shall be installed concealed inside the wall cavities and ceiling space.

2. Provide a continuous raceway system in accordance with NEC Article 800 for horizontal cable runs through all inaccessible ceiling (including drywall) and wall cavity spaces. All flexible raceway system runs shall be securely attached to ceiling joists and wall studs 3-feet O.C and removal and addition of cables in the future.

3. UTP Cables shall be supported by Cable Hangers 3-foot on center. When installed in cable tray zip-tie to cable tray away from STP, coaxial cables, and optical fiber cables. Provide additional stacked Cable Hangers when filled greater than 50%.

3.9 LIGHTING SYSTEM FUNCTIONAL TESTING

A. Lighting system functional testing shall comply with the following requirements:

1. Provide plan markup which indicates the exact location of each sensor, direction of aim, and certify on the plan that the direction of aim and placement are in compliance with manufacturer's requirements. Include this plan with the Operation & Maintenance Manuals.

2. Occupancy Sensor Controls:

a. Certify that the occupancy sensor has been located and aimed in accordance with the manufacturer's recommendations.

b. All devices shall be tested. Verify the following:

1) Where occupant sensor controls include status indicators, verify correct operation.

2) The controlled lights turn off or down to the permitted level within the specified time.

3) The lights turn on only when manually activated.

4) The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

3. For Time – Switch Controls:

a. Verify that timers are properly programmed with weekday, weekend and holiday schedules.

b. Provide documentation to the Owner of time-switch controls programming including weekday, weekend, and holiday schedules and set-up and preference program settings. Include a copy in testing documentation package for approval by the Engineer.

c. Verify time of day and day of week are properly set.

d. Verify that any battery back-up is installed and energized.

e. Verify that any override timer is set for less than 2 hours.

f. Simulate occupied condition and verify the following:

1) All lights can be turned on or off by respective area control switch.

2) Light switches control only those lights in the enclosed area where the switch is located.

g. Simulate unoccupied condition and verify the following:

1) Non-exempt lights turn off.

2) Manual override switches allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.

h. For Daylight Responsive Controls:

1) Verify that the control sensing devices have been properly located, field calibrated and set for accurate control set points and threshold lighting levels.

2) Daylight controlled lighting loads adjust to light levels set points in response to available daylight.

3) The location of calibration adjustment equipment is readily accessible only to authorized personnel.

4) Record all set points and verify with calibrated light meter the actual field recorded lighting control levels.

5) Upon request, repeat measurements in the presence of the Design Professional or their authorized representative to validate lighting level control response.

4. Create a log of deficiencies noted during testing. Correct all deficiencies prior to project Commissioning Activity. Refer to Section 019113.

5. Provide records of all lighting system functional testing to the Commissioning Agent on the test form(s) provided within this section PRIOR to scheduled project functional testing.

6. Correct any deficiencies and discrepancies noted by the Commissioning Agent during their functional testing.

7. The Commissioning Agent will incorporate all final testing results into the project Commissioning Record.

B. Test Form:

1. Instruction: Contractor to complete either the following form or the form contained in the approved testing plan for each room in the project that receives lighting controls. Include completed forms in the Operation and Maintenance Manuals. Provide electronic copy of all completed testing forms and reports to the Commissioning Authority for their use.

Room Name/Number:	***Date:***	
Testing Agent's Name:		
Testing Agent's Signature:		
Testing Agent's Company & Position:		
Occupancy Sensor Controls	*Initials*	*N/A*
Verify that the occupancy sensor has been located and aimed in accordance with the manufacturer's recommendations such that occupants within the space properly trigger lighting operation without false trigger from adjacent areas.		
Verify that the status indicators on the occupancy sensor are operating correctly.		
Verify that the controlled lights turn OFF or down to the permitted level within the specified time.		
Verify that the controlled lights turn ON only when manually activated.		
Verify that the lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.		
Record sensitivity level and delay settings for occupancy sensor control:		
Time - Switch Controls	*Initials*	*N/A*
Verify that the timers are properly programmed with weekday, weekend, and holiday schedules.		
Record time schedule as programmed:		
Verify that the time of day and day of week are properly set.		
Verify that battery back-up is installed and energized.		
Verify that the override timer is set for less than 2 hours.		
Simulate occupied condition: I verify that all lights can be turned on or off by respective area control switch.		
Simulate occupied condition: I verify that the lighting switches control only those lights in the enclosed area where the switch is located.		
Simulate unoccupied condition: I verify that all non-exempt lights turn off.		
Simulate unoccupied condition: I verify that the manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.		
Daylight Responsive Controls	*Initials*	*N/A*
Verify that the control sensing devices have been properly located, field calibrated, and set for accurate control set points and threshold lighting levels.		
Verify that the daylight controlled lighting loads adjust to light levels set points in response to available daylight.		
Verify that the location of calibration adjustment equipment is readily accessible only to authorized personnel.		
Record set point (foot-candles):		
Record lighting control level with calibrated light meter (foot-candles):		
Record cut-off time (minutes):		
Record fade rate (units/second):		

3.10 TRAINING

A. Upon completion of the system startup, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the lighting control system. Include sign in sheet with Operation & Maintenance Manuals.

3.11 WARRANTY

A. All lighting controls equipment included in this section shall be fully tested and guaranteed for a period of five years after Owner's Representative written acceptance.

END OF SECTION 260923

SECTION 262400 - SWITCHBOARDS AND PANELBOARDS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Circuit Breakers
2. Group Mounted Switchboard
3. Service Entrance Power Monitor

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)
   a. 240 - Overcurrent Protection
   b. 404 - Switches
   c. 408 - Switchboards and Panelboards
2. The following National Electrical Manufacturers Association (NEMA) Standards:
   a. NEMA AB 1 1993 - Molded Case Circuit Breakers and Molded Case Switches
   b. NEMA PB 1 - Panelboards
   c. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.

d. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

e. NEMA 250 - Enclosures for Electrical Equipment

3. The following American National Standards Institute (ANSI) standards:

a. ANSI/NETA-2013 ATS for Electrical Power Equipment and Systems

b. ANSI C37 – Low-Voltage Power Operated Circuit Breakers

c. ANSI/IEEE C12.1 Code for Electric Metering

4. The following U.L. Standards:

a. UL 50 - Enclosures for Electrical Equipment

b. UL 67 - Panelboards

c. UL 98 - Enclosed and Dead-Front Switches

d. UL 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures

e. UL 857 - Underwriters Busway Standard

f. UL 891 – Standard for Switchboards

g. UL 943 - Standard for Ground Fault Circuit Interrupters

h. UL 1066 - Low-Voltage Power Operated Circuit Breakers

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Thermal Magnetic Molded Case Circuit Breakers

2. Electronic Trip Molded Case Circuit Breakers

3. Electronic Trip Insulated Case Circuit Breakers

4. Switchboards, including the following:

a. Dimensioned plans and elevations.

b. Internal and External Connection Diagrams.

c. Power and control wiring diagrams.

d. Bill of Materials

e. Any modifications made to the switchboard or distribution system design to accommodate manufacturer’s standard equipment.

f. Where utility equipment is required in the switchboard, show required modifications to the switchboard, and submit drawings reviewed and approved by the utility company.

5. Service Entrance Power Monitor

1.5 MINOR MODIFICATIONS

A. Provide modifications to circuit breaker trip rating within the frame size at no additional cost, until shop drawings are reviewed and submitted.

1.6 FIELD SUPERVISION

A. Provide field supervision and start-up by a qualified representative of the equipment manufacturer. Provide certification that the equipment has been installed in accordance with the manufacturer's requirements.

2.0 PART 2 - PRODUCTS

2.1 CIRCUIT BREAKERS

A. General

1. UL 489 listed.

2. Below 250Amps – Unless otherwise noted, operation shall be from a fixed thermal magnetic trip unit. Permanent trip unit containing individual thermal and magnetic trip elements.

3. 250Amps and above - Include field adjustable electronic Long Time, Short Time, and Instantaneous trip unit.

4. 400Amps and above - Include field installed interchangeable rating plugs.

5. Provide an over-center, trip-free handle to provide quick-make, quick-break contact action.

6. Provide multi-pole breakers with common trip.

7. When the circuit breaker has tripped, the handle shall move to a position between the "on" and "off" positions. Provide a visual indication that the circuit breaker has tripped.

8. The ampere rating shall be clearly marked on the face of the circuit breaker.

9. Series rated fuse/circuit breaker installations are not acceptable.

10. Make provisions to add circuit breaker handle locks.

11. Circuit breakers shall have voltage, ampere, and interrupting ratings as called for on the Panelboard Schedule.

12. New circuit breakers installed in existing panelboards shall be UL listed for use in panelboard.

B. Thermal Magnetic Molded Case Branch Circuit Breakers

1. Molded case circuit breakers shall be constructed of a glass reinforced insulating material. All current carrying components shall be completely insulated and isolated from the outside of the circuit breaker.

2. 60°C terminal temperature rating for circuit breakers rated 125 amperes or below.

3. 75°C terminal temperature rating for circuit breakers rated above 125 amperes.

4. All 20 and 30 ampere, single pole circuit breakers shall be UL listed for switching duty.

5. Circuit breakers shall be bolt-on. Plug-on acceptable in load centers on residential applications only.

6. Circuit breakers rated 250 amperes and below shall be UL listed HACR type.

7. Where ground fault circuit breakers are required, provide a shunt trip circuit breaker with a zero sequence sensing ground fault module.

8. Design Make: Square D QOB (250 volt), EH, EHB (480 volt), I-Line style (600 volt).

9. Acceptable Manufacturers:

a. Eaton

b. ABB

c. Siemens

d. Square D

C. Standard Function Electronic Trip Molded Case Circuit Breakers

1. Microprocessor based true RMS sensing current sensing device with accuracy to the thirteenth harmonic.

2. Sensor frame and rating plug size shall be as indicated on the Panelboard Schedule.

3. UL listed to carry 80% of the ampere rating continuously.

4. Provide the following time/current response adjustments:

a. Long Time Pickup

b. Long Time Delay

c. Short Time Pickup

d. Short Time Delay (I2t IN only)

e. Instantaneous Pickup

f. Ground Fault Pickup

5. Provide a means to cover the trip unit adjustments in accordance with NEC Article 240-6(b).

6. Provide trip indication for overload, short circuit, and ground fault trips.

7. Tripping system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing.

8. Design Make: Square D LX, MX, NX, PX

9. Acceptable Manufacturers:

a. Eaton

b. ABB

c. Siemens

d. Square D

D. Arc Mitigation and Safety Options

1. Shall be provided on all circuit breakers 1200 Amps or larger.

2. Alternate Maintenance Setting Switch (AMS)

3. Designed for the temporary arc-flash incident energy reduction during maintenance activities.

4. For each feeder circuit breaker, provide a manual switch on the compartment door to switch the circuit breaker short-time tripping characteristics to instantaneous with minimum pick-up setting, in order to reduce the danger from potential arc-flash at downstream equipment.

5. Provide a lock feature for the AMS switch so that it may be locked in either the Off or On maintenance mode position.

6. Provide a blue LED indicating light to indicate AMS switch is in the maintenance mode.

7. Wire contacts on all AMS switches to a common alarm input to plant control system.

8. Provide for remote AMS switches or indication, as needed.

9. If circuit breaker integral trip unit cannot be controlled as specified, provide discrete relay with shunt-trip or equivalent to provide specified performance.

2.2 GROUP MOUNTED SWITCHBOARD

A. General:

1. Locate equipment as called for on the drawings. Refer to the Power One Line Diagram for system design.

2. The Contractor shall verify that any equipment submitted that is not by the Design Make Manufacturer shall fit into the space available. Any modifications required to fit non-design make equipment shall be made at no additional cost to the Owner.

3. Any modifications made to the switchboards layout or design shall be specifically shown on the shop drawings.

4. Provide full capacity bus throughout the entire switchboard. Construct busway to allow future expansion of switchboard in all directions with physical accessibility. Entire switchboards shall be fully equipped to accept future devices, including all appropriate connectors and mounting hardware.

B. Electrical Ratings:

1. 480Y/277 volts, three phase, four wire, 60 Hz.

2. Ampere rating as called for on the drawings.

3. Main bus shall be plated copper.

4. Provide full capacity, isolated, plated copper neutral bus.

5. Provide plated copper ground bus, sized per the National Electric Code. Ground bus shall run the entire length of the switchboard.

6. Braced for 65,000 amperes available fault current.

C. Construction

1. UL 891 Construction.

2. Dead Front Construction suitable for freestanding mounted against the wall.

3. Front only switchboard accessibility to all internal connections and removable parts.

4. Front switchboard alignment.

5. Limiting dimensions shall be 90” high x 36” deep x width as required on Contract Documents wide.

6. NEMA 1 construction for indoor installation.

7. 1 ½” steel channels under the entire perimeter of the switchboard.

8. Steel barriers between each section of the switchboard.

9. All switchboard sections shall be bussed together.

10. All busbar joints and connections shall be plated with silver, tin or nickel. The current density at contact surfaces in busbar joints shall not exceed 200 amperes per square inch for copper and 150 amperes per square inch for aluminum. A permanent label providing torque values or tightening instructions for all busbar joints shall be affixed to each section of a switchboard. Use bolts and conical spring washers for solid connection. Tighten to manufacturer’s recommendations.

11. Incoming conductors shall be conduit and cable and shall enter at the top of the switchboard.

12. Provide all necessary transition spaces as required to accommodate the bus work.

13. Provide engraved lamicoid plastic labels for each overcurrent protective device in the switchboard.

14. Provide manufacturer’s standard paint finish.

D. Electrical Characteristics:

1. Service Entrance Rated. Provide removable neutral to ground link.

2. Provide long barrel, NEMA two hole compression terminal lugs for all cables terminated at the busway. Size lugs for cables terminated.

3. Provide main overcurrent protective devices as called for on the Switchboard Schedule.

4. Where no main overcurrent protective devices are called for, the switchboard shall be equipped with no more than six overcurrent protective devices that disconnect power to all loads in the building. Clearly label each device as a service entrance disconnecting means.

E. Utility Metering Section

1. Provide space in switchboard for installation of utility company metering transformers. Equipment shall meet all utility requirements for Service Entrance Equipment. Coordinate entire installation with the Utility.

2. Physical arrangement, mounting, and space requirements shall be approved by the Utility before submitting shop drawings. Include one copy of utility approved drawings with submittals.

3. Install metering transformers and make connections as directed by Utility.

4. Provide all wiring in 1 ½" rigid conduit from the metering transformers to the utility meter.

5. Metering section shall be cold sequenced, built into the main disconnect section.

6. Provide steel barriers between the metering compartment and all adjacent sections.

7. Provide an engraved lamicoid label with ½" lettering reading "Utility Company Metering Compartment".

F. Non-Utility Metering

1. Provide Service Entrance Power Monitor as called for in this specification section. Install circuit monitor semi-flush mounted in the front of the switchboard in the main incoming compartment connected ahead of all load circuit breakers. Bring all circuit monitor and instrument transformer leads to a terminal strip mounted in the switchboard.

G. Distribution Section

1. Group mounted molded case circuit breakers.

2. All sections bus connected.

3. Steel barriers between all distribution sections.

4. All space for future overcurrent protective device shall be equipped with all necessary mounting hardware and connectors.

H. Design Make: Eaton Pow-R-Line Series

I. Acceptable Equivalents:

1. Square D QED-2 Series

2. ABB Spectra Series

3. Siemens SB2 Switchboard

2.3 SERVICE ENTRANCE POWER MONITOR

A. The service entrance power meter shall be used for basic power monitoring of the building electrical service.

B. The monitor shall be installed ahead of any branch devices or main distribution panels. It shall be designed to mount is the same enclosure section as the main circuit breaker without requiring a separate switchgear section for CTs.

C. Current Transformers

1. Provide required quantity of split-core hinged current transformers for each 3-phase, 4-wire power monitoring and metering location called for on the drawings and in this section.

2. The CTs turn ratio shall be calculated to provide a maximum current output that matches input limitations of the metering device.

3. All CTs shall be approved by the system manufacturer and meet the readout accuracy requirements listed in this section.

D. The monitor shall be capable of providing the following power measurements:

1. THD & Frequency

2. Voltage Phase to Phase and Phase to Neutral

3. Amperage Phase to Phase and Phase to Neutral

4. Minimum and Maximum:

a. Voltage and Current

b. Frequency

c. Power Factor

d. kW and kVAR

5. Real and Reactive Energy (kW/kVAR)

E. RJ-45 Ethernet port for data acquisition port and 80kB internal memory

F. Sampling rate 64 samples/cycle

G. Power quality analysis 31st harmonic

H. Class 0.5S active energy IEC 62053-22

I. High-definition LCD display

J. Number of Outputs: 2 relay 2 digital

K. Control power voltage range: 90-457 VAC

L. Design Make: Eaton Power Xpert Meter 2000

M. Acceptable Equivalents:

1. Electro Industries Shark 200

2. Square D Powerlogic PM5340

3. Siemens

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

F. Provide testing in accordance with ANSI/NETA-2013 ATS for Electrical Power Equipment and Systems.

3.2 CIRCUIT BREAKERS

A. Install circuit breakers in panelboards and switchboards as called for on the plans and as recommended by the manufacturer.

B. Adjust circuit breaker pick-up level and time delay settings to the values called for on the drawings indicated in the coordination study designated by the Engineer.

C. Submit documentation that a qualified representative from the equipment manufacturer has inspected and approved the installation.

3.3 SWITCHBOARDS

A. Verify equipment location before ordering or installing switchboards.

B. Provide a 4" high concrete pad as follows:

1. Constructed of 3000 psi concrete.

2. Pad shall extend 4" beyond all sides of the switchboard, except in the back for switchboards mounted tight against the wall.

3. Provide 6" x 6" #4 welded wire mesh.

4. Securely bond pad to floor by roughing the floor and coating with cement grout.

C. Provide a drip pan above the switchboard wherever exposed piping is present. Provide a 1 ¼" copper pipe from the pan to the floor drain.

D. Provide grounding bushings at all conduits terminating at the switchboard.

E. Provide all power and control wiring as required.

F. Provide copper color-coded control wire with crimp spade to screw terminals for all control wiring. Wire shall be UL listed for switchboard use.

G. Paint all nicks, scratches, unpainted bolt heads, etc., with two coats of paint.

H. Prior to energizing, thoroughly clean the switchboard, insulators and bus.

I. Prior to energizing, obtain the services of a qualified manufacturer's representative to test the switchboard for correct installation.

J. Provide identification as required per Section 260100.

3.4 SERVICE ENTRANCE POWER MONITORS

A. Provide manufacturer startup and commissioning of the complete power monitoring system after installation of all components. The manufacturer representative for the system shall return to the site as many times as required until all systems and components are fully operational. The electrical contractor is responsible for coordinating all training and system commissioning of the system with the owners representative and the manufacturer representative.

B. Provide potential transformers for monitoring and metering devices requiring a different control power voltage than the connected bus voltage.

C. The electrical contractor shall be responsible for all PT and CT installation locations and over-current protection. Locations shown on the drawings reference the tenant load to be metered only. Provide separate enclosures to house the CTs if they do not fit in the indicated load panel or enclosed breaker.

D. Tie wrap and neatly arrange all PT and CT wiring inside electrical enclosures. Provide one piece lengths of control wiring from the CTs its corresponding meter, splices in the CT wiring is not acceptable unless approved by the manufacturer.

E. Provide all required wiring as recommended by the manufacturer. Wiring includes but is not limited to:

1. RS-485 twisted shielded 2-pair 22 AWG network wiring to the DDC system panel for that building.

F. Provide EMT conduit for all RS-485, Ethernet, and twisted control wiring from CTs and remote meters back to the main data recorder. Label all corresponding junction boxes with the following wording "Metering".

G. Meet with owner's representative and provide original system configuration. Provide all required programming and software configuration for the owner to be read and record, the monthly kWH and peak kW.

H. Where external circuit connections are required, terminal blocks shall be provided and the manufacturer's drawings shall clearly identify the interconnection requirements including wire type to be used.

I. All wiring required to externally connect equipment lineups shall be installed by the Electrical Contractor.

J. Provide (1) hours of training on the complete system operation and programming to the owner selected staff members. Training shall be done by manufacturer representative of the metering equipment.

END OF SECTION 262400

SECTION 262913 - SWITCHES, CONTACTORS AND MOTOR CONTROLLERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 DESCRIPTION OF WORK

A. This section includes minimum requirements for the following:

1. Disconnect Switches
2. Motor Control Equipment
3. Low Voltage Fuses

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)
    a. 240 - Overcurrent Protection
    b. 404 – Switches
    c. 430 – Motors, Motor Circuits, and Motor Controllers
2. The following National Electrical Manufacturers Association (NEMA) Standards:
    a. NEMA AB 1 1993 - Molded Case Circuit Breakers and Molded Case Switches
    b. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.
    c. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

d. NEMA 250 - Enclosures for Electrical Equipment

3. The following American National Standards Institute (ANSI) standards:

a. ANSI/IEEE C12.1 Code for Electric Metering

4. The following U.L. Standards:

a. UL 50 - Enclosures for Electrical Equipment

b. UL 98 - Enclosed and Dead-Front Switches

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Disconnect Switches

2. Motor Control Equipment

3. Low Voltage Fuses

1.5 MINOR MODIFICATIONS

A. Provide modifications to fuse sizes within the frame size at no additional cost, until shop drawings are reviewed and submitted.

1.6 FIELD SUPERVISION

A. Provide field supervision and start-up by a qualified representative of the equipment manufacturer. Provide certification that the equipment has been installed in accordance with the manufacturer's requirements.

2.0 PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Three pole, single throw, or as called for on the drawings.

B. Quick-make, quick-break switch operating mechanism.

C. Mechanical service life (switching cycles) / typical: 10000

D. 600VAC rated, current rating as called for on the drawings.

E. Defeatable dual cover interlock external override mechanism to open the disconnect switch door without opening the disconnect switch.

F. All current carrying parts shall be plated to resist corrosion.

G. Lugs shall be removable and rated for 75°C temperature rating.

H. Switch blades shall be visible when the switch is in the open position and the door is open.

I. Switch shall be padlockable in the OFF and ON positions.

J. Provide fusible switches with rejection type fuse holders and fuses as indicated on the plans or as per fed equipment requirements.

K. Enclosure shall be steel with gray baked enamel paint.

L. Provide NEMA type enclosures as called for on the drawings. Provide NEMA Type 3R for all rooftop and exterior switches.

M. NEMA type 1 enclosures shall be equipped with knockouts.

N. Design Make: Square D

O. Acceptable Equivalents:

1. Eaton

2. Siemens

2.2 MOTOR CONTROL EQUIPMENT

A. General

1. Provide motor starters, disconnect switches, etc., as listed on the Electric Equipment and Control Schedule on the drawings.

2. Starters, contactors and controllers shall comply with NEMA standards having general purpose NEMA 1 or 1B enclosure unless otherwise called for. Provide explosion proof, weather resistant or watertight construction as required. Starters shall be minimum NEMA size 0 with overloads in each phase sized per NEC, nameplate motor full load amperage, service factor, and motor operating conditions.

3. Pad lock arrangements shall be provided to lock the disconnect device in the "off" position. Magnetic starters shall be provided with a control power transformer with 120V secondary and primary and secondary fusing and be sized to accept the loads imposed there on. Starters shall have transformer type pilot lights and 6 volt long life bulbs. Each starter subject to electrical interlock and/or automatic control shall have necessary auxiliary contacts.

4. Auxiliary devices: Provide pushbutton stations, pilot lights, devices, relays, transformers, selector switches, electric thermostats, auxiliary starter contacts as required for functions called for. Provide separate relay for each speed to operate electric dampers or other devices as required for multispeed motor circuit.

5. Manual Motor Starter: Provide all starters with thermal overload(s); and pilot light(s), and handle lock-out provisions. Gang starter with selector switch for multispeed applications. Provide single or 2-pole as required:

   a. 120 volt, single-pole, surface mounted: Square-D FG-1P.

   b. 120 volt, single-pole, flush mounted: Square-D FS-1P.

   c. 240 volt, two-pole, surface mounted: Square-D FG-2P.

   d. 240 volt, two-pole, flush mounted: Square-D FS-2P.

   e. 120 volt, single-pole, two speed, surface mounted: Square-D FG-11P.

   f. 120 volt, single-pole, two speed, flush mounted: Square-D FS-101P.

   g. 240 volt, two-pole, two-speed, surface mounted: Square-D FG-22P.

   h. 240 volt, two-pole, two-speed, flush mounted: Square-DFS-202P.

   i. 120 volt, single-pole, H-O-A selector, surface mounted: Square-D FG-72P.

   j. 120 volt, single-pole, H-O-A selector, flush mounted: Square-D FS-72P.

   k. 240 volt, two-pole, H-O-A selector, surface mounted: Square-D FG-72P.

   l. 240 volt, two-pole, H-O-A selector, flush mounted: Square-D FS-72P.

   m. 120 volt, single-pole, surface mounted, explosion proof: Square-D FR-1H.

   n. 240 volt, two-pole, surface mounted, explosion proof: Square-D FR-2H.

   o. Manual Motor Starter - Speed Controller: Shall be similar to "Manual Motor Starter", above, except two-gang with motor speed control sized to handle motor indicated, with positive full on and full off bypass of speed control unit.

6. Manual Starter with Relay: Shall be similar to "Manual Motor Starter", above, except two-gang with relay sized for load indicated, and hand-off-automatic switch. Connect relay for 120V operation on load side of starter in "automatic" mode. Coordinate connection of Form C maintained contact for control with Mechanical Contractor.

B. Magnetic Starters

1. Shall be single-speed, across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings.

2. Starters shall be mounted in NEMA 1 enclosures unless otherwise indicated.

3. Magnetic starters shall be equipped with double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring.

4. Starter shall have straight-through wiring. Coils shall be of molded construction and shall be replaceable from the front without removing starter.

5. Overload relays shall be melting alloy type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

6. Provide hand-off-auto selector switch**,** start-stop pushbuttons and "run" pilot light in cover. Wire for maintained contact unless otherwise noted.

C. Combination Magnetic Starter: Shall be similar to "Magnetic Starter", above, except shall include fusible disconnect switch connected ahead of starter. The disconnect handle shall be in control of the disconnect device with the door open or closed. Disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off".

D. Combination Two-Speed Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except with two starters, and six thermal overload units coordinated to match torque and horsepower characteristics of the motor. Starter shall be designed for variable torque operation, and shall be provided with high-low-off-auto selector switch and high and low pilot lights mounted in the cover. Wire for maintained contact unless otherwise noted.

E. Combination Reduced Voltage Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except auto-transformer closed transition reduced voltage type with auto-transformer protection by winding over-temperature device.

F. Packaged Control Unit: Shall be furnished under Division 22 or 23, and connected by Electrical Contractor. Generally consists of one or more starters, disconnect switches and additional control devices prewired.

G. Contactor: Shall be similar to "Magnetic Starter", above, except without thermal overload units.

H. Duplex Motor Controller

1. General Operation

a. Controller consists of two starters in a common enclosure with separate fused disconnect switches for each starter.

b. An integral alternation circuit shall be provided which alternately operates first one motor and then the other on each successive closing of an external control device.

c. If one motor is running and its associated disconnect is opened, an overload relay trips or the starter is de-energized for any reason; the other motor will automatically be started.

2. Magnetic starters shall be single-speed; across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings.

3. Magnetic starters shall be mounted in NEMA 1 enclosures unless otherwise indicated.

4. Magnetic starters shall be equipped with double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring.

5. Overload relays shall be melting alloy type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

6. Provide hand-off-auto selector switch**,** start-stop pushbuttons and "run" pilot light in cover for each motor. Wire for maintained contact unless otherwise noted.

7. Provide one fused control circuit transformer.

8. Controller shall be prewired with a terminal block for connection of external control devices.

I. Design Make: Square D Class 8XXX

J. Acceptable manufacturers:

1. Square D

2. Eaton

3. Siemens

2.3 LOW VOLTAGE FUSES

A. All fuses rated 600 volts and below shall be rejection type dual-element, time-delay type. Provide one complete sets of fuses for all fusible disconnect switches, plus 3 spare fuses of each size. Deliver spare fuses to the Owner and obtain receipt.

B. Acceptable manufacturers: Fuses 600 amperes and below: Bussman Type FRN-R (300 volts), Type FRS-R (600 volts) or Approved Equal.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

3.2 DISCONNECT SWITCHES

A. Install disconnect switches in locations shown on plans. Install true and level.

B. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer's recommendations.

C. Provide identification as required per Section 260100.

D. Provide fuses in all fusible switches.

E. All roof mounted disconnect switches shall be a minimum NEMA 3R rating.

F. Provide stainless steel hardware and uni-strut racking for all roof mounted disconnect switch supports. Do not install disconnect switches on roof curbs below the roof flashing level. Maintain roof warranty for all disconnect switch and associated raceway support installations.

G. Disconnect switches may be mounted to HVAC equipment where approved by the equipment manufacturer and not interfere with access panel or internal components.

3.3 LOW VOLTAGE FUSES

A. Install low voltage fuses in disconnect switches as called for on the plans.

B. Turn all spare fuses over to the Owner and obtain receipt.

3.4 MOTOR CONTROL EQUIPMENT

A. Provide overload and fuses. Coordinate sizes with division 22 or 23 contractor.

B. Terminate control wiring. Coordinate with division 22 or 23 contractor.

C. Prior to releasing the starter and disconnect order the division 26 contractor shall obtain verification in writing from the division 22 and 23 contractors that all starter and disconnect sizes and types are correct. The division 26 contractor shall bear all cost if written approval is not obtained prior to releasing the order and size changes are required.

END OF SECTION 262913

SECTION 262923 – ADJUSTABLE-SPEED DRIVES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. All Adjustable Speed Drives will be furnished and installed by the Electrical contractor. The Electrical contractor shall provide all internal control wiring jumpers, communication card installation and network settings communicate with the temperature control system, overload settings, and factory startup.

C. The Division 22 and 23 contractors will furnish all adjustments and programming temperature controls system settings and sequences.

1.2 DESCRIPTION OF WORK

A. This section includes minimum requirements for variable speed motor controls referred to as Adjustable Speed Drives (ASD) also referred to as Variable Frequency Drives (VFD) or Variable Speed Drives (VSD).

B. The drive manufacturer shall supply the drive and all necessary options as specified. All drives installed on this project shall be from the same manufacturer and have a common user interface (control panel). The manufacturer shall have been engaged in the production of this type of equipment for a minimum of 15 years. Drives that are manufactured by a third party and “brand labeled” shall not be acceptable. Drive manufacturers who do not build their own power boards and assemblies, or do not have full control of the power board manufacturing and quality control, shall be considered as a “brand labeled” drive.

C. This specification is a supplement to the drive schedule. The drive schedule identifies the specific requirement for each drive instance on the project including size, voltage, enclosure rating, disconnecting means, and harmonic mitigation requirements of the drives.

D. This section includes minimum requirements for the following:

1. Standard Adjustable Speed Drives

1.3 QUALITY ASSURANCE

A. All adjustable speed drives shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Each drive shall be subjected to the following test and quality control procedures.

1. Each new product design shall undergo a 4000-hour pre-production burn-in test. A minimum of ten units shall be used to accumulate this entire time. Each unit shall be temperature cycled between 32 and 100 degrees Fahrenheit.

2. Every ASD shall be functionally tested under motor load. During this load test the ASD shall be monitored for correct phase current, phase voltages, and motor speed. Correct Current Limit operation shall be verified by simulating a motor overload. Manufacturing test data on each drive shall be recorded and stored by the manufacturer.

3. Verification of proper factory presets shall performed on 100% of all parameters to ensure proper microprocessor settings. Verification that the proper factory settings are loaded correctly in the drive shall be done via the drive serial interface port. Any parameter changes that are required after the addition of options such as communication cards or bypass shall be verified in addition to the drive only defaults.

4. All options shall be functionally tested including operation of a motor in the bypass mode if supplied. Proper sizing and adjustment of the integral motor overload shall be set and verified.

C. Referenced Standards and Guidelines:

1. Institute of Electrical and Electronic Engineers (IEEE)

   a. IEEE 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems

2. Underwriters Laboratories

   a. UL 508, 508A, 508C

   b. UL 61800, 61800-5-1, 61800-5-2

   c. UL 1995

3. The Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA)

   a. NEMA ICS 7-2014, Adjustable Speed Drives

4. International Electrotechnical Commission (IEC)

   a. EN/IEC 61800

5. National Electric Code (NEC)

   a. NEC 430.120, Adjustable-Speed Drive Systems

6. CSA Group

a. CSA C22.2 No. 274

D. Qualifications:

1. Drives shall be UL labeled as a complete assembly. The base ASD shall be UL listed for 100 kA SCCR when installed in accordance with the manufacturer's guidelines.

2. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50% for up to 0.2 seconds, sags to 70% for up to 0.5 seconds, and sags to 80% for up to one second.

1.4 SUBMITTALS

A. Provide a summary list of all ASD's with the following information:

1. Bill of materials.

2. Dimension drawings.

3. Wiring diagrams.

4. Product data sheets including:

a. Integrated electrical protection.

b. Agency certifications.

c. Environmental tolerances.

d. Electrical characteristics including harmonic performance

e. Enclosure material and rating.

f. Control (inputs, outputs, power supplies).

g. Motor lead length @ 8 kHz carrier frequency.

5. List of all operator interface devices.

6. List of any exceptions to this specification.

1.5 START-UP SERVICE AND TRAINING

A. ASD's shall not be powered up without authorization from the ASD manufacturer. The contractor shall notify the ASD manufacturer when the units have been installed and shall schedule startup by a factory trained and authorized technician. This technician shall complete a startup report that records all ASD data, settings and a checklist of tests and observations. A copy of this test report shall be forwarded to the project Commissioning Authority and included in the Operation and Maintenance Manual.

B. The ASD factory trained, and authorized technician shall make all final adjustments as required for proper operation. Coordinate with the mechanical contractor and equipment vendors as required.

C. Provide one 2-hour training session on site by a ASD factory trained and authorized technician. This session shall review all operation and maintenance requirements plus the fundamentals of ASD's and their application to AC motors.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Provide one copy of complete documentation for each type of adjustable speed drive installed. Documentation shall be bound and included in the Operation and Maintenance Manuals required in this Specification. Documentation shall include the following:

1. Wiring diagrams

2. Schematics

3. Operating and maintenance manuals

4. Local service representative

5. Emergency on sight technical support information

6. Recommended maintenance procedures

7. Recommended spare parts list

2.0 PART 2 - PRODUCTS

2.1 COMMON ADJUSTABLE SPEED DRIVE CAPABILITIES

A. The drive package as specified herein and defined on the drive schedule shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer to ISO9001 standards.

B. The drive shall provide full rated output from a line of +10% to -10% of nominal voltage. The drive shall continue to operate without faulting from a line of +25% to -25% of nominal voltage.

1. Drives shall be capable of continuous full load operation under the following environmental operating conditions:

a. Ambient temperature -15 to 40° C (5 to 104° F).

b. Altitude 0 to 1000 m (0 to 3,300 ft) above sea level.

c. Humidity 5 to 95%, non-condensing.

2. Supply Connection:

   a. Voltage and power range:

      1) 3-phase

      2) Frequency: 48 to 63 Hz

      3) Fundamental power factor: 0.98

      4) Efficiency at rated power: 98%

3. Motor Connection:

   a. Supported motor types:

      1) Asynchronous motor

      2) Permanent magnet motor

      3) SynRm

   b. Voltage:

      1) 3-phase

      2) From 0 to supply voltage

      3) Frequency: 0 to 400 Hz

C. All drives shall utilize the same Advanced Control Panel (keypad) user interface.

1. Plain English text

   a. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable).

   b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.

   c. Safety interlock, run permissive, and external fault status shall have the option of additional customized project specific terms, such as: AHU-1 End Switch, Office Smoke Alarm, CT-2 Vibration.

2. The control panel shall include at minimum the followings controls:

   a. Four navigation keys (Up, Down, Left, Right) and two soft keys to simplify operation and programming.

   b. Hand-Off-Auto selections and manual speed control without having to navigate to a parameter.

c. Fault Reset and Help keys. The Help key shall include assistance for programming and troubleshooting.

3. Multiple Home View screens shall be capable of displaying up to 21 points of information. Customizable modules shall include bar charts, graphs, meters, and data lists. Displays shall provide real time graphical trending of output power, frequency, and current within selectable intervals of 15/30/60 minutes and 24 hours.

4. The control panel shall display the following items on a single screen; output frequency, output current, reference signal, drive name, time, and operating mode (Hand vs Auto, Run vs Stop). Bi-color (red/green) status LED shall be included. Drive (equipment) name shall be customizable.

5. There shall be a built-in time clock in the control panel. The clock shall have a battery backup with 10 years minimum life span. Daylight savings time shall be selectable.

6. I/O Summary display with a single screen shall indicate and provide:

   a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs. Drives that require access to internal or live components to measure these values, are not acceptable.

   b. The programmed function of all analog inputs, analog outputs, digital inputs, and relay outputs.

   c. The ability to force individual digital I/O high or low and individual analog I/O to desired value, for increased personal protection during drive commissioning and troubleshooting. Drives that require access to internal or live components to perform these functions, are not acceptable.

7. The drive shall automatically backup parameters to the control panel. In addition to the automatic backup, the drive shall allow two additional unique backup parameter sets to be stored. Backup files shall include a time and date stamp. In the event of a drive failure, the control panel of the original drive can be installed on the replacement drive, and parameters from that control panel can be downloaded into the replacement drive.

8. The control panel shall display local technical support contact information as part of drive fault status.

9. The control panel shall be removable, capable of remote mounting.

10. The control panel shall have the ability to store screen shots, which are downloadable via USB.

11. The control panel shall have the ability to display a QR code for quick access to drive information.

12. The LCD screen shall be backlit with the ability to adjust the screen brightness and contrast, with inverted contrast mode. A user-selectable timer shall dim the display and save power when not in use.

13. The control panel shall include assistants specifically designed to facilitate start-up. Assistants shall include: First Start Assistant, Basic Operation, Basic Control, and PID Assistant.

14. Primary settings for HVAC shall provide quick set-up of all parameters and customer interfaces to reduce programming time.

15. The drive shall be able to operate with the control panel removed.

D. All drives shall have the following hardware features/characteristics as standard:

1. Two (2) programmable analog 4-20mA inputs shall accept current or voltage signals. Current or Voltage selection configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.

2. Two (2) programmable analog 4-20mA outputs. At least one of the analog outputs shall be adjustable for current or voltage signal, configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.

3. Three (3) programmable Form-C relay outputs. The relay outputs shall include programmable on/off time delays. The relays shall be rated for a continuous current rating of 2 Amps. Maximum switching voltage of 250 VAC / 30 VDC. Open collector and Form-A relays are not acceptable. Drives that have less than (3) Form-C relay outputs shall provide an option card to provide additional relay outputs.

4. Drive terminal blocks shall be color coded for easy identification of function.

5. The drive shall include an isolated USB port for interface between the drive and a laptop. A non-isolated USB port is not acceptable.

6. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.

7. The drive shall have cooling fans that are designed for field replacement. The primary cooling fan shall operate only when required and be variable speed for increased longevity and lower noise levels. Drives whose primary cooling fans are not variable speed, shall include a spare cooling fan.

8. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute.

9. The input current rating of the drive shall not be greater than the output current rating. Per NFPA 70 430.122, drives with higher input current ratings may require the upstream wiring, protection devices, and source transformers to be upsized.

10. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.

11. Earth (ground) fault detection shall function in both modulating (running) and non-modulating modes.

12. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition. Drives that do not include coordinated AC transient surge protection shall include an external TVSS/SPD (Transient Voltage Surge Suppressor/Surge Protection Device).

13. The drive shall include a robust DC bus to provide short term power-loss ride through. The DC bus Joule to drive kVA ratio shall be 4.5 J/kVA or higher. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.

E. All drives shall have the following software features as standard:

1. A Fault Logger that stores the last 16 faults in non-volatile memory.

   a. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.

   b. The date and time of each fault and fault reset attempt shall be stored in the Fault Logger.

2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory.

   a. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, and automatic reset of a fault.

   b. The date and time of each event's start and completion points shall be stored in the Event Logger.

3. Programmable start method. Start method shall be selectable based on the application: Flying-start, Normal-start, and Brake-on-start.

4. Programmable loss-of-load (broken belt / coupling) indication. Indication shall be selectable as a control panel warning, relay output, or over network communications. This function to include a programmable time delay to eliminate false loss-of-load indications.

5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in "Watts." Heating functions based only on "percent current" are not acceptable.

6. Advanced power metering abilities shall be included in the drive. Drives without these data points, must include a separate power meter with each drive.

    a. Instantaneous output power (kW)

    b. Total power, broken down by kWh.

    c. Time based kWh metering for: current hour, previous hour, current day, and previous day.

    d. Energy saving calculation shall be included that shows the energy and dollars saved by the drive.

7. The drive shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.

8. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command, the Drives shall provide a dry contact closure that will signal the damper to open. When the damper is fully open, an end-switch shall close, allowing the drive to run the motor.

    a. The drive shall also include a programmable start delay, for when an end-switch is not provided.

9. Start interlock circuit - Four separate start interlock (safety) inputs shall be provided. When any safety is opened, the motor shall be commanded to stop. The control panel will display the specific safety(s) that are open. The status of each safety shall be transmitted over the network communications. Wiring multiple safeties in series is not acceptable.

10. External fault circuit – Three separate external fault inputs shall be provided. This circuit shall have the same features and functionality as the start interlock circuit, except it shall require a manual reset before the drive is allowed to operate the motor.

11. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature, and allows higher switching frequency settings without derating the drive. It shall be possible to set a minimum and a target switching frequency.

12. The drives nameplate horsepower shall be fully rated at 8kHz switching frequency with a minimum motor lead length of 150 feet.

13. Visual function block adaptive programming allowing custom control schemes, minimizing the need for external controllers. I.e. cooling tower staging logic. A free software tool shall be used to configure adaptive programming.

14. The ability to automatically restart after an over-current, over-voltage, under-voltage, external fault, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable. Each of these faults may have automatic restart individually disabled via a parameter selection.

15. Three (3) programmable critical frequency lockout ranges to prevent the drive from operating the load continuously at an unstable speed/load.

16. Seven (7) programmable preset frequencies/speeds.

17. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.

18. PID functionality shall be included in the drive.

    a. Programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped based on the level of a process feedback signal.

    b. The drive shall include an independent PID loop for customer use, assigned to an Analog Output. This PID loop may be used for cooling tower bypass valve control, chilled water valve, etc.

19. At least 4 parameter user sets that can be saved to the permanent memory and recalled using a digital input, timed function, or supervision function.

20. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source, allowing the drive control to remain powered by a UPS during an extended power outage.

21. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.

22. The drive shall include a fireman's override mode. Upon receipt of a contact closure from the Fire Alarm Life Safety system, the drive shall operate in a dedicated Override mode distinct and separate from the drive's Normal operation mode. The following features will be available in the drive override function:

    a. The Override mode shall be secured by password to prevent changes once programmed.

    b. The drive shall ignore external inputs and commands not defined as part of the override function.

    c. Override operation mode shall be selectable between: single frequency, multiple fixed frequencies, follow an analog input signal, PID control, or come to a forced stop.

    d. High priority safeties shall stop the drive and lower priority safeties shall be ignored in Override mode.

e. The drive shall be configurable to receive from 1 to 3 discrete digital input signals and operate at up to three discrete speeds.

23. The drive shall have multi-pump functionality and an intelligent master/follower configuration for controlling up to 8 parallel pumps equipped with drives. The drive shall have a parameter synchronization feature to program the PID, multi-pump, and AI parameters in all parallel drives. The functionality to start and stop the pumps based on capacity, operating time or efficiency of the pump to ensure each pump is operated regularly.

a. The multi-pump functionality shall control:

1) Flow Control

2) Pressure Control

3) Pump Alternation

F. Security Features

1. The drive manufacture shall clearly define cybersecurity capabilities for their products.

2. The drive shall include password protection against parameter changes.

a. There shall be multiple levels of password protection including: End User, Service, Advanced, and Override.

b. The drive shall support a customer generated unique password between 0 and 99,999,999.

c. The drive shall log an event whenever the drive password has been entered.

d. The drive shall provide a security selection that prevents any “back door” entry. This selection even prevents the drive manufacturer from being able to bypass the security of that drive.

e. A security level shall be available that prevents the drive from being flashed with new firmware.

3. The “Hand” and “Off” control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.

G. Network Communications

1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2. Provide communication card to support BACnet/IP

2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card-based protocol. Once installed, the drive shall automatically recognize any optional communication cards without the need for additional programming.

3. The drive shall not require a power cycle after communication parameters have been updated.

4. The drive's relay output status, digital input status, analog input/output values, Hand-Auto status, warning and fault information shall be capable of being monitored over the network. The drive's start/stop command, speed reference command, relay outputs and analog outputs shall be capable of being controlled over the network. Remote drive fault reset shall be possible.

H. Disconnect – A circuit breaker shall be provided on all drives. The disconnect shall be door interlocked and padlockable. Drive short circuit protection shall be included on all packaged units that include a disconnecting means. All disconnect configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Disconnect packages manufactured by anyone other than the drive manufacturer, are not acceptable.

I. Bypass – Bypass drive packages shall be provided as indicated on the drive schedule. All drive/bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Bypasses manufactured by anyone other than the drive manufacturer, are not acceptable.

1. The drive and bypass package shall be a complete factory wired and tested bypass system consisting of a padlockable disconnect device, drive output contactor, bypass contactor, and drive input fuses.

2. The drive and bypass package shall have a UL listed short circuit current rating of 100 kA, for 240 VAC and 480 VAC systems, and this rating shall be indicated on the rating label.

3. The bypass control shall be powered by a three-phase switch mode power supply with a voltage tolerance of +30%, -35%. Single-phase power supplies and control power transformers (CPT) are not acceptable.

4. All bypass packages shall utilize a dedicated LCD bypass control panel (keypad) user interface. The bypass control panel must be a separate display from the drive control panel. Bypass packages that use a single shared drive/bypass control panel are not acceptable, due to that control panel acting as a single point of failure.

    a. The bypass shall include a two-line, 20-character LCD display. The display shall allow the user to access parameters and view:

        1) Bypass input voltage, current (Amps) and power (kW)

        2) Bypass faults, warnings, and fault logs

        3) Bypass operating time and energy consumption (resettable)

b. The bypass control panel shall include the following controls:

1) Four navigation keys (Up, Down, Enter, Escape)

2) Bypass Hand-Off-Auto, Drive mode / Bypass mode selectors, Bypass fault reset

c. The following LED indicating lights or control panel display indications shall be provided.

1) Drive mode selected, Bypass mode selected

2) Drive running, Bypass running

3) Drive fault, Bypass fault

d. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.

5. All bypasses shall have the following hardware features/characteristics as standard:

a. Six (6) digital inputs and five (5) Form-C relay outputs. The digital inputs shall be capable of accepting both 24 VDC and 24 VAC. The bypass control board shall include an auxiliary power supply rated 24 VDC, 250 mA.

b. Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable. Third contactor “isolation contactors” and service switches are not an acceptable alternative to drive isolation fuses.

c. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.

d. The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive’s control board has failed. Network communications shall remain functional. Bypass systems that do not maintain full functionality in the event of a drive failure, are not acceptable.

6. All bypasses shall have the following software features as standard:

a. Programmable loss-of-load (broken belt / coupling) indication shall be functional in drive and bypass mode.

b. The bypass shall also support run permissive and start interlock control functionality, including start delay, as previously specified in the drive section.

c. The bypass control shall monitor the status of the drive and bypass contactors and indicate when there is a welded contactor contact or open contactor coil.

d. The bypass shall include a selection for either manual or automatic transfer to bypass. The automatic transfer mode shall allow the user to select the specific drive fault types that result in an automatic transfer to bypass. The automatic transfer mode shall not allow a transfer to bypass on motor related faults. Automatic transfer schemes that do not differentiate between fault types, are not acceptable.

e. The bypass shall include the ability to select the operating mode of the system (Drive/Bypass) from either the bypass control panel or digital input.

f. The bypass shall include a supervisory control mode that monitors the value of the drive's analog input (feedback). This feedback value is used to control the bypass contactor on/off state. The supervisory mode shall allow the user to maintain hysteresis control over applications such as cooling towers and booster pumps.

g. Selectable Class 10, 20, or 30 electronic motor overload protection shall be included in both drive and bypass mode.

h. The drive and bypass shall be designed to operate as an integrated system when in Override mode. Whether operating in drive or bypass mode, the low priority safeties will be ignored, and high priority safeties will be followed. External start/stop commands will be ignored. There shall be four selectable Override modes:

1) Bypass only, with two smoke control modes:

a) Fixed pre-configuration of digital inputs

b) Configurable high/low priority safeties and faults, to allow configuration to meet needs of local Authority Having Jurisdiction.

2) Drive only

3) Drive then transfer to bypass, in the event of a drive fault

4) Force to Stop

7. The bypass relay output status, digital input status, warning and fault information can be monitored over the network. Status information shall be monitored, including; operating mode (drive vs bypass), current drawn in bypass mode, broken belt, and phase-to-phase voltage. The bypass start/stop command, force to bypass command, and relay outputs shall be capable of being controlled over the network.

2.2 STANDARD ADJUSTABLE SPEED DRIVE

A. Technology and Harmonics Performance:

1. The standard ASD shall produce an adjustable AC voltage / frequency output. It shall be of the pulse-Width Modulated (PWM) technology and shall consist of a 6-pulse minimum full-wave diode bridge converter to convert incoming AC utility power to DC power, a capacitor filter/storage network and an inverter power transistor switching output section. The microprocessor controller generating inverter output shall include the internal base driver and specified protection and sensing circuits. The ASD waveform generator shall be IGBT based and capable of extended carrier frequency operation.

2. Provide all standard adjustable speed drives less than 25 horsepower with dual (positive and negative DC link) chokes equivalent to 5% to reduce the harmonics to the power line.

3. Harmonic Performance: THD <45% above 60% load

B. Design Make: ABB ACH580 Series

C. Acceptable Equivalents:

1. Danfoss VLT HVAC Series

2. Eaton PowerXL DH1 HVAC Series

3. Square D S-Flex Series

4. Yaskawa HV600 Series

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install incoming 60Hz power conductors and frequency modulated conductors in separate conduits.

B. Electrical contractor to provide fire alarm fan shut down relay connection between I/O's "12" and "18". Provide normally closed connection such that the connected air handler supply or return fan motor stops when the fan shut down relay is actuated. This relay shall be installed in series with the DDC system start/stop signal.

C. Install ASD in an accessible location. Refer to contract documents for more information.

D. Motor lead lengths shall not exceed manufacturers recommendations as described in part 2 of this section.

E. Provide all start up services and training as described in part 1 of this section.

F. Completely assemble and provide connections to all terminal or terminal strips and any miscellaneous control devices.

G. Input and motor leads for each ASD shall be in a separate dedicated steel conduit.

H. Adjust drive controls in accordance with manufacturer's requirements. Switching frequency shall have an initial set point of 6 KHz.

I. Coordinate entire installation, including communications interface with the temperature control contractor prior to ordering ASD.

J. Provide factory trained representative and drive programming as required to meet temperature controls sequence of operation.

K. Coordinate controls programming with the Division 22 or 23 contractor.

L. When the ASD is located remotely from the motor and the associated disconnect switch, provide an interlock in the disconnect switch and provide 2-#12AWG in ½" C from the ASD to the interlock. This shall be interfaced to disable the ASD prior to disconnection of power to the motor.

3.2 COORDINATION

A. Provide motor overload programming for connected load. Coordinate sizes with Division 22 or 23 contractor.

B. Provide all terminations of control wiring and coordinate with Division 22 or 23 contractor.

C. Prior to releasing the adjustable speed drive order the Division 26 contractor shall obtain verification in writing from the Division 22 and 23 contractors that all sizes and types are correct. The Division 26 contractor shall bear all cost if written approval is not obtained prior to releasing the order and size changes are required.

3.3 WARRANTY

A. The drive product warranty shall be 24 months from the date of installation and programming. The warranty shall include parts, on-site labor, and travel time and travel costs, or replacement of the complete drive as determined by the drive manufacturer's technical support representative.

END OF SECTION 262923

SECTION 265100 - LIGHTING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete installation, including luminaires, standards, hangers, supports, fittings, lamps, wiring, and connections as indicated in the Contract Documents. Types of luminaires in this project include LED.

B. Refer to the General and Supplementary Conditions, Division 1 Specifications Sections for proposed phasing of this project.

C. Refer to Specification Section 019113 for commissioning requirements related to this project.

D. Refer to section 260923 for Wired Lighting Controls.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. LED Luminaires
2. LED Drivers
3. Lamps
4. Emergency Driver
5. Diffusers

1.3 SUBMITTALS

A. Submit shop drawings as described in Section 260010. All luminaire types and components shall be submitted in a single complete brochure which shall be in the form of a soft cover binder with each luminaire separated by an identified index tab. Information on each luminaire shall include:

1. Manufacturer and Catalog Number.
2. Dimensioned Construction Drawing(s).
3. Standard Catalog "Cut" Sheet.
4. Lumen Output
5. CRI and Kelvin Temperature
6. Lens/Louver Type.

7. Driver w/ Dimming Technology

8. Lamp Type.

9. Lumen Loss Information

B. Emergency Driver

C. Warranty Information

1.4 QUALITY ASSURANCE

A. Luminaires shall be standard products of manufacturers regularly engaged in the manufacture of the specific type luminaires specified and shall be the manufacturer's latest standard design that complies with specification requirements. Firms installing the luminaires shall have a minimum of five (5) years of successful installation experience on projects with interior lighting work similar to the requirements of this project.

B. Codes and Standards

1. NEC:

a. Shall comply with Articles 220, 410 and 510 as applicable to installation and construction.

2. NEMA:

a. Shall comply with Standard Publication Nos. LE 1 and LE 2 as applicable to lighting equipment.

3. UL:

a. All interior lighting luminaires and components shall be UL listed and labeled.

b. Comply with all applicable UL standards including UL 486A and B.

4. CBM:

a. Fluorescent and HID ballasts shall comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

5. All work shall comply with applicable local code requirements of the authority having jurisdiction.

C. Verify the availability of all luminaires proposed to be used in the execution of the work prior to submitting for approval. The discontinuance of production of any luminaire after such approval has been granted shall not relieve the Contractor from furnishing an approved luminaire of comparable quality and design at no additional cost.

D. Luminaires shall be as specified in the "Luminaire Schedule." Luminaire types, characteristics, photometrics, finishes, etc., correspond to the first manufacturer, and associated catalog number, listed in the "Luminaire Schedule." Provide a sample luminaire from the factory for any products not listed as acceptable for approval. The Owner's Representative reserves the right to disapprove any luminaire type submitted which is not equal in quality, appearance or performance to the luminaire specified.

E. All luminaires shall meet the Total Luminaire Efficiency (TLE) requirements of the New York State Energy Conservation Construction Code.

2.0 PART 2 - PRODUCTS

2.1 LED LUMINAIRES

A. General:

1. Manufacturers shall be a registered with the Department of Energy (DOE) as a Quality Advocate and taken the pledge to be listed on the LED lighting facts website.

2. Luminaire measurements have been standardized and are in compliance with IESNA Standard LM-79 test procedure.

3. LED’s have been standardized and are in compliance with IESNA Standard LM-80 and demonstrate L70 life after 50,000 hours.

4. Luminaires shall be either Energy Star certified or Design Lights Consortium listed to qualify for NYSERDA or Utility provider rebate incentives. Submitted luminaires not currently on the DLC or Energy Star listed products list (http://www.designlights.org/) will be rejected.

5. Manufacturers shall prove color consistency across all LED’s via 4 step MacAdam Ellipse.

6. Luminaires shall be tested at an ambient temperature of +25 degrees for a minimum of 6000hrs.

7. Maximum junction temperature of 80°C.

8. Minimum drive current of 350mA. Maximum drive current of 700mA.

9. All LED luminaires shall have a minimum Color Rendering Index (CRI) of 80.

10. Luminaires shall a minimum 5 year warranty.

11. Refer to Luminaire Schedule on drawings for complete Luminaire makes and models.

2.2 LED DRIVERS

A. Dimmable Driver (0-10v):

1. Driver shall be of the constant current type.

a. Voltage: 120/277 as noted on drawing

b. Driver Current: 350mA – 700mA.

c. 0-10v dimming capable down to 1%.

d. Maximum THD: 10%

e. Minimum Power Factor: 0.9

2. Acceptable Manufacturers.

a. eldoLED - ECOdrive

b. Signify Advance – Xitanium

c. Lutron – Hi-lume

d. Osram Sylvania - Optotronic

2.3 LAMPS

A. LED Replacement Lamps

1. LED T8 32W Replacement

a. LED replacement for fluorescent T8 lamps shall be 16w, bypass style. All lamps shall have a minimum CRI of 80, a minimum of 110 lumens per watt and meet all requirements of the New York State Energy Conservation Construction Code.

b. Correlated Color Temperature of 4,000K (Kelvin)

c. LED replacement for 2-ft Fluorescent T8 lamps – 8 Watts, 1050 rated lumens, 50,000hr lamp life, 160 beam angle, 131 LPW, 80 CRI, not dimmable.

d. LED replacement for 4-ft Fluorescent T8 lamps – 16 Watts, 2050 rated lumens, 50,000hr lamp life, 160 beam angle, 114 LPW, 80 CRI, not dimmable.

e. LED replacement for Fluorescent T8 lamps with driver is acceptable as an alternative to bypass type lamps. At time of submittal contractor shall supply lamp and driver information sheet.

f. Acceptable Manufacturers:

1) Green Creative

2) TCP Lighting

3) Philips Lighting

4) Approved Equal

2. Type A-19 Replacement lamp shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
6	480	80 lm	3000	80	25,000 hrs	40
9	800	88 lm	3000	80	25,000 hrs	60
15	1600	106 lm	3000	80	25,000 hrs	100

3. Type BR30 Replacement lamp shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
13	1400	63 lm	3000	83	25,000 hrs	65

4. Type CA11 Replacement candelabra lamp with E12 base shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life Based on L70	Equivalent Incandescent Wattage
4	300	75 lm	3000	80	15,000 hrs	60

5. Type CA11 Replacement candelabra lamp with E26 medium screw base shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
5	300	60 lm	3000	80	15,000 hrs	60

6. Type MR16 2-Pin GU5.3 base replacement lamp shall have the following characteristics for use on 12 Volt system:

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
4	25°	300	60 lm	2700	82	25,000	20
4	35°	300	60 lm	2700	80	25,000	20
7	25°	500	55 lm	3000	80	25,000	50
7	35°	500	66 lm	3000	80	25,000	50

7. Type PAR 38 Replacement flood lamp E26 medium screw base

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
12	12°	660	55 lm	2700	82	25,000	40
12	25°	660	55 lm	2700	82	25,000	40
12	35°	660	55 lm	2700	82	25,000	40

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
18	12°	1200	70 lm	3000	90	50,000	60
18	25°	1200	70 lm	3000	90	50,000	60
18	40°	1200	70 lm	3000	90	50,000	60

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
26	12°	1500	58 lm	3000	82	50,000	100
26	25°	1500	58 lm	3000	82	50,000	100
26	40°	1500	58 lm	3000	82	50,000	100

8. Acceptable Replacement Lamp Manufacturers

   a. General Electric

   b. Philips

2.4 EMERGENCY DRIVER

A. Emergency Ballast shall be installed in conjunction with LED Driver intended for normal luminaire operation. Contains internal battery that shall automatically switch over to power designated lamp(s) upon loss of normal power via internal voltage sensing device. Battery shall be maintenance free, nickel-cadmium type, and be an integral part of ballast assembly. Life expectancy of battery shall be minimum of seven years.

B. All emergency ballasts shall be inverter type with Class 2 Output.

C. UL listed metal enclosure.

D. UL 924 listed for Emergency Lighting and Power Equipment

E. Temperature Operation: 20°C to +55°C

F. Shall include an emergency test switch with LED indicator remotely mounted in outlet box in ceiling above or adjacent to luminaire.

G. Recessed LED Downlight Luminaire LED performance – Shall up to 300 lumens minimum of 90 minutes on an output voltage of 30-130VDC. Design Makes: LED – Bodine BSL17 Series

H. Linear style LED Strip LED performance – Shall up to 1,000 lumens minimum of 90 minutes on an output voltage of 15 - 52 VDC. Design Makes: LED – Bodine BSL310 Series

2.5 DIFFUSERS

A. Lenses:

1. Extruded 100 percent virgin acrylic material with a minimum weight of ten ounces per square foot.

2. Type 12 - Clear material with 0.125 inch overall thickness with .080 Inch penetration comprised of 3/16 inch square based female cones aligned 45 degrees to the length and width of the panel.

3. Type 19 - Clear material with 0.156 inch overall thickness with 0.080 inch penetration comprised of 3/16 inch square based male cones aligned parallel and perpendicular to the length and width of the panel.

4. White matte - White material with 0.125 inch overall thickness.

5. While overlay - White material with 0.040 inch overall thickness.

6. The maximum deflection at the center of a 2 foot x 4 foot lens shall be no greater than 0.250 inch. Arched or warped lenses will not be accepted.

7. Parabolic Louvers

a. Medium cell louver - One piece injection molded acrylic, with all parabolic surfaces prepared with a primary undercoat, highly specular vacuum metalized finish, and encapsulated in a protective acrylic lacquer coating. Cell dimensions shall be nominal 1-1 /2 inches x 1-1 /2 inches x I inch deep, and shall provide approximately 38 degree shielding with a louver efficiency of not less than 52 percent. This louver shall have a VCP index rating of 0.93 for semi-specular silver finish. Panel finish shall be specular silver.

8. Baffles and Louvers

a. Cross Baffle - Constructed of 0.050 inch aluminum with one-way blades to provide 45 degree shielding. Blades 1-1/2 inches high and spaced 1-1/2 inches apart. While enamel finish. Side shields for support of the blades. Width to extend the full width of the lighting unit and of lengths to form a continuous baffle with no visible joints. Where inside and outside comers are required, the blades shall be mitered.

b. Parabolic Baffle - Constructed of 0.050 inch aluminum with one-way blades to provide 45 degree shielding. Blades 1-1/2 inches high and spaced 1-1/2 Inches apart. Clear anodized finish. Side shields for support of the blades. Width to extend the full width of the lighting unit and lengths to form a continuous baffle with no visible joints. Where inside and outside comers are required, the blades shall be mitered.

c. Directional Louver - Constructed and fabricated of aluminum with a "cold bonding joint method for integral vibration free and precise alignment of cells. Louver finish shall be custom color as directed by the Architect.

2.6 LUMINAIRE SCHEDULE

A. Luminaire schedule is found on the drawings.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions, under which luminaires are to be installed, and substrate for supporting luminaires. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Refer to respective reflected ceiling plan for each area. Reflected ceiling plans indicate proper luminaire location only. Locate occupancy sensors and photo sensors per the manufacturer's recommendations. Coordinate the proper arrangement with all other ceiling mounted items. Contract Documents indicate luminaire characteristics (type), quality, quantity, etc. Verify with the ceiling supplier design of actual ceiling installed in each area and coordinate compatible luminaire flange/trim type.

B. General

1. Install interior luminaires at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's 'Standard of Installation", NEMA standards, and with recognized industry practices.

2. Provide luminaires and/or luminaire outlet boxes with hangers to properly support luminaire weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Engineer.

3. Make installation such that the luminaire is free of finger marks, flaws, scratches, dents or other imperfections.

4. Arrangement

a. Align edges of luminaires with walls or other building elements. Where indicated by dimensions or indicated on Drawings, maintain indicated arrangement.

b. For wall to wall installed luminaires, field measure length required after completion of the wall construction and prior to ordering the luminaires. Fabricate in largest lengths allowable.

5. Recessed Mounting

a. Verify ceiling construction and material prior to ordering luminaires. Provide plaster frames for plaster ceilings and flanged frames for drywall ceiling. Provide necessary mounting hardware and accessories to adapt luminaire to ceiling construction. Provide gaskets, trims, flanges, etc. as required to prevent light leaks around trim. Where installing 'lay-in' type luminaires, each Luminaire shall be supported completely independent of the ceiling system by way of 12-AWG galvanized steel support wires. Support wires shall be attached from all four corners of the Luminaire housing to the building structure. Each support shall be capable of supporting 100 pounds. Provide saddle hangers or tie bars attached to runners or between crossbars of ceiling systems as a safety measure. Provide mounting splines or other positive means of maintaining alignment and rigidity.

6. Stem Mounting

a. Use self-aligning hangers in canopies for hanging luminaires true to vertical. Do not deface ceiling or walls. Locate hangers at intersections of joints or at centers of blocks in rooms with patterned type ceiling materials such as acoustic tile. Use hangers capable of supporting four times luminaire weight. Align continuous rows of luminaires maintaining luminaires level without rotation about the longitudinal axis. Rigidly support outlet box independent of ceiling system from building structure. Where obstructions prevent direct support of outlet, provide offset or trapeze hangers of outlet box. Stem shall be supported directly from building structure on centers as called for by the manufacturer. There shall be a minimum of two stems per individual four foot luminaire, and three stems per individual eight foot luminaire for steel luminaires. Extruded aluminum luminaires shall have hangers as called for by the manufacturer.

b. Provide brackets from the manufacturer of the same finish and material as the luminaires to present a seamless continuous row mounting appearance. Provide continuous row mounting brackets between all adjoining luminaires.

7. Surface Ceiling Mounting

a. Mount surface luminaires tight to surface without distorting surface. Space luminaires in continuous rows to correspond to ceiling joint intersections. Continuous row luminaires may be fed by a single outlet where luminaires contain approved wireways and suitable wiring is used. Provide hangers for each luminaire, each rated to support four times the luminaire weight. Provide offset or trapeze hangers where required. Supports shall be provided on a maximum of 4 foot centers with a minimum of two hangers per individual four foot luminaire and three hangers per individual eight foot luminaire. Hangers shall be supported from the building structure and independently from ceiling system or other building services.

b. Fasten luminaires securely to structural supports.

3.3 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and equipment shall be delivered with UL and manufacturer's labels intact and legible in factory fabricated containers.

B. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

C. Handle interior lighting luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged luminaires or components; replace with new.

3.4 SEQUENCING AND SCHEDULING

A. Coordinate with other work including ceiling type, wires/cables, electrical boxes, fittings, and raceways, to properly interface installation of interior luminaires with other trades.

3.5 REUSE AND REPAIR OF EXISTING LUMINAIRES

A. Reuse existing luminaires only where called for. Perform the following work, as required, to upgrade existing luminaire. Replace faulty, leaking, or noisy ballast. Replace broken, damaged, worn, or faulted lamp sockets. Provide new luminaire wire. Provide new acrylic lens system to match existing, where existing is broken. Re-lamp luminaires. Completely damp clean lens and interior of luminaires.

B. If ballasts have leaked, remove material deposited in luminaire. Assume material was PCB contamination, or a test samples to show material is not PCB and submit a report. Dispose of material as required by EPA, including clean-up materials used. Dispose of ballast which does not have non PCB label in PCB containers and have containers taken to EPA approved incinerators. Follow all EPA regulations for transporting material.

C. New luminaires may be provided to replace existing luminaires scheduled to remain or be reused, subject to shop drawing approval.

3.6 REMOVAL OF BALLAST IN EXISTING LUMINAIRES

A. Assume ballast contains PCB materials unless labeled otherwise or test samples to show materials are not PCB; submit test report. Remove all ballast from existing luminaires indicated on contract documents. Dispose of all ballast which do not have non-PCB labels in PCB containers and pay all costs to have containers taken to EPA approved incinerators and disposed of per all EPA regulations. Follow all EPA regulations for transporting containers and materials. If ballast has leaked in existing luminaire, remove material deposited in luminaire and dispose of those materials as listed above. Provide Certificate of Disposal and all associated paperwork to Owners representative.

3.7 REMOVAL OF LAMPS IN EXISTING LUMINAIRES

A. Assume all fluorescent lamps contain Mercury materials unless labeled otherwise or test samples to show materials do not contain Mercury and submit test report. Remove all lamps from existing luminaires indicated on contract documents. Dispose of all lamps which do not have non-Mercury labels in compliance with the requirements of the New York State Department of Environmental Conservation and all applicable Federal Laws. Follow all regulations for transporting materials. Provide Certificate of Disposal and all associated paperwork to Owner’s representative.

3.8 EMERGENCY DRIVERS

A. Provide separate non-controlled conductor from line side of lighting circuit to each emergency driver voltage sensing input. Refer to manufacturers wiring diagram.

B. Connect all emergency drivers and emergency switching modules to allow switching unless luminaire is specifically shown to be used as a night light.

C. Provide adhesive 1” diameter round red sticker on all luminaires with internal emergency drivers.

D. Provide remote test switch or testing means for all emergency drivers accessible from below ceiling.

3.9 LAMPS

A. Provide lamps in all luminaires.

B. Replace any lamp whose color is determined to be unsatisfactory. Replace all lamps which are found to have failed during the 12 month warranty period.

C. All lamps shall be new and unused. If permanent lighting system is used for temporary construction lighting, lamps shall be replaced upon turn over to Owner.

D. Furnish stock or replacement lamps amounting to 15%, but not less than 4 lamps in each case, of each type and size lamp used in each type luminaire. Deliver replacement stock as directed to Owner's storage space.

3.10 WARRANTY

A. All lighting and lighting controls equipment included in this section shall be fully tested and guaranteed for a period of five years after Owner’s Representative written acceptance.

3.11 FINAL CLEANING

A. Prior to acceptance, damp clean diffusers, glassware, trim, reflectors, lamps, louvers, lens and similar objects of all luminaires. Remove all dirt, corrosion, foreign material, finger marks, and blemishes. Replace all burned out lamps and failed components.

END OF SECTION 265100

SECTION 271000 - HORIZONTAL AND BACKBONE COMMUNICATION CABLING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. Provide (2) Cat. 6A 1-foot Patch Cables

1.2 SCOPE

A. Horizontal cabling includes STP between Public Address Speakers, access control system, and security system equipment and devices as required by the manufacturer and called for on the drawings.

B. Horizontal cabling includes Category 6A UTP for all data outlets from the Communications Equipment Room (CER) to the outlets as called for on the drawings. The horizontal cabling includes all horizontal cables, patch panels, patch cables, termination, testing, and mechanically terminated jacks/inserts and faceplates in the work area and the mechanical termination in the CER.

C. Provide 15-foot service loop of horizontal cable at each WAP outlet location. Neatly coil and Velcro wrap the service loop in an accessible location.

D. UTP Backbone cabling includes new interior and exterior multipair-pair UTP cable between CERs, IDFs, and buildings. Additional required components include 110-blocks, termination, testing, direct buried splice cases, lightning protection, and required grounding. Telephone handsets and PBX programming by others.

E. Backbone cabling includes interior and exterior multi-mode and single-mode optical fiber run between CERs (Communication Equipment Rooms) and between buildings. Additional required components include patch panels, connectors, patch cables, splice cases, termination, and testing.

F. Horizontal cabling includes audio and video cabling as indicated on the drawings.

G. This section includes minimum requirements for the following:

1. Cat. 6A Cabling

2. Cat. 6A Patch Cables

3. Connecting Hardware

4. 100 Ohm UTP Cable Testing

5. STP Cabling

1.3 QUALITY ASSURANCE

A. All cable shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Provide with the submittals, documentation from an independent testing agency indicating that the complete assembly including cable and termination hardware has been tested and meets the performance criteria called for.

C. Provide contractor or sub-contractor experienced in all telephone and fiber splicing and trained and experience with the fusion splicing equipment to be used on this project.

D. Materials and work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA – 568-A

2. ANSI/TIA/EIA – 568-C

3. ANSI/TIA/EIA – 569-B

4. NFPA 70 - 2014

5. BICSI Telecommunications Distribution Methods Manual

6. FCC 47 CFR 68

7. NEMA - 250

8. NEC - Articles 770 and 800

1.4 SUBMITTALS

A. Manufacturers catalog sheets, specifications and installation instructions for all products in this section.

B. Fusion splicing kits, pigtails, and splice trays.

C. Test results for all telephone and data UTP cable, and fiber splicing, new fiber cable installations performed in this project. Submit immediately upon completion of cable installation for review and include second copy in final O&M manuals.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Provide an end-to-end connectivity solution in which all horizontal cabling and connecting hardware are made by the same manufacturer. At a minimum, all connecting hardware and UTP patch panels shall be from the same manufacturer. Refer to specification section 271100 for additional information regarding patch panels.

2.2 CAT. 6A CABLING (100 OHM UNSHIELDED TWISTED PAIR)

A. Shall be Category 6A type cable compliant with the requirements of the most current edition of the TIA/EIA-568-B.2-10-2008 standard.

B. Physical Characteristics:

1. Shall be CMP, plenum rated.

2. Conductor shall be 23 AWG solid bare annealed copper.

3. Outer jacket color shall be blue.

4. Category marking shall be printed every one foot. Footage indicators shall also be provided on jacket.

5. The diameter of the insulated conductor shall be .023 in. maximum.

6. Shall consist of (4) twisted pairs.

7. Shall be suitable for the environment in which they are to be installed.

8. The color coding of pairs shall be:

Pair 1	W-BL; BL
Pair 2	W-O; 0
Pair 3	W-G; G
Pair 4	W-BR; BR

9. The overall diameter of the cable shall be no greater than 0.295 inches.

10. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.

11. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.

C. Transmission Characteristics:

1. Cable shall be tested & characterized to 625 MHz.

a. Cable shall exhibit a PSNEXT loss of at least the following:

Frequency MHz	NEXT dB
1.0	73.3
4.0	64.3
10.0	58.3
16.0	55.2
20.0	53.8
31.25	50.9
62.5	46.4
100.0	43.3
200	38.8
250	37.3
300	36.1
400	34.3
500	32.8
625	31.4

b. Cable shall exhibit an Attenuation loss of less than the following:

Frequency MHz	Attenuation dB
1.0	2.1
4.0	3.8
10.0	5.9
16.0	7.5
20.0	8.4
31.25	10.5
62.5	15.0
100.0	19.1
200	27.6
250	31.1
300	34.3
400	40.1
500	45.3
625	51.2

c. Cable shall exhibit a Return loss according to the following:

Frequency MHz	Return Loss (dB)
1	20.0
4	23.0
10	25.0
16	25.0
20	25.0
31.25	23.6

62.5	21.5
100	20.1
200	18.0
250	17.3
300	16.8
400	15.9
500	15.2
625	14.5

D. Design Make: Belden 10GX13 Series

E. Acceptable Manufacturers:

1. OCC
2. Bertek
3. Commscope

2.3 CAT. 6A PATCH CABLES

A. Meets all above requirements for 100 OHM unshielded twisted pair cable (Cat. 6A cable), except stranded conductors.

B. Factory terminated RJ-45 male at both ends with strain relief at ends of the cable.

C. Ultra-small diameter patch cord.

D. 1-foot in length.

E. Outer jacket color shall be as noted in this section above.

F. Design Make: Belden CAD110XXX Series

G. Acceptable Manufacturers:

1. OCC
2. Bertek
3. Commscope

2.4 COPPER CONNECTING HARDWARE

A. Color shall be electric white or ivory unless otherwise noted below.

B. Physical Characteristics

1. Faceplates shall be provided with labels and plastic label protector strip.

2. Faceplates shall be modular keystone jack type, 4-port minimum or 1-gang opening with mounting bezels to accept combination keystone jacks and multimedia jacks.

3. Each jack shall be an individually constructed unit and shall snap mount into the faceplate keystone opening.

4. Jack housings shall be high impact 94 V-0 rated thermoplastic.

5. Jacks shall have a temperature rating of -10 °C (14°F) to 60°C (140 °F) in conformance with ANSI/TIA/EIA-568-A.

6. Jack housings shall fully encase and protect printed circuit boards and IDC fields.

7. Housing shall be ultrasonically welded for tamper resistance.

8. Modular jack contacts shall accept a minimum of 2500 mating cycles without degradation of electrical or mechanical performance.

9. UTP jack IDCs shall accept a minimum of 20 re-terminations without degradation of electrical or mechanical performance.

10. Contacts will maintain a minimum vertical deflection force of 100 grams over deflection window.

11. Modular jack contact wires shall be formed flat for increased surface contact with mated plugs.

12. Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.

13. Jack termination shall follow the industry standard 110 IDC. Includes insulated barrier between IDC contacts.

14. Jacks shall have a designation indicating the cable type on the nose which can be plainly seen from the front of the faceplate.

15. Jacks shall utilize a paired punch down sequence. Cable pair twists shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.

16. Jacks shall terminate 22-26 AWG stranded or solid conductors.

17. Jacks shall include wire retention stuffer cap that hold terminated wires in place and allow the conductors to be visually inspected in the IDC housing.

18. Jacks shall be color code marked with both T-568A and T-568B wiring.

C. RJ-45 Jack Design Makes:

1. Cat. 6A Data Jacks +18” AFF (Orange Colored)

2. Voice Jacks at +18" AFF (Blue Colored)

3. Voice Jacks +48" AFF in Plastic Wall Mount Phone Bracket w/ Metal Ears – Belden AX102902 w/ Blue Cat. 6 Jack

4. Design Make: Belden AX10XXXX Series

D. Multimedia & Accessory Jack Design Makes:

1. Blank Jack Snap-In –Belden AX102262

2. Type F Jack – Belden AX102904

3. S-Video Jack – Belden AX101883

4. RCA Three Color Stereo Audio/Video Jack – Belden AX101879

5. VGA HD-15 pin barrel connector – Belden AX102336

6. Other components and mounting bezels/inserts as required for special mounting conditions and for floor boxes, surface raceways and modular furniture.

E. Faceplate Design Makes:

1. Single Gang 4-Port Faceplate w/ ID Windows – Belden AX102249

2. Single Gang Faceplate for Combination Multimedia & Data Jacks – Belden AX101747. Provide w/ required bezels/inserts

F. Acceptable Manufacturers:

1. Panduit

2. Hubbell

3. Legrand

2.5 100 OHM UTP TESTER

A. User Interface

1. 240 x 320 backlit LCD display

2. Date stamp of all tests

3. Tone generation audio warning

B. Physical interface shall be modular RJ-45 connector and a serial port with DB-9 connector.

C. Shall test cable for compliance with the following standards:

1. TIA Category 3, 5E, 6 and 6A: 100 Ohm
2. ISO/IEC 11801 and EN 50173 Class C and D: Link
3. ISO/IEC 11801 and EN 50173 Class C and D (new): Permanent Link or Channel
4. Aus/NZ Class C and D: Basic Link or Channel
5. STP cabling, (IBM Type 1, 150 □)
6. ANSI TP-PMD IEEE 802.3 10BASE5, 10BASE2: Ethernet with coaxial cabling
7. IEEE 802.3 10BASE-T, 100BASE-TX, 1000BASE-T: Ethernet with twisted pair cabling IEEE 802.5: Token Ring, 4 Mbps or 16 Mbps

D. Shall perform the following tests as a minimum:

1. NEXT, NEXT @ Remote
2. Wire Map
3. Characteristic Impedance
4. Length
5. DC Loop Resistance
6. Propagation Delay Return Loss (RL), RL @ Remote
7. Delay Skew
8. Attenuation
9. Attenuation-to-Crosstalk Ratio (ACR), ACR @ Remote
10. Power Sum ACR, PSACR @ Remote
11. ELFEXT, ELFEXT @ Remote
12. Power Sum ELFEXT, PSELFEXT @ Remote
13. Power Sum NEXT, PSNEXT @ Remote

E. Shall use injector for complete wire mapping and TDR for determining cable length.

F. Shall measure NEXT for all six pair combinations and Attenuation on all four pairs from 1.0 to 500 MHz.

G. Design Make: Fluke “DSX-5000” or Approved Equal

H. Acceptable Manufacturers:

1. WaveTek

2. Lantek

2.6 PUBLIC ADDRESS STP CABLING

A. Cable shall be ASTM tinned copper, 18 AWG (7x26 stranded), Shielded Twisted Pair (STP). Pair counts as required by manufacturer.

B. 300 Volt insulation, plenum rated.

C. Aluminum foil shield with tinned copper drain wire.

D. Cable shall be UL listed NEC type CMP, constructed in accordance with UL 444.

E. Cable shall be fully functional from -10°C to 60°C.

F. Design Make: West Penn or Approved Equal

2.7 ACCESS CONTROL STP CABLING

A. Aluminum foil shield with tinned copper drain wire.

B. Cable shall be UL listed NEC type CMP, constructed in accordance with UL 444. Plenum Rated

C. RS485 Network Wiring: RS-485 standard compliant, up to 4000 feet (1200 m), 22-24 AWG Tinned Copper, FEP (Tefon) insulation, Impedance: 100-120 Ohms Capacitance: 12-16pf/f.

D. Reader Wiring: 3-Pair 22 AWG Shielded

E. Design Make: West Penn or Approved Equal

2.8 LABELING

A. All labels shall be typed on self-adhesive label strips where a plastic protector is not present on the termination equipment.

B. All letters and numbers shall be capital and the same font, black colored text on white background, closest to size 12 ARIAL FONT as possible.

C. Label maker Design Make: DYMO or Approved Equal.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Horizontal Cable Runs:

1. All interior cabling shall be installed concealed inside the wall cavities and ceiling space.

2. Provide a continuous raceway system in accordance with NEC Article 800 for horizontal cable runs through all inaccessible ceiling (including drywall) and wall cavity spaces. All flexible raceway system runs shall be securely attached to ceiling joists and wall studs 3-feet O.C and removal and addition of cables in the future.

3. UTP Cables shall be supported by Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray zip-tie to cable tray away from STP, coaxial cables, and optical fiber cables. Provide additional stacked Cable Hangers when filled greater than 50%.

4. STP Cables shall be supported by Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray zip-tie to cable tray away from horizontal cables, coaxial cables, and optical fiber cables. Provide separate dedicated Cable Hangers for all STP and Access Control Cabling.

5. In finished locations provide surface raceway for cabling installations from ceiling down to outlet or device where cabling cannot be concealed in construction. Provide conduit to outlet and devices for all exposed no-finished installations in mechanical rooms, gymnasiums, auditoriums, and rooms without accessible ceilings from Cable Hangers and Cable Tray.

6. Refer to specification section 260533 – Raceways for maximum cable fill and supporting hardware specifications.

7. Where larger cable quantities are required to share a single raceway refer to EIA/TIA-569 Conduit Sizing Table 4.4-1.

8. All new device outlets in finished areas shall be flush mounted in the walls.

9. Provide surface raceway for all wiring installations in unfinished areas and conduit for all areas with no ceiling open to the structure.

10. All exterior cabling shall be run in direct buried conduit.

11. Provide separate pathways for all control, video, and signal wiring from 120V branch circuiting.

12. Provide all sleeves as required for routing of cables.

13. Provide firestopping at all firewall and floor penetrations.

14. Do not untwist Cat. 6 cable pairs more than 0.5 in. when terminating.

15. Provided inner duct as required to route A/V signal cabling in plenum ceiling spaces. Inner duct shall be 1 ½" diameter, plenum rated, and have pull tape. Design Make: Carlon CH4X1C-350.

16. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

17. Install cable in neat and workmanlike manner. Neatly bundle and tie all cable in at terminations.

18. Maintain the following clearances from EMI sources.

    a. Power cable - 6 in.

    b. Fluorescent Lights - 12 in.

    c. Transformers - 36 in.

19. Do not install with more than 110N pull force.

3.2 UTP CABLE TESTING

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of each applicable ANSI/TIA/EIA section listed above for each cable type.

2. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

3. The testing parameters called for in this section shall apply for up to 90 meters of horizontal cable, a work area equipment cord, an RJ45 outlet and 2 cross connect connections in the closet.

4. The test parameters shall include Wire Map, Length (report only), Attenuation and NEXT.

5. Wire Map - The wire map test shall verify pair to pin termination at each end and check for connectivity errors. The wire map shall indicate the following for each of the eight conductors:

    a. Continuity to the remote end

    b. Shorts between any two or more conductors

    c. Crossed pairs

d. Reversed Pairs

e. Split Pairs

f. Any other miswiring

6. Attenuation - The link attenuation and NEXT of all cables shall be tested. The link is the sum of the attenuation of all connecting hardware, patch and equipment cords, and cable. The following tables indicate the acceptable values:

Attenuation			
Frequency (MHz)	**Category 3 (dB)**	**Category 5e/6 (dB)**	**Category 6A (dB)**
1.0	3.2	2.0	2.1
4.0	6.1	4.1	3.8
10.0	10.0	6.5	5.9
16.0	13.2	8.2	7.5
20.0	-	9.3	8.4
31.25	-	11.7	10.5
62.5	-	17.0	15.0
100.0	-	22.0	19.1
155	-	28.1	24.1
200	-	32.4	27.6
300	-	41.0	34.3
350	-	44.9	37.2
400	-	-	40.1
500	-	-	45.3
625	-	-	51.2

PS Next (worst pair to pair)			
Frequency (MHz)	**Category 3 (dB)**	**Category 5e/6 (dB)**	**Category 6A (dB)**
1.0	40.1	70.3	73.3
4.0	30.7	61.2	64.3
10.0	24.3	55.3	58.3
16.0	21.0	52.2	55.2
20.0	-	50.7	53.8
31.25	-	47.8	50.9
62.5	-	43.3	46.4
100.0	-	40.3	43.3
155	-	37.4	40.4
200	-	35.7	38.8
300	-	33.1	36.1
350	-	32.1	35.1
400	-	-	34.3
500	-	-	32.8
625	-	-	31.4

B. Data reporting and accuracy

1. General: a Pass or Fail result for each parameter shall be determined by the allowable limits for each parameter. If the test result of a parameter is closer to the test limit than the accuracy of the tester it shall be marked with an asterisk. Data at all measured points shall be uploaded to a P.C. and printed on a laser printer.

2. Wire Map: Wire map tests shall be marked "Pass" if wiring is determined correct.

3. Length: Test results shall be reported in meters.

4. Attenuation: Report the attenuation value and the frequency at point of failure or the highest frequency passed. Measured attenuation values lower than 3dB used for a pass/fail determination. Report the attenuation per unit length for links longer than 15 meters. Attenuation shall be measured from 1 MHz to 16 Mhz (Category 3) or 350 Mhz (Category 5e/6) or 500 MHz (Category 6A) in the steps listed in the tables above.

5. NEXT: Report the NEXT value and "pass or fail" for samples based on the following:

Frequency Range (MHz)	**Maximum Step Size (MHz)**
1-31.35	0.15
>31.25-100	0.25

C. Submit copies in binder format and 4 copies on compact disks containing all summary reports, full plot data test results, tester software tools required to view and inspect and print any selection of the test reports, spreadsheets, end to end reports and as built drawings called for at the completion of job.

3.3 LABELING

A. Label each and every termination port for all new cables.

B. Label all new patch panels.

C. Label all new Racks and Cabinets with the CER, Wiring Closet, MDF, or IDF name.

D. UTP Cabling

1. Jack or Outlet termination - All labels shall be typed indicating the CER, Patch Panel Name, and Port Number. Example for CER A, Patch Panel B, port 11: "AB11".

2. Wiring Closet, Data Closet, MDF, or IDF termination: Label all termination ports with [Room Number]-[Cable Number]. Examples "128-01", "128-02", etc. If the cable is run to equipment such as a Fire Alarm Panel or Public Address System label it as [Room Number]-[Equipment Name].

3. Label all Patch Panels in order of top to bottom starting with A.

4. If the UTP cable is run to a separate building, label the UTP Patch Panel with the Building Name in addition to the Patch Panel Name.

END OF SECTION 271000

SECTION 275116 - IP PUBLIC ADDRESS

SYSTEM 1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, software, licensing, and equipment required for the complete installation of work called for in the Contract Documents.

B. Refer to specification section 271000 - Horizontal and Backbone Communication Cabling for speaker and hardware interconnection cabling.

1.2 SCOPE OF WORK

A. Expand the existing Rauland Telecenter IV Public Address system as noted on the contract drawings. Provide new horizontal cabling for each speaker.

B. Provide PA system headend with components included in this specification section. Install in location shown on the drawings.

C. The following equipment is included as part of this section:

1. Speakers, Backboxes and Baffles

D. Refer to the specification section 271000 for horizontal cabling requirements.

1.3 SUBMITTALS

A. Product data for each component.

B. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of all equipment and materials with associated manufacturers cuts sheets which are to be used.

C. Wiring Diagrams: Detail wiring for power, signal, control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.

D. Details and description of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.

E. Installer Certificates: Signed by manufacturers certifying that they comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. Provide the following within thirty (30) days after notification to proceed:

1. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.

2. The Installer shall demonstrate to the satisfaction of the Owner or his representative that he has:

a. Adequate plant and equipment to pursue the work properly and expeditiously.

b. Adequate staff and technical experience to implement the work.

c. Suitable financial status to meet the obligations of the work.

d. Technically capable and factory trained service personnel at local service facility to provide routine and emergency service for all products used in this project.

B. Because the life expectancy of this type of communications system normally exceeds 10 years, the owner expects continuity from the service provider. Therefore, the installing/servicing company must have been an authorized provider of the manufacturer's product for at least 10 years.

C. Each major component of equipment shall have the manufacturers name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL Label, or other data that is die-stamped into the surface of the equipment shall be easily visible.

D. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.

2.0 PART 2 - PRODUCTS

2.1 SPEAKER ASSEMBLIES

A. Flush Ceiling Speaker

1. 8" Diameter Speaker:

a. 1" voice coil with 10 ounce magnet weight.

b. Frequency response uniform over 60 to 16,000 Hz.

c. Axial sensitivity of 96 dB at 1 meter with 1 watt input.

d. 15 watt RMS power rating.

e. 8 ohm voice coil impedance.

f. 25V/70V line matching transformer with taps at ¼, ½, 2½, and 5 watts.

g. Accessible volume control attenuation knob on outside and center of grill.

h. 50-ohm potentiometer for volume control

2. Baffle:

a. 22 gauge cold-rolled, zinc-treated steel, nominal 11-1/2' square.

b. Scratch and mar-proof white baked powered epoxy finish.

3. Back Box:

a. Round recessed box constructed of one piece 22 gauge steel with white powered epoxy finish and an interior treated with a fire retardant resonance damping material.

b. Bottom interior of box shall have a 9" diameter pad of 3/8" thick acoustic foam for additional vibration and resonance control.

4. Design Make: Rauland US0215 speaker with AXX 1001 baffle back box and ACC 1101 back box.

5. Acceptable Manufacturers:

a. Bogen.

b. Dukane.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. All information for the system wiring shall be supplied by the manufacturer.

B. The paging system drawings are schematic. The system manufacturer shall incorporate their wiring requirements on the system drawings. The contractor shall be responsible, in conjunction with the system manufacturer for complete wiring requirements and conduit sizes.

C. Provide amplifier quantities as required to handle all connected speakers and 40% future capacity.

3.2 INSTALLATION

A. Install all devices shown on plan. Verify the exact location of all devices on architectural ceiling plans and elevations or with existing construction. If a mounting height is not called for on the plans, verify the height prior to roughing the backbox.

B. Install PA system cabling in one of the following pathways:

1. In ring run 4" on center above ceilings that do not contain ACBM.

2. Reuse existing raceway and conduit sleeves installed for the original system.

3. In new raceway provided in this contract for all exposed locations in finished classrooms, offices, conference, break rooms, and corridors.

4. In conduit in mechanical areas such as the boiler room and fan rooms.

C. Where surface raceway is required, paint to match existing walls.

D. Connect the speakers to operate at the following wattages:

1. Offices and Rooms less than 500 sq.ft.: 0.5 watt

2. Classrooms and Rooms over 500 sq.ft.: 1 watt.

3. Exterior: 7.5 watts.

4. Corridors: 2 watts.

E. After system has been completely tested, "dress out" the central equipment rack. Neatly bundle all cable with nylon cable. Provide sufficient loop in the cable bundle to allow moving the cabinet away from wall for maintenance, repairs and additions.

3.3 SYSTEM TESTING AND ADJUSTMENTS

A. Before final acceptance of the system, the Contractor, in the presence of the Owner's representative, shall test each and every component and device in the system. Test shall be documented with signed copy submitted to the Owner and Architect/Engineer.

B. Upon completion of the system installation, it shall be the responsibility of the Contractor to perform the necessary adjustments and balancing of all signals and amplifier level controls to insure proper system operation.

C. The system shall be physically inspected by the Owner's representative and the Architect/Engineer to assure that all equipment is installed in a neat and workmanlike manner as called for in the plans and specifications.

D. As a minimum requirement, the internal intercommunication system should be tested to prove the following:

1. The complete sound system is free from grounds, opens and shorts.

2. Each device function as specified herein.

3. Proper adjustment of all speaker taps to provide clearly audible, but unobtrusive paging in all areas.

E. Fill out test report at the end of this section.

F. The Contractor shall be responsible for minor system adjustments such as tap changes, signal balancing, etc., for a period of one year after system acceptance. Respond to a call from the Owner within 48 hours. These adjustments shall be performed at no additional cost to the Owner.

3.4 OWNER CUSTOMIZATION

A. Paging Zones: Meet with the owner's representative and discuss zone programming options prior to finalizing the zone programming. Configure up to 8 separate zones per. building.

B. Bell schedules: Meet with the owner's representative and obtain in writing the typical day bell schedule for each day of the week. Configure all required warning bells. Provide separate programming for half school days.

C. Bell tones: Play the available bell schedule tones for the owner's representative to review and select from.

D. Overlapping zones: Meet with the owner's representative and obtain any offices, rooms, or corridors that may be shared between two different administrations. Configure separate zones to share paging circuits for all identified common areas.

E. The Contractor shall properly instruct maintenance personnel to perform emergency repairs to the system such as replacement of defective standard components such as speakers, tap settings, volume adjustment, amplifiers, etc.

3.5 INSTRUCTION MANUALS

A. The Contractor shall provide, in addition to the approved copies of the public address/intercom/clock system submittals, complete written operating instructions, pertinent system orientation documents, and system service and parts list and testing documentation.

B. The Contractor shall provide four complete sets of service manuals and wiring diagrams of the entire system, including manufacturer's parts and numbers, schematics, complete with operating information, including equipment characteristics, operating voltages, etc.

3.6 TRAINING

A. Provide two initial one-hour training sessions for district maintenance and front office personnel. The training shall include the following:

1. User/password login from the LAN

2. Paging interface thru the building telephone system, including access codes for security.

3. Bell schedule adjustments

4. Auxiliary input selection such as electronic audio file or analog input from a phone or PC audio output, or streaming media input.

5. Bell tone selection adjustments

6. Time synchronization settings,

7. User/password login from the LAN

B. Provide a follow-up one hour training session, 3 months after the initial session, at the convenience of the owner. This session shall be used to answer all user questions and provide additional training as required.

3.7 WARRANTY

A. Provide one-year warranty on all parts and labor.

B. The warranty shall take effect after the Owner has accepted the system.

3.8 TEST FORM

A. Instructions: Contractor to fill out each location in project based on final installed quantity.

Room Number	**Cable free from ground or short** **(yes or no)**	Speaker Tap Setting (watts)	Program announcement is intelligible (yes or no)
Example: *101*	*Example:* *yes*	*Example:* *½ watt*	*Example:* *yes*

END OF SECTION 275116

SECTION 283110 - FIRE DETECTION AND ALARM SYSTEM WITH VOICE EVACUATION

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. Provide installed spare devices as listed in this section to be turned over at the end of the project to the owner.

C. Labeling of addressable devices to be approved by owner and each addressable device shall be provided with a custom label designation (e.g. M1-44) in black text on an adhesive backed plastic label. Labeling on device to be by Electrical Contractor (EC).

1.2 DESCRIPTION OF WORK

A. Expand the existing Potter IPA-4000 fire alarm voice evacuation system to the new addition and provide modules for new HVAC units.

B. This section includes minimum requirements for the following:

1. Addressable Input Modules (Monitor)
2. Addressable Output Modules (Control)
3. Carbon Monoxide Detectors
4. Manual Pull Stations
5. Smoke Detectors
6. Duct Type Smoke Detectors
7. Heat Detectors
8. Audible Notification Appliances (Speakers)
9. Audible/Visual Notification Appliances (Speaker/Strobes)
10. Visual Notification Appliances
11. Carbon Monoxide Visual Notification Appliances
12. Magnetic Door Hold Opens

1.3 QUALITY ASSURANCE

A. All raceways shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. The fire alarm system contractor shall be a NYS licensed fire alarm installer.

C. Materials specified herein shall comply with the applicable requirements of

1. The following Articles of the National Electric Code (NFPA 70)

a. Article 760 - Fire Alarm Systems

2. The following National Fire Protection Agency (NFPA) standards:

a. NFPA 72 - National Fire Alarm Code

b. NFPA 101 - Life Safety Code

3. Latest adopted edition of the NYS Building Code

4. Latest adopted edition of the NYS Mechanical Code

5. The following U.L. Standards:

a. UL 864/UOJZ,APOU - Control Units for Fire Protective Signaling Systems

b. UL 268 - Smoke Detectors for Fire Protective Signaling Systems

c. UL 268A - Smoke Detectors for Duct Applications

d. UL 521 - Heat Detectors for Fire Protective Signaling Systems

e. UL 228 - Door Holders for Fire Protective Signaling Systems

f. UL 464 - Audible Signaling Appliances

g. UL 1638 - Visual Signaling Appliances

h. UL 38 - Manually Activated Signaling Boxes

i. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems

j. UL 1481 - Power Supplies for Fire Protective Signaling Systems

1.4 SUBMITTALS

A. Provide standard product data for all equipment indicating the type, size, rating, style, catalog number, and listing of the equipment and quantities.

B. Provide calculations for sizing all batteries and power supplies. The calculations shall include a listing of current used by all current consuming devices in both the standby and alarm mode on each circuit. Provide voltage drop calculations indicating acceptable minimum end of line voltage for the specific equipment used.

C. Provide a complete riser diagram indicating types of devices, number of initiation and signal loop circuits, class of wiring system, and type of wiring and listing for indoor and outdoor use. Include candela and dB level for all notification devices on riser.

D. Architectural floor plans and drawings showing system details including specific location of FACP, all system devices, device ID label addresses, raceway sizes, raceways routings cabling in raceways, end of line devices, power supplies and any other system components.

E. Provide a complete riser diagram indicating all devices with addresses, number of initiation and signal loop circuits, class of wiring system, and type of wiring.

1.5 SYSTEM DESCRIPTION

A. Point addressable network capable fire alarm system with manual and automatic initiation devices. The system shall allow individual alarm and real-time status device level communication back to all other fire alarm panel(s).

B. System shall be supervised to continuously monitor the integrity of the circuit conductors and power supplies.

C. Performance of the fire alarm system circuits shall be in accordance with Class B operation for Initiating Device Circuits (IDC) and Class B operation for Notification Appliance Circuits (NAC's).

D. The fire alarm control panel shall permit on-site programming to accommodate facility expansions, renovations, or fire alarm system modifications. All memory shall be non-volatile.

E. The control panel shall have 24 VDC output power supplies for notification appliance circuits and sprinkler system activation bell. System shall be capable of adding additional power supplies as required to power all notification appliances.

F. Summary Reports:

1. The Fire Alarm Control Panel shall be capable of displaying and printing summary reports. The summary reports shall include:

a. A list of all alarm points not in their normal state.

b. A list of all points in the system, including their current status.

c. A list of data for all control by event programs.

d. A list of data for all time initiated programs.

G. Alarm Priority:

1. Alarms shall be processed at three levels of priority:

a. Fire alarms shall have the highest priority.

b. Other alarms that require interaction by the attendant shall have the second level of priority.

c. Monitored points which do not require interaction by the attendant shall be the lowest level of priority.

H. System Access:

1. Access to the system shall be controlled by at least three levels of security to prevent programming modifications by unauthorized personnel.

a. The lowest level of access, shall permit the attendant to view the system display, print alarms and perform life safety control by event functions. The Attendant has minimal access to the system functions.

b. The mid-level access shall permit the attendant to change user programmable parameters.

c. The highest level of access shall permit the modification of system software. This level shall be accessed only by a qualified representative of the equipment manufacturer.

1.6 SEQUENCE OF OPERATION

A. Upon an abnormal condition on the fire alarm system, the appropriate LED (alarm, supervisory, or trouble) shall flash. The panel audible alarm shall pulse for alarm conditions and sound steadily for trouble or supervisory conditions. All abnormal events shall be logged into the database, along with the date and time.

B. For the purposes of this specification section audible base smoke detectors and listed fire alarm speaker devices are considered audible signal devices.

C. For the purposes of this specification visual strobes or combination speaker/strobes are considered visual devices.

D. Voice Evacuation System:

1. Each listed fire alarm speaker shall be connected back to the network voice evacuation system. It shall be programmed and connected so a single pre-recorded or live message can be transmitted from a fire alarm panel or fire fighter telephone to all connected fire alarm speakers or specific buildings or units where partial alarms are provided as part of the sequence of operation.

2. Each voice amplifier shall be listed with the FACP to provide visual strobe and audible fire alarm notification and voice instruction.

3. Each continuous building audio booster panel(s) shall be connected so they can provide Fire Alarm notification to its individual continuous building.

4. The Fire Alarm System shall have the highest priority and take-over in the event the Mass Notification System is providing audio input.

5. Upon activation of the Voice Evacuation System within every building, during manual notification a “Supervisory Condition” shall be indicated in the FACP of the corresponding building. When the activation is cleared the FACP shall indicate “Normal Condition”.

6. A microphone located in the fire alarm control panel and any indicated remote annunciator panels with microphone shall be capable of manual live audio message broadcast to the voice evacuation system.

E. Operation of any single smoke detector, heat detector, or manual pull station in shall cause the following to happen:

1. Signal a general alarm condition at the fire alarm control panel.

2. Activate the Voice Evacuation System and connected NAC panels to sound all audible and visual alarm signal devices throughout the continuous building in a temporal code or with voice instructions until silenced at the FACP.

3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.

4. Notify the UL listed central station via dial up digital communicator.

5. Operate the fan shut-down relay for the HVAC systems in the same smoke compartment or smoke zone.

6. Operate all smoke dampers in the same smoke compartment or smoke zone. Dampers shall close 30 seconds after their respective fan systems have shut down.

7. Release all doors on magnetic hold opens.

8. Subsequent initiating alarms shall repeat the respective sequence of operations.

F. Operation of any single heat detector in unoccupied spaces (mechanical or storage rooms) or operation of more than one alarm initiating device(s) in any building shall cause the following to happen.

1. Signal a general alarm condition at the fire alarm control panel.

2. Activate the Voice Evacuation System and connected NAC panels to sound all audible and visual alarm signal devices throughout the continuous building in a temporal code or with voice instructions until silenced at the FACP.

3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.

4. Notify the UL listed central station via dial up digital communicator.

5. Release all doors on magnetic hold opens.

6. Subsequent initiating alarms shall repeat the respective sequence of operations.

G. Operation of any carbon monoxide detector shall cause the following to happen:

1. Signal a supervisory signal only at the fire alarm control panel and remote annunciator.

2. All carbon monoxide detectors throughout the building shall provide activation of a distinct carbon monoxide detector audible code within the same continuous floor. Activate all connected carbon monoxide visual notification appliances.

3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.

4. Notify the UL listed central station via dial up digital communicator.

5. Subsequent supervisory alarms shall repeat the respective sequence of operations.

H. Synchronize all visual notification appliances (strobes) in the same field of view as per NFPA 72.

I. The Fire Alarm System wiring and power supplies shall be electrically supervised and report trouble conditions to the fire alarm control panel. Any opens, shorts or grounds on the system wiring shall cause the following to happen

1. Sound a distinct pulsed trouble signal at the fire alarm control panel.

2. Flash the yellow common trouble LED.

3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels. The visual indication shall remain until the alarm condition is reset.

4. Subsequent trouble alarms shall repeat the respective Sequence of Operation.

J. Alarm Silencing:

1. Pressing the "Alarm Silence" button shall cause all audible and visual notification appliances to be deactivated. A yellow LED located in the fire alarm control panel shall illuminate to indicate the alarm has been silenced.

2.0 PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/SUPPLIERS AND EQUIPMENT

A. The existing system serving this building is the Potter IPA-4000 series fire alarm control panel. All devices provided as part of this contract shall be compatible with this system.

2.2 NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANELS

A. Shall be compatible with the fire alarm panel and audible and visual notification signal devices.

B. Supervises for power loss, brownout, and batteries, and has power-on and trouble LEDs.

C. Two trip inputs with configurable output correlation.

D. Four independently controlled power-limited output circuits with general alarm operation, available as Class B or Class A. Provides strobe synchronization.

E. Sized to accommodate all devices shown on drawing plus a minimum of 30% spare capacity.

F. Output: 2 Amp per circuit @ 24VDC nominal.

G. Provide with 120VAC power supply, batteries and charger sized to support the system for 24 hours, and then operate all notification appliances for 15 minutes.

H. All equipment mounted in NEMA 1 lockable enclosure.

I. Addressable type when used with addressable notification devices.

J. Design Make: Potter PSN1000 series

2.3 ADDRESSABLE INPUT MODULES (MONITOR)

A. Addressable device used to connect 2 class B analog initiating device circuits.

B. Input circuit wiring requirements

1. Maximum allowable wire resistance - 50 ohms per circuit

2. Maximum allowable wire capacitance - .1uF per circuit

C. Polling and alarm/active status provided by on board red and green LEDs.

D. Design Make: Potter PAD100 Series

2.4 ADDRESSABLE OUTPUT MODULES (CONTROL)

A. Addressable device with a form “C” dry relay contact used to control external appliances such as door closers, fans, dampers etc.

B. Provide a remote LED alarm and key operated test switch for each damper connection. Install remote test switches in visible (below ceiling space) and accessible locations adjacent each damper.

C. Relay contact rating:

1. 24 VDC = 2amps (pilot duty)

2. 120 Vac = .5 amps

D. Polling and alarm/active status provided by on board red and green LEDs.

E. Design Make: Potter PAD100 Series

2.5 CARBON MONOXIDE DETECTORS

A. The FACP shall receive separate trouble status, current threshold conditions, and alarms from the carbon monoxide, smoke or heat detectors.

B. Flush mounts over a standard 4”x4” two-gang backbox.

C. Audible alarm for carbon monoxide signal shall be different than smoke alarm signal.

D. Single analog addressable consumes only one address. Carbon monoxide detector receive both communications and sensor power from the FACP battery backed power source.

E. Alarm conditions shall be indicated by a steady red glow from the LED mounted on the sensor.

F. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring. The detector shall be tamper resistant and shall be removable only with a special tool.

G. Carbon monoxide detector may be standalone where provided with a dedicated addressable input module or mounted with a listed combination smoke or heat sensor base. Combination systems shall be listed in accordance with UL 2075 and UL 268.

H. Includes carbon monoxide gas warning module (temporal code 4) for a repeated sequence of four cycles of 100 msec on with 100 msec off, followed by 5 seconds off per NFPA 720, Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units.

I. UL 2034 Carbon monoxide alarm detection.

J. Design Make: Potter PAD100-CD, System Sensor, or Approved Equal.

2.6 MANUAL PULL STATIONS

A. Semi-flush, dual-action type.

B. High impact red housing with contrasting white “Pull for Fire” lettering.

C. Upon activation, handle shall lock in the alarm condition. A key shall be required to reset the manual pull station. Cylinders shall be keyed to match the fire alarm control panel.

D. Provide addressable input module.

E. Design Make: Potter PAD100-PSDA

2.7 SMOKE DETECTORS

A. Detector shall operate on a light scattering principal. The detector shall have a photo-optic chamber with an infrared light emitting diode and a high speed light sensing photo diode. Capable of sensing visible products of combustion.

B. Alarm conditions shall be indicated by a steady red glow from the LED mounted on the sensor.

C. Sensor shall be microprocessor based, with electronic point addressing to indicate to the system which device is in alarm.

D. The sensor shall be continuously monitored to measure any changes in sensitivity due to dirt, smoke or humidity. Any buildup of foreign material shall cause trouble signal at the control panel indicating that maintenance is required.

E. Sensor shall be capable of automatic device mapping and day/night sensitivity adjustment.

F. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring. The detector shall be tamper resistant and shall be removable only with a special tool.

G. Provide auxiliary relays and 24 VDC power for elevator capture or smoke evacuation control where indicated.

H. Design Make: Potter PAD200-PD

2.8 DUCT TYPE SMOKE DETECTORS

A. Smoke detector shall be solid state, unipolar type with dual chamber construction and operate on the ionization principle.

B. Capable of detecting both visible and non-visible products of combustion.

C. Self-compensating circuitry to provide stability against aging and dust.

D. Field adjustable sensitivity pre-set in the factory.

E. Enclosure suitable for mounting on an air duct, with a sampling tube that extends into the duct air stream.

F. Suitable for installation within an air-duct system with air velocities from 300-4,000 feet per minute.

G. Provide a remote LED alarm and key operated test switch for each duct smoke detector. Install remote test switches in visible (below ceiling space) and accessible locations adjacent each duct smoke detector.

H. Design Make: Potter PAD200-DUCT

2.9 HEAT DETECTORS

A. Self-restoring thermal detector.

B. Rated at 135°F (or as indicated on drawings) fixed temperature. Provide 190°F fixed temperature in boiler rooms, kitchens and where indicated on plans.

C. Design Make: Potter PAD100-HD

2.10 CEILING MOUNTED AUDIBLE NOTIFICATION APPLIANCES (SPEAKERS)

A. Shall be compatible with the Voice Communications Control Panel.

B. Provide back box and tile bridge for ceiling recessed installations.

C. Operate on a 25 VRMS or 70.7 VRMS.

D. Provide with a line supervisory capacitor.

E. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

F. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

G. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

H. Speaker shall be 4-inch, 8 ohms impedance.

I. White housing with red text reading “FIRE”.

J. Design Make: Potter FASPKR

2.11 CEILING MOUNTED AUDIBLE/VISUAL NOTIFICATION APPLIANCES (SPEAKER/STROBES)

A. Shall be compatible with the Voice Communications Control Panel.

B. Provide back box and tile bridge for ceiling recessed installations.

C. Audible speaker shall have the following characteristics:

1. Operate on a 25 VRMS or 70.7 VRMS.

2. Provide with a line supervisory capacitor.

3. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

4. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

5. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

6. Speaker shall be 4-inch, 8 ohms impedance.

D. Visual strobe shall have the following characteristics:

1. ADA compliant.

2. White light output of 15, 30, or 75 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

E. White housing with clear lens and contrasting red “FIRE” lettering on two sides.

F. Design Make: Potter SPKSTR-24CLP

2.12 WALL MOUNTED AUDIBLE/VISUAL NOTIFICATION APPLIANCES (SPEAKER/STROBES)

A. Provide back box for recessed installation.

B. Audible speaker shall have the following characteristics:

1. Shall be compatible with the Voice Communications Control Panel.

2. Operate on a 25 VRMS or 70.7 VRMS.

3. Provide with a line supervisory capacitor.

4. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

5. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

6. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

7. Speaker shall be 4-inch, 8 ohms impedance.

C. Visual strobe shall have the following characteristics:

1. ADA compliant.

2. White light output of 15, 30, or 75 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. High impact red housing with clear lens and contrasting white “FIRE” lettering.

E. Provide weather resistant model where noted on floor plans.

F. Design Make: Potter SPKSTR-24CLP

2.13 CEILING MOUNTED VISUAL NOTIFICATION APPLIANCES

A. Provide back box and tile bridge for ceiling recessed installations.

B. 24 VDC.

C. Visual strobe shall have the following characteristics:

1. ADA compliant.

2. White light output of 15, 30, or 75 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. White housing with clear lens and contrasting red “FIRE” lettering on two sides.

E. Design Make: Potter CS

2.14 WALL MOUNTED VISUAL NOTIFICATION APPLIANCES

A. Provide backbox for recessed installations except for installations on existing walls.

B. 24 VDC.

C. Visual strobe shall have the following characteristics

1. ADA compliant.

2. White light output of 15, 75, or 177 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. High impact red housing with clear lens and contrasting white “FIRE” lettering.

E. Provide weather resistant model where noted on floor plans.

F. Design Make: Potter S-24

2.15 CARBON MONOXIDE VISUAL NOTIFICATION APPLIANCES

A. Provide backbox for recessed installations.

B. 24 VDC.

C. Visual strobe shall have the following characteristics

1. ADA compliant.

2. White light output of 15, 75, or 177 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. High impact white housing with amber lens and contrasting red “ALERT” lettering.

E. Provide with separate signage with text “CARBON MONOXIDE ALARM”.

F. Design Make: Potter CS-24

2.16 MAGNETIC DOOR HOLDERS

A. Magnetic door holders shall be provided as part of the electrical contract.

B. Provide surface mounted 24VDC or 120 VAC field selectable. Power shall be from separate power supply and not the FACP.

C. Electrical Contractor shall mount and connect all magnetic door holders.

D. 1-gang mountable, 3 5/8” projection depth

E. 316 stainless steel alloy housing with satin aluminum finish

F. Design Make: ASSA ABLOY Rixon 998M or Approved Equal

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All installations shall be accomplished in a professional manner by qualified personnel regularly engaged in and experienced in this type of Work. All fire alarm installers shall possess a state license for installation of fire alarm systems where required

2. During installation and testing, and prior to the system being put into service, all manual stations shall be appropriately marked "NOT IN SERVICE" by the Contractor.

3. Provide all 120-volt, 60 cycle AC required to power the system and all remote power supplies.

4. Wiring to all initiation and signal circuits shall be two wire class B. A fault on a circuit loop shall cause a trouble alarm to initiate at the fire alarm control panel.

5. All wiring shall conform to NEC Articles 725 and 760, and to NFPA-72, "National Fire Alarm Code".

6. Detection and initiating equipment shall be listed by UL or approved by FM.

7. Install smoke detectors a minimum of 3 feet away from any air supply or return diffuser.

8. All surface mounted devices shall be mounted on a special box furnished by fire alarm equipment manufacturer. Total assembly shall be secure, smooth contour and have no protrusions.

9. Where detectors are installed on wood or masonry surfaces, attach brackets directly to the surface with tamperproof fasteners. Where detectors are installed on suspended ceilings, provide additional supports in the ceiling, such as channel support system, angle iron or additional runner bars. Fasten the additional supports rigidly to the ceiling runner bar system. Attach bracket to the supports with tamperproof fasteners. Install metal spacers between the bracket and supports so that the ceiling tiles will not be a part of the support system.

10. Mount FACP and all sub panels at working height.

11. Provide additional programming at the FACP for custom LCD messages. All initial programmed messages shall be modified to match the final room/space designation after occupancy has occurred

12. Provide type label adjacent to all programmed LEDs or buttons customized on Fire Alarm Panels. Provide engraved plastic label on each fire alarm panel indicating the building name that will display during annunciation sequences

13. Provide and wire fan shutdown relay contacts in series with starters ahead of all control devices.

14. FACP initiating circuits will be populated leaving at least 20% spare addresses per loop and floor.

15. All FACP or AUXILIARY NAC output circuits shall leave at least 20% spare output power for future expansion

16. Coordinate assignment of ADDRESS LABELS for all reporting points on fire alarm system with the owner.

17. All controlled devices such as smoke dampers, fire dampers, elevator control and door control shall be supervised to within 4’ of the controlled device.

B. Audible/Visible Device Installation:

1. Field verify audible alarm type in existing building and provide to match existing signal type.

2. Visual strobes shall be 75-candela output in all other locations unless otherwise noted.

3. Devices shall be installed at eighty inches (80") minimum above the floor, or six inches (6") below the ceiling, whichever is lower, in accordance with ADA guidelines.

4. Audible devices intended for operation in public spaces shall have a sound level of not less than seventy-five (75) dBA at ten feet (10'), nor more than 110 dBA at the minimum hearing distance from the device.

5. Audible devices intended for operation in private spaces shall have a sound level of not less than forty-five (45) dBA at ten feet (10'), nor more than 110 dBA at the minimum hearing distance from the device.

6. All audible emergency alarm signals shall be at least 15 dBA over the existing sound level within a space or shall exceed the maximum sound level by 5 dBA for at least 60 seconds, whichever is louder. Within areas occupied by persons with hearing impairments, audible emergency alarms must have the intensity and frequency to provide notification of an alarm condition.

7. ALL NAC POWER EXTENDERS and other system power supplies shall be approved by FACP manufacturer, support full monitoring and meet all NFPA requirements. Provide required 120-volt branch circuit for proper system operation

8. ALL VISUAL NOTIFICATION APPLIANCES will be synchronized with all others in a given area where 2 or more devices can be viewed simultaneously

9. Do not exceed 80% loading on any NAC power circuit.

C. Voice Evacuation System

1. Program up to four pre-recorded messages.

2. Configure the fire alarm panel and remote annunciator mounted microphone to allow live message broadcast under alarm conditions. The live voice messages shall over-ride any repeating alarm tones.

3. Provide intelligibility testing of the system as outlined in NFPA 72. Adjust tap values as required to achieve speech intelligibility and volume output of audible notification devices.

D. Carbon Monoxide Detectors

1. Provide SLC circuit connection, 24V power supply, and necessary relays. Connect SLC circuit to addressable base carbon monoxide detectors from area fire alarm panel per. manufacturer guidelines. Where addressable base CO detectors are not available from fire alarm system manufacturer provide addressable input module connected to conventional UL 2075 and UL 864 Compliant type CO detector.

2. All carbon monoxide detectors shall be interconnected to provide notification thru all other CO devices and any indicated audible or visual strobes.

3. Provide signage identifying the carbon monoxide alarm to notify occupants in event of alarm. Provide adhesive typed label on carbon monoxide detectors with audible alert and carbon monoxide strobes to display the following text “CARBON MONOXIDE ALARM”.

E. Wiring:

1. Install all wiring in accordance with manufacturer's recommendations and the National Electric Code.

2. All interior wiring shall be installed in a separate metal raceway system or where wiring can be concealed above accessible suspended ceilings, open air fire rated cable with separate cable hangers may be used. Where open air fire rated cable with separate cable hangers are used all wall penetrations shall be sleeved with EMT conduit with bushings and appropriate Fire Sealing. Provide surface raceway in finished areas to conceal exposed wiring. Provide EMT conduit in mechanical rooms, unfinished areas and for all exposed wiring not concealed. Wiring in unoccupied crawl spaces may be open air fire rated cable with separate cable hangers. Paint all junction box covers in the raceway system RED.

3. Do not install speaker wiring in same raceway as initiating device and visual strobe circuit wiring. Provide independent raceway system for all speaker wiring installations.

4. Type AC or MC Fire Alarm Cable is not permitted as a wiring method for this project.

5. Wire and cable shall be #14 AWG size, solid copper, THHN/TWN for horns, manual stations, smoke or heat detectors, waterflow switches, valve supervisory switches and other initiating and indicating devices. Communication loop wiring shall be shielded or accordance with the Manufacturer's recommendations.

6. Wiring shall be continuous from device to device. Splicing shall be accomplished by use of terminal blocks in locked cabinets keyed alike with the fire alarm control unit, or junction boxes. No connections or splices shall be made underground.

7. Control cabinets shall not be used as pull boxes or raceways. Wiring gutters and locked terminal cabinets shall be used.

8. The Fire Alarm System wiring shall be installed in a workmanlike manner, subject to the approval of the project manager.

9. All harnessing of wires shall be accomplished by use of approved nylon tie wraps.

10. All wiring shall be numbered, and color coded in accordance with this Specification and approved submittal drawings.

11. Tests of all wiring shall be conducted for proper connection, continuity, and resistance to ground. The minimum allowable resistance between any two conductors or between conductors and ground is one (1) megohm as checked by a "megger" after all conduit, conductors, detector bases, etc. have been installed, but before the detector devices are plugged into the base or end-of-line devices installed.

F. Routing:

1. All fire alarm system conduits shall be installed either parallel or perpendicular to building structural members.

2. All fire alarm system conduits shall be provided at a height so as not to obstruct any portion of a window, doorway, stairway, or a passageway, and shall not interfere with the operation of any existing mechanical or electrical equipment.

3. All fire alarm system conduits and cable shall be routed to minimize the potential for physical damage, either mechanical or by fire.

4. All fire alarm system conduits, junction boxes and cable shall be concealed where possible.

5. All fire alarm system junction boxes, pull boxes, terminal cabinets, control enclosures and device backboxes shall be readily accessible for testing, service and maintenance.

G. Wall, Floor and Ceiling Penetrations:

1. All conduit penetrations of walls shall be provided with escutcheon plates on either side of the wall.

2. All conduit penetrations of walls, floors, and ceiling shall be sealed around the conduits, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity.

H. Concealment:

1. Conduit shall be concealed except where shown on the drawings.

2. All conduit, raceways, junction boxes, panels, electrical enclosures, relays and device backboxes shall be concealed in ceiling spaces, electrical shafts or closets in all finished areas.

3. Conduit, raceways, junction boxes, panels, electrical enclosures, relays and device backboxes may be exposed in unfinished areas.

4. All fire alarm system components, including devices, junction boxes, electrical enclosures, relays and device backboxes shall be provided so as to be readily accessible for inspection, testing, service and maintenance.

I. Terminations:

1. All fire alarm conductor terminations shall be on numbered terminals or terminal strips. All fire alarm conductor terminations shall be within junction boxes, device backboxes, terminal cabinets, control panels or other satiable metal enclosures. Terminals and terminal strips shall be suitable for the size and number of conductors connected to them.

2. All connections and end-of-line devices shall be accessible for inspection, testing and servicing.

3. Terminations to terminals other than barrier/pressure plate type terminals shall use crimp-on ring-type or Y-type spade connectors.

4. Splices shall be permitted only when routing of existing conductors prohibits point-to-point terminations in existing junction boxes, terminal cabinets, etc. All such splices shall be provided with new terminal strips with proper labeling in junction boxes, terminal cabinets, etc.

J. Control Panel Location and Wiring:

1. Install annunciator panels in locations indicated on the drawings.

2. All control panel wiring shall be fully dressed and bundled with nylon tie wraps. Bundled wiring shall be routed parallel to terminal strips within control panels, with individual conductors turned out at 90 degree angles to their associated terminal connections. AC power conductors shall be bundled and routed separately from low voltage conductors. A minimum 2-inch separation shall be maintained between AC power conductors and low voltage conductors wherever possible. All control cabinets shall be sized to accommodate the requirements of this section.

3. Each conductor terminating within a control panel shall be uniquely numbered with durable plastic tags or uniquely identifiable by a combination of numbers and color codes. These conductor numbers shall be shown on the record (As-Built) drawings in a manner allowing ready identification of any field wiring conductor in any control panel.

K. Mounting and Labeling of Devices:

1. All fire alarm devices shall be rigidly mounted, using appropriate backboxes, to building structural members, permanent walls, ceilings or fixtures designed for the purpose.

2. All devices shall be labeled with device address or device count as appropriate. Label shall be sticky back type attached to base of device. Label identification shall be consistent with As-Built drawings.

3. All addressable control modules shall be labeled with the device being controlled and the location of that device.

L. Color Coding and Wire Numbering:

1. All conductors entering and leaving terminal cabinets and junction boxes shall be numbered in a logical and consecutive manner.

2. All conductors shall be color coded. Color coding shall be by wire insulation, not taping or banding. The numbering and color coding shall be continuous for each circuit wire.

3. Wires shall be numbered at each connection, termination, and junction point. Wire numbering tags shall be Brady Perma-Code, Westline, or equal.

4. Color coding shall be as follows:

CIRCUITS	COLOR CODES
Alarm Initiating Circuits	Yellow (-) and Orange (+), red (alarm) blue (alarm)
Horns, 24VDC	Slate(-) and Brown (+)
Smoke Detector	Yellow (-) Orange (+) red (alarm) blue (alarm)
Heat Detectors, Pull Stations	Purple (alarm) Black (alarm), connected to the same zone

Fan Shutdown	Blue (-) White (+)
Strobes, 24VDC	Violet (-) and Pink (+)
System AC Power	Black and White
Sprinkler Horn	Black and White
Valve Supervision	Orange and Yellow
DC Power, Door holds	Black (-) and Red (+)

3.2 INTERRUPTIONS TO EXISTING FIRE ALARM SYSTEM

A. General:

1. Do not remove any portion of the existing fire alarm system from operation while installing new work without written approval of the Owner's Representative.

2. Pupil occupied spaces must have existing systems maintained during school operation.

3. In order to meet the above requirements, provide temporary wiring and relocations of existing and/or new equipment as required. These temporary locations shall be approved by the Owner's Representative and arranged to maintain the required system coverage.

3.3 TESTING

A. General:

1. After complete installation of the equipment and submittal of as-built drawings, the Contractor shall perform complete tests of the system. After these tests have been completed, the Contractor shall request final acceptance inspection and tests in the presence of the Project Manager and local authority. Coordination of final acceptance test date and times with those to be present is the responsibility of the Contractor. The Contractor shall demonstrate that all conditions of the plans and specifications have been met. The tests shall include proper operation of all devices and testing of supervised circuits. The installation will be checked against the as-built drawings. The Contractor shall furnish all testing materials and instruments. A punch list will be developed and the Contractor shall correct punch list items. There will be a reinspection of punch list items. If additional reinspection's are found necessary to assure compliance with the Contract, they shall be made at the Contractor's expense.

a. The Contractor shall provide, at no additional cost to the Contract price, the following services by the Manufacturer's representative:

1) Prior to the final inspection, "pre-test" the entire fire alarm system to assure that all new equipment is properly installed and functions in accordance with plans and specifications.

2) The Manufacturer's representative shall certify that the entire new and existing installation was tested and performed satisfactorily.

2. Final acceptance tests shall be coordinated by the contractor and performed in the presence of the owner's representative as follows:

   a. Operation of the fire alarm control panel and indicating components in accordance with factory recommended procedures.

   b. Operational tests of all devices (i.e., detector, waterflow indicator, manual pull box, and valve supervisory device) in accordance with the factory recommended procedures.

   c. Audible/visible testing of all indicating appliances. Tests shall include sound level (dBA) and light intensity (lumens). Audible testing shall be performed and documented for each space with any doors closed.

   d. Checks of each initiating circuit or device address for correct indications at the control unit, and any remote annunciator.

   e. A checkout report shall be prepared by the contractor and submitted to the Owner's Representative. The checkout report shall include a listing of detector sensitivity for each detector. The report shall summarize the results of all tests and shall serve as the contractor's certification that the system is properly installed and fully functioning

B. Installation contractor shall provide a "Statement of Compliance Letter" to Authority Having Jurisdiction prior to scheduling any acceptance testing, per NYS Fire Code. "Statement of Compliance Letter" shall indicate that the fire alarm system was installed per all applicable codes and standards as well as per the contract documents. Acceptance testing shall not be scheduled without providing the "Statement of Compliance Letter" to the AHJ.

C. The complete fire protection system shall be fully tested and guaranteed for a period of one year after Owner's Representative written acceptance.

D. Prior to acceptance testing the contractor shall complete and submit the "Record of Completion" form as identified in NFPA 72.

E. An acceptance test of the complete system shall be conducted by the contractor and fire alarm equipment vendor/installer as directed by the owner after the system has performed a 100% Pre-Test. Submit a written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved.

3.4 IDENTIFICATION

A. All system devices shall be labeled in the field.

B. For each smoke detector, heat detector, flame detector, duct mounted type smoke detector, manual pull station and/or other alarm initiating device, provide the following:

   1. Adhesive backed, vinyl cloth, numbered labels, identifying the device specifically by system address.

2. Labels shall be white background color with solid black numbers. Numbers shall be not less than 5/8" high x 1/8" stroke wide.

3. Design Equipment: Seton Nameplate Co.- Style M3847 or equivalent.

C. For each shut down relay and/or auxiliary control relay and for specific remote lamps, provide the following:

1. Adhesive backed, engraved lamicoid type labels specifically identifying what the fan shut down relay is shutting down, what relay is controlling or what the remote lamp is connected to.

2. Labels shall be black face with white sandwich color, nom: 1/2" tall x 2" wide, with capital letters not less than 3/16" tall engraved into the surface.

3. Design Equipment: Local fabrication by contractor.

D. Provide labels for all smoke detectors that activate elevator recall, smoke hatch operation or fireman's car operation.

E. All addressable control modules shall be labeled with address, the name of the device being controlled and the location of that device.

F. All labels shall be visible once device is installed.

G. Provide label on each power supply indicating power supply designation, 120 volt panel and associated circuit breaker number.

H. All concealed covers for all system outlet and pull boxes installed shall be factory or field painted red.

1. On the inside face of each outlet box cover, Contractor shall provide labeling, indicating; System address, Circuit Number, Horn/Speaker/Strobe Circuit Number, etc.

I. Provide identification of each circuit breaker feeding on each FACP, Notification Appliance Power Supply Panel and Notification Appliance Power Supply Extender Panel indicating that the circuit feeds the fire alarm system per NFPA 72 by marking in RED "Fire Alarm System".

3.5 CLEANING AND ADJUSTMENT

A. Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by the manufacturer.

B. Occupancy Adjustments: Within one year of the date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit the actual occupied conditions.

3.6 CENTRAL MONITORING AND PROGRAMMING REQUIREMENTS

A. Provide communication wiring from the fire alarm panel digital communicator to the telephone system utility demark. Provide all cross connects to establish two independent phone line connections. Coordinate phone lines with the owner to their selected central monitoring agency.

B. Provide documentation of all FACP messages. FACP messages must be approved by the engineer and owner's representative, prior to start of system programming. Provide custom messages and alarm coding as directed by the owners selected central monitoring agency.

C. FACP descriptors utilize room/space designations and numbers to be used by the facility after occupancy and those descriptors shall be approved by the engineer and Owner's representative. Descriptors shall be no longer than (1) full line of characters on the FACP display and shall contain the room number and room use type.

D. Contractor shall allow for two fire alarm system re-programming as directed by the Owner's representative. Contractor shall include all time and travel expenses for (2) two all day site visits for system re-programming during the warranty period.

E. Provide all required alarm and supervisory alarm output settings to the owners selected central monitoring agency.

3.7 RECORD DOCUMENTS

A. Provide complete set of as-built record drawings and documents.

B. Record Documents shall include all documents required by the Submittal Section of this specification updated to reflect as-built project conditions.

C. Prior to request for final payment submit a quantity of bound Operator Manuals that shall include as a minimum:

1. All documents required by the Submittal Section of this specification updated to reflect as-built project conditions

2. Final Bill of Material.

3. Instruction report stating when instruction was given and who was in attendance, signed by the Owner's Representative. Provide written operator instructions for basic system operation, interpretation of system outputs, operation of manual evacuation signaling and ancillary controls and the use of drill functions (if applicable).

4. Detailed description of routine maintenance and testing as required and recommended for each type of device installed. Maintenance guide shall include:

a. Listing of each individual device that requires periodic testing and maintenance.

b. Step by step procedures for the testing and maintenance for each device listed.

c. Schedule for the testing and maintenance as recommended by NFPA 72 for each device listed.

5. Submit a written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved. Certificate of Completion, Fire Alarm System Inspection and testing form and all other system acceptance documents as described in NFPA-72.

6. Update existing building O&M manuals to indicate new device locations, addresses and signal circuit numbers. Revise and correct existing building manuals to reflect renovations and changes to the existing system.

3.8 WARRANTY AND INSTRUCTION

A. The complete fire protection system shall be fully tested and guaranteed for a period of one year after Owner's Representative written acceptance.

B. Provide 3 sets of keys to all panels, manual stations, etc., to the Owner's Representative.

END OF SECTION 283110

SECTION 311201 - SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in Division 31, 32 and 33.

1.2 DESCRIPTION OF WORK

A. The extent of site preparation is shown on the drawings.

B. Site preparation work includes, but is not limited to, the following:

1. Site investigation and underground utility identification
2. Protection of existing trees, shrubs, ground covers and lawns to remain
3. Topsoil stripping and stockpiling on site (See Section 329201)
4. Site clearing and removals
5. Asphalt milling
6. Saw cutting
7. Relocations/salvaged materials
8. Clean up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 329201 – Seeded Lawns

C. Section 334001 - Storm Drainage

1.4 SITE INVESTIGATION

A. The Contractor shall visit the site before bidding, inform and familiarize themselves of all site conditions, including but not limited to, site topsoil, sub-soil, rock, subsurface and groundwater conditions affecting proposed work. No allowance or additional cost will be made in the work of this contract for failing to determine overall project site conditions.

B. Verify locations and protect utilities and structures, whether or not shown on the drawings. Existing utilities and structures shown on the drawings are for the Contractor's convenience and locations are not guaranteed.

C. Verify survey information given on drawings. Walk the site with the Owner's Facilities Management Personnel to discuss approximate locations of reputed utilities not shown on the survey, prior to performing work. Notify the Architect of any and all discrepancies prior to commencing work. Commencement of work will be construed as

complete acceptance of survey information. The Contractor shall provide and perform Ground Penetrating Radar (GPR) utility location prior to performing any excavation.

D. Locate and protect from disturbance existing survey monuments, pins, markers and benchmarks whether or not shown on drawings. When any disturbance or damage occurs, notify Architect in writing within 24 hours. Describe nature of disturbance or damage and date first occurred. Provide copies to applicable government and municipal agencies. Pay costs for restoring monument to satisfaction of said agencies, at no additional expense to the Owner.

E. Contractor shall provide Test Pits at all connection points at existing utilities and at all utility crossings to verify utility locations, size, type, invert, and elevations prior to ordering materials for construction. Notify the Architect of finding immediately. Contractor shall furnish all labor and materials to accomplish.

1.5 JOB CONDITIONS

A. The terms "Architect" and "Landscape Architect" for Divisions 31, 32 and 33 work shall mean Appel Osborne Landscape Architecture, 102 West Division St., Suite 100, Syracuse, NY 13204, Tel. (315) 476-1022. Facsimile (315) 479-7573 or other representative(s) that King and King Architects may determine.

B. Examine drawings and specifications for the entire project. Become familiar with the scope and sequencing of work required. Coordinate and cooperate with other Contractors and trades working in and adjacent to the project.

C. Examine work prepared prior to this contract. Commencement of work will be construed as complete acceptance of all preparatory work by others.

D. Obtain and pay for permits required by authorities. Perform the work in compliance with applicable standards, codes and requirements of governing authorities having jurisdiction.

E. Safety is the sole responsibility of the Contractor.

F. Burning on site and use of explosives are not permitted.

G. Responsibility for existing utilities:

1. Contact Dig Safely New York at least two (2) full working days, and not more than ten (10) working days, before digging begins or as required by latest state law. Locate by hand excavation and provide protection from damage to existing utilities to remain in the area. (Tel. 811)

2. Existing utilities encountered within excavated areas shall be supported, blocked and/or braced in a manner approved by the owner of the utility. Leave supports in place to the extent required by the owner of the utility.

3. Should uncharted or incorrectly charted utilities be encountered, notify the Architect immediately for directions as to procedure.

4. Do not break utility connections without providing temporary

services as acceptable to the Architect and the owner of the utility.

5. Repair and pay for damages to existing utilities as directed by utility Owner at no additional cost to the Owner.

6. Cap ends of utilities to be abandoned or removed in accordance with regulatory agencies and as directed by the Architect.

H. Provide protections and conduct operations to prevent injury and damage to persons, work of other Contractors, existing items to remain, structures, pavements, lawns, and adjacent properties.

I. Restore work damaged by this Contractor inside and outside the contract limits to the condition existing prior to the start of work, unless otherwise directed, to the satisfaction of the Architect at no additional cost to the Owner.

J. Vehicular and pedestrian traffic control:

1. Maintain vehicular and pedestrian traffic during construction activities.

2. Provide alternate routes and traffic control around closed and obstructed traffic ways as required by governing regulations or the Owner.

3. Provide temporary fencing, flagpersons, barricades, warning signs, and warning lights or other measures to protect the public and cause the least interruption of work.

K. Field Measurements: Take necessary field horizontal and vertical measurements required in order to perform the work and design intent shown on the drawings, and outlined in the specifications. Assume complete responsibility for accuracy of such measurements and dimensions.

L. Removal of spoils, dust control, debris and clean up:

1. Control air pollution caused by dust and dirt; comply with governing regulations. Water to control dust when necessary and as directed by the Architect or Certified Erosion Control Specialist. Provide water sprinkling materials, equipment and labor to prevent the nuisance of dust to the surrounding areas.

2. Legally dispose of removed and demolished items, including trash and debris, off the Owner's property, at a licensed disposal facility having adequate capacity to accept the project's waste.

3. Burning of combustible materials on the site is not permitted.

4. During the contract and at intervals as directed by the Architect, clear the site of extraneous materials, rubbish, construction waste, and debris. Leave the site in a clean, safe, neat, well-draining condition.

5. Soil Removal: Sweep roads, access ways, paved areas, and parking areas where soil, mud and debris have dropped or tracked from construction and delivery

vehicles on a daily basis and as directed by the Architect or Certified Erosion Control Specialist.

6. Spoils: Remove from site and dispose when not required for fill or determined to be unsatisfactory soil material per Section 312201 - Site Earthwork.

M. Construction Review - General: Site visits will be made by the Architect to observe construction conformance to drawings and specifications. The occasional site visits by the Architect shall not be construed as supervision of construction or make them responsible for the safety programs and precautions, including but not limited to: the safe access, visit, use, work travel, or occupancy of any person. Site visits shall not make the Architect responsible for means, methods, techniques, sequences or procedures of construction selected by the Construction Manager, Contractor or his Sub-contractors.

N. Site Complexity: The existing site will be intensively developed. Because of the construction and resulting graphic complexity, it is impractical to show every detail. However, the general design intent is clearly shown and shall be applied to individual conditions not specifically shown as directed by the Architect and at no additional cost to the Owner.

O. Asbestos, Toxic and Hazardous Materials: The Division 31, 32 and 33 site work contract does not include testing for, handling or removal of hazardous materials such as, but not limited to: asbestos, fuel, oil, PCB's, or other toxic or hazardous waste materials as identified by the EPA and/or NYSDEC. If any such materials are encountered during any part of the site work, the Contractor is responsible for identifying potential hazardous material and immediately notify all governing agencies having jurisdiction as required by law. Also, within one (1) hour of discovery notify the Architect, Landscape Architect, Consultants, and Owner. The Owner shall provide testing and removal by others, under separate contract. The Contractor shall recommence work under this contract when the Owner provides written certification that remediation is complete per governing agency. The Contractor shall not be penalized for any delays caused by the hazardous testing and removal, unless such hazardous material incident was a result of Contractor's operations. The Contractor shall indemnify and hold harmless the Architect, Landscape Architect, Consultants and Owner, agents, and employees from and against all claims, damages, losses and expenses, direct and indirect or consequential damages, including but not limited to fees and charges of attorneys and court and arbitration costs, arising out of or resulting from the performance of the work by the Architect, Landscape Architect, Consultants and Owner, or claims against the Architect, Landscape Architect, Consultants and Owner arising from the work of others, related to hazardous waste.

The above indemnification provision extends to claims against the Architect, Landscape Architect, Consultants and Owner which arise out of, are related to, or are based upon, the dispersal, discharge, escape, release or saturation of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, or pollutant in or into the atmosphere, or on, onto, upon, in or into the surface or subsurface soil, water or water courses, objects, or any tangible or intangible matter, whether sudden or not.

Should the hazardous material incident be the result of the Contractor's operations, the Contractor shall be responsible for all costs associated with the discovery and remediation of such hazardous material such as, but not limited to: testing, consultant

fees, damage, loss, fees and charges of attorneys, court and arbitration costs, claims by other contractors, direct and indirect or consequential damages.

P. Salvageable Items: Remove at any time after work starts. Storage or sale on site of salvageable and removed items is not permitted. Do not remove topsoil from site without written permission from the Owner.

Q. SUBMITTALS/PROCEDURES: Submit Tests, Shop Drawings, Material Certificates (showing content/mechanical analysis) and Manufacturer's Product Data (MPD) to Architect for review a minimum of two (2) weeks prior to installation.

1. Provide a minimum of five (5) copies from material producer or laboratory, stamped as checked and approved by the Contractor before submittal to the Architect or as otherwise indicated in Division 1. (Note: Electronic submittal process may be acceptable when approved by the Owner and Architect.)

2. Refer to individual specification sections for a list of required submittals.

3. For each material certificate required, provide certification by an Architect approved independent testing laboratory which gives analysis results and states that the material complies with or is superior to the specified requirements.

1.6 SUBMITTALS: (See 1.5, above)

A. Provide photographic documentation. Photographically document existing features which, may be affected by the construction, inside and outside the contract limit line. Existing features include, but are not limited to: structures, pavements, curbs, utilities, lawns and vegetation, especially individual trees which are over six (6") inches in diameter and noted to remain on the drawings. Also, particular attention shall be paid to the construction access, stockpile and haul road areas. Distribute a copy of the photographic documentation (digital format) to the Owner and Architect prior to the start of construction.

PART 2 - PRODUCTS

2.1 PROTECTIVE DEVICES

A. Shall include, but not be limited to; plastic fence, temporary chain link fence and gates, wood planks, rubber mats, barriers, lights, barricades, coverings, traffic controls, steel plates, and other temporary protections.

B. Contractor to provide all necessary protections required by Occupational Safety and Health Administration (OSHA).

PART 3 - EXECUTION

3.1 PROTECT EXISTING VEGETATION TO REMAIN

A. Prior to commencing site preparation work, notify Architect, and meet on site to locate existing trees, lawns and vegetation which are to remain.

B. Protect and keep existing vegetation to remain free from physical damage. Keep in a healthy, vigorous growing condition for the entire construction period as follows:

1. Keep site disturbance and staging limits to a minimum. Obtain approval from Owner for material and equipment storage areas. Limit access points and routes to the project site. Coordinate site access with other trades and contractors on the work site.

2. Groups of Trees and Vegetation: Place orange plastic construction fencing around drip line(s) of trees and plant beds as detailed or directed by the Architect. Do not store materials, run equipment, park vehicles, or otherwise disturb area within the drip line (full canopy of tree) or in plant beds.

3. Specimen and Individual Trees: Protect each as noted and detailed. Do not store materials, run equipment, park vehicles or otherwise disturb area within the drip line (full canopy of tree).

C. Rejuvenate damaged vegetation by pruning watering, fertilizing, staking and other methods as directed by the Architect. Replace trees and other vegetation that cannot be restored to full growth with comparable size, quantity, quality and species as determined by the Architect.

D. Repair lawns disturbed due to construction operations outside the grading limits, as specified and directed by the Architect. Provide screened topsoil, seed, and mulch over damaged lawn areas, access ways or where tire rutting occurred.

3.2 TOPSOIL STRIPPING AND STOCKPILING ON SITE

A. Strip full depth of existing topsoil from areas to be regraded, paved, or otherwise built upon. When amount of available topsoil exceeds what is indicated in geo-tech/boring report, on site test pits, or Contractor assumed depth, continue to remove all topsoil and lower the paved or built element subgrade. Place additional satisfactory earth fill in uniform depths as indicated in the Site Earthwork Section 312201. Maintain finished grades as shown on the drawings. This work shall be done at no additional cost to the Owner.

B. Minimum quantity of topsoil shall be as needed to provide four (4") inches settled depth on lawn areas. Verify quality and quantity. Supply imported topsoil when amount of available topsoil meeting above requirements is less than what is required for the proposed lawn areas. See Section 329201 for imported topsoil requirements.

C. When amount of available topsoil meeting above requirements exceeds what is required for the proposed lawn areas, lower the lawn subgrade and place additional topsoil in a uniform depth as directed by the Architect. Maintain finish grades as shown on the drawings. This work shall be performed and supplied at no additional cost to the Owner.

D. Topsoil shall be well drained, homogeneous texture soil of uniform grade, without the admixture of subsoil material. Topsoil shall be free of dense material, hardpan, and stone over three-quarters (3/4") inch in diameter, and other objectionable foreign material including, but not limited to, brick, concrete, asphalt, glass, nails, screws, toxins,

hazardous wastes and chemicals (such as, but not limited to, atrizene and muriatic acid) that may be injurious to humans, animals and plant materials.

E. Stockpile on site where shown on the drawings or as directed by the Owner. Provide all hauling as necessary. Do not mix topsoil stockpiles with other materials. Do not remove topsoil from site without written permission by the Owner. Stabilize and maintain all stockpiles as specified.

3.3 SITE CLEARING AND REMOVALS

A. Items and materials noted to be removed shall become the property of the Contractor, unless otherwise noted. Obtain Owner's approval prior to removal off site or for relocation of salvaged material on site. Remove material off site and legally dispose of it. Backfill voids with imported granular backfill, placed in eight (8") inch layers compacted to 95% maximum density.

B. Remove physical elements above and below grade as shown and which interfere with proposed construction. Physical elements include but are not limited to: trees, root systems, shrubs, vines, grass, vegetation, pavements, walks, curbs, gutters, foundations, previous construction materials, glass, headwalls, flared end sections, catch basins, manholes, inlets, drywells, septic tanks, unused utilities, pipes, cisterns, walls, rocks, and other debris.

C. Trees, shrubs and roots shall be completely removed and disposed of legally off site.

D. Maintain existing utilities shown to remain and protect from damage during demolition and construction operations. Do not interrupt existing utilities; provide temporary services when required, as acceptable to the Architect.

E. Research with Owner possible locations of existing subsurface utilities prior to excavating.

3.4 ASPHALT MILLING

A. Mill existing asphalt to limits shown on the drawings and dispose off site.

B. The Contractor shall use equipment with automatic grade and slope controls, capable of cold milling existing asphalt pavement to an accurate depth of cut, profile and cross slope and shall be capable of loading the milled material directly into trucks.

C. Cold milling asphalt pavement shall be performed in a manner which prevents the tearing and breaking of underlying and adjacent pavement and the contamination of the millings with granular subbase material, subgrade or deleterious materials. All millings shall be loaded directly to trucks from the milling machine and hauled to stockpile or disposed of.

D. The milled surface shall be swept and jet washed clean prior to installation of new surface material. The Contractor shall sweep the surface in a manner which minimizes dust.

E. The Contractor shall promptly repair any and all localized areas of distress in the milled surface that may present a hazard to traffic, the finished surface, the stability of the new asphalt, or deemed unsuitable by the Architect, at no additional cost to the Owner.

F. Contractor shall apply NYSDOT approved tack coat to the cleaned, milled surface in preparation to received new top course asphalt as specified in Section 321201 - Asphalt Paving.

3.5 SAW CUTTING

A. The Work consists of vertical saw cutting of the existing asphalt or concrete pavement structure to facilitate the removal of the asphalt or concrete bound material.

B. The equipment shall be capable of producing a smooth vertical saw cut without causing damage to the adjacent pavements or related site features.

C. The Contractor shall saw cut the asphalt/concrete pavement to a depth which will allow removal of the material without causing damage to the adjacent pavement. Rough, jagged or cracked edges will not be acceptable. Concrete pavement shall be removed at the nearest contraction joint.

3.6 RELOCATIONS

A. Any item noted to be relocated shall be removed by the Contractor from its existing position without damaging it, stored, protected from theft, fire, vandalism and damage for the project duration. Reset in the location(s) and in the manner detailed, noted on the drawings or specified.

B. Backfill voids with imported granular fill material, placed in eight (8") inch layers compacted to 95% maximum density when located in proposed pavement areas or 90% maximum density when located in proposed non-paved areas.

C. Salvaged items shall be returned to the Owner as noted on the drawings. Move items to Owner designated areas.

3.7 CLEAN UP

During the contract and at intervals as directed by the Architect and as site preparation is completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 311201

SECTION 312201 - SITE EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of site earthwork and site grading is shown on the drawings.

B. Site earthwork includes, but is not limited to, the following:

1. Fill Materials
2. Source Quality Control
3. Shoring, Bracing and Supporting
4. Horizontal and Vertical Layout
5. Grading and Excavation
6. Compacted Backfill and Fill
7. Stone Blanket(s)
8. Field Quality Control Testing and Inspection Services
9. Guarantee
10. Clean Up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312501 - Erosion, Sediment and Pollution Control

C. Section 334001 - Storm Drainage

1.3 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D 75 - Practice for Sampling Aggregates

D. ASTM D 422 - Particle-Size Analysis of Soils (without Hydrometer Analysis)

E. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3)

F. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

G. ASTM D 2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)

H. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

J. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

K. ASTM D 6938 - In Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods

L. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

M. ASTM D 5084 - Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

N. Deep Ripping and Decompaction shall be per NYSDEC recommendations, latest edition

O. Occupational Health and Safety Administration Regulations and Standards

P. American Sports Builders Association (ASBA): Sports Fields - A Construction and Maintenance Manual, latest edition.

Q. ASTM F2898-11 – Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-Confined Area Flood Test Method

R. EN 12616 – Permeability of Synthetic Turf Sports Field Base Stone by Double Ring Infiltrometer, Method A.

1.4 SUBMITTALS (See Section 311201, 1.5)

A. Furnish name of New York State licensed Land Surveyor to be employed and perform project layout. Obtain Architect's approval prior to performing work.

B Submit written report on NYS licensed Land Surveyor's letterhead verifying that professional's involvement with the project layout. The report shall briefly state the scope of services performed for the project, the dates work was accomplished, and an explanation of any adjustments required, specifically listing as-built and FIELD VERIFY requirements as noted in 3.2 of this specification section.

C. Provide Earthwork Contractor's experience requirements as indicated in 1.5, "Quality Assurance". Obtain Architect's approval prior to performing work.

D. Samples: 10 lb. samples of each type of fill; submit in airtight containers to testing laboratory.

E. Materials Sources: Submit name of imported materials source for each type of fill material.

F. Fill Composition Test Reports (Imported and Onsite): Provide results of laboratory tests (less than 2 months old) on proposed and actual materials used to determine acceptability. This shall include:

1. One optimum moisture-maximum density curve (Modified Proctor) for each soil/imported fill type as determined by ASTM D1557, Method A, latest issue.
2. Sieve Analysis - ASTM D422
3. Moisture Density Relationship - ASTM D1557, Method C / ASTM D698
4. Plasticity Index - ASTM D4318
5. Soundness Test - ASTM C88
6. Soil Classification - AASHTO and ASTM D2487

G. Compaction Density Test Report(s) required in Field Quality Control of this specification.

H. Contractor's NYS Licensed Professional Engineer's layout and design calculations of sheet piling and shoring required.

I. Synthetic Turf Permeability Testing: Engage an independent testing agency to perform ten (10) permeability test of both the finishing stone and base stone of proposed synthetic turf stone blanket as determined by ASTM D2434, ASTM F2898-11, and EN 12616. Results shall meet the following at minimum:

1. permeability of base stone $\geq$ 40"/hour
2. permeability for finishing stone $\geq$ 40"/hour

1.5 QUALITY ASSURANCE

A. Perform all site earthwork, site grading and excavation in compliance with requirements of governing authorities having jurisdiction, OSHA Standards, and "References" in this project specification.

B. The Owner will employ a licensed soil testing and inspection service for Field Quality Control Testing of materials. This Contractor will coordinate day to day scheduling with the Owner's testing agency for conformance with "Field Quality Control Testing and Inspection Services" in this project specification.

C. Earthwork Contractor Experience Requirements: Submit business name, business Owner(s) name(s), business address, telephone number, website and/or email address signed by the Contractor/Subcontractor who meets the qualifications set forth in this specification and is proposed by the Contractor to perform the Earthwork for this Project. Provide a list of at least four (4) Earthwork projects of comparable size, scope and quality completed successfully by the proposed Contractor/Subcontractor within the past three (3) years that includes the date completed, project Owner's name and current contact information, including telephone numbers and email addresses.

D. Layout Foreman Experience: The Earthwork Contractor must provide a competent layout foreman skilled in this specific type of layout/earthwork project. The

layout/earthwork foreman shall have a minimum of four (4) similar projects completed within the last three (3) years. Provide a list of projects layout/earthwork foremen has completed including project name, address, Owner contact information and project scope of work.

1.6 JOB CONDITIONS

A. Job conditions in Section 311201 apply.

B. Provide sufficient quantities of fill materials to meet project schedule and requirements. When necessary, store materials on site in advance of need.

C. When fill materials need to be stored on site, locate stockpiles where directed by Owner.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination of material types.

3. Protect all stockpiles from erosion and deterioration of materials by covering with plastic sheets, tarps or as directed by the Architect.

D. Moisten or dry, fill or backfill materials, to the proper moisture content as determined in accordance with ASTM D1557, Method C in order to obtain proper compaction as indicated.

1.7 SUB-SURFACE SOIL INFORMATION

A. Geo-technical Report/Data has not been provided by the Owner. Test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner, provided such operations are acceptable to the Architect and Owner. Coordinate test locations with Owner prior to starting work. Backfill immediately when completed and repair to satisfactory conditions as determined by the Architect. It is expressly understood that the Owner, Architect, Landscape Architect, and Consulting Engineers are not responsible for interpretations or conclusions drawn therefrom by the Contractor.

1.8 UNUSUAL SUBSURFACE CONDITIONS

A. Notify the Architect immediately in writing via email when unusual conditions are encountered during excavation, including, but not limited to: excessive flooding, miscellaneous structures, uncharted or unlocated utilities, foundations, bed rock, toxic and hazardous materials and chemicals (such as muriatic acid and atrizene), suspected archaeological artifacts, and unsatisfactory soil materials. Request clarification from the Owner's Representative or Architect before proceeding. Refer to paragraph 3.4 of this specification.

PART 2 -PRODUCTS

2.1 FILL MATERIALS

A. **Satisfactory General Earth Fill:**

1. To be used at least 5'-0" outside of structural elements, running track, field events and synthetic turf subgrade areas.

2. Satisfactory general earth fill shall be satisfactory on-site subsoil, or hauled in off-site subsoil free of toxics, hazardous wastes and chemicals (such as, but not limited to, atrizene and muriatic acid) that may be injurious to humans, animals and plant materials. Satisfactory earth fill shall also be free of rubbish, debris, wood, masonry, metal, frost, vegetation, organics or other deleterious material, which cannot be properly compacted. Use satisfactory general earth fill that is dry and free of clay. Rocks, gravel or soil shall not be larger than 3" in any dimension/direction.

3. Satisfactory earth fill materials are also defined as those complying with the American Association of State Highway Transportation Officials (AASHTO), M-145 soil classification Groups A-1, A-2-4, A-2-5, A-3 and Unified Soil Classification System GW, GP, GM, GC, SW, SP, SM, and SC (or a combination of these group symbols) as determined by ASTM D2487.

B. **Imported Granular Backfill:**

1. Imported granular backfill to be used for asphalt pavement subbase, concrete subbase, storm structures, storm pipes, water pipes, other structures, and where indicated on the drawings.

2. Backfill shall be run of crusher stone meeting the following gradation as determined by ASTM-C136:

Standard Sieve Sizes	Percent Passing By Weight
2" or 50 mm	100%
3/4" or 19 mm	75 - 90%
1/4" or 6.3 mm	25 - 60%
#40 or 0.425 mm	5 - 40%
#200 or 0.075 mm	0 - 8%

3. Backfill shall be free of debris and deleterious materials. In no case shall the plasticity index exceed 5.0 or the percentage passing the 200 mesh sieve exceed 8%. The quality of the imported granular backfill shall be determined by the magnesium sulfate soundness test, if considered suspect by the Architect or Geotechnical Engineer. The maximum percent loss at four cycles by weight shall be 20.

C. **Imported Structural Fill:**

1. Imported structural fill to be used in areas of structural elements, for top eight (8") inches of design subgrade elevation for running track, field events, and synthetic turf fields and where noted on the drawings.

2. Shall be run-of-bank or run-of-crusher gravel free from organic matter or other deleterious materials, meeting the material gradation requirements of Item 304.05

Sub-base Course, Type 4, of the NYSDOT's Standard Specifications for Construction Materials, as determined by ASTM C136.

Standard Sieve Sizes	Percent Passing By Weight
2" or 50 mm	100%
1/4" or 6.3 mm	25 - 60%
#40 or 0.425 mm	5 - 40%
#200 or 0.075 mm	0 - 8%

3. Imported structural fill shall be accepted on the basis of gradation, soundness, plasticity index and a well-defined Moisture-Density Relationship Curve. Imported structural fill to be placed within 8" of final exterior subgrade shall be subject to Soundness requirements. Soundness shall be less than 30% loss based on a four-cycle magnesium sulfate soundness test. Plasticity Index of that portion of fill material passing the No. 40 mesh sieve shall not exceed 5.0.

D. **Stormwater Management Trench (SMT) Backfill:**

1. Shall be No. 1 clean, washed, crushed stone or crushed gravel meeting the following gradation as determined by ASTM C136:

Standard Sieve Size	Percent Passing By Weight
1" or 25.0 mm	100%
1/2" or 12.5 mm	90-100%
1/4" or 6.3 mm	0-15%

E. **Stone Blanket (For Synthetic Turf):**

1. Material shall be a 100% fractured, by mechanical means, with elongated characters on each individual particle larger than 1/4". Material shall be clean of mineral fines with particles smaller than 1/4" by manufactured means. Rounded sands and crushed gravels are prohibited.

2. Shall be crushed hard durable limestone meeting the following gradation as determined by ASTM C136:

Standard Sieve Sizes	Base Stone Percent Passing by Weight	1/2" Max. Depth Finishing Stone Percent Passing by Weight
1-1/2" or 38.0 mm	100	-
1" or 25.0 mm	95 - 100	-
3/4" or 19.0 mm	80 - 100	-
1/2" or 12.5 mm	60 - 80	100
3/8" or 9.5 mm	30 - 50	95 - 100
No. 4 or 4.75 mm	20 - 40	70 - 85
No. 8 or 2.36 mm	10 - 30	45 - 60

No. 16 or 1.18 mm	2 - 25	25 - 40
No. 40 or 0.425 mm	5 - 17	2 - 12
No. 200 or 0.075 mm	0 - 4	0 - 3

3. Delivery Moisture Content: Processed stone must contain 90% to 110% of the optimum moisture content to ensure that fines do not migrate and to facilitate proper compaction. The Contractor shall ensure aggregate leaving the source plant meets this requirement and shall be required to apply water to the processed stone on site if necessary, to achieve the minimum moisture content.

4. Stone blanket stone shall be free of debris and deleterious materials. In no case shall the plasticity index exceed 5.0 or the percentage passing the 200-mesh sieve exceed 4%. The quality of the stone blanket shall be determined by the magnesium sulfate soundness test, if considered suspect by the Architect or Geotechnical Engineer. The maximum percent loss at four cycles by weight shall be 20.

5. Soil Separation Fabric: Shall commercially manufactured non-woven polypropylene filter fabric. Standard of quality shall be Mirafi 140N as manufactured by TENCATE or Architect approved equal.

6. Mechanical analysis of base and finishing stone shall be reviewed and approved by both the Architect and Turf Manufacturer.

2.2 UNSATISFACTORY SOIL MATERIALS

A. Shall be defined as soil with high percentage of decomposed rock, sand, organic matter or moisture laden clay to prevent adequate compaction. Also, soil with toxics, hazardous wastes and chemicals (such as atrizene and muriatic acid) that may be injurious to humans, animals and plant materials. Also, soil with significant quantities of rubbish, debris, wood, masonry, metal, frost or other deleterious material which, in the opinion of the Geotechnical Engineer, Owner's Representative, and Architect, cannot be properly compacted shall be classified as unsatisfactory.

B. Unsatisfactory soil materials are defined as those described in AASHTO M-145, soil classification, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 with CBR value less than 7.0. Also Unified Soil Classification System ML, CL, OL, MH, CH, OH as determined by ASTM D2487 (or a combination of these group symbols) with CBR value less than 7.0 in addition to peat (PT) and other highly organic soils, cobbles, boulders; and soil materials, of any classifications that have a moisture content at the time of compaction beyond the range of 1% below and 3% above the optimum moisture content of the soil material/backfill material, as determined by the Moisture Density Relationship test.

C. When unsatisfactory soil materials are encountered at proposed subgrades and other design elevations, proceed as described in Part 3 (Execution) of this Section.

D. When excavated materials become unsatisfactory as a direct result of the Contractor's work, this shall result in the rejection of the unsatisfactory soil materials by the Architect.

E. The use of slag (a byproduct of metal processing) or recycled/crushed concrete is unacceptable for any use on this project site.

2.3 SOURCE QUALITY CONTROL

A. See "Submittals" and "Quality Assurance" of this specification section for general requirements for testing and analysis of soil and fill materials.

B. Where fill materials are specified by reference to a specific standard, Contractor is responsible to test and analyze all samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest until approved.

2.4 SHORING, BRACING AND SUPPORTING

A. Shoring and bracing shall conform to the requirements of the Occupational Health and Safety Act.

B. Shoring and bracing shall be provided, placed and maintained at the locations and elevation that are necessary or required to: support and protect the sides and bottom of the excavation; prevent undue disturbance or weakening of the supporting materials below or beside the works; prevent movement of ground which may disturb or damage the work, adjacent pavements, property, structures or other works.

C. Provide materials for shoring, bracing, and supporting, such as sheet piling, uprights, sheathing, stringers, and cross-braces, in good serviceable condition. Use timbers that are sound and free of large or loose knots.

D. Provide design by Contractor's NYS Licensed Engineer, when shoring is required to perform work as shown on the drawings. Submit to Architect for approval.

E. Installation: Shoring and bracing shall be driven and placed so that it can be removed as backfilling takes place without damage to the pipeline or its appurtenances, structures, and without settlement of or damage to adjacent pavements and structures.

F. Removal: The Contractor shall remove all shoring and bracing as the excavation is backfilled, unless directed by the Architect to be left in place. The procedure for extracting shoring and bracing and placing backfill shall ensure the backfill load is applied gradually, and disturbance of the works or foundation material is avoided.

G. Support all utilities as required by the municipality/utility owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field conditions such as bench marks, monuments, topography, inverts, locations of utilities and property lines before proceeding. Notify the Architect immediately, in writing, of discrepancies prior to commencing work. Commencement of work will be construed as complete acceptance of survey and layout information. Additional costs resulting from failure to verify field conditions prior to commencing work shall be borne by this Contractor and at no additional cost to the Owner.

3.2 LAYOUT

A. Stake layout up to and including those elevations and dimensions specifically noted on drawings as "FIELD VERIFY" (FV). Ensure that the field elevation and dimension agrees with the elevation and dimension on the drawings before continuing. Notify the Architect immediately, in writing, of any discrepancies prior to commencing work. Additional costs resulting from failure to verify dimensions as noted on drawings shall be borne by this Contractor and at no additional cost to the Owner.

1. Assume sole responsibility for the accuracy of the layout work.

2. Run from point(s) of beginning (POB), base lines, property monuments, benchmarks, iron survey pins, or other points given on the drawings.

3. Roads, Parking Areas, and Walks: Accurately locate and stake curb lines, center line, swales, point of curve and tangency as necessary to accurately build.

4. Buildings and Site Features: Accurately locate and stake corners, offset corners, slopes, and center lines as necessary to accurately build.

5. Pipe Work: Accurately locate with laser.

B. Athletic Field Layout:

1. Provide accurate layout, alignment and dimensions for fields as shown on drawings and detailed by professional NYS Land Surveyor approved by the Architect.

2. Accurately locate and stake field corners, subsurface location monuments and backstops. Use Owner approved corner markers or stakes 2" x 2" x 2' long pressure treated wood with 16d common nail set flush in top of stake as metal detection element. Set top of athletic field location stakes flush with adjacent finish grades. Spray paint top of stake with day glow orange paint. Protect during construction. Replace if removed at no additional cost to the Owner. Remove as directed by the Architect.

3. Temporarily stripe synthetic turf stone blanket subgrade with field line marking mixture approved by Architect. Meet tolerances described in 3.3 of this specification Section. Correct differences as directed by the Architect.

4. Temporarily stripe synthetic turf stone blanket surface every five (5) yards across the field with field line marking mixture approved by Architect. Correct surface high and low spots as described in Section 334001 prior to synthetic turf installation.

3.3 GRADING

A. Cut and Fill: Presume the earthwork does **NOT** balance on site. Meet the grades shown on the drawings. Haul in or haul away as may be necessary. Provide earthwork

calculations and provide for imported or exported material as part of bid. No additional costs will be allowed.

B. Grade areas as indicated, including transition areas, with uniform levels and slopes between finish elevations.

C. Cut to grades and profiles indicated.

D. Set grade stakes at fifty-foot (50') intervals, at corners, and breaks in grade.

E. Conduct operations to avoid ponding of water. Provide all pumping equipment, sump pits, and temporary diversion swales where and when necessary to continue work performance on schedule and as specified.

F. Shape subgrade surface of site elements to within 0.10' above or below required subgrade elevation, compacted as required and sloped to provide drainage as shown on the drawings. Notify Architect and Geo-Technical Engineer for subgrade review prior to continuing work.

G. Shape subgrade surface of athletic field areas using laser plane control system for grading of subgrade elevation to ensure accuracy in grade tolerances of +0" to - ¼" in 10' any direction. Compact as required and sloped to provide drainage as shown on the drawings. Notify Architect and Geo-Technical Engineer for review prior to continuing work.

H. Refer to Section 311201 for topsoil requirements.

3.4 EXCAVATION

A. Remove and legally dispose of material encountered to obtain required subgrade elevations, including pavement, obstructions visible on ground surface, underground structures and utilities indicated to be removed.

B. Sloping and Benching: Follow OSHA recommendations based on soil type to determine slope configurations. Slope the sides of excavations five (5') feet deep and over to the angle of repose of the material excavated; otherwise, shore, and brace where sloping is not possible either because of space restrictions or stability of material excavated.

C. Bracing and Shoring:

1. Provide bracing and shoring as required in excavations, to maintain sides and to protect structures from settlement.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open. Carry down shoring and bracing as the excavation progresses.

3. Remove shoring and bracing before completion of backfilling except where required for structural support or slope stability.

4. The design, installation, and maintenance of such shoring and bracing required to accomplish the above purpose are the sole responsibility of the Contractor.

5. Follow OSHA recommendations for bracing and shoring.

6. Indemnify the Owner, the Landscape Architect, Architect, and the Consulting Engineers against any action arising from damage to existing structures, utilities or injury to persons resulting from the Contractor's actions or failure to act, in carrying out the intent of this section.

D. Protections: Protect structures, vegetation, utilities, sidewalks, pavements, and other facilities in areas of work. Barricade and secure open excavations and provide warning lights/signage from dusk to dawn each day.

E. Extent of Excavations: Excavate for structures to elevations and dimensions shown, extending excavation a sufficient distance to permit placing and removal of other work and for review. Trim bottom to required lines and grades to provide solid base to receive concrete or imported granular backfill material.

F. Unsatisfactory Soil Materials: When unsatisfactory soil materials, as defined in this specification, are encountered at design elevations, immediately notify the Architect in writing by email or other equally expeditious means. Continue as directed by the Architect and Geo-Technical Engineer. When, in the sole opinion of the Architect, conditions are not a result of Contractor's negligence, additional excavation may be directed by the Architect and paid for as a Change Order on a unit price or negotiated price basis in accordance with Contract Documents. This additional excavation shall be measured each day and verified by the Owner's representative and the Contractor's Superintendent. A daily written accounting, attested by both parties, shall be maintained with copies daily to the Architect. No claim for extra compensation will be considered except through the procedure outlined above. Assume **25 cy** of undercutting and removals, placement of soil stabilization fabric (SSF) and providing and compacting to 95% density imported granular backfill material in Base Bid. Unit price provided shall be utilized to add to or delete from this assumed quantity to account for actual quantity encountered.

G. Unauthorized and Over Excavation: Consists of removal of materials beyond required subgrade elevations or dimensions without specific direction of the Architect or Geotechnical Engineer. Unauthorized or over excavation, as well as remedial work directed by the Architect or Geotechnical Engineer, shall be at Contractor's expense. Fill of unauthorized excavations shall be as follows (all at no additional cost to the Owner):

1. Fill the voids created by the removal of materials beyond indicated subgrade elevations with lean concrete (2000 psi). Or;

2. Extending the indicated bottom elevation of the concrete footing to the lower elevation. Or;

3. Adding imported granular backfill material compacted to 95% density to proper design elevation and layout as directed by the Architect. Testing agency to perform compaction testing prior to proceeding.

H. Dewatering:

1. Contractor shall anticipate seasonal variations of soil moisture content and groundwater in the Base Bid as verified by site investigation indicated in Section 311201.

2. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

    a. Surface and ground water shall be intercepted and removed before entering excavations. All necessary measures shall be taken. Earth dikes, ditches, or other devices, if required, shall be constructed to prevent such flows.

3. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

    a. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

    b. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.

    c. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

4. The Contractor shall at all times provide and maintain proper and satisfactory means and devices (i.e. ditches, temporary pipes, pumps, and/or other temporary construction) for the removal of all water entering the excavations. Water shall be removed as fast as it may collect, in such manner that shall not interfere with the execution of the work or in the proper placing of pipe, structures or other work.

5. Provide and operate sufficient pumping machinery to keep excavated parts free of water. Dig sump pits when necessary into which the excavation shall be drained. Take care and proper precautions in the use of pumps so that in no case will foundations, footings and utilities already in place or existing foundations, footings of adjacent structures or utilities be undermined or disturbed, and erosion occur due to pumping.

6. Do not discharge pumped materials into any body of water, wetland, adjacent property, roadside swales, subsurface storm systems, or any infiltration practices as determined by the Architect. Provide temporary sediment basins, traps, and filter bags for pumped water.

7. Adjust, repair, replace, or clean all work, surfaces, and property, which may have been affected as a result of any dewatering operation.

I. Prepare subgrade and twelve (12") inches of existing sub-soils below subgrade elevations in excavated areas to minimum density of 95% in structure, pavement, utility areas, trenches, and 90% under lawn non-paved areas.

J. Rock and Rock Excavation:

1. Rock Definition: Shall be defined as solid hard material located in ledges, bedded aggregate deposits and unstratified masses, and all-natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock, which must be removed by pneumatic hammers. Rock does not include shale, slate, soft sandstone, hardpan, masonry or concrete rubble, boulders less than three (3) cubic yards, such other rock material which is decomposed, stratified, weathered or shattered, or any material capable of being removed by a well maintained Caterpillar 225 power shovel, D8 Dozer with Ripper, or Architect approved equivalent.

2. Rock Excavation Administrative Procedures: When encountered, shall be stockpiled for measurement before removal and paid for on a unit price basis in accordance with Contract Documents. Notify Architect immediately of rock discovery prior to performing any rock removal or continued excavation. Rock excavations as defined shall be measured each day and verified by the Owner's designated representative and the Contractor's on-site Superintendent. A daily written accounting, attested to by both parties, shall be maintained with copies daily to the Architect. No claim for extra compensation will be considered except through the procedure outlined above.

3. Rock Excavation Removal Procedures: Includes removal and disposal of rock. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions.

   a. 24 inches outside of concrete forms other than at footings.

   b. 12 inches outside of concrete forms at footings.

   c. 6 inches outside of minimum required dimensions of concrete cast against grade.

   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

   e. 8 inches beneath bottom of concrete slabs-on-grade.

   f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

4. Any over excavation due to rock excavation and removal shall be handled as directed under "Over Excavation" in this Section.

5. Contractor has the option to remove existing rock and dispose off-site or crush existing rock and use as satisfactory general earth fill when it meets gradation noted in 312201 for imported granular backfill material.

3.5 BACKFILL AND FILL

A. Preparation of Ground Surface to Receive Fill: Remove vegetation, organic materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Break up and remove existing foundations, concrete slabs, abandoned utilities, and site features. Plow, strip, roughen, or break up slopes steeper than 1 vertical to 4 horizontal so that fill material will bond to existing surface.

B. Execute these steps when the existing ground surface, after removal of the above unsatisfactory soil materials, has a density less than that specified under "Compaction" for the particular area classification: Break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to the required depth and percentage of maximum density.

C In no case shall fill be placed on a subgrade that is wet, muddy, rutted, spongy, frozen or that contains frost or that has not been tested and approved to achieve satisfactory results.

D. Areas to receive any fill or backfill should be properly prepared, proof rolled, tested per "Field Quality Control" within this specification, inspected and approved by the Architect and Geo-Technical Engineer prior to the placement of fill.

E. Following grade approval by the Architect and Geo-Technical Engineer, place imported granular backfill, imported structural fill and satisfactory general earth fill material in layers not more than eight (8") inches in loose depth in a manner to minimize segregation. The fill shall be placed in nearly horizontal lifts commencing at the lowest fill area elevation and proceeding with each lift upward and outward from the lower lift.

F. Moisture Content: Contractor shall anticipate seasonal variations of all soils (on site or imported) and imported fills moisture content in the Base Bid and timing required for such shall be included in the project schedule. The moisture content of the materials shall be adjusted prior to application of compaction such that it is no more than 1% below or 3% above the optimum moisture content of the material. Apply water to surface, subgrade or layers of soil material when required to achieve compaction densities stated below. Remove and replace, or scarify and air dry, soils or imported materials that is too wet to permit compaction to specified density.

G. Compaction:

1. Compact each eight (8") inch layer of fill and backfill materials.
2. Compact fill and backfill material below subgrade for structures, slabs, pavements, and utilities to minimum 95% of optimum in place density as determined by ASTM D1557, Modified Proctor.
3. Compact fill material below subgrade for lawns or unpaved areas to minimum 90% of optimum in place density as determined by ASTM D1557, Modified Proctor.

H. Equipment:

1. Use sheepsfoot rollers, pneumatic tired rollers, drum rollers, vibrating tampers, and other compaction equipment capable of obtaining the required density throughout the entire layer being compacted.

2. Use power-driven hand tampers for compacting materials adjacent to site structures.

3. For utility trenches or other confined areas, small compaction equipment may be necessary such as a vibratory plate, jumping jack or walk-behind vibratory roller. In these cases, lift heights no greater than six (6") inches should be maintained.

I. Reconditioning Compacted Areas: Where previously completed compacted areas are disturbed by subsequent construction operations (by any Contractor), traffic or adverse weather, scarify and dry out the surface, regrade, and recompact to the required density prior to further construction at no additional cost to the Owner. Use hand tamping for recompaction over underground utilities and trenches.

3.6 STONE BLANKET (FOR SYNTHETIC TURF)

A. Prepare subgrade under the stone blanket to a smooth, firm, well draining surface, sloped as detailed. At no time shall the subgrade be rutted by construction traffic including during the stone blanket material installation. Engage with Owner's testing agency to proof roll the turf subgrade and mark "soft spots" for additional compaction. Repair or replace areas that do not pass proof rolling test as directed by the testing agency.

B. Install geotextile fabric, overlapping rolls a minimum of 24" at all seams. Install and secure flat drains into perimeter storm pipe with approved couplers as shown on the drawings. Secure all coupler connections with waterproof PVC tape.

C. Handling and Placement:

1. Prior to stone blanket material placement, remove any excess or contaminated backfill from the storm pipes, flat drains, and/or geotextile fabric as directed by the Architect.

2. Should any separation of the materials occur during any stage of the spreading or stockpiling, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation.

3. Utilize a laser plane control system for the grading of the processed stone to ensure accuracy in the grade tolerances of +0" to -1/4" in 10'-0" (measured in any direction).

4. Install processed stone base, from sideline toward center-line, parallel to the flat drain network, to the lines and grades shown on the drawings. Under no circumstances shall the material be pushed more than 30' from the point of discharge. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation of the aggregates),

preferably a self-propelled paving machine or laser controlled low ground pressure (LPG) dozer.

5. Shape the final surface of the processed stone to receive the turf system component and continue until the deviation from the required elevation does not exceed a maximum deviation from grade of +0" to -1/4" in ten feet (10'), when measured in any direction using a 10' straight-edge.

6. Engage Owner's testing agency to proof roll wherever possible and mark "soft spots" for additional compaction. Use static tandem drum-type roller of not less than five (5) tons weight. Repair or replace areas that do not pass proof rolling test as directed by the testing agency.

7. The stone blanket base stone shall be compacted and unyielding, as directed and approved by the Architect.

8. Install finishing stone and roll tight to achieve a unyielding condition so that the surface shall not deviate more than 1/4" in 10' (measured in any direction) when placed under a 10' foot straight edge. This tolerance is required over the entire field.

9. On the completed stone blanket, install temporary painted lines fifteen (15') feet on center approximately on the 5 yard line and review for proper planarity. Perform "string grading" check along these 5 yard lines in the presence of the Architect and Turf Installer. Adjust high and low areas with similar stone blanket material as directed by the Architect and Turf Installer prior to placement of the turf.

10. The surface of the stone blanket course shall be well drained at all times. The permeability of the aggregate shall be checked per ASTM 2434 (constant head) testing methods. Test samples shall be as described in this specification section.

11. Once the stone blanket is in place, the testing agency shall perform permeability tests on the stone blanket in locations as directed by the Architect per EN 12616 and ASTM F2898-11. Provide water necessary for tests.

12. All test results will be logged and documented by the Contractor's Onsite Layout Foreman and Geotechnical Engineer for the testing agency. If at any time the stone blanket base does not meet project specifications, it shall be the Contractor's responsibility to restore, at his expense, the stone blanket base to the required grade, cross section, permeability, infiltration, and density.

13. After the Contractor has independently confirmed compliance with all the above tolerances (planarity and elevation verified by a licensed surveyor and compaction, gradation, permeability, and infiltration verified by geotechnical engineer), he shall notify the Architect and schedule a final site observation for approval. The Contractor shall make available an orbital laser system and other equipment to the Owner's Inspection Team for the inspection process.

14. Once the stone blanket is approved by the Owner, Architect, Geotechnical Engineer and Turf Installer, install the synthetic turf over the stone blanket as

shown on the drawings, approved submittals and as specified. Prior to start of synthetic turf installation, the Turf Manufacturer/Turf Installer of the synthetic turf system shall inspect the stone blanket and supply a letter certifying base acceptance for the purposes of obtaining the Manufacturer's warranty for the synthetic turf playing surface.

15. The Site Contractor is responsible for providing daily onsite supervision of Turf Installer subcontractor at all times to ensure stone blanket planarity, drainage, and compaction is maintained during and after the turf installation.

3.7 FIELD QUALITY CONTROL TESTING AND INSPECTION SERVICES

A. Soil Testing Service/Geo-Technical Engineer must inspect and approve density tests, retesting, and proof rolling of subgrades, as described in this section, before further construction work is performed thereon.

B. Perform compaction density testing on compacted fill and imported granular base course in accordance with ASTM D1556, ASTM D1557, ASTM D2922, and D3017.

C. In place density testing should be performed at a frequency of one (1) test per 500 square feet per lift in smaller open areas, one (1) test per 2,500 square feet per lift in larger open areas, and one (1) test per 25 feet per lift in confined areas and utility trenches.

D. When the test results indicate that insufficient compaction has been obtained in any layer, the Contractor shall take action to modify or alter the moisture content in the soil, to provide additional compaction and testing or otherwise to increase the in-place soil density. If the Contractor cannot obtain satisfactory compaction due to material properties, the Contractor shall remove the unsatisfactory material and replace with new material at no additional cost to the Owner.

E. Materials contaminated by mud, debris, organics, frost, and/or other deleterious materials shall be removed and replaced with uncontaminated specified material.

F. No fill or backfill shall be placed over an area or lift of fill that has not be tested and achieved satisfactory results.

G. Proof Rolling: On pavement subgrades, in cut areas only, unless otherwise directed by the Architect, the only testing required will be the proof rolling as described below:

1. Provide Soil Testing Service/Geo-Technical Engineer with 48-hour advance notification when subgrades are ready to proof roll.

2. Proof Roll the prepared pavement subgrade surface with fully loaded ten (10 c.y.) cubic yard earth moving truck or, in the opinion of the Architect/Geo-Technical Engineer, using a 5-ton smooth drum roller making at least 3 overlapping passes, in each of 2 perpendicular directions, on static mode at a speed of 1 to 4 feet/second. Check for unstable areas. Subgrades that rut, pump or deflect under the truck's tires may be judged unstable by the Architect/Geo-Technical Engineer. These areas may require further compaction or undercutting as directed by the Soil Testing Service/Geo-Technical Engineer.

H. Stone Blanket Field Testing:

1. Subgrade: Proof rolling and density testing for subgrade as described in Section 312201.

2. Stone Blanket (for Synthetic Turf Field):

a. Proof rolling as described.

b. Permeability Test: Perform two (2) permeability test of both installed finishing and base stone as determined by ASTM D2434 confirming permeability rate outlined in "SUBMITTALS" of this specification section.

c. Infiltrometer Tests: Engage the independent testing agency to perform permeability testing of the in-place stone blanket per EN 12616 and ASTM F2898-11. Results shall meet the following: Direct infiltration rate of stone blanket system ≥ 40"/hour.

i. Notify Architect forty-eight (48 hrs.) hours in advance and provide water, materials, machinery and labor to carry out testing in presence of Architect.
ii. Perform ten (10) permeability tests each on the installed synthetic turf stone blanket in areas as directed by the Architect.
iii. Repair all test areas to match surrounding stone blanket material.

3.8 GUARANTEE

A. Guarantee concrete slabs, pavements, trenches, utilities, structures, synthetic turf, track, field events and lawns free from settlement for a period of one (1) year from the date given on the certificate of substantial completion or final punch list when satisfactorily completed and accepted by the Architect, whichever is later.

B. Repair to proper grade and alignment any and all settlement of concrete slabs, pavements, trenches, utilities, structures, synthetic turf, track, field events and lawns adversely affected by settlement within one (1) year after date given on the certificate of substantial completion or final punch list when satisfactorily completed and accepted by the Architect, whichever is later, at no additional expense to the Owner. In damaged compacted areas, scarify the surface, re-shape, and compact to required density prior to further construction.

C. All repairs/corrections shall be completed to the satisfaction of the Owner within seven (7) days of written notice by the Owner.

3.11 CLEAN UP

During the contract and at intervals as directed by the Architect and as earthwork is completed, clear the site of surplus earth, large surface stones, debris, tools and equipment. Leave the site in a clean, safe, well draining, and neat condition.

END OF SECTION 312201

SECTION 312501 - EROSION, SEDIMENT AND POLLUTION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide erosion, sediment and pollution controls as directed by the Architect to significantly reduce runoff on downstream and neighboring properties. This includes temporary control measures to mitigate land disruption by other Contractors during construction of this project.

B. Erosion, sediment and pollution control includes, but is not limited to, the following:

1. Temporary concrete washout facility
2. Temporary sediment filter bag for pumped water
3. Construction site dust control
4. Spill prevention, reporting and documentation
5. Clean up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312201 - Site Earthwork

C. Section 329201 – Seeded Lawns

D. Section 334001 - Storm Drainage

1.3 REFERENCES

A. Spill Guidelines Manual (SGM) New York State Dept. of Environmental Conservation.

B. New York State Standards and Specifications for Erosion and Sediment Control, dated July 2016 or latest edition.

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Manufacturer's Data (MPD) are required for:

1. Sediment Filter Bag
2. Spill Response Equipment

B. Listing of emergency contract numbers. This list shall include the name of an Emergency Response Contractor that may be used in certain situations.

1.5 QUALITY ASSURANCE

A. Perform erosion, sediment and pollution control in compliance with applicable requirements of the New York Standards and Specifications Erosion and Sediment Control Manual, dated July 2016 (or latest edition) or other governing authorities having jurisdiction.

B. It is this Contractor's responsibility to prevent stormwater pollution from running offsite. All pollution control work related to the site contract shall be included in the Base Bid. All pollution control work related to other contracts shall be on a time and material basis and back-charged to the responsible party.

C. In the event of a chemical or hazardous spill or release, the individual(s) who caused the spill is responsible for prompt and proper clean-up. If the spill requires cleanup procedures beyond the means of the Contractor, an emergency spill cleanup Subcontractor shall be hired by the Contractor. They shall be utilized when the Contractor does not have the appropriate training, equipment or materials to cleanup the area safely and effectively. This shall be done at no additional cost to the Owner. Any testing and cleanup required post cleanup shall be provided by the Contractor at no additional cost to the Owner.

1.6 JOB CONDITIONS

A. Job conditions in Sections 311201, 312201, 329201 and 334001 apply.

B. Contractor will take all necessary precautions to avoid allowing dust generation that violates NYSDEC regulations and compromises compliance with governing authorities air monitoring plan.

1.7 INSPECTIONS AND MAINTENANCE

A. The Architect or qualified personnel of the Operator shall inspect disturbed areas of the construction site at least once per week. Special attention will be focused on areas not finally stabilized, structural control measures, point discharge (outlets) and locations where vehicles enter or exit the site. Disturbed areas will be inspected for pollutants entering the drainage system. Structural control measures will be reviewed for effectiveness in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site will be inspected for evidence of off site sediment tracking.

B. The Contractor shall provide timely maintenance of vegetation erosion and sediment control measures, and other protective measures, during construction. Corrective measures must be performed within one (1) calendar day of the Architect's or Operator's (Owner's) report. Failure by the Contractor to perform corrective work within this schedule automatically authorizes the Operator to hire others and backcharge this Contractor. The Architect or Operator will send a letter or email correspondence one (1) calendar day before hiring others and backcharging this Contractor.

C. The Contractor shall conduct daily inspections of the equipment staging and maintenance, fueling, hazardous waste staging and waste storage areas to ensure that spill control measures are in place. Stock appropriate clean-up materials whenever changes occur in the types of chemicals used or stored on site.

D. The Operator (Owner) shall provide long term maintenance of the storm water facilities after the site is finally stabilized.

1.8 SPILL PREVENTION, REPORTING AND DOCUMENTATION

A. To minimize the potential for discharge to the environment of oils, petroleum, or other hazardous substances, the following requirements shall apply:

1. All oil, petroleum, or hazardous materials stored or temporarily relocated on site during the construction process shall be stored in a way to provide protection from vehicular damage and to provide containment of leaks or spills. Temporary berms, dikes, storage basins, or similar methods shall be employed as appropriate on site.

2. Maintain file of Material Safety Data Sheets (MSDSs) or other references for recommended spill clean-up methods and materials.

3. Keep spill response equipment readily accessible.

B. In the event of a spill contact the Construction Manager, Owner (Operator), and Architect. The Contractor shall also notify all other Contractors working around the area of the spill.

C. If spilled material has entered any sanitary/storm sewer system then contact the municipality or agency with jurisdiction over the system, in addition to those listed in this section.

D. The contractor shall be responsible for the initiation of spill reporting and documentation procedures. All petroleum spills must be reported to NYSDEC Spill Hotline at 1-800-457-7362, less than two (2) hours following discovery. All petroleum spills must be reported to NYSDEC unless all of the following apply:

Criteria	Description
Quantity	Must be known to be less than 5 gallons.
Containment	Must be contained on an impervious surface or within an impervious structure. No access to the environment.
Control	Must be under control and not reach a drain or leave the impervious surface.
Cleanup	Must be cleaned-up within two (2) hours of occurrence.
Environment	Must not have already entered into soil or groundwater or onto surface water.

E. A release of a "reportable quantity"[1] or unknown amount of a hazardous substance must also be immediately reported to the NYSDEC Spill Hotline. Spills of reportable quantities of chemicals or "harmful quantities"[2] of oil to navigable waters must be reported to the federal National Response Center, 1-800-424-8802 or 1-202-426-2675.

[1] *Reportable Quantity*: Refers to the quantity of a hazardous substance or oil that triggers reporting requirements under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) (USEPA, September 1992).

[2] *Harmful Quantity*: Includes discharges that violate applicable water quality standards, cause a film, sheen, or discoloration on a water surface or adjoining shoreline; or cause a sludge or emulsion to be deposited beneath the water surface or shoreline (40 CFR 110.3).

PART 2 - PRODUCTS

2.1 TEMPORARY SEDIMENT FILTER BAG FOR PUMPED WATER

A. Provide prefabricated bags/pouches with nonwoven geotextile fabric. The standard of quality shall be Dirtbag as manufactured by ACF Environmental, 800-448-3636 or Architect approved equal.

B. Provide wooden pallet to set filter bag on for ease of disposal.

2.2 TEMPORARY CONCRETE WASHOUT FACILITY

A. Concrete washout facility to fully contain all concrete washout needs of the entire project and all contracts.

B. Concrete washout facility shall be temporary straw bales that are lined with a single sheet of a minimum of 10 mil polyethylene sheeting that extends over the entire basin to prevent escape of discharge. Place a secure, non-collapsing, non-water collecting cover over the concrete washout facility prior to inclement weather to prevent accumulation and overflow of precipitation.

C. Provide concrete washout to prevent discharge from concrete trucks or equipment cleaning to inlets, surface or groundwater.

D. Concrete washout facility shall be no closer than 50 feet from environmentally sensitive areas such as waterbodies, wetlands, and open drainage facilities and watercourses. Signs shall designate concrete washout facilities.

E. Ensure that the concrete washout facility complies with all Federal, State and local laws, rules, and regulations. Ensure that the concrete washout facility is in place before delivery of concrete to site.

F. Provide a sign identifying area as "Concrete Washout" acceptable to the Architect. Maintain throughout the project duration.

2.3 SPILL RESPONSE EQUIPMENT

A. The following is a list of recommended spill control material. The contractor is responsible to have spill control and personnel protective equipment readily available for the materials being used. Acquire sufficient quantities and types of appropriate spill control materials needed to contain any spills that can be reasonably anticipated. The need for equipment to disperse, collect and contain spill control materials should be on site at all times.

1. Personal Protective Equipment
   a. Chemical Splash Goggles
   b. Gloves

c. Boot Covers
d. Tyvek Aprons or Suits

2. Absorption Materials
   a. Spill Pillows and Socks
   b. Absorbent Booms and Pads
   c. Dikes for use on rough surfaces
   d. Storm Structure Covers
   e. "Loose" Absorbents

3. Tools
   a. Shovel, Broom, Brush
   b. Disposal Bags
   c. Sealing Tape
   d. Hazardous Waste Stickers
   e. "Danger" and "Keep Away" Signs
   f. Five gallon pails or 20 gallon drums with polyethylene liners

B. Basis of Design shall be provided by: 3M, 888-364-3577; New Pig Corporation, 800-468-4647; SpillKits911, 800-474-5911; Dawg, Inc., 800-935-3294; or Architect approved equal.

C. Place spill response equipment in a readily assessable location within or immediately adjacent to the project site.

PART 3 - EXECUTION

3.1 REQUIREMENTS

A. Between the Pre-Construction Meeting and starting site work, the Contractor shall:

1. Review inspection and maintenance procedures.
2. Designate specific Owner and Contractor personnel responsible for daily inspection and maintenance.

3.2 GENERAL EROSION CONTROL

A. Install initial construction erosion control features, as indicated on drawings and specifications or as directed by the Architect, prior to topsoil stripping, earthwork, and removal of existing vegetation. Keep the disturbance to a minimum and shall not exceed five (5) acres, unless directed by the Architect. Install other features as described in the sequence of erosion, sediment and pollution control on the drawings.

B. Start permanent seeding within seven (7) calendar days of rough grading. When this is not possible, provide temporary seeding of 100% perennial rye grass at the rate of six pounds (6#) seed per one thousand (1,000 sf) square feet. Provide temporary seeding within seven (7) days on non-roof, non-paved areas. When adverse weather conditions prevent good germination, repeat seeding as directed by the Architect until the area is stabilized. Till under temporary grass and fine grade when preparing for final permanent lawn stabilization.

C. Until a disturbed area is stabilized, trap runoff sediment by the use of sediment debris basins, diversion swales, sediment traps, or other methods acceptable to the Architect and governing authorities. Provide temporary dry mulch (straw) to stabilize exposed soils as directed by the Architect.

D. Provide erosion controls on slopes and swales traversing, bordering, or leaving the site. Limit the water flow to a nonerosive velocity.

E. Do not store fill materials within one hundred (100) feet of the banks of any streams or waterbodies, intermittent or perennial.

F. Inspect erosion and sediment control measures immediately after each rainfall and at least daily during prolonged rainfall. Make required repairs immediately.

G. Remove sediment deposits when they reach approximately one-half of the height of the barrier. Dispose sediment in a manner that does not result in additional erosion or pollution.

H. Provide prompt (weekly) removal and disposal of rubbish and debris in accordance with the governing authorities, Owner policies, and good housekeeping measures.

3.3 MUNICIPAL SEWER, SWALES AND WETLAND EROSION CONTROL

Control erosion, siltation and pollution to municipal sewers, swales and wetlands by taking appropriate measures such as, but not limited to, the following:

A. Do not disturb the bed and banks of waterbodies unless specifically shown on drawings. When bed and bank work is shown, obtain permits and proceed with work creating the minimum disturbance necessary to complete the project.

B. Prevent petroleum products and excessive amounts of silt, clay, and muck from entering municipal sewers, waters, swales or wetlands of New York State during construction.

C. Prevent fresh concrete, concrete leachate, and washings from equipment and trucks, from entering municipal sewers, waters, swales or wetlands of New York State during construction.

D. Place silt fence to control erosion at the downslope edge of disturbed areas. This barrier to sediments is to be put in place before disturbance of the ground occurs and is to be maintained in good condition until disturbed land is heavily vegetated or otherwise permanently stabilized.

E. Seed areas of soil disturbance resulting from this project with appropriate perennial grass seed and mulched with straw within seven (7) calendar days as described in general erosion control. Mulch shall be maintained until a suitable vegetative ground cover is established and as directed by the Architect.

3.4 CONSTRUCTION SITE DUST CONTROL

A. The Contractor shall prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety issues.

B. Dust control applies to construction roads, access points, other disturbed areas and stockpiles subject to surface dust movement and dust blowing.

C. Contractor may use any number and combination of dust control methods, as approved by the Architect. They include:

1. Applying water to haul roads
2. Restricting vehicle speeds to 10 mph
3. Hauling materials in properly tarpped or watertight containers.
4. Covering stockpiles and materials
5. Wetting equipment and work area
6. Mulching
7. Spray adhesives and polymer additives (MSDS sheets required)
8. Barriers and wind breaks

D. Contractor is responsible for any cleanup and site restoration associated with dust control measures, dust pollution on or off the project site property at no additional cost to the Owner.

3.5 TEMPORARY SEDIMENT FILTER BAG FOR PUMPED WATER

A. Install prefabricated bags/pouches on top of straw bale base as recommended by the manufacturer. Replace system when full (discharge into bag/pouch is significantly reduced).

B. Silt may be used as general site fill or hauled off site. Remove straw bales, fabric, and prefabricated bags/pouches off site. Regrade area and return to lawn as specified.

3.6 TEMPORARY CONCRETE WASHOUT FACILITY

A. Install in accordance with New York State Standards and Specifications for Erosion and Sediment Control in a location as approved by the Owner. Provide a stable surface, easily accessible by concrete trucks.

B. A sign shall be installed adjacent to each washout facility to inform concrete equipment operations to utilize the proper facilities. The sign shall be installed as detailed and maintained throughout the project.

C. Temporary concrete washout facility shall be constructed and maintained in sufficient quantity and size to contain all liquids and concrete waste generated by washout operations for the entire project and by all Contracts.

D. Perform washout of concrete mixers, delivery trucks, and other delivery systems in designated areas only.

E. Wash concrete only from mixer chutes into approved concrete washout facility.

F. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.

G. Contents of the concrete washout facility shall not exceed 50% capacity of the facility. At or before 50% capacity is reached, discontinue pouring concrete until the facility is cleaned out. Remove hardened concrete and properly dispose off site. Allow slurry to evaporate or remove from site and dispose off site. Immediately replace the liner if it gets damaged.

H. Remove concrete washout facility when it is no longer needed as directed by the Architect.

3.7 SPILL RESPONSE EQUIPMENT

Use per manufacturer's recommendations and as directed by the NYSDEC, or other governing agencies.

3.8 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as erosion, sediment and pollution control procedures are completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well draining, and neat condition.

B. Clean storm ponding areas, catch basins and detention basins: Clean out contaminants, sediment, rubbish, construction debris, foreign objects and accumulated floatables from chambers and ponding areas thoroughly, immediately prior to final acceptance.

END OF SECTION 312501

SECTION 321201 - ASPHALT PAVING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of asphalt paving is shown on the drawings.

B. Asphalt Paving work includes, but is not limited to, the following:

1. Soil Stabilization Fabric
2. Granular Base Course
3. Asphaltic Concrete
4. Bituminous Tack Coat
5. Self-Adhering Waterproof Membrane
6. Hot Pour Crack Sealing and Filling
7. Field Quality Control
8. Clean up

C. Provide all materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation (Asphalt Milling)

B. Section 312201 - Site Earthwork

C. Section 321820 – Resilient Track Surface

D. Section 334001 - Storm Drainage

1.3 REFERENCES

A. The latest editions of the following Standards, as referenced herein, shall be applicable:

1. New York State Department of Transportation Standard Specifications, Section 402 - “Hot Mix Asphalt (HMA) Pavements" and 407 - "Bituminous Tack Coat"
2. “Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).”
3. American Sports Builders Association (ASBA) Asphalt Guidelines, latest edition

B. The following reference standards shall apply for Testing and Inspection:

1. ASTM D1074: Standard Test Method for Compressive Strength of Bituminous Mixtures
2. ASTM D1188: Standard Test Method for Bulk Specific Gravity and Density of Compacted Mixtures Using Paraffin-Coated Specimens.
3. ASTM D2041: Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

4. ASTM D2726: Standard Test Method for Bulk Specific Gravity and Density of Non-absorptive Compacted Bituminous Mixtures
5. ASTM D2950: Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
6. ASTM D3203: Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
7. ASTM D3549: Standard Test Methods for Thickness or Height of Compacted Bituminous Paving Mixture Specimens
8. NYSDOT Materials Method 28 Friction Aggregate Control and Test Procedures

C. The following reference standards shall apply for pavement markings:

1. ASTM D562, D711, D1475, D1640, D2369, D3723, D3960.
2. DOT Code of Federal Regulations, Hazardous Materials and Regulations Board, Reference 49CFR, ICC Regulations
3. Federal Specification TT-P-115E, Type III (Type I if V.O.C. compliance)

D. Additional testing required, only if directed in writing by Architect, due to asphalt installation and material issues:

1. ASTM C295: Standard Guide for Petrographic Examination of Aggregate
2. ASTM D1560: Standard Test Methods for Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus
3. ASTM D4125: Standard Test Methods for Asphalt Content of Bituminous Mixtures by the Nuclear Method
4. ASTM D5444: Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
5. ASTM D6307: Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
6. ASTM D6931: Standard Test Method for Indirect Tensile (IDT) Strength of Asphalt Mixtures
7. ASTM D7312: Standard Test Method for Determining the Pavement Shear Strain and Complex Shear Modulus of Asphalt Mixtures Using the Superpave Shear Tester

1.4 SUBMITTALS

A. Provide Paving Contractor experience requirements, as outlined in "Quality Assurance" of this specification section, for the following:

1. General Paving
2. Running Track/Field Events

B. Provide Asphalt Producer Vendor Certificate and proof of quality control monitoring as outlined in "Quality Assurance" of this specification section.

C. Provide material certificates showing content/mechanical analysis for the following:

1. Asphaltic Concrete Mix Design with Authorization Signature:

a. Type/name of mix (less than 24 months old)

b. All aggregates gradations and quality measurements
c. Plot (0.45 power graph) of the final aggregate blend
d. Bulk (dry) specific gravity of all aggregates and final aggregate blend (Gsb) including worksheets for natural (virgin) as well as reclaimed asphalt pavement (RAP)
e. Grade of asphalt binder (PG) being used
f. Optimum percent asphalt binder (Pb)
g. Mix air voids at optimum (Va)
h. Bulk specific gravity of mix at optimum (Gmb)
i. Theoretical maximum specific gravity of mix at optimum
j. Voids in the Mineral Aggregate (VMA) and Void Filled with Asphalt (VFA)
k. Dust to total asphalt content (AC) ratio
l. All design data and associated design curves

2. Bituminous Tack Coat

D. Provide Manufacturer's Product Data (MPD) for the following:

1. Soil Stabilization Fabric
2. Self-Adhering Waterproof Membrane
3. Hot Pour Crack Sealing and Filling

E. Submit Asphalt Placement Work Plan, indicating paving pass widths, paving directions, site access, and timing/coordination of any site equipment installation (posts, boxes, fencing, etc.) indicated in 3.3 of this specification section. Supply Owner with yield calculations for all asphalt paving products and materials used on the project as part of the work plan.

F. Field Quality Control test reports as indicated in this specification section.

G. As-built survey required for running track and field events, prior to athletic surfacing installation.

1.5 QUALITY ASSURANCE

A. Paving Contractor Experience Requirements:

1. General Paving: Contractor shall have the experience of at least five (5) years in business. Paving superintendent has a minimum of three (3) years' experience as a paving crew operating foreman.

2. Running Track and Field Event Asphalt: Contractor shall have the experience of at least five (5) similar installations within the past three (3) years. These installations shall be in locations, size and operating conditions similar to those for this project. Employ only thoroughly trained personnel, experienced and familiar with running track and field event paving and the tolerances required by the governing body. Provide project references including dates, project contacts, and approximate project cost.

B. Asphalt Testing and Inspection Services:

1. The Owner will employ and pay for the services of an Independent Testing Agency to provide testing and inspections of asphalt pavements.

2. The services and the information provided by the Testing Agency are provided for the sole benefit of the Owner. The information is provided to the Contractor for the sole purpose of being aware of what is being reported.

3. The Contractor is solely responsible for assuring the work complies with the Contract Documents in all respects and may not rely on the testing agency for this or any other assurances. The Testing Agency and their representatives are not authorized to revoke, alter, relax, enlarge, or release any of the requirements of the Contract Documents, approve or accept any portion of the work, perform or excuse any duties of the Contractor, or be involved in the scheduling of any work.

4. Asphalt paving materials and operations shall be tested and inspected as the work progresses. Failure by the Testing Agency to detect any defective work or material shall not in any way prevent later rejection (when such defect is discovered) nor shall it obligate the Owner for final acceptance.

C. Asphalt producer shall monitor production according to the procedures of NYSDOT Material Method 28 Friction Aggregate Control and Test Procedures. Asphalt producer shall be a New York State approved/certified HMA (Hot Mix Asphalt) manufacturing facility.

D. Calibrated equipment and qualified personnel must be always accessible during the construction of the HMA.

1.6 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Atmospheric conditions for applying courses:

1. Hot mix asphalt shall generally arrive on the project site between 270°-300° F. (per asphalt producer recommendations).
2. Place asphalt concrete wearing course or bituminous surface treatment only when atmospheric temperature is above 50 degrees F. and rising, and when asphalt binder course is thoroughly dry.
3. Place binder course only when air temperature is above 45 degrees F. and rising and when asphalt base course or granular stone base course is thoroughly dry.

C. Grade Control: Establish and maintain required lines and elevations.

D. Codes and Standards: Perform the work in compliance with applicable requirements of governing authorities having jurisdiction. Obtain and pay for permits required by local authorities.

E. Construction Review and Testing: Notify and coordinate with the Independent Testing Agency and Architect when the subgrade is shaped and ready for proof rolling. Also,

when the granular base course is fully installed, compacted and ready for density testing. Protect subgrade and subbase at all times.

F. When staging or scheduling delays occur and wearing course cannot be installed directly after binder course installation before winter, provide temporary asphalt transition ramp/collar around drainage structures in paved areas and at handicap ramps to prevent damage by snow plow. Remove prior to installation of wearing course. Power wash surface and apply asphalt tack coat, as specified, prior to wearing course installation, at no additional cost to the Owner.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver all materials to the job site with all labels intact and legible at time of installation.

B. Store materials off ground under cover. Protect from damage or deterioration.

C. Handle materials to prevent damage to surface, edges, ends and factory applied finishes of items. Damaged material shall be rejected and replaced.

PART 2 - PRODUCTS

2.1 SOIL STABILIZATION FABRIC

A. Shall be a heavy duty, commercially manufactured woven polypropylene geotextile. Standard of quality shall be Mirafi 500X, manufactured by TenCate or Architect approved equal.

2.2 GRANULAR BASE COURSE

A. Shall be as specified in Section 312201.

B. The graded and designed granular base below all new Asphaltic Concrete Pavements shall be constructed, tested, and prepared in accordance with Section 312201 - Site Earthwork of the Contract Documents.

2.3 ASPHALTIC CONCRETE

A.

Pavement Types	Percent Asphalt*
19.0mm Type 3 Binder Course	4.8% Asphalt
9.5mm Type 7 Top Course	6.3% Asphalt

* Percentage of Asphalt is approximate and shall be based off actual project submittals provided by the Asphalt Producer.

B. Hot Mix Asphalt Top Course: Pavement shall meet the minimum requirements for 9.5 mm (Type 7) SUPERPAVE Hot Mix Asphalt Top Course (75 gyrations), with a PG 64-22 Binder as specified in Section 402, of the current NYSDOT Standard Specifications, with the exception that the maximum proportion of Recycled Asphalt Pavement (RAP) to virgin aggregates shall not exceed 20% of the total mix.

Hot Mix Asphalt Top Course for Running Tracks and Track Field Events: Pavement shall meet the minimum requirements for 9.5 mm (Type 7) SUPERPAVE Hot Mix Asphalt Top Course (50 gyrations), with a PG 58-22 or PG 58-28 Binder as specified in Section 402, of the current NYSDOT Standard Specifications. Top Course Pavement shall be considered virgin material and contain 0% RAP. No RAP shall be allowed in surface course asphalt for running track and track field events.

C. Hot Mix Asphalt Binder Course: Pavement shall meet the minimum requirements of 19.0mm SUPERPAVE Hot Mix Asphalt Binder Course (75 gyrations), with a PG 64-22 Binder, as specified in Section 402, of the current NYSDOT Standard Specifications, with the exception that the maximum proportion of Recycled Asphalt Pavement (RAP) to virgin aggregates shall not exceed 20% of the total mix.

D. The coarse aggregate used in HMA shall be sound, angular crushed stone (crushed or rounded gravel is not acceptable). The fine aggregate shall be well graded, moderately sharp to sharp (angular) sands.

2.4 SELF-ADHERING WATERPROOF MEMBRANE

A. Shall be a composite membrane designed specifically to prevent water from permeating joints and cracks. Product shall be comprised of self-adhering rubberized asphalt and durable poly propylene non-woven fabric with a "peel-n-stick" release. Standard of quality shall be 12" Mirafi MTK as manufactured by TenCate or Architect approved equal.

B. Priming material composed of refined asphalt and rapid drying solvent meeting ASTM D41. Polyguard 650 RC Liquid Adhesive or Architect approved.

C. Contractor to provide 1,500 linear feet in Alternate SC-03 and 1,500 linear feet in Alternate SC-04.

2.5 HOT POUR CRACK SEALING AND FILLING

A. Single component, hot applied asphalt crack and joint sealant capable of withstanding temperatures of up to 450° without experiencing polymer degradation.

B. Shall be supplied in solid blocks comprised of heat stabilized polymers and asphalt.

C. Meeting the following material requirements when tested in accordance with ASTM D5329. (see chart below)

Chemical & Physical Analysis

Recommended Application Temperature	350-400°F
Maximum Heating Temperature	450°F
Cone Penetration at 25°C	50 max.
Flow at 60°C, mm	0.
Softening point	200°F Min.
Flexibility 0°F	(1" Mandrel)-Pass
Specific Gravity	1.17
Asphalt Compatibility	Passes

D. Standard or quality shall be Crack Master Supreme as manufactured by Thorworks Industries, Inc., 800-395-7325, www.thorworks.com or approved equal.

PART 3 - EXECUTION

3.1 PREPARE SURFACE

A. Prior to commencement of asphalt paving, all excavations, drainage, utilities, backfilling, fencing, bollards, storm structures, curbing installations, adjustments, proof-rolling and density test procedures shall be complete to the satisfaction of the Architect.

B. Prior to commencement of tack coat and asphalt paving within pavement milled areas, as shown on the plans, all cracks and joints in the milled pavement surface shall be prepared and filled in accordance with the project specifications. Any oil or grease spots shall be scraped and treated to prevent bleeding through the tack coat.

C. Saw cut, using straight and true lines, all existing asphalt pavements to remain in place with straight, neat edge for abutting against proposed asphalt pavement.

D. Provide and confirm field quality control as described in Section 312201 for pavement subgrade and granular base course stone.

3.2 CONSTRUCT PAVEMENT GRANULAR BASE COURSE

A. General: Consists of placing granular base course material, in layers of specified thickness, over prepared subgrade and fabric to support a pavement course.

B. Grade Control: Provide engineering layout per Section 312201 and grade stakes. During construction, protect grade stakes; maintain lines and grades including crown and cross-slope of each course.

C. Install soil stabilization fabric after subgrade has been acceptably compacted and proof rolled. Install soil stabilization fabric as recommended by the manufacturer AND;

1. Lay fabric in direction of construction traffic.

2. Overlap fabric side to side and end to end a minimum of two (2') feet.

3. Establish reasonable compaction and rut stability before using heavy or vibratory compaction equipment.

D. Placing:

1. Place granular base material over soil stabilization fabric, on prepared subgrade in layers of uniform thickness, conforming to the asphalt pavement details on the drawings.

2. Place granular base material in a maximum of six (6) inch layers and compact with a vibratory or 10 ton smooth wheeled roller.

E. Provide density testing as described in Section 312201.

F. Surface Smoothness: Test finished surface for smoothness. Surface will not be acceptable when it deviates more than 3/8" measured by a 10 foot straightedge, in any direction.

G. The finished grade of the granular base course shall be verified to ensure that the final finished product of the bituminous concrete pavement surface will be installed to the lines and grades of the existing pavements and proposed elevations surveyed by the Contractor prior to the start of the paving work.

3.3 PLACE ASPHALT MIX

A. General:

1. The Contractor shall submit a paving plan, indicating intended direction of paving, number of pulls, etc. for approval prior to the start of paving operations.

2. Joints: Saw cut vertical straight, neat edges for joints required. Joints shall be sharp and clean, conforming to shapes drawn on drawings. Ragged joints will not be accepted.

3. Mill two (2') feet into surface of adjacent asphalt so joints do not line up or "stack".

4. Place bituminous tack coat to all surfaces as indicated in this specification. When pavement surface temperature is above or below the 75-130 degrees F. range, the grade of asphalt emulsion must be modified according to NYSDOT standards. Tack coat shall not be applied to a wet surface or when the pavement surface temperature is below 45 degrees F.

5. Place asphalt on approved prepared surface, spread and strike-off.

6. Spread mixture at minimum temperature of 225-240 degrees F. Place inaccessible and small areas by hand. Hand work shall be minimized to ensure the best possible finished surface.

7. Place each course to required grade, cross-section, and compacted thickness.

8. Paving operations shall not be scheduled when ample time does not exist to place, compact, and finish roll the hot mix asphalt during daylight hours and prior to rainfall.

B. Pavement Placing: Shall be installed in accordance with Section 402-“Hot Mix Asphalt (HMA) Pavements”, of the current NYSDOT Standard Specifications.

C. Paving Equipment:

1. Must be capable of placing, spreading and finishing courses of HMA to the specified thickness.

2. HMA shall be free of marks, segregation and be placed to the required uniform elevation with a smooth texture not showing tearing, shoving, or gouging.

3. Auger extensions are required while pavers are extended beyond the basic screed width.

4. Paving equipment shall be self-propelled and capable of maintaining the line and grade shown on the plans with suitable electronic equipment. The screed shall be straight and true with no bow and utilizing a vibratory screed. Paving equipment should have fully functional screed heaters and joint preheaters.

D. Asphaltic Concrete shall be installed as follows:

1. Medium Duty Asphalt Pavement: Installed in two (2) lifts consisting of 19.0mm SUPERPAVE Hot Mix Asphalt Binder Course overlain by 9.5mm SUPERPAVE Hot Mix Asphalt Top Course.

E. Place in strips not less than ten (10') feet wide, unless otherwise acceptable. In placing each succeeding pass after the placement of the initial pass, the screed of the paver shall be set such that it overlaps the preceding pass by 6" and be sufficiently high such that when compacted, a smooth joint is produced. Prior to pinching the joint, the excess material shall be pushed onto the edge of the new pass with a lute. Excess material shall be removed.

F. After first lift has been placed and rolled, place succeeding lifts and extend rolling to overlap previous lifts. Where possible, top course shall be placed at right angles to binder course and in the direction that the drainage flows. Where this is impractical, offset joints of the two courses by a minimum of two (2') feet so upper and lower joints do not align.

G. For pavement placing on the running track and track field events: the paver shall be equipped with and utilize both automatic (laser controlled) grade and slope control to maintain required tolerances. Pavement of running track oval passes shall be continuous. Paving equipment shall be equipped with sonar pods or no contact skis for athletic asphalt construction.

3.4 ROLL ASPHALT MIX

A. General:

1. Rollers shall conform to the manufacturer's specifications for all ballasting. At least one vibratory roller shall be required for each project, with two rollers required as a minimum. (Three rollers shall be required when tonnage is greater than 300 tons/day.)

2. Rollers shall be of a good condition and capable of compacting the HMA to the minimum in-place density required by this specification. Compact asphalt with a nominal 10 ton steel wheel roller or pneumatic rubber tired roller. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

3. Begin rolling when mixture will bear roller weight without obvious or excessive displacement.

B. Finish Rolling: Each lift of the Asphaltic Concrete Pavement shall be mechanically rolled and compacted to the finished thicknesses specified in the Contract Documents. The pavements shall be compacted to a minimum of 94%-97% (95%-102% at longitudinal joints) of the materials theoretical density as determined by AASHTO Method T 209 and an air void percentage of 5%-6% maximum.

C. Patching: Remove and replace paving areas mixed with foreign materials, dirt, and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

D. Joints:

1. The Contractor shall sequence the installation and orientation of all Asphaltic Concrete Pavements such that the minimum numbers of longitudinal and transverse joints are produced and in accordance with the approved Asphalt Placement Work Plan.

2. Neat, straight butt joints between successive passes. Offset joints a minimum of six (6") inches between lifts of asphalt.

3. When repairs or staging of work occurs, make neat vertical saw cut between old and new work to create butt joint. Heat joint prior to pouring. Cold joints are <u>not</u> acceptable.

4. Apply bituminous tack coat to all surfaces and rates indicated under "Bituminous Tack Coat" of this specification section. Tack coat shall not be required on abutting vertical edges for pavements placed in the same day.

5. Minimize construction, longitudinal, and transverse joints left open for an extended period of time.

6. Construct longitudinal joints by paving in a hot fashion with a temperature of not less than 220°F to ensure maximum performance and adhesion.

7. Compact all joints to provide for a neat, uniform and tightly bonded joint that will meet both surface tolerances and density requirements of this specification.

8. Cut straight and true (vertical construction or transverse joints if the material has cooled to less than 220°F prior to the placement of the next pass to ensure the best performing joint possible.

F. Edges: Roll at 45 degrees as detailed, creating clean edge conforming to shapes indicated on the drawings. Ragged edges will not be accepted. Return and saw cut ragged edges at no additional cost to the Owner as directed by the Architect.

G. The final finished grades of the new Bituminous Concrete Pavements must be smooth and true to the contours and shall be installed to the lines and grades of the site prior to

start of construction. The final finished grades shall match adjacent pavement surfaces and concrete slabs, aprons, and doorways.

H. Construction Delays (over 48 hours): When placement of the wearing course over the binder course is delayed over 48 hours, thoroughly clean existing surface of dirt, oil and other debris by pressure washing and sweeping. Place bituminous tack coat as specified in this section.

3.5 ASPHALT TOLERANCES

A. Thickness and Density: Compact each asphalt course to produce the thickness indicated on the drawings within the following tolerances:

1. Binder Course: Plus or minus 1/4-inch
2. Wearing Course: Plus or minus 1/8-inch

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. For Asphalt Concrete:
   Binder Course Surface: 1/4"
   Wearing Course Surface: 1/8"

C. Topographically Survey: Survey the running track and field events prior to placing the resilient track surface and provide the Architect with a plan indicating elevation shots as follows: Elevation shots shall be a minimum of four (4) at regular equal intervals across the track (from inside to outside of lanes). This shall be continued around the track at 10' o.c. until the entire track is covered. When this survey indicates that surface conditions are not acceptable based on project and governing body tolerances, the Contractor shall be responsible for correcting the rejected areas without delay or additional costs.

D. Asphalt Cores: Shall be provided as indicated under "Field Quality Control" of this specification.

3.6 FIELD QUALITY CONTROL

A. The Owner’s Testing Agency shall provide the following in the daily report at a minimum:

1. Verify the following for the asphalt mix design prior to asphalt placement:

   a. The asphalt mix design has been approved.
   b. The asphalt mix design specifies the minimum relative compaction and the methods required to determine maximum density.

2. Verify the asphalt subgrade has been acceptably proof-rolled. (See Section 312201.)

3. Inspect /test aggregate base course material for in-place density (95%) and thickness. Test materials for gradation classification, and physical properties. (See Section 312201.)

4. Inspect/test asphalt wearing course material for compaction during placement and conduct thickness measurements during lay-down. Take temperature of the asphalt mixture and compare actual temperature with the approved asphalt mixture design range. As a minimum, perform the following inspection/tests:

   a. Collect trip tickets from trucks delivered to the site and verify correct mix design being used for the project.
   b. Temperature tests: one per truck.
   c. Lay down thickness (uncompacted): one per strip or 500 square feet minimum
   d. Verify equipment rolling pattern and passes to ensure proper compaction: one per day
   e. Density test (daily lab density): one test per 5000 square feet minimum
   f. Hot mix samples (laboratory testing for density per ASTM D1188): one per day
   g. Thickness per ASTM D3549 and density samples per ASTM D2950 by a properly calibrated nuclear asphalt testing device. If there is a disagreement between tests done by ASTM D2950 and ASTM D1188, the values done by ASTM D1188 will govern: one test per 20,000 square feet (surface lift), one test per 10,000 square feet (base lift)
   h. Air voids per ASTM D3203 or D2726: one test per 5000 square feet minimum
   i. Verify compaction at the joints and seams. The completed paved surface to be true to grade and cross section. Verify smoothness by using an unleveled 10 foot straightedge and ensuring no gap at any point between straightedge and pavement exceeds surface smoothness requirements above except at interception or at changes of grade.
   j. The screed/lay down thickness tolerance shall be between 1/8 to 3/16 inches greater than the required asphalt minimum layer requirement. When screed depth is set for the exact thickness as specified, immediately notify the Owner's Representative and Contractor that the installed asphalt thickness may be deficient to achieve the specified minimum thickness. Identify areas of non-complying thickness and attach a drawing identifying the areas to the daily field report.
   k. Immediately notify the Owner's Representative and Contractor when paving is being conducted in cold weather and asphalt temperatures are below or above the design mix range.
   l. Check the surface grades and drainage patterns. Identify on a drawing all paved areas that are holding water after asphalt placement and notify the Owner's Representative and Contractor. Small ponding areas (bird baths) larger than two (2') feet in any dimension are not acceptable. When this test proves that surface conditions are not acceptable, the Contractor will be responsible for correcting the problem areas. Install a one (1") inch shim coat of wearing course material, or other means acceptable to the Architect.
   m. Verify tack coat and edge coat have been applied at the proper rate.

5. Asphalt Cores: Shall be as directed by the Architect.

   a. Prior to final acceptance of the asphalt and before lining or other surface materials (resilient track surfacing, etc.) are placed, the Owner's Testing Agency shall core 3" diameter areas of the asphalt surfacing where directed by the Architect. Consistency, density, thickness, and tensile strength per ASTM D6931 will be evaluated.
   b. Patch core areas as directed by the Architect to match adjacent density, texture and thickness.
   c. Coordinate day to day scheduling with the Testing Agency.
   d. If cores vary significantly from the contract requirements, additional cores will be performed by the Testing Agency as directed by the Architect. Once the overall general quality is determined, provide remedial work as directed by the Architect to achieve the quality and consistence as specified.

B. Unacceptable Paving: Remove and replace unacceptable paving as directed by the Architect, immediately and without argument or delay. Correction of deficient areas in the wearing course shall be done by sawcutting and removal of defective area of work. Tack coat shall be applied to all edges and the pavement shall be replaced. Shimming or skin patching of the wearing course shall not be permitted. Correction of deficient areas within the binder course shall be corrected by sawcutting and milling high spots, and truing and leveling low spots or as directed by the Architect.

3.7 SURFACE PROTECTION

A. Protection: After final rolling and sealing, do not permit any type of vehicular or construction traffic on pavement until it has cooled and hardened as recommended by the producer/manufacturer, minimum of 48 hours.

B. Provide protection including, but not limited to, fencing, traffic cones, barrels, lights, reflective signs, flagpersons and barricades until mixture has cooled and attained its maximum degree of hardness.

3.8 SELF-ADHERING WATERPROOF MEMBRANE

A. Surface Protection: Existing pavement surface must be cleaned of all loose dirt and debris and be dry. Cracks wider than 3/8-inch should be filled with suitable crack filler. Severally spalled or other distressed areas must be repaired according to this specification. Note: Commercial crack filler expands under the heat of any overlay and therefore the crack should be filled level or just below the existing pavement surface.

B. Primer: (Surface shall be primed as follows):

1. Primer must be used on all milled surfaces. The liquid adhesive shall be placed on the surface, at a minimum rate of 250 square feet per gallon on milled surfaces.

2. The primer must be completely dry prior to application of the membrane.

3. Primer may be applied using brushes, rollers or by spraying at the prescribed rate of application. Never apply primer to wet or frozen surfaces.

4. Areas primed and not covered with membrane within 24 hours should be re-primed. Smoothness and porosity of existing asphalt surface may affect coverage rate. Do not apply liquid adhesive at heavier rates than recommended,. Excessive material build-up will delay drying and membrane application.

C. Temperature: The surface temperature should be 45 degrees F. and above when installing self-adhering waterproof membrane. Storage temperature should not exceed 125 degrees F.

D. Installation:

1. Center the roll over the joint or crack to be treated with the release paper attached. Allow for a material overrun of 4 to 6 inches beyond each end of the crack to ensure a waterproof seal. Cut the membrane with utility knife. Install the self-adhering membrane by removing release paper.

2. Material should be laid smooth and adhere well to the existing pavement by rolling the membrane with a pickup truck or pneumatic roller. A stiff broom can also be used to aid adhesion.

E. Tack Coat: A standard NYSDOT approved tack coat is applied over the self-adhering membrane and the remaining portion of the surface before placing the hot mix asphalt layer as specified.

3.9 HOT POUR CRACK SEALING AND FILLING

A. The crack must be free from moisture, dust, and loose aggregate. Routing or wire brushing are preferred methods followed by a compressed air heat lance immediately prior to sealing. The substrate and air temperature must be above 45°F.

B. Shall be melted in direct fired or oil jacketed melters. Material should reach recommended pouring temperature of 350-400°F. Fresh material may be added as sealant is used.

C. Apply heated crack filler using either a pump and wand system or a pour pot. For best results the sealant depth to width ratio should not exceed 2 to 1 (i.e. 2-inches deep to 1-inch wide). The cooled sealant height should not exceed 1/8" above surrounding pavement. Using a sealing shoe or squeegee, band the material 2 to 3 inches wide over the crack.

3.10 CLEAN UP

During the contract, and at intervals as directed by the Architect, and as asphalt paving is completed, clear the site of extraneous fabric, gravel, asphalt and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 321201

SECTION 321301 - SITE CONCRETE WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of site concrete work is shown on the drawings and includes formwork, reinforcement, accessories, cast in place concrete, installation of embedded items, finishing, curing, mix designs, testing and acceptance requirements for concrete.

B. Site Concrete work includes, but is not limited to, the following:

1. Concrete pads
2. Concrete long/triple jump pits
3. Concrete footings, bases, and thrust blocks
4. Concrete scheduling April 1 to October 15
5. Clean up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321800 Series – Synthetic Turf

C. Section 323001 - Athletic Field Equipment and Furnishings

D. Section 323101 – Vinyl Clad Chain Link Fence and Gates

E. Section 331101 - Water Distribution

F. Section 334001 - Storm Drainage

1.3 REFERENCES

A. ACI 301-96 - Specifications of Structural Concrete for Buildings

B. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement

C. ASTM C31 - Standard Practice for Making and Curing Test Specimens in the Field

D. ASTM C33 - Concrete Aggregate

E. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

F. ASTM C94 - Ready-Mixed Concrete

G. ASTM C109 - Test Method for Compressive Strength of Hydraulic Cement Mortars

H. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete

I. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)

J. ASTM C150 - Portland Cement

K. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete

L. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method

M. ASTM C260 - Air Entraining Admixtures for Concrete

N. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete

O. ACI 315 - Details and Detailing Concrete Reinforcement

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Manufacturers Product Data (MPD) and Samples where indicated are required for the following:

1. Expansion Joint and Sealant (Vertical and Horizontal): MPD and Color Samples
2. Water Based Curing and Sealing Compound
3. Slip Dowel System
4. Cold Weather Admixture
5. Hot Weather Admixture
6. Air Entrainment
7. Form Release

C. Submit proposed 4,500 psi concrete mix design and test data in accordance with ACI 301 to the Architect for review prior to commencement of the work.

1. Indicate the locations and elements for which the mix will be used.
2. Include in the concrete mix design all required or proposed admixtures necessary to facilitate the installation of the concrete by the means and methods selected by Contractor for this project.

D. Mill test certificates and/or test reports for cement indicating compliance with these specifications.

1.5 QUALITY ASSURANCE

A. Concrete Testing Services: The Owner shall employ an acceptable independent testing laboratory to perform materials evaluation, testing of concrete mixes, and quality control testing. Coordinate day to day scheduling with the testing agency. Field technician shall be ACI Certified Grade 1 Field Technician.

B. Construct and erect concrete formwork in accordance with ACI 301 and 347.

C. Perform concrete reinforcing work in accordance with ACI 301.

D. Perform cast-in-place concrete work in accordance with ACI 301.

E. Conform to New York State Building Code.

F. Field quality control tests are specified in Part 3 - Execution.

1.6 JOB CONDITIONS

A. Job conditions in Section 312201 apply. Provide ample and skilled manpower for concrete installation which is a recognized time sensitive procedure.

B. All concrete work shall conform to American Concrete Institute (ACI) 304R-00 "Guide for Measuring, Mixing, Transporting and Placing Concrete".

C. Do not install concrete work when the temperature of the outside air is below 50 degrees F. and falling unless suitable means acceptable to the Architect are provided to protect work from cold and frost and ensure that mortar and concrete will cure without freezing as indicated in "Cold Weather Concreting" below.

D. Cold Weather Concreting: Provide non-chloride accelerating water reducing admixture in site concrete work placed at ambient air temperatures below 50 degrees F. (10 degrees C.). Comply with International Masonry Industry All-Weather Council cold weather construction and protecting recommendations and American Concrete Institute 306R-10 "Guide to Cold Weather Concreting."

E. Hot Weather: Provide water reducing retarding admixture in site concrete work placed at ambient air temperatures above 80° F. Comply with American Concrete Institute 305R-10 "Guide to Hot Weather Concreting."

F. Construction Review: Notify the Architect/Geotechnical Engineer when stairs, retaining walls, walks, ramps, curbs and pads are formed and ready to receive concrete. Radius form layout shall be inspected and approved by the Architect.

G. Schedule: Unless otherwise directed in writing by the Architect, construct site concrete work from April 1 to October 15. This permits a minimum 30 day dry curing period prior to possible application of deicing chemicals by the Owner.

H. Site concrete work performed between October 16 and March 30 will require an additional written one (1) year guarantee with the understanding that above average concrete deterioration and replacement by the Contractor is likely.

PART 2 - PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES

A. Forms: Either steel or wood, exterior type softwood, PS1, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use forms that are straight and free of distortion and defects, extending the full

depth of concrete. Concrete walks which require radius form work shall be set with flexible forms, conforming to the shapes and dimensions as indicated.

B. Lumber: PS 20.

C. Form Ties: Snap-off, metal type of fixed length, cone type.

1. Ties shall be left in place and equipped with swaged washers or other approved devices to prevent seepage of moisture along the tie.
2. Depth of Breakback: Minimum one (1") inch.
3. Unless otherwise noted, provide form ties, which will not leave holes larger than one (1") inch diameter in concrete surface.

D. Dovetail Anchor Slot: Galvanized steel, form filled, release tape sealed slots; bend tab anchors.

E. Form Release Agent: Shall be non-staining and non-residual. Increte Wall Form Release manufactured by Increte or Architect approved equal.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, plain finish, free of rust and/or oxidation. Reinforcing bars shall be bundled and tagged with grades and suitable identification markings, shall be waterproof, and shall not be removed until steel is placed.

B. Steel Welded Wire Reinforcement ASTM A185, plain type:

1. Flat Sheets
2. Mesh size: 6 x 6 (standard W1.4 x W1.4, heavy duty W2.1 x W2.1)
3. Free of rust and/or oxidation

C. Reinforcement Accessories:

1. Tie Wire: FS QQ- W-461 G, annealed steel, back, 16-gage minimum.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. They shall provide sufficient supports at close enough spacing so that the steel will carry the weight of the workmen and the fresh concrete without deformation from its specified location.

D. Fabricate concrete reinforcing in accordance with ACI 315.

E. Slip Dowels: Shall be a slip dowel system comprised of a round dowel sleeve and corresponding base. Standard of quality: shall be Speed Dowel as distributed by A.H. Harris, (860) 216-9500 or Architect approved equal.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type 1 or Type II, Portland type.

B. Aggregates (ASTM C33):

1. Fine aggregates: clean, sharp, natural sand.
2. Coarse Aggregates: 3/4" maximum size stone meeting the requirements of New York State Department of Transportation Specification 703.02.

C. Water: Clean and not detrimental to concrete.

2.4 ADMIXTURES

A. Calcium Chloride in concrete is prohibited.

B. Air Entrainment Admixture: ASTM C260, Darex AEA ED or Architect approved equal.

C. Water Reducing Admixture: ASTM C494, Type A; not containing more chloride ions than are present in municipal drinking water.

D. High Range Water Reducing Admixture: ASTM C494, Type F or G; not containing more chloride ions than are present in municipal drinking water.

E. Cold Weather Accelerating Admixture: (Ambient temperature below 50°F.) Non-chloride water reducing accelerating admixture, ASTM C494, Type C, PolarSet as manufactured by WR Grace & Co. or Architect approved equal. Mix at rates recommended by the manufacturer. No reduction in compression rating of the concrete is permitted.

F. Hot Weather Water Reducing and Retarding Admixture: (Ambient temperature above 80° F.) Shall be Daratard series admixture, ASTM C494, Type D, as manufactured by WR Grace & Co. or Architect approved equal. Mix at a rate recommended by the manufacturer. No reduction in compression rating of the concrete is permitted.

2.5 RELATED MATERIALS

A. Expansion Joints:

1. For Radius Applications: Expansion joint filler shall be polyethylene closed cell backing with peel off strip, X-Foam as manufactured by W.R. Meadows or Architect approved equal.
2. For Straight Applications: Expansion joint filler shall be fiber expansion joint with peel off snap-cap, as manufactured by W.R. Meadows or Architect approved equal.

B. Caulking for flat slabs shall be one part elastomeric self leveling polyurethane gray sealant Pourthane SL or Architect approved equal. Caulking for vertical surfaces shall be one component elastomeric gun grade polyurethane sealant Pourthane NS, color as selected by the Owner to match wall stain or Architect approved equal.

2.6 COMPOUNDS, HARDENERS, AND SEALERS

A. Water Based, Acrylic, Curing and Sealing Compound: ASTM C309, Type 1, Class A and B, clear or translucent. Standard of quality shall be VOCOMP-20 as manufactured by W.R. Meadows or Architect approved equal.

2.7 CONCRETE MIX

A. Mix and deliver ready-mix concrete in accordance with ASTM C94.

B. Concrete:

1. Compressive Strength (Minimum at 28 days): 4,500 psi
2. Slump (Maximum): 2 to 4 inches
3. Air Entrainment: 5-8.5%
4. Flexural Strength (ASTM C78): 650 psi at 28 days.

C. Use water-reducing admixture in all concrete.

D. Water/Cement Ratio: Maximum 0.42 for 4,500 psi concrete.

E. Cement Factor Per Cubic yard: Minimum 560 lbs. for 4,500 psi concrete.

1. Substitution of fly ash for cement is prohibited.

F. Maximum Size of Coarse Aggregate:

1. General Work: Per ACI 301, 3/4" maximum.

G. Select admixture proportions for normal weight concrete in accordance with ACI 301.

H. Add air-entraining agent to concrete mix for all concrete work exposed to exterior.

2.8 MIXING WATER CONTROL

A. The quantity of mixing water used in the concrete mix shall be determined by the Contractor, except that the Architect/Geotechnical Engineer may direct that such quantity of water be reduced if the slump of the concrete exceeds the specified slump. The Contractor's determination of the quantity of mixing water shall conform to the various limits on water/cement ration and slump specified. Concrete consistency shall be uniform from batch to batch.

B. During the course of the work, the batch plant will make quantitative measured moisture determinations of the aggregates utilized in each batch. Aggregate weights and batch water requirements shall be adjusted accordingly for measured aggregate moisture content.

C. When concrete is transported in units approved for mixing, the addition of not more than 10% of the total design water will be permitted at the job site to obtain initial slump.

1. Any addition of water shall be followed by mixing of at least 30 revolutions in the mixing speed range.
2. No more than two additions of water at the point of deposition before discharge shall be allowed.
3. No retempering of the concrete will be permitted. Retempering is defined as the addition of water after the mix has attained its desired initial slump.

PART 3 - EXECUTION

3.1 CONCRETE PADS

A. Surface Preparation: Remove loose material from the compacted subgrade surface immediately before placing concrete. Remove any standing water, mud, debris, frost, snow, ice from surfaces upon or against which concrete is to be placed.

B. Proof-roll prepared subgrade surface to check for unstable areas and the need for additional compaction. Do not begin concrete pour until such conditions have been corrected, subgrade is compacted to 95% and ready to receive concrete.

C. Form Construction: Construct to required size and shape. Brace and secure to maintain alignment, elevation and position. Check completed formwork for grade and alignment, prior to installing concrete. Clean forms as needed to removed foreign matter.

D. Install welded wire mesh on concrete brick or mesh chairs to proper level in maximum lengths possible. Offset end laps in both directions. Splice laps with tie wire. Lifting mesh after concrete pouring is not acceptable.

E. Prepare concrete mixture including the following:

1. Add hot weather or cold weather admixture to accommodate field weather conditions.

F. Concrete Testing: Will be performed as described in Part 3, "Field Quality Control" of this specification section.

G. Conveying:

1. Convey concrete by means that will prevent segregation and loss of mortar form the mix.
2. Provide adequate manpower and equipment in the form of buckets, buggies, chutes, conveyors or other approved means to assure continuous operation.
3. Convey concrete so that no equipment with aluminum parts comes in contact with fresh concrete.

H. Concrete Placement: Do not place concrete until subgrade and forms have been checked for line and grade. Moisten granular base course as required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they have been brought to the required finish grade, alignment, and expansion joints have been installed.

I. Spread concrete as soon as it is deposited on the granular base course, using methods which prevent segregation of the mix, and with as little rehandling as possible. Consolidate concrete along the face of forms. Consolidate with care to prevent dislocation of mesh, reinforcing and joint materials.

J. Install Concrete Walk Joints:

1. Construct expansion and contraction joints as detailed and as shown on plans. Concrete joints that do not follow the pattern(s) shown on the plans and/or changes that have been approved by the Architect will be removed and replaced at no additional cost to the Owner.
2. When the walkway is abutting existing walks, place transverse joints to align with previously placed joints, unless otherwise shown.
3. Contraction Joints: Approximately 5' on center. Break walk into individual slabs of not more than twenty-five (25 sf) square feet with jointing tool, round edges. Saw cut scoring pattern (contraction joints) to depth shown on details for each type of concrete work with new, sharp concrete sawblade one day (24 hours) after the pour. Joint cuts to be clean, sharp, uniformly made cuts to achieve scoring pattern as shown and detailed. Note: When tooled joints or saw cutting is not performed as described, an extended three (3 yr.) year written guarantee or credit for defective work will be required as determined by the Architect at no additional cost to the Owner.
4. Expansion Joints: Provide where abutting building(s), columns, structures, concrete paving and curbs, catch basins, manholes, inlets, walks, walls, other fixed objects and as directed by the Architect.
5. Locate expansion joints at thirty feet on center (30' o.c.) for each walkway lane, unless otherwise shown. Provide slip dowels as detailed and specified.
6. Locate expansion joints with slip dowels at all flush building access points, whether specifically shown on drawings or not.
7. Extend joint fillers full width and depth of the joint, flush with finished pavement grade, and not less than 1/4" or more than 1/2" below the finished pavement surface. Joint surfaces shall be clean and dry prior to installation of sealant as per manufacturer's recommendations. Remove excess sealant on surfaces adjacent to joint.

K. Concrete Finishing:

1. Perform concrete finishing using machine or hand methods as required.
2. After striking off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
3. After floating, test surface for trueness with a ten (10') foot straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous, smooth finish.
4. Work edges of slabs and joints with a 1/8" radius edging tool, two (2") wide, unless otherwise shown.
5. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows.
6. Broom finish, by drawing a medium hair broom across the concrete surface as detailed. Repeat operation when required to provide a medium texture acceptable to the Architect.
7. For handicap curb ramps, tool grooves along sloping surfaces in line with drainage flow as detailed.
8. Curing: Refer to schedule noted in 1.6, above.

    a. Immediately after placement, protect concrete form premature drying.

b. Remove all dirt, dust, oil, grease, asphalt and foreign matter. Cleanse with caustics and detergents as required. Rinse thoroughly and allow to dry.
c. Stir curing compound thoroughly before using.
d. Apply a continuous, uniform film by solvent-resistant low pressure spray only, short-nap roller or lamb's wool applicator. For best results, use a canister curing compound sprayer. Use spray tip number 8004 or equivalent for water-based or waterborne products.
e. For curing, apply first coat evenly and uniformly as soon as possible after final finishing. Apply second coat when all construction is completed and structure is ready for occupancy.
f. When soil contamination occurs, notify the Architect immediately in writing. Remove contaminated soils and legally dispose of, provide soil test(s), replace soil, plantings and lawns at no additional cost to the Owner.

3.2 FOOTINGS, BASES, AND THRUST BLOCKS

A. Footings, Bases: Locate and provide where shown on drawings and as detailed.

B. Thrust Blocks: Locate and provide where shown on drawings. Also for sanitary force main and water pipes at (1) connections to existing systems, (2) at changes in horizontal alignment of 22-1/2 degrees or more, and (3) at tees, crosses, valves, hydrants and plug (end of pipe) conditions. Block and anchor with concrete so that there will be no movement of the pipe in the joints due to internal or external pressures. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6" below the fittings of pipe, to 12" above the fittings. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be recaulked or tightened if necessary. Concrete thrust blocks shall conform dimensionally to details shown on drawings.

3.3 INTERRUPTION OF CONCRETING

A. Should placing concrete be suspended or unavoidably interrupted, provide key ways and bulkheads to prevent feather-edging when work is resumed. Roughen horizontal surface for bond.

3.4 REPAIR AND PROTECTION FOR CONCRETE WORK

A. Cut out and replace defective concrete work which has blisters, cracking, crazing, curling, discoloration, dusting, efflorescence, low spots, pop outs, scaling or mortar flaking, spalling, settling, or heaving as defined by Portland Cement Association 2001, "Concrete Slab Surface Defects" and as directed by the Architect.

B. Modify or replace concrete not conforming to the required lines, details, elevations and specifications as directed by the Architect.

C. Protect the work from damage until acceptance of the work. Exclude traffic from concrete work for at least fourteen (14) days after placement. When construction traffic is permitted, maintain concrete as clean as possible by removing surface stains and spillage of materials as they occur.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed by ACI certified technicians; Grade 1. Certificates shall be submitted to the Architect for persons performing inspection and testing prior to the start of work.

B. Field Inspection and testing shall be paid for as directed under 1.5 "Quality Assurance". Where retesting, additional inspection, lab tests or other professional services are required due to rejected work, any cost associated therewith will be solely at the Contractor's expense.

C. The Contractor shall plan his operations to allow adequate time for all required testing and inspection.

D. The Contractor shall provide facilities and equipment necessary to obtain and handle representative sample of materials to be tested.

E. The testing laboratory shall be responsible to the Owner for the field control of all concrete and may reject batches because of high slump, uncontrolled air entrainment, delays or other conditions of non-compliance with these specifications.

F. Sampling and Field testing will be performed during concrete placement per ASTM C31, C39, C143, C172 and C173.

G. Five (5) Concrete Test Cylinders: Taken for every 30 or less cubic yards of concrete placed are required or a fraction thereof;

1. Two (2) Cylinders will be tested at 7 days, two (2) cylinders will be tested at 28 days and one (1) cylinder will be held for possible testing at a later time.

H. One (1) Additional Test Cylinder: Taken during cold weather concreting, to be cured on the job site under the same conditions as placed concrete it represents, is required.

I. Air Content Test: Taken for each set of test cylinders taken, is required.

J. One (1) Slump Test: Taken for each set of test cylinders taken is required.

K. Test results will be reported by telephone to the General Contractor and Architect on same day tests are made. Written report with copies will follow to the Owner, Architect, and Landscape Architect. Email copies of laboratory test, evaluation reports for concrete materials and mix designs will be submitted.

3.6 CLEAN UP

During the contract and at intervals as directed by the Architect and as concrete work is completed, clear the site of gravel, concrete, appurtenances and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 321301

SECTION 321801 – SYNTHETIC TURF

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of synthetic turf work is shown on the drawings and listed in the alternate descriptions.

B. Synthetic turf work includes, but is not limited to, the following:

1. Drainage blanket surface inspection and approval
2. 2 ½" pile height, dual blended, U.V. resistant polyethylene slit film and ridged monofilament fiber turf stitched into a primary and secondary backing.
3. Tufted-in game lines and perimeter lines. Remaining required game markings and logos shall be permanently inlaid as specified.
4. Resilient three (3) layer infill system, consisting of a mixture of rubber granules and silica sand.
5. Maintenance manual and onsite maintenance training
6. G-max testing prior to Owner use of facility
7. Twelve (12) year manufacturer's warranty
8. Revisiting site for future G-max testing and infill adjustments
9. Turf Use Sign
10. Clean up

C. Provide all labor, materials, tools and equipment necessary to install synthetic grass system as indicated on the plans and as specified.

D. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instructions and in accordance with all approved shop drawings and submittals. The final product shall be a well-draining, even playing surface free of distortion, inconsistent infill levels, and other imperfections.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 323001 - Athletic Equipment and Furnishings

C. Section 334001 - Storm Drainage

1.3 REFERENCES

A. FM P7825 - Approved Guide; Factory Mutual Research Corporation: current edition

B. ASTM Standard Test Methods:

D1577 - Standard Test Method for Linear Density of Textile Fiber
D5848 - Standard Test Method for Mass per Unit Area of Pile Yarn Floor Covering
D418 - Standard Test Method for Testing Pile Yarn Floor Covering Construction

D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
D2256 - Standard Method of Test for Tensile Properties of Yarns by Single Strand Method
D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf playing Surfaces
D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
F355A - Standard Test Method for Shock-Absorbing Properties of Play Surfaces
F355E - Standard Test Method for Standard Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sport Systems, and Materials Used for Athletics, Recreation and Play
F1936 - Standard Test Method of Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
F1551 - Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials
F2765 - Standard Specification for Total Lead Content in Synthetic Turf Fibers
D5603- Standard Classification for Rubber Compounding Materials-Recycled Vulcanizate Particulate Rubber

C. European Standard EN-71-3 - Safety of Toys Part 3: Migration of Certain Elements.

D. National Federation of State High School Associations (NFHS) Rules and Interpretations, latest edition.

E. Synthetic Turf Council (STC): Suggested Guidelines for the Essential Elements of Synthetic Turf Systems, latest edition and Guidelines for Crumb Rubber Used in Synthetic Turf Fields, latest edition.

F. American Sport Builders Association (ASBA): Sports Fields - A Construction and Maintenance Manual, latest edition.

1.4 SUBMITTALS (See Section 311201, 1.5)

A. Prior to the Architect approval of specified synthetic turf system, submit the following within seventy two (72) hours of bid opening, as requested:

1. Submit two (2) 12” x 12” rag samples of proposed synthetic turf carpet and two (2) 12” x 12” boxed turf samples including infill representative of finished synthetic turf system.

2. Certified copies of independent (third-party) laboratory reports on ASTM tests as follows:

a) Specific Gravity, ASTM D792
b) Tuft Bind, ASTM D1335
c) Grab Tear Strength, ASTM D1682 or D5034

d) Pile Height, Face or Pile Weight & Total Fabric Weight, ASTM D418 or D5848
e) Primary & Secondary Backing Weights, ASTM D418 and D5848
f) Flammability (Pill Test), ASTM D2859
g) Water Permeability, ASTM F1551
h) Yarn Breaking Strength, ASTM D2256

3. List of five (5) similar existing (in play) blended slit film/monofilament hybrid installations that have been installed in the Northeast Region of the United States including, Owner representative and telephone number(s).

4. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide a letter showing evidence that their turf system does not violate any other manufacturer's patents, patents allowed or patents pending.

5. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide three (3) copies of a current 3rd party, NON-CANCELABLE warranty insurance policy, supported by an A-Rated domestic insurance carrier, with a policy minimum claim limit of at least $1,000,000. and annual aggregate limit of at least $15,000,000. in order to fully cover the full replacement of the turf system in the event of total failure. Actual policy must be submitted for approval.

6. Letter stating the products expected useful life under normal use conditions defined in the manufacturer's warranty.

7. A letter and specifications sheet certifying that the products in this section meet or exceed specified requirements including certification from the turf manufacturer that lead or lead chromate are not used in the manufacturing of the specified system.

B. Submit the following prior to ordering of materials:

1. Shop Drawings (to scale) indicating:

a) Colored Field Layout and Field Marking plan for the specified NFHS sports.
b) Colored Logo / Lettering Designs and Dimensions.
c) Roll/Seaming Layout
d) Methods of attachment, field openings and perimeter conditions.

2. Material Certificates: Provide material certificates for each material used in the turf system from the turf manufacturer that will be used for this project including, but not limited to, type and composition of fiber(s), primary and secondary backing, and urethane(s).

3. Samples: Submit two (2) 12” x 12” samples of each turf color specified to be used for tufted and inlaid lines / logos. Tufted and Inlaid turf shall match the specified synthetic turf system. Provide two (2) bagged samples each of rubber and sand infill material.

4. Supplier Certification that crumb rubber infill (CRI) being used for the turf system is from only used, whole, vulcanized automobile, SUV, or truck tires and produced in compliance with North American tire manufacturing specifications. Include documentation of compliance with EN-71-3 Standard for Children's Toys as indicated in Part 2, Paragraph 2.1, D. Include documentation of compliance with ASTM D5603-01 as indicated in Paragraph 7.3.2.

5. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide a sample warranty that meet requirements in 1.8 of this section.

6. Submit copies of proposed installation foreman's resume. Installation crew must meet or exceed all requirements outlined in Section 1.8.

C. Provide crumb rubber infill (CRI) order certification noting type and origin of raw material, production facility, production method, fiber content (%), and CRI sieve and gradation analysis. All supersacks shall provide traceability to date of production and origin of processing.

D. No reclaimed infill, sand or rubber, from other synthetic turf field installations are permitted.

E. Prior to Final Acceptance, the Turf Contractor shall submit to the Architect / Owner:

1. Independent G-Max test results and a letter indicating compliance with future G-Max testing as specified in 1.5 of this Section.

2. Three (3) copies of Maintenance Manuals, which will include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system.

3. Recommended Maintenance schedule provided by vendor for first three (3) years after installation.

4. Synthetic Turf Warranty: Submit twelve (12) year fully executed Manufacturer Warranty and ensure that forms have been completed in Owner's name and registered with Manufacturer and Insurance carrier. This includes the Certificate of Insurance from the Insurance Carrier confirming that the third-party insurance policy, non-cancelable and pre-paid is in effect covering this installation and is in force.

F. Turf Use Sign (MPD and Sample)

1.5 QUALITY ASSURANCE

A. Turf Manufacturer Qualifications: Company specializing in manufacturing of products specified in this section. The Turf Contractor and/or the Turf Manufacturer:

1. Must be experienced in the manufacture and installation of this specific type of synthetic infill blended fiber grass system including fibers, backing, backing

coating, adhesives, infills and installation methods at exterior sites over the last three (3) years.

2. Must have a minimum of five (5) exterior fields installed with same slit film/monofilament product specified still in use and fields should be a minimum of 65,000 square feet in size.

B. Turf Installer Qualifications: Company specializing in performing the installation work of this section.

1. The Turf Contractor must have been in business (under its' current name and Ownership) for at least the past five (5) years and must have a minimum of twenty five (25) athletic fields still in use in the United States for a minimum of the last five (5) years.

2. The designated Supervisory Personnel on the project must be factory certified, in writing by the Turf Manufacturer, as competent in the installation of this specified blended slit film/monofilament material, including sewing seams and proper installation of the infill mixture.

3. The Factory Certified Supervisory Personnel shall be on site to certify the turf installation and Warranty compliance.

4. The Turf Contractor must provide competent workmen skilled in this specific type of synthetic grass installation. The installation crew / technicians shall have experience of at least three (3) fields in play with the same monofilament fiber system being used.

C. Prior to the beginning of the synthetic turf installation:

1. The installer of the synthetic turf shall inspect the stone drainage sub-base for tolerance to grade.

2. String line the entire field every five (5') feet to identify high and low spots. Assist the stone drainage blanket installer with correcting any deficiencies in a proper and timely manner.

3. The turf installer will review and confirm Owner provided project test results for stone drainage base compaction, planarity and permeability to be in compliance with project specifications as it relates to the synthetic turf warranty.

4. The turf installer will accept the stone drainage sub-base in writing and supply a "Certificate of Base Acceptance" for the Architects approval before turf installation can begin.

D. Shock Attenuation Evaluation (G-Max Testing):

1. Near the completion of the turf, hire a third party, independent testing agency to perform ten (10) in place G max tests in compliance with ASTM F1936 and F355A, in locations as directed by the Architect. If any test results exceeds **125**,

modify the infill material ratios as necessary to achieve satisfactory results. Perform additional testing to verify the results as directed by the Architect.

2. Guarantee / Warranty: During the twelve (12) year guarantee period, the G max rating shall remain less than **165**. Hire a third party, independent testing agency to perform ten (10) in place G max tests, in locations as directed by the Owner, during the first, third, fifth, seventh, ninth and eleventh years. If any test results meet or exceed **165**, modify the infill material ratios as necessary to achieve satisfactory results. Perform additional testing to verify the results as directed by the Owner. If the G max rating exceeds **165** after three (3) attempts to repair the high rating, the Turf Contractor and Turf Manufacturer shall fully replace the synthetic turf field within ninety (90) calendar days at no cost to the Owner.

E. Materials Quality:

1. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields used for full contact football. The materials as hereinafter specified, should be able to withstand full climatic exposure in the specific location of the field, be resistant to insect infestation, rot, fungus and mildew; it shall also withstand ultra-violet light and heat degradation, and shall have the basic non clogging characteristic of vertical flow through drainage allowing free movement of surface run-off vertically through the turf where such water may flow through the stone blanket and into the field perimeter drainage system.

2. The adhesive bonding and sewn seams of all system components shall provide a permanent, tight, secure, and hazard free athletic playing surface. All inlaid lines / markings / logos and sewn seams shall remain in place throughout the duration of the warranty period.

3. The installed synthetic turf system (turf and infill), for the life of the product, shall drain through a rate of not less than 20 inches +/- per hour.

4. Crumb Rubber Infill:

   a. Shall not contain more than 0.01% by weight liberated fiber in accordance with the Synthetic Turf Council.
   b. Shall not contain more that 0.1% by weight within a 100-gram sample of metal content in accordance with ASTM D5603-01.
   c. Provide testing of every one (1) supersacks of CRI for iron content per load (or 44 bags), in accordance with ASTM D5603-01, 7.3.2. This would average 5 bags per field.
   d. Crumb rubber infill material that does not meet the standards for ASTM D5603-01 and EN-71-3 shall be removed and replaced at no additional cost to the Owner.

5. Material that does not meet the standards shall be removed and replaced at no additional cost to the Owner.

6. Recycled crumb rubber infill (CRI) from other synthetic turf fields is NOT acceptable for use at this site.

1.6 PRE-INSTALLATION MEETING

A. Convene One (1) Week after receipt of Submittals identified in 1.4, A. above;

1. An interview shall take place at a time and date to be determined by the Architect at the District Office of Maine-Endwell CSD. Present at this meeting shall be the Architect, Landscape Architect, Owner's Representative(s), the Project Manager and Site Superintendent for the Prime Contractor and the Project Manager and Project Foreman for the Turf Installer. The purpose of this meeting will be to review turf product and installation means and methods, to interview and ascertain the experience and competence of the Turf Installer, as well as, the onsite Project Foreman for this project and to review the project schedule. The basis of choosing this particular product shall be in part due to the results of this interview process. Contractor shall submit all required submittals before this meeting as described in 1.4, A. above.

B. Convene Two (2) Weeks Prior to Stone Drainage Blanket Completion:

1. A second meeting shall take place at a time and date to be determined by the Architect at the District Office of Maine Endwell CSD. Present at this meeting shall be the Architect, Landscape Architect, Owner's Representative(s), and the Project Manager for the Prime Contractor. The purpose of this meeting shall be to review and confirm schedule. (with particular attention on the turf installation) and to confirm that the turf product has been ordered by way of notarized copies of the original confirmed Purchase Order and guaranteed delivery date.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in wrapped, neat, secure condition. Provide means to unload products from delivery trucks.

B. Store products under cover and elevated above grade. Turf and turf material left on bare ground is not acceptable to be used, and may be rejected by the Architect.

C. Protect all products and installation area from vandalism, theft, other construction, premature use, etc. until Owner acceptance and Architect sign off.

1.8 WARRANTY

A. The warranty coverage shall not be prorated nor place limits on the amount of the field's annual usage.

B. The Turf Contractor and/ or Turf Manufacturer shall provide a twelve (12) year Warranty and supported by a prepaid third party insured eight (8) year warranty, from an A-rated domestic insurance carrier, which warrants the usability and playability of the artificial turf system for its intended uses. Letters of credit are not acceptable.

C. The Turf Contractor and/or Turf Manufacturer must verify that their onsite representative has inspected the installation and that the work conforms to the Turf Manufacturer's requirements.

D. The Warranty shall support that all designs, game markings, and layouts conform to all currently applicable National Federation State High School Association or NCAA rules and regulations, or league specific requirements, depending on application.

E. The Warranty must have the following minimum characteristics:

a. Provide full coverage for a minimum of twelve (12) years from the date of Substantial Completion.

b. The turf fabric shall not lose more than an average 2% per year and not be limited to the amount of annual usage.

c. Shall guarantee the availability of replacement material for the synthetic turf system installed for the life of the warranty, including items that are no longer serviceable to maintain a serviceable and playable surface.

d. The warranty shall be all encompassing of the turf system including, but not limited to, the fibers, backing, adhesives, infill, tape and logos.

e. The Warranty shall include general wear including lacrosse goal crease(s) and damage caused from UV degradation.

f. The Warranty shall specifically exclude vandalism, and acts of God beyond the control of the Owner or the manufacturer.

g. Covers defects in the installation and workmanship, and further warrant that the installation was done in accordance with both the Manufactures' recommendations and any written directives of the Manufacturer's onsite representative.

h. Shall NOT be limited to just the repair or replacement of affected areas. Shall include all necessary materials, labor, transportation, removals, and disposal costs to complete repairs or replacement.

i. The synthetic grass turf must maintain an ASTM F355A and ASTM F1936 G-max of between 125 and 165 for the life of the Warranty. Refer to 1.5, D. of this section.

j. The synthetic grass turf must maintain an ASTM F355E of between 700 and 1000 for the life of the Warranty. Refer to 1.5. of this section.

k. Any repairs or service to the field requested by the Owner or the Owner's representative shall be addressed within seven (7) days from the date of written notification.

1.9 MAINTENANCE SERVICE

A. The Turf Contractor will train the Owner's facility maintenance staff in the use of the specified maintenance attachments and equipment to routinely groom, sweep and plow the field.

B. The Turf Contractor will provide the Owner's facility maintenance staff with a recommended maintenance schedule specific for the intended level of use, etc.

1.10 SUBSTITUTIONS

A. If a product is being submitted as a substitution to the specified product; then the Prime Contractor shall submit and request a product material substitution with his/her bid. The Prime Contractor shall at a minimum provide the following for review by the Architect and Owner:

1. All submittals as specified herein
2. Product comparison
3. Cost Information (including proposal of change in Contract Sum)
4. Contractor's certification that proposed substitution complies with requirements in the Contract Documents
5. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

PART 2 - PRODUCTS

2.1 SYNTHETIC TURF SYSTEM

A. The installed synthetic turf system shall have the following physical properties:

Property	Specification	ASTM
Product Weight:	63 oz/sy (+/- 2 oz)	D418/D5848
Pile Yarn Weight:	42 oz/sy	D418/D5848
Fiber Denier	10,800 (mono); 5,000 (slit)	D1577
Yarn Thickness:	235 microns (mono); 100 microns (slit)	D3218
Pile Height:	2 ½" nominal	D418/D5848
Avg. Tuft Bind:	9+ lbs. (with infill)	D1335
Primary Backing:	7 oz/sy	D418/D5848
Secondary Backing:	16 oz/sy (urethane)	D418/D5848
Avg. Grab Tear (length)	>200 lbs./force	D5034
Avg. Grab Tear (width)	>300 lbs./force	D5034
Abrasiveness Index	<25	F1015
Permeability	>40 inches/hour	DIN 18-035-6
Pill Flammability	Pass	D2859
G Max (Impact)	< 125 at install, < 165 over life of field	F355A / F1936
Tufting Gauge	3/4"	
Stitch Rate	4 stitches per 1"	
Field Color	Field Turf Green, Summer Green	
Roll Width / Length	15'wide and up to 220' long	
Infill	3 lbs/sf cryogenic ground rubber / 6.2 lbs/sf sand	
Drainage	porous non-woven fabric backing	

B. Turf Carpet: shall consist of 100% polyethylene U.V. stabilized slit film fiber (Classic HD) and monofilament fiber (Revolution) extruded by spinneret and tufted into a primary

backing (double layered polypropylene fabric treated with U.V. inhibitors) with a secondary backing with an application consisting of a minimum of 16 ounces of heat activated urethane per square yard to permanently lock the fiber tufts in place (Sure Lock Coating System).

1. The Carpet shall be furnished in 15' wide rolls with four (4") inch white, football 5-yard lines tufted into each roll, when applicable. The perimeter white line shall also be tufted into the individual sideline rolls, when applicable. The rolls shall be of sufficient length to go from sideline to sidle line without splicing. Head seams, between the sidelines, will not be acceptable. All seams will be sewn (glued seams are NOT acceptable) and thread for sewing shall be as recommended by the Turf Manufacturer.

2. The fiber shall be low friction, UV-resistant fiber measuring not less than 2 ½" high. The same fiber from the above listed projects (Section 1.4, B.) must be used on this project.

3. All colored inlaid lines, sport markings, numbers, and logos shall be made of the same exact monofilament fiber material as specified for the field carpet and shall be cut in and glued or "inlaid" as recommended by the Turf Manufacturer.

C. Field Markings: All markings to be installed in accordance with the Owner / Architect approved shop drawings, NFHS, and ASBA standards.

1. Tufted Lines: field lines to be tufted into the turf:

   a. Football: Color shall be white.
      1) Side lines
      2) End lines
      3) 5-yd lines
      4) Goal lines

2. Inlaid Lines: field lines to be inlaid into the turf:

   a. Football: Color shall be white, except where noted.
      1) 10-yd numbers and arrows
      2) 1-yd hash markings
      3) Inbound hash markings
      4) Extra point lines
      5) Kick off markings
      6) Limit lines and Coaches Box

   b. Soccer: All lines shall be inlaid yellow.
   c. Men's Lacrosse: All lines shall be inlaid black.
   d. Women's Lacrosse: All lines shall be inlaid red.
   e. Field Hockey: All lines shall be inlaid orange.
   f. Logos, Text, and Graphics: will be inlaid according to color and artwork, submitted by the Owner / Architect to the Turf Contractor.

D. Resilient infill three (3) layer system: The resilient infill materials shall be approved by the Manufacturer. The infill shall consist of a resilient layered granular system of approximately 3 lbs. per square foot of cryogenically hammer-milled SBR crumb rubber and 6.2 lbs. per square foot of selected and graded dust free silica sand engineered to provide the look, feel, footing, and shock absorption of a natural grass field in ideal conditions.

1. Cryogenically ground SBR Crumb Rubber: Granules shall contain minimal dust or contaminants and shall be derived from the cryogenically hammer milled processing form of recycled tires. Color shall be substantially black and shall meet the 10 – 20, 8 – 16 or 8 – 14 mesh size designation.

   a. The clean, uniformly sized particles shall be consistent in shape and particle size distribution.

   b. The particles shall resist abrasion in high traffic and excessive wear applications and provide stability to artificial sports turf applications.

   c. The particles shall be processed and sized under rigid specifications and Manufacturers' statistical and quality control assurance program.

   d. Particles shall be structurally pure and consistently uniform in size distribution for predictable performance.

2. SBR Crumb Rubber Certification: The Turf Contractor / Turf Manufacturer shall provide in writing that they maintain an ongoing Quality Control program meeting all the standards of the STC Guidelines for CRI Used in Synthetic Turf Fields and capable of meeting all specifications described herein.

   a. Turf Contractor shall supply the Architect with a copy of the Crumb Rubber Infill (CRI) Shipment / Order Certification that includes, type and origin of raw material (certify that it comes from tires), production facility, production method, fiber content (%), and (CRI) sieve / gradation analysis.

   b. The SBR rubber infill provided for this project shall comply with the Synthetic Turf Council's recommended testing guidelines for infill based on the EN 71-3 standard for children's toys or come from a source that maintains an active Environmental Labs (UL) Environmental Claim Validation Summary showing that the rubber produced actively meets the EN 71 standard and CPSIA standard for lead. Provide written document stipulating the above.

3. Sand Particulate: The sand provided as a component of the infill mixture shall be rounded so as to minimize abrasion to the athlete and synthetic grass fibers. Supplied from either Unimin or US Silica or Architect approved equal.

E. Inlaying Materials:

1. Adhesive for inlaying lines and markings shall be a two-component fast set urethane adhesive obtained from a single manufacturer and be equivalent to

Ultrabond Turf PU 2K as manufactured by Mapei Corporation (800)-992-6273, or one-part moisture-cured polyurethane obtained from a single manufacturer and be equivalent to 34-G as manufactured by Synthetic Surfaces, Inc. (908)-233-6803 or Architect approved equal.

2. Seaming Tape: Tape for securing inlaid lines shall be high quality tape made with a minimum roll width of twelve inches (12").

F. Alternating Field Panels: Field color shall be dual color alternating panels with monofilament fibers of field green and summer green. Other marking colors shall be as noted in 3.4.

G. Standard of Quality shall be: **Field Turf Vertex Prime (FTVTP-1)** synthetic turf system as manufactured by:

FieldTurf International, Inc.
Dalton, GA 30721
www.fieldturf.com
Contact: Chris White, (607)-729-8500
Or Architect approved equal.

2.2 TURF USE SIGN

A. Shall be as provided by the turf manufacturer for exterior use and securing to chain link fence. Sign shall clearly denote the major prohibitions on the turf field, including but not limited to, use of sunflower seeds, food, tobacco products, chewing gum, smoking, driving stakes, fireworks, etc.

PART 3 - EXECUTION

3.1 GENERAL

A. The installation shall be performed in full compliance with approved Shop Drawings and Submittals.

B. Only trained technicians, skilled in the installation of outdoor athletic caliber synthetic turf systems working under the direct supervision of the Factory Certified Installation Supervisors, shall undertake any cutting, sewing, gluing, top-dressing or brushing operations.

C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the infill mixture.

D. All designs, markings, layouts, and materials shall conform to all currently applicable NFHS rules and/or other rules or standard that may apply to this type of synthetic grass installation. All designs, markings and layouts must first be approved by the Architect and Owner in the form of an approved shop drawings. All markings will be installed in full compliance with those drawings.

3.2 EXAMINATION

A. Verify that all stone drainage sub-base leveling is complete prior to installation.

B. The surface to receive the synthetic turf shall be inspected by the Turf Contractor, and prior to the beginning of installation, the Turf Installer must accept the sub-base planarity in writing. The surface must be perfectly clean as installation commences and planarity shall be maintained to a surface tolerance that does not exceed 0"-1/4" over 10 feet and 0"-1/4" from design grade throughout the installation process by the Turf Contractor.

3.3 TURF INSTALLATION

A. Install in accordance with Manufacturer's instructions. The Turf Contractor shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted in writing, by the Manufacturer's onsite representative, and submitted to the Architect/Owner, verifying that the changes do not in any way affect the warranty or performance of the system. Infill materials shall be approved by the Manufacturer and installed in accordance with the Manufacturer's standard procedures.

B. The carpet rolls are to be installed directly over the properly prepared stone drainage blanket or resilient pad, if applicable. Rolls shall be laid out flat a minimum of four (4) hours prior to starting seaming procedures and allowed to relax / expand. Extreme care should be taken to avoid disturbing the stone blanket or pad, both in regard to compaction and planarity. Provide a 2-5 ton static roller onsite to repair and properly stabilize any disturbed areas of the stone blanket.

C. The full width rolls shall be laid out across the field. Turf shall be sufficient length to permit full cross-field installation from sideline to sideline. No "head" or cross seams will be allowed in the main playing area between sidelines. Utilizing standard state of the art sewing procedures each roll shall be attached to the next. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing field turf.

D. All seams shall be sewn using double bagger stitches and polyester thread (per the manufacturer's standard sewing procedures). Seams shall be flat, tight and permanent with no separation or fraying, for the life of the carpet.

E. Infill materials shall be applied in numerous thin lifts. The turf shall be brushed as the mixture is applied. The infill material shall be installed to a depth determined by the Manufacturer or 1.75 inches within the fiber matrix. The mix shall be uniform and an even thickness to assure proper playing characteristics.

F. All equipment used for spreading of infill shall be fitted with a magnetic tow bar, so that as CRI is being installed, metallic impurities will be collected. If spreading equipment cannot be fitted with a magnetic tow bar, the contractor shall follow each pass of the spreading machine with a magnetic tow bar equipped on separate equipment to collect metallic impurities as the infill is being installed.

G. The infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical. Specifically formulated rubber and sand infill shall be installed in accordance with manufactures system recommendations.

H. Synthetic turf shall be attached to the perimeter edge detail in accordance with the Manufacturer's standard procedures and as detailed.

I. Inlaid markings that are not tufted into the system shall be cut in and glued in accordance with synthetic turf contractors approved seaming methods for "inlaid" game markings.

J. Prior to field acceptance, the turf shall be groomed by means of a nylon rotary brush to provide the look, feel and safety of optimally maintained natural grass, including subtle undulation normally associated with natural grass athletic fields as reviewed and approved by the Architect. The field shall have a magnetic tow bar run over the final surface one last time prior to the final grooming.

K. The Turf Contractor shall leave the Owner two (2) full spare bags of crumb rubber/sand blend to use in topdressing the fields. Leave in a location as approved by the Owner.

3.4 TURF USE SIGN

A. Shall be installed at each gate entry into the synthetic turf field.

B. Install on chain link fence and anchor securely with vandal resistant hardware.

3.5 CLEAN UP

A. Contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items to the satisfaction of the Architect / Owner.

B. All usable remnants of new material shall be neatly rolled up and turned over to the Owner at a place and area designated by the Owner.

C. During the contract and at intervals as directed by the Architect and as synthetic turf installation is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well draining, neat condition.

D. Surfaces, recesses, enclosures, etc., shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

END OF SECTION 321801

SECTION 321820 - RESILIENT TRACK SURFACE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of resilient track and field event surfacing is shown on the drawings and listed in the alternate descriptions .

B. Resilient track surfacing system work includes, but is not limited to, the following:

1. 400 meter track layout conforming to NFHS planarity standards
2. Medium duty asphalt/milled and topped asphalt pavement inspection and acceptance
3. Resilient track and field event surfacing
4. Line striping, shape and event markings
5. Warranty: Five (5) years.

C. The resilient track surface shall be an encapsulated polyurethane synthetic track surface. The final product shall be a track surface free of distortion, inconsistent textures and other imperfections.

D. The Contractor shall provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications. All quantities and dimensions shall be field verified by the Contractor.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321201 - Asphalt Paving

1.3 REFERENCES

A. Codes and standards follow the current guidelines set forth by the National Federation of State High School Associations (NFHS), National Collegiate Athletic Association (NCAA), American Sports Builders Association (ASBA), International Amateur Athletic Foundation (IAAF), along with the current materials testing guidelines as published by the American Society for Testing and Materials (ASTM).

B. Performance Standards: The new resilient track surfacing system shall exhibit the following minimum performance standards as required by the IAAF:

1.	Thickness:	13 mm (½”)
2.	Force Reduction:	35 to 50%
3.	Vertical Deformation:	0.6 to 2.5mm
4.	Friction:	≥ 0.5(47 TRRL Scale)
5.	Tensile Strength:	≥ 0.5 MPa
6.	Elongation at Break:	≥ 40%
7.	Color:	Hertha Blue

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Standard printed specifications of the resilient track surfacing system to be installed on this project.

B. An affidavit attesting that the resilient track surfacing material to be installed meets the requirements defined by the manufacturers currently published specifications and any modifications outlined in those technical specifications. (Material Certification)

C. A resilient track surfacing system sample, 4" x 6" in size, of the same resilient track surfacing system to be installed on this project.

D. All submittals required in Quality Assurance of this specification, and a list of ten (10) completed facilities within the last two (2) years of the exact resilient track surfacing. The reference list must be under the current contractor name and include the installing supervisor.

E. A current IAAF/World Athletics Certificate test report proving the product to be installed meets the current IAAF/World Athletics Performance Standards for Synthetic Surfaced Athletic Tracks (Outdoor) with the documented certified test results.

F. Line Marking Paint: MPD

G. Shop drawings provided by the Track Computing Statistician (TCS) indicating all event markings, lines, locations, color, governing rules (NFHS) and races to be accommodated. This drawing shall also verify 400 meter dimensions of the track layout prior to the resilient surface installation.

H. Written correspondence from the resilient track surfacing Contractor accepting the planarity of all asphalt receiving track surfacing.

1.5 JOB CONDITIONS

A. All job conditions in Section 321201 apply.

B. The resilient surfacing contractor shall coordinate the work specified with an authorized and appointed representative of the Owner so as to perform the work during a period and in a manner acceptable to the Owner. A manufacturer's representative shall be on site during the surface and marking installation to make "on the spot" recommendations to meet field conditions.

C. Installation shall not take place if adjacent or concurrent construction generates excessive dust, abrasives or any other byproduct that, in the opinion of the resilient track surfacing Contractor, would be harmful to the resilient track surfacing material, until completion of such works.

D. Apply surfacing and markings in a warm, dry atmosphere at ranges as recommended by the manufacturer. Work must be completed prior to October 15 for proper curing. Do not install track surface during or within 12 hours after rainfall or if rain is pending. Protect from freezing and other construction. If, in the opinion of the installer of the resilient track material, the weather and/or climate conditions are detrimental to the proper installation of the surfacing materials, work shall be delayed until conditions are acceptable. Installation shall be executed only in dry conditions.

E. Contractor to provide temporary barriers to prevent entry to construction area and to protect adjacent properties and Owner's site elements from damage during resilient track surfacing installation.

F. Construction Review: Notify the Architect at the following phases:

1. When the 400 meter track is staked out.

2. When the 400 meter track is ready to receive the resilient track surfacing.

3. When the 400 meter track is ready to receive the markings.

1.6 QUALITY ASSURANCE

A. Measurements: Shall be made by an experienced NYS Licensed Land Surveyor who is approved by the Architect and must certify that "all points shown on the 'as built drawing' were accurately measured and properly designated on the track in accordance with current governing rules and accepted tolerances and Owners desires" with license stamp, name, address and date. Submit name(s) for approval.

B. Resilient Track Contractor Qualifications:

1. The Contractors must be an approved installer by the product manufacturer.

2. The Contractor shall be able to furnish evidence that they have been in business for a period of not less than three (3) years, under the present name, and if required, furnish financial statements for each of the past three (3) years.

3. The Contractor must have installed a minimum of ten (10) outdoor track facilities in the last two (2) years using the exact, IAAF/World Athletics certified, resilient track surface, as specified herein by the contractor bidding this project. Provide a reference list with contract names and phone numbers. The Architect will qualify the bidding firm and applier based on phone contact with the above information.

4. The Contractor is required to provide documentation that shows the selected specified and installed product meets current IAAF/World Athletics performance Standards for Synthetic Surfaced Athletics Tracks (Outdoor) and is certified in terms of the IAAF/World Athletics certification system as updated to present day.

C. Manufacturer's Qualifications:

1. The manufacturer must have an IAAF/World Athletics certified track surfacing product meeting the performance standards in this specification, 1.3, B.

2. The manufacture's must be ISO 9001:2015 and ISO 14001:2015 Certified

3. The manufacturer must have a minimum of ten (10) years experience manufacturing polyurethane for resilient track surfaces

D. Calculations: For all dimensions to properly mark the track will be done by an experienced and qualified Track Computing Statistician (TCS) with at least three (3) years proven experience approved by the Architect. Calculations and dimensions shall be guaranteed "to be accurate and correct in accordance with the current governing rules and regulations and the Owners' desires" by the TCS. All dimensions and angles calculated from one of the four PC lines shall appear on an "as built" drawing with name, address and date of the guarantor. Submit name(s) for approval.

E. Event Markings and Lines: Shall be done by experienced qualified person with at least three (3) years proven experience, approved by the Architect, who must guarantee "all markings were made using the designated points, in accordance with current governing rules and Owners' desires", with his name, address and date. Submit name(s) for approval.

1.7 WARRANTY

A. Resilient track surfacing shall be fully guaranteed against faulty workmanship and material failure for a period of ten (10) years from the date of acceptance. The warranty coverage shall not be prorated nor limited by the amount of usage. Track striping and marking shall be warranted for a period of two (2) years. Any defects appearing during these periods shall be promptly corrected within thirty (30) days of written notification at no additional cost to the Owner.

B. Resilient surfacing material found to be defective as a result of faulty workmanship and/or material failure shall be replaced or repaired at no charge, upon written authorization within the warranty period.

C. The warranty excludes damage or defects caused by vandalism, abuse, or acts of God.

PART 2 - PRODUCTS

2.1 ASPHALT PAVEMENT

A. Shall be as described in Section 321201.

B. For NCAA/NFHS certification the following criteria must be followed. The track surface, i.e. asphalt substrate, shall not vary from planned cross slope by more than ± 0.2%, with a maximum lateral slope outside to inside of 1%, and a maximum slope of 0.1% in any running direction. The finish asphalt shall not vary under a 10' straight edge more than 1/8".

2.2 SURFACING

A. Primers: Standard of quality shall be BEYPRIM, a polyurethane based primer specifically formulated to be compatible with the paved-in-place SBR granules and BEYPUR track surfacing material.

B. Black SBR Granules: The rubber granules for the base mat shall be recycled SBR rubber, processed and chopped to 1-3 mm size containing less than 1% dust.

C. Polyurethane Binder: Binder for the black mat shall be BEYPUR, an MDI-based single-component, polyurethane binding agent. The binder shall not have a free TDI monomer level above 0.2% and must be solvent free. The binder must be specially formulated for compatibility with SBR rubber crumb.

D. Seal Coat: Seal coat shall be BEYPUR 200, a two-component thixotropic elastomeric polyurethane specifically formulated for sealing paved rubber granule mats. The material shall be applied by a squeegee to ensure the black mat is sealed. The application of EPDM dust is not allowed.

E. Elastomeric Polyurethane: BEYPUR, the two-component U.V. stabilized elastomeric polyurethane compound from polyol and isocyanate components, based on one hundred percent (100%) Methylene Diphenyl Isocyanate (MDI). No Toluene Diisocyanate Isocyanate (TDI) will be allowed. Color shall be: HERTHA BLUE.

F. EPDM Granulate: The EPDM granulates shall be 0.5-1.5mm in size and shall contain a minimum of 20% EPDM polymer. The EPDM granulates and the U.V. stabilized elastomeric polyurethane shall be color matched.

G. Pigmented Polyurethane Coating: Apply two applications of aliphatic, pigmented waterborne polyurethane coating with a VOC content < 20 g/L. Aliphatic coating shall be color matched to the EPDM granulate. Coverage shall be 7 gallons per 1,000 square feet.

H. Line Marking Paint: All line and event markings shall be applied in one (1) coat by experienced personnel utilizing a single component, moisture cured, aliphatic polyurethane paint compatible with the resilient track surfacing specified.

I. Standard of quality shall be **Beynon BSS 300 Resilient Track Surfacing** as supplied by Crafco Athletic Surfacing/Copeland Coating Company 3600 US-20, Nassau, NY 12123, 518-766-2932 or Architect approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. NYS Licensed Land Surveyor shall verify dimensions shown on plan. After TCS has computed calculations for a 400 meter track (400 meter plus 1/4 inch total length), NYS Licensed Land Surveyor shall stake out track. Submit calculations to the Architect for approval as indicated in this specification.

B. Locate and establish radius points along with all necessary control points using a transit or Theodolite capable of reading direct to 20 degrees.

C. The paving Contractor shall prepare subgrade and place asphalt pavement to create a verifiable 400 meter track meeting NFHS, NCAA, and ASBA current standards.

D. Surface Inspection: Prior to the application of the resilient track surface, inspect the asphaltic base for conformity to planarity requirements as noted in Section 321201. The surface shall not deviate from the specified grade and planarity more than 1/8 inch in ten (10') feet measured in any direction. All areas not in conformance with the above requirements will be removed and replaced by the paving Contractor, with compatible materials as approved by the track manufacturer and allowed to cure prior to application of resilient track surface, at no additional cost to the Owner and no impact to the project schedule.

E. Curing: Before application of the resilient surface can begin, the asphalt and shot blasted / sealed concrete should be cured for at least twenty-eight (28) days. It shall be responsibility of the resilient track surfacing Contractor to determine if the concrete and asphalt have cured sufficiently prior to installing resilient surfacing.

F. Cleaning: The area to be surfaced shall be clean and free of any loose or foreign particles (dirt, oil, etc.) prior to commencement of the work by use of a power blower and/or high pressure washer. Any oil spills (hydraulic, diesel, motor oil, etc.) must be completely removed, either by chipping out or removing and replacing with new, keyed in asphalt. [If resurfacing, Contractor shall remove any vegetation migrating in the existing base or surface shall be removed in a manner to not damage the surface. Edge the entire track surface and field events to remove all sod, grass and potential bond breakers.]

G. Mask out and protect from overspray adjacent areas including, but not limited to, asphalt, fencing, bleachers, vehicles, buildings, synthetic turf, and grass to avoid overspray problems. Contractor is responsible for any costs for cleaning related to any possible overspray.

H. It shall be the responsibility of the Site Contractor to determine if the asphalt surface meets all design specifications, i.e. cross slopes, planarity and specific project criteria. After all the above conditions are met, the resilient track surfacing Contractor must, in writing, accept the planarity of the asphalt receiving track surfacing before work can commence.

I. Any concrete surface to be covered with resilient track surfacing shall be shot blasted and sealed as recommended by the manufacturer.

J. Installation shall not take place if adjacent or concurrent construction generates excessive dust, abrasives or any other by-product that, in the opinion of the installer, would be harmful to the track material, until completion of such works.

K. Apply synthetic track surfacing in dry weather when pavement and atmospheric temperatures are fifty (50) degrees Fahrenheit or above. Maximum temperature cannot exceed 105 degrees at any point during a 24-hour period.

L. Rain cannot be falling. If there is a threat of rain, work shall cease until dry conditions can be re-established on the track pavement. Work is to proceed only when adequate curing can be guaranteed by the manufacturer.

3.2 RESILIENT SURFACE

A. Priming: Install per manufacturer’s recommendations.

B. Base Course: The SBR granules and BEYPUR moisture cured binder shall be mixed together on site to regulate the ratio/quantity of SBR, not to exceed 82% in the base mat portion of the system. The BEYPUR moisture cured binder shall be mixed with the SBR rubber so that a minimum of 18%, by weight, exists in the final mixture. This mixture is then mechanically installed using the paver.

C. Seal Coat: The two BEYPUR 200 components are mixed at the prescribed ratio homogeneously with a suitable mixing device. The coating is squeegee applied to the base mat, making it impermeable.

D. Encapsulated Wear Course: The 0.5 to 1.5mm EPDM granules shall be integrated into the BEYPUR two component polyurethane and spray applied with specialized equipment to achieve the full depth encapsulated texture 5mm wearing course. The resilient textured finish shall be a dense matrix of encapsulated EPDM granules. The homogeneous wearing course shall be applied in situ with the base course.

E. Protective Coating: The first application of the pigmented aliphatic polyurethane coating shall be spray applied over the entire synthetic surfaced area at a rate of 200-250 square feet per gallon. The second application of pigmented aliphatic polyurethane coating shall be spray applied over the initial application at a rate of 200-250 square feet per gallon in the opposite direction.

3.3 EVENT MARKINGS AND LINE STRIPING

A. Line Striping: All line and event markings shall be applied by experienced personnel utilizing polyurethane based paint compatible with the resilient track surfacing. All marking dimensions will be certified in accordance with the specifications issued by the appropriate sanctioning or governing body such as NFHS.

B. Coordinate a meeting with the Architect and Owner's Athletic Director to layout options and events including, but not limited to, governing rules, location of finish line, races to be accommodated, color code, and design of markings/logos/text. Prepare a written list and graphic layout plan of all events and markings agreed to by the Architect and Owner's Athletic Director to distribute to all parties. A preliminary List of Events follows:

TRACK EVENTS

1. 100 meters (both directions on straightaway)
1. 200 meters
2. 55 meter hurdles
3. 100 meter hurdles (both directions on straightaway)
3. 110 meter hurdles (both directions on straightaway)
4. 200 meter hurdles
5. 400 meter run
6. 800 meter run
7. 1500 meter run
8. 1600 meter run
9. 3000 meter run
10. 3200 meter run

11. 4 x 100 meters relay
12. 4 x 200 meters relay
13. 4 x 400 meters relay
14. 4 x 800 meters relay
15. 4 x 1600 meters relay

SPECIAL NOTES

1. Two turn stagger
2. Three turn stagger (4 x 400 meter relay)
3. Four turn stagger (4 x 200 meter relay)
4. California box start - Break line will be at beginning of first straightaway. Use dotted line. (By 1500 meter start)
5. Different colored line between lanes 4 & 5. It should go around track approximately 300 meters and stop at the beginning of the last straightaway. It could start at the beginning of the two-turn stagger.

FIELD EVENTS

1. The long jump marks should be placed at 8 feet and 12 feet from pit. Also, painted line at 4 feet for younger athletes.
2. Triple jump marks should be placed at 20 feet, 24 feet, 28 feet, 32 feet, 36 feet and 40 feet. Mark each starting point.

C. Provide calculations by a TCS. Layout events by a NYS Licensed Land Surveyor with a written letter guarantee verifying accuracy of the markings.

D. Place event lines and markings with proper alignment and dimensions. Protect all adjacent surfaces to remain with tape, drop cloth, or other approved means. Apply at rates as recommended by the manufacturer. Lines shall be sharp and clean with no overspraying along edges.

E. Identify all markings, when appropriate, by painting the identification directly onto the track surface in 4" letters just below or in front of each mark in the right hand portion of the lane. Paint all of the large (3' high) lane numbers (4 sets) in 2 colors (shadowed backgrounds). All lines shall receive sufficient paint to assure complete opacity and uniformity of color. Thin paint only when hot weather dictates some thinning for smooth application is required.

3.4 POLE VAULT, TRIPLE/LONG JUMP, AND HIGH JUMP RUNWAYS

A. Install as described for the track surface.

3.5 FIELD QUALITY CONTROL

A. Prior to final acceptance, core three (3), 3" diameter areas of the track surfacing where directed by the Architect. Consistency and density will be evaluated. Patch core areas as directed by the Architect to match adjacent density and texture.

B. If cores vary significantly from the sample, provide additional cores as directed by the Architect. Once the overall general quality is determined, provide remedial work as

directed by the Architect to achieve the quality as specified. Costs for coring, patching and remedial work shall be paid by this Contractor at no additional cost to the Owner.

3.6 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as track construction is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 321820

SECTION 323001 – ATHLETIC EQUIPMENT AND FURNISHINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of athletic equipment and furnishings is shown on the drawings and as specified in the contract documents.

B. Athletic equipment and furnishings work includes, but is not limited to, the following:

1. Providing, installing, and turning over select athletic equipment and furnishings as noted in the specifications and as detailed.
2. Instruction of Owner's Designated Representative
3. Cleanup

C. Provide all labor, materials, tools and equipment necessary to install athletic equipment and furnishings as indicated on the plans and as specified.

D. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instructions and in accordance with all approved shop drawings and submittals.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 – Site Earthwork

B. Section 321301 – Site Concrete Work

1.3 REFERENCES

A. National Federation of State High School Associations (NFHS)

B. American Sport Builders Association (ASBA)

C. Manufacturers Data and Recommended Installation Requirements

1.4 SUBMITTALS (See Section 311201, 1.5)

A. Provide Manufacturer's Product Data (MPD), Material Certificate and samples as noted:

1. Long/Triple Jump Pit (Pre-fabricated) with Sand Catchers and Covers: MPD. Sample and sieve analysis of granular sand fill. – Alternate SC-01
2. Location Monument (as needed): MPD
3. Communication Boxes: MPD
4. Weighted Track Crossing Mat: MPD
5. Football Goal Post Pads: MPD and shop drawing
6. Stadium Regulations Sign: MPD and shop drawing

1.5 JOB CONDITIONS

A. All job conditions in Specification Section 312201 apply.

1.6 QUALITY ASSURANCE

A. Manufacturer's warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

B. Installer Experience Requirements:

1. Submit business name, business owner(s) name(s), business address, telephone number, website and/or email address signed by the Contractor/Subcontractor who meets the qualifications set forth in this specification and is proposed by the Contractor to perform the installation of the Athletic Equipment and Furnishings.

2. Provide a list of at least five (5) work projects of comparable size, scope and quality completed successfully by the proposed Contractor/Subcontractor within the past three (3) years that includes the date completed, project Owner's name and current contact information, including telephone numbers and email addresses.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in wrapped, neat, secure condition. Provide means to unload products from delivery trucks.

B. Protect all products and installation area from vandalism, theft, other construction, premature use, etc. until Owner acceptance and Architect sign off.

C. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately reordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

1.8 SUBSTITUTIONS

A. If a product is being submitted as a substitution to the specified product; then the Prime Contractor shall submit and request a product material substitution with his/her bid. The Prime Contractor shall at a minimum provide the following for review by the Architect and Owner:

1. All submittals as specified herein
2. Product comparison
3. Cost Information (including proposal of change in Contract Sum)
4. Contractor's certification that proposed substitution complies with requirements in the Contract Documents
5. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

PART 2 - PRODUCTS

2.1 LONG/TRIPLE JUMP PIT WITH SAND CATCHERS & COVERS – ALTERNATE SC-01

A. Prefabricated aluminum long/triple jump sand pit system including sand catcher assembly and aluminum cover set.

B. Components: Long/triple jump sand pit system shall be fabricated of 1/8" thick aluminum, having the following attributes:

1. Base form unit: 6”W (150mm) x 6.56’L (2m) fabricated of 0.125in thick aluminum, gusset reinforced construction, male/female keyed feature, bolt-together design. Six (6) required per pit.

2. Corner base form unit: 6”W (150mm) x 5.66’ (1.72m), x 2.14’ (0.65m) fabricated of 0.125in thick aluminum, gusset reinforced construction, male/female keyed feature, bolt-together design, with prefabricated 90° corner. Four (4) required per pit.

3. Sand catcher unit: 12”D (305mm) x 19.6”W (500mm) x 6.56’L (2m) fabricated of 0.125in thick aluminum, gusset reinforced construction, male/female keyed feature, bolt-together design, integrated 45° cover ledge. Includes 25mm (1.0in) deep, 0.9M (3.0ft) long aluminum mesh grate and black perforated rubber mat. Six (6) required per pit (includes runway insert unit).

4. Corner sand catcher unit: 12”D x 19.6”W x 6.56’L (2m) fabricated of 0.125in thick aluminum, gusset reinforced construction, male/female keyed feature, bolt-together design, integrated 45° cover ledge, with prefabricated 90° corner. Includes 25mm (1.0in) deep, 0.9M (3.0ft) long aluminum mesh grate and black perforated rubber mat. Four (4) required per pit.

5. Aluminum cover set: Reinforced aluminum welded construction fabricated of 0.125in thick aluminum, recessed to accept 13mm (0.5in) track surfacing, two (2) recessed handles per panel, 45° beveled ends conducive with cover ledge. Eight (8) prefabricated cover panels required per pit.

C. Two (2) triple/long jump pits with sand catchers and covers required.

D. Basis of design and standard of quality shall be model SPSCHS JumpForm® and SPCVRHS Pit Cover Assembly Set as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

E. Granular Sand Fill:

1. Specifically selected granular sand fill consisting of grains of closely-sized, washed and dried silica sand. Shall be white, sub-angular in shape to control compaction. Infiltration rate shall be greater than 35 in/hr, and the material shall have a penetrometer value of 1.9-2.2.

2. Shall have the following gradation:

Sieve Size	% by Weight Passing
#10	trace
#18	3.0
#35	11.0
#60	43.0
#140	41.0
#270	1.0
Sand	99.4
Silt	0.3
Clay	0.2

3. Basis of design and standard of quality shall be Tour Grade® 535 Bunker Sand distributed by Fairmount Santrol, 800-255-7263, or Architect approved equal.

2.2 LOCATION MONUMENT (Provide 2 as needed)

A. Shall be galvanized threaded rod, free of rust and straight. Size as shown.

B. Concrete shall be 4,500 psi as specified in Section 321301.

2.3 COMMUNICATION BOXES

For Use in Resilient Track Surfacing (Provide 2):

A. Shall be 18"W x 30"L x 14"H constructed of 3/16” aluminum. Cover is made of 1/8” aluminum (plywood unacceptable) and includes flexible gasket seals. Cover shall be recessed 0.5 inches to accept resilient track surfacing. Shall have two (2) hand holes that are each 7.668” square. Secured with two cover panel locks. Stainless steel leveling bolts and assembly hardware.

B. Basis of design and standard of quality shall be model CBTS1830 ComBox® as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

For Use in Synthetic Turf (Provide 2):

A. Shall be 18"W x 30"L x 14"H constructed of 3/16” aluminum, for synthetic turf installation. Cover is made of 1/8” aluminum (plywood unacceptable) and includes flexible gasket seals to prevent infill migration. Cover shall be recessed to accept synthetic infill turf. Shall have two (2) 10-1/8” diameter hand holes with circular lids; lids to have “turn and lock” feature.

B. Basis of design and standard of quality shall be model CBIT1830 ComBox® as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.4 WEIGHTED TRACK CROSSING MATS - NARROW USE

A. Mat shall be 7’-6”W x 40’L constructed of black non-woven polypropylene geotextile.

B. Shall be reinforced with 19 oz. vinyl wrapped galvanized steel chain around the perimeter for ballast purposes. Color as selected by owner. Provide color chart.

C. Provide two (2) mats.

D. Standard of quality shall be TCM7540 Weighted Track Crossing Mat as manufactured by Sportsfield Specialties, Inc., 888-975-3343 or Architect approved equal.

2.5 WEIGHTED TRACK CROSSING MATS - WIDE USE

A. Mat shall be 15'-0"W x 40'L constructed of black non-woven polypropylene geotextile.

B. Shall be reinforced with 19 oz. vinyl wrapped galvanized steel chain around the perimeter for ballast purposes. Color as selected by owner. Provide color chart.

C. Provide two (2) mats.

D. Standard of quality shall be TCM1540 Weighted Track Crossing Mat as manufactured by Sportsfield Specialties, Inc., 888-975-3343 or Architect approved equal.

2.6 FOOTBALL GOAL POST PADS

A. Fully Encased Vinyl Covering: 19 oz Vinyl - 19 Oz Polyester Scrim Coated Vinyl, Grab Tensile; 450 x 450 lbs./in, Tongue Tear: 84 x 85 Lbs. Vinyl cover is stitched using polyester thread, color: Black. Covering Color: Provide color chart to match School colors.

B. Filler Foam: 18" Outside diameter polyurethane foam core - Density (PCF): 1.3 +/- .05., Indention load deflection: 40 U 48 lbs. at 25% compression, Tear Strength: 1.5-2.5 lbs./inch.

C. Attachment: Center of polyurethane foam core is cutout to fit specific pole diameter (up to 6") - Velcro attachments sewn the entire 6" height of the pad to secure the core.

A. Custom lettering as shown on the drawings. Lettering color shall be selected by owner. Provide color chart.

B. Provide one (1) pair.

E. Standard of quality shall be Model GPPRDG Round as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.7 STADIUM RULES SIGN

A. Sign Plate:

1. Sign Plate shall be aluminum sheets .090" (approximately 3/32") thick, with two coats of Dupont Imron spray semigloss paint.

2. Letters, numbers, symbols, and arrows shall be engineering grade, (EG) reflective. Sign plates, letters and numbers shall meet the colors and regulations

described in the "Manual of Uniform Traffic Control Devices", latest edition, as published by the State of New York Department of Transportation, Division of Traffic and Safety.

3. The following Sign Schedule shall apply:

SIGN WORDING	SIGN NO.	SIZE	LETTER SIZE / COLORS
Stadium Regulations	N/A	Per Detail	Per Detail

4. Hardware shall be galvanized.

5. Standard of quality shall be as manufactured by Eastern Metal/USA-Sign, www.usa-sign.com or Architect approved equal.

PART 3 EXECUTION

3.1 LONG/TRIPLE JUMP PIT WITH SAND CATCHERS & COVERS

A. Install jump pit sand catchers per manufacturer's recommendations.

B. Install settled depth of specified sand.

C. Install pit covers as detailed and per manufacturer's recommendations. Resilient track surface shall be applied to cover recess.

3.2 LOCATION MONUMENT (Provide 2 as needed)

A. Accurately locate monument.

B. Core hole for monument to depth indicated on drawings and fill to elevation indicated on drawings with concrete.

C. Install threaded rod as shown. Position of center of rod shall mark location of monument as dimension on plans. Set rod plumb.

D. Install a temporary wooden stake over monument for field verification of subsurface location monument. Remove wooden stake as directed by the Architect.

3.3 COMMUNICATION BOXES

A. Site Contractor shall install per drawings and manufacturer's recommendations. The Site Contractor shall provide complete excavation, trenching, bedding, conduit, pull strings, backfill and compaction. Wiring will be provided and installed by the Electrical Contractor.

3.4 WEIGHTED TRACK CROSSING MATS - NARROW USE

A. Turn over to Owner as directed by the Architect.

3.5 WEIGHTED TRACK CROSSING MATS - WIDE USE

A. Turn over to Owner as directed by the Architect.

3.6 FOOTBALL GOAL POST PADS

A. Install as shown on the plans and as directed by the manufacturer.

3.7 INSTALL STADIUM RULES SIGNS

A. Install "STADIUM REGULATIONS" signs at each gate entry and as indicated on the plans. Install on fence and anchor securely with vandal resistant hardware.

3.8 INSTRUCTION OF OWNER'S DESIGNATED REPRESENTATIVE

A. After installation and prior to final acceptance of the Project, provide an instruction period for the Owner's designated representative. Instruction shall be sufficient to cover the contents of the equipment operations and maintenance requirements, a walk-through of the project, and a review of all warranties

3.9 CLEAN UP

A. During the contract and at intervals as required by the contract documents and as directed by the Architect and as field event furnishings are installed, clear the site of all extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well-draining, neat condition.

END OF SECTION 323001

SECTION 323101 - VINYL CLAD CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of vinyl clad chain link fence is shown on the drawings and includes, but is not limited to, the following:

1. Stockpile existing chain link fence and reinstalling where shown on drawing.
2. New vinyl clad chain link fence and gates.

B. Provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321201 - Asphalt Paving

C. Section 321301 - Site Concrete Work

1.3 REFERENCES

A. ASTM F552 Standard Terminology Relating to Chain Link Fencing

B. ASTM F567 Standard Practice for Installation of Chain Link Fence

C. ASTM F626 Standard Specification for Fence Fittings

D. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric

E. ASTM F900 Standard Specification for Industrial and Commercial Swing Gates

F. ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials

G. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework

H. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

I. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates.

J. WLG 2445 Chain Link Fence Manufacturers Institute, Chain Link Fence Wind Load Guide for the Selection of Line Posts and Line Post Spacing.

K. Americans with Disabilities Act (ADA) Standards, Adopted by the US Department of Justice 2010, or latest edition.

1.4 SUBMITTALS

A. Provide Qualification Experience requirements as specified in "Quality Assurance" of this section. Provide a list of completed projects including Owner contact information.

B. Manufacturer's Product Data (MPD): Manufacturer's catalog cuts indicating material compliance and specified options.

C. Shop Drawings: For fence, backstops, and gates including plan layout and details illustrating fence heights, location and sizes of posts, finishes, rails, braces, and installation procedures. Provide footing sizes and hardware list.

D. Samples:

1. 4" section of line post with specified vinyl coating.
2. 12" x 12" section of vinyl fence fabric .

E. PVC Fence Cap: MPD and color chart for Owner selection.

F. Provide a copy of manufacturers 15-year warranty.

1.5 JOB CONDITIONS

A. All job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect when fence and gates are staked out.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company having manufacturing facilities in the United States with five (5) years experience specializing in manufacturing of chain link fence products.

B. Fence Contractor: Contractor having five (5) years experience installing similar projects in accordance with ASTM F567.

C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.

D. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.

1.7 WARRANTY

A. Provide manufacturer's standard limited warranty that its chain link fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of fifteen (15) years from the date of purchase.

PART 2 - PRODUCTS

2.1 GENERAL

A. Vinyl Chain Link Fence and Gates: Shall conform to Chain Link Fence Manufacturer's Institute specifications. See drawings for sizes of posts and fabric.

B. All posts, rails, fittings, fabric and tension bars shall be vinyl coated galvanized steel, painting of these items will not be acceptable.

C. Color System: All posts, rails, fittings, fabric, hardware, and tension bars shall be black in compliance with ASTM F934.

D. Standard of quality: shall be Color Bond II, Class 2b as manufactured by Merchant Metals, (888) 260-1600 or Architect approved equal.

E. All operable parts of gate shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. No force greater than 5 pounds shall be required to operate.

2.2 CHAIN LINK FABRIC

A. The base metal of chain-link fabric is composed of commercial quality medium high carbon, hot-dipped galvanized steel wire. Core wire tensile strength 75,000 psi.

B. The vinyl coating is securely fused over the galvanized steel wire by the Thermal Fusion process under pressure to 5,000 psi to insure a dense and impervious covering free of voids, having a smooth and lustrous surface appearance. The vinyl coating thickness, 6 mil (0.15 mm) to 10 mil (0.25 mm), zinc coating weight, and wire tensile strength conforms to ASTM F668 Class 2B. The wire shall be vinyl clad before weaving and is free and flexible at all joints. The mesh is measured by the distance between the wires forming parallel sides of the mesh. The height of the fabric, measured from the ends of the knuckles, has a permissible variation of plus or minus one inch.

C. Wire Coating: Only Plasticized Polyvinyl Chloride (PVC) with low temperature (-20 degrees C.) plasticizer, no fillers, extenders or extraneous matter, other than the necessary stabilizers and pigments are used. Colors are stabilized and have a light fastness that withstands a minimum WEATHER-O-METER exposure of 4,000 hours without any deterioration (Test Equipment Operating Light and Water Exposure Apparatus Carbon-Arc Type) ASTM-D 1499. The vinyl covering, in addition, resists attack from prolonged exposure to diluted solutions of most common mineral acids, sea water and diluted solutions of most salts and alkali.

D. Fabric is knuckled at both selvages (top and bottom). Any twisted salvage will be rejected.

Usage	Mesh Size	Break Load of Wire	Thermally Fused -Vinyl Coated Core Wire Gauge
Standard	2" (50 mm)	1290 lbF	9 ga. [0.148" (3.76 mm)]

2.3 STEEL PIPE FRAME WORK

A. Steel pipe Type I: ASTM F1043 Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz/ft² (550 g/m²) on the outside and 1.8 oz/ft² (550 g/m²) on the inside surface. Exterior of pipe to have ASTM F1043 PVC thermally fused color coating, minimum thickness 10 mils (0.254 mm) to 15 mils (0.38 mm). Regular Grade: Minimum steel yield strength of 30,000 psi (205 MPa) [all sizes]

B. Top, Intermediate and Bottom Rails: Top rail is thermally fused vinyl coated galvanized steel pipe in 21 foot lengths jointed by 7" inches long sleeves, vinyl clad, to run continuously along top of fence. Bottom and intermediate rails shall conform to specifications for top rail and are jointed at line posts with vinyl clad boulevard clamps.

C. Line Posts: Line posts are thermally fused vinyl coated galvanized steel pipe. Posts are sufficient length to allow for installation as detailed and are spaced in the line of fence not farther apart than 10 feet.

D. Terminal and Corner Posts: Shall be thermally fused vinyl coated galvanized steel. Each post is of sufficient length to allow for a depth as detailed. Fabric is attached to the terminal post by means of vinyl coated tension bars and held by vinyl coated tension bands. Corner posts are placed at each change in direction or as directed by the Architect. All corner and terminal posts are braced with vinyl-clad galvanized steel minimum 1.66 inch O.D. brace, rail, 10 feet long, with a diagonal 3/8 inch diameter truss rod, and attached to the first adjacent line post.

2.4 FITTINGS

A. All fittings to be PVC thermally fused color coated having a minimum thickness of 0.006” (0.152 mm) per ASTM F626. PVC color to match fabric and framework. Moveable parts, nuts and bolts to be field coated with PVC liquid touch up after installation.

B. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. For top rail, provide line post loop tops to secure top rail.

C. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.

D. Top rail sleeves: 7” (178 mm) PVC coated galvanized steel sleeve per ASTM F626 that allow for expansion and contraction of rail.

E. Wire ties: 9 gauge (0.148”) (3.76 mm) vinyl coated galvanized steel wire for attachment of fabric to line posts and rails. Tie wire PVC coated and in compliance with ASTM F626. Color to match fabric color.

F. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105”) (2.67mm) pressed vinyl coated steel by 3/4” (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16” (7.94 mm) galvanized carriage bolt and nut.

G. Tension (stretcher) vinyl coated galvanized steel bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.

H. Truss rod assembly: PVC coated galvanized steel minimum 5/16" (7.9mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626.

I. Carriage bolts and nuts: Galvanized of commercial quality but not vinyl coated. Provide PVC touchup paint to color coat all nuts and bolts, when fence is completed.

2.5 CHAIN LINK SWING GATES

A. Swing gates: Fabricate chain link swing gates in accordance with ASTM F900. Gate frame to be of welded construction. Weld areas to be protected with zinc-rich paint per ASTM A780 then over coated with liquid PVC to match frame. The gate frame members are to be spaced no greater than 8' 0" (2.44 m) apart horizontally or vertically. Exterior members to be 1.900" (48.3 mm) OD pipe, interior members when required shall be 1.660" (42.2 mm) OD pipe. PVC coated pipe to be [Grade 1 ASTM F1083] per section 2.3. Chain link fabric to match specification of fence system. Fabric to be stretched tightly and secured to vertical outer frame members using tension bar and tension bands spaced 12" (304.8 mm) on center and tied to the horizontal and interior members 12" (304.8 mm) on center using 9 gauge vinyl coated galvanized steel ties per section 2.4.

B. Hinges: Hot dip galvanized powder coated pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180°.

C. Latch: Powder coated galvanized forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.

D. Double gates: Provide powder coated galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide powder coated galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.

E. Keeper to secure open leafs: Provide galvanized gate hold back keeper for each gate leaf over 5' (1524 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position. Verify with Owner and Architect prior to installing.

F. Latch, hinges, moveable parts shall be field coated with liquid PVC.

G. Gate posts: PVC color coated Grade 1 pipe ASTM F108 per section 2.3.

H. Accessibility: Provide HC accessible gates per MPS S14-1 c. and per ANSI A117.1 404.2.6 (gate hardware) and 404.2.9 (gate smooth bottom surface). Provide smooth solid aluminum panel on both sides of the bottom of each chain link fence gate as detailed. Minimum 12" height from bottom of gate, attached securely to bottom of gate with Architect approved fasteners.

2.6 FENCE GUARD/CAP

A. Install at all track perimeter fencing.

B. Shall be premium grade, 3" wide x 4 ½" high, and wall thickness of .10”

C. Constructed of heavy duty, UV resistant polyethylene. Color selected by Owner.

D. 5-Year Limited Warranty.

E. Basis of design and standard of quality shall be Premium Fence Guard as distributed by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.7 CONCRETE FOOTINGS

A. Shall be 4,500 psi as specified in Section 321301, 2.3, 2.4.

PART 3 - EXECUTION

3.1 SITE EXAMINATION AND PREPARATION

A. Ensure property lines and legal boundaries of work are clearly established.

B. Survey of fence location to be provided by Site Contractor.

C. Clearing: The Site Contractor shall clear, grub and remove vegetation/debris for the fence installation area.

D. Verify areas to receive fencing are completed to final grade with finished elevations shown on the drawings.

3.2 CHAIN LINK FRAMEWORK INSTALLATION

A. Install chain link fence system in accordance with ASTM F567, manufacturer's instructions, and Chain Link Fence Manufacture's Institute specifications.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.

C. Space line posts uniformly maximum ten (10’) feet on center.

D. Excavation: Drill holes of diameters and spacings shown, for post footings in firm, undisturbed or compacted soil.

1. Excavate hole depths as detailed when in firm, undisturbed soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

2. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site, as directed.

E. Setting Posts: Remove all loose and foreign materials from sides and bottoms of holes.

1. Center and align posts in holes. Install posts plumb, in neat, straight lines, and with minimal waviness of top railing.

2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

3. Trowel finish tops of footings, and dome surface to direct water away from posts. Extend footings for posts as detailed.

4. Keep exposed concrete surfaces moist for at least 7 days after placement, or cure with curing material, or other acceptable method.

F. Concrete Strength: Allow concrete to attain at least 75% of its minimum 28-day compressive strength, but in no case sooner than 7 days after placement, before rails, tension bands or fabric is installed. Do not stretch and tension fabric and wires, and do not hang gates until the concrete has attained its full design strength.

G. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

H. Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6’ (1829 mm) and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.

I. Top rail: Install in lengths of 21’ (6.400 m). Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.

J. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps. A center rail is required for fabric height 8'-0" and over.

K. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.

L. Fasteners: Peen ends of bolts or score threads to prevent removal of nuts. Paint all exposed surfaces, nicks or scratches, nuts and bolts, with liquid black PVC touch up paint.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on security side or play side for athletic facilities as directed by the Architect, pull fabric taut; thread the tension bar through fabric and attach to terminal posts with tension bands spaced maximum of 15” (381 mm) on center and attach so that

fabric remains in tension after pulling force is released. Install fabric so that it is above finish grade as detailed.

B. Secure fabric using wire ties to line posts at 12" on center and to rails and braces 12" on center. Tie wire shall be secured to the fabric by wrapping it two (2), 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude so as to avoid injury if a pedestrian may come in contact with the fence.

3.4 CHAIN LINK GATE INSTALLATION

A. Swing gates: Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be as shown on drawings and/or as directed by the Owner. Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 12” diameter by 48” deep. Gate leaf holdbacks shall be installed on all double gates and all gate leafs greater than 5’ (1524 mm) in width as directed by the Owner, if required.

3.5 ACCESSORIES

A. Fence Cap: Install as directed by the manufacturer.

3.6 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as chain link fence, backstop and gate installation is completed, clear the site of all extraneous concrete, gravel, fence material or debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323101

SECTION 329201 - SEEDED LAWNS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the lawn work is shown on the drawings. The lawn work limits equal the Contract Limit Line except as noted on the drawings. Non-paved, non-roofed areas within the Contract Limit Line shall receive four (4") inches settled depth of topsoil and lawn seed. Existing lawn areas that are not disturbed require no additional work. Lawn types as shown on the drawings are defined as follows: strip and stockpile 4" topsoil, remove debris, replace 4" topsoil, seed, and mulch.

B. Lawn work includes, but is not limited to, the following:

1. Placing and spreading stockpiled topsoil
2. Importing, placing and spreading topsoil
3. Seed bed preparation
4. Seeding lawns
5. Mulching and fertilizing
6. Maintenance: See watering, mowing, fertilizing, core aerating, weed control, grow in and other specific requirements.
7. Clean Up

C. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation (Topsoil Stripping)

B. Section 312201 - Site Earthwork

1.3 REFERENCES

A. ASTM D4972 - Standard Test Method for pH of Soils

B. ASTM D5268 - Standard Specification for Topsoil Used for Landscaping Purposes

C. ASTM D422 and D1140 - Standard Test Method for Particle Size Analysis of Soils

D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effect

E. ASTM F1647 - Standard Test Method for Organic Material Content of Athletic Field Rootzone Mixes.

F. ASTM F1632 - Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sportsfield Rootzone Mixes

G. ASTM F2060 - Standard Guide for Maintaining Cool Season Turfgrasses on Athletic Fields

H. National Turfgrass Federation, Inc.

I. National Turfgrass Evaluation Program (NTEP).

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Furnish name of Landscape Contractor or Nurseryman to perform lawn work and a list of completed projects including contact information for each project demonstrating compliance with applicable qualification requirements outlined in 1.5 "Quality Assurance" of this specification section.

B. Provide Material Certificates and MPD for:

1. Seed species and source
2. Limestone
3. Fertilizers
4. Hydromulch
5. Straw (dry mulch) - location of straw producer

C. Provide Topsoil Test Report (for Onsite and Imported Topsoil): Submit test results from Architect approved independent testing laboratory on their letterhead. Report shall:

1. Certify soil texture, organic content, and particle size analysis.
2. Chemical analysis testing nitrogen, phosphorus, potassium, calcium, magnesium, cation exchange capacity, base saturation percentages, micronutrients and acidity (pH).
3. Provide timing and rates of soil additives, liming and fertilizers. (Materials and procedures regarding soil amendments and fertilizers specified in this section are approximate.) Adjust all soil amendments to comply with test results based on actual soil tests and as directed by the Architect at no additional cost to the Owner.

D. Provide letter on Contractor’s letterhead certifying that only topsoil from the above tested source was used on the project.

E. Lawn Seed Mix: Submit one (1 lb.) pound seed sample for each mix specified in supplier's unopened package with supplier's certification statement clearly showing the following:

1. Name and address of labeler
2. Lot number
3. Kind and variety of turfgrass seed listed in order of predominance
4. Percent by weight of pure seed of each species and variety (percent purity)
5. Germination percentage (percent viable seed)
6. Percent by weight of other crop seed
7. Percent by weight of weed seed
8. Percent undesirable grass seed
9. Percent by weight of inert matter

10. Date on which the germination test was conducted

F. Submit seed tags from **ALL** used or partially used seed bags. At times throughout the project, the Architect may request seed samples of onsite seed bags.

G. Provide schedule for review and approval as outlined under "Sequence and Scheduling" of this specification section.

1.5 QUALITY ASSURANCE

A. Lawn Contractor: Work shall be contracted to a single, established Landscape Contracting or Nursery firm having sufficiently experienced crews, supervisor(s), specialized equipment, and an excellent record of performance on completed lawn projects of comparable size, scope, and quality. Provide expert turfman to direct the work in the field on a regular, daily basis. The expert turfman shall be employed by the same company engaged in the installation of the lawn work for a minimum of five (5) years.

B. Nomenclature: Seed names shall conform to the National Turfgrass Federation, Inc.

C. Seed Quality Rating: Shall meet testing standard for New York State outlined by the National Turfgrass Evaluation Program (NTEP).

D. Testing: If required by the Architect for poor lawn grow in, engage an Architect approved independent, qualified New York State testing service and turfgrass specialist to evaluate Contractor grow in practices and materials used. Pay for all testing/inspection services, materials, and manpower to correct lawn areas as approved by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed:

1. Packing and Shipping: Ship seed and associated materials with certificates of inspections required by governing authorities.

2. Do not make substitutions. If specified seed material is not obtainable, submit to the Architect proof of non-availability and a proposal for use of equivalent material with similar performance criteria as the originally specified seed material.

3. Store all seed at the site in a cool, dry place in a manner to prevent wetting and deterioration, as approved by the Architect. Replace any seed damaged during storage as directed by the Architect.

4. Deliver seed in supplier's unopened packages bearing labels showing the supplier's name and seed analysis by weight.

B. Fertilizer:

1. Deliver fertilizer in the manufacturer's standard sized bags showing the weight, analysis, and manufacturer's name. Store all fertilizer under a waterproof cover or in a dry place as approved by the Architect.

1.7 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Lawn Work:

1. Perform lawn work after planting, fine grading and other work affecting the ground surfaces in the lawn work areas has been completed satisfactorily.

2. Where practical, the Owner will provide a connection to the water system such as, but not limited to, existing yard hydrants, building hose bibs, etc. If this source is insufficient, not available or practical to provide a source of sufficient water to meet the requirements herein, the Contractor shall secure a water source sufficient to meet the water requirements herein such as, but not limited to, municipal hydrants, water truck, etc. at no additional cost to the Owner.

3. Contractor shall provide all watering equipment and appurtenances such as, but not limited to, meters, backflow preventer, labor, hoses, sprinklers, irrigation and watering equipment.

4. Calendar dates for seeding under "Sequence and Scheduling" of this specification section shall apply.

5. For General Lawn, perform lawn seeding using mechanical and hand seeding methods. Hydromulching is not permitted within ten (10') feet of buildings edges.

6. Protect newly seeded lawns from vehicles, vandalism, or trespass. Provide temporary fencing or barriers as required.

C. Construction Review:

1. Upon completion of topsoil spreading and seed bed preparation, notify Architect to review work.

2. The Architect may review fine graded areas by the Contractor to check for surface smoothness and general compliance with grading requirements. Fill or cut by hand raking or other acceptable means to achieve smooth, even well-draining lawn surfaces free of "bird baths" and breaks in grade as directed by the Architect at no additional expense to the Owner.

3. Review of any fine graded lawn areas by Architect shall not alleviate the Contractor of his responsibility for conforming to the required grades as shown on the drawings, nor be misconstrued as final acceptance of lawn work.

1.8 SEQUENCING AND SCHEDULING

A. Schedule: Prior to construction, provide a schedule which addresses the following lawn thresholds involving erosion control stabilization and competitive use of playfields:

1. Seeding Installation: The Contractor may invoice for 50% of the approved schedule of value breakdown at the time of acceptable installation.

a. Unless otherwise directed in writing by the Architect, seed lawns from April 1 to May 15, and from August 15 to October 1. Seeding between May 16 and August 14 is not acceptable unless adequate water supply is available and applied to the turfgrass as required herein and approved by the Architect.

b. Proceed with and complete seeding as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.

2. Substantial Completion: The Contractor may invoice for 25% of the approved schedule of value breakdown at the time of substantial completion as described in Part 3, "Standards For Substantial Completion Of Lawns" of this specification section. At this time, the Architect may issue the Notice of Termination to satisfy the NYS DEC stabilization requirements. The date of substantial completion is anticipated approximately 60 days after lawn installation presuming all Contractor maintenance operations have been vigorously performed.

3. Final Acceptance: The Contractor may invoice for the final 25% of the approved schedule of value breakdown at the time of final acceptance as described in Part 3, "Standards For Final Acceptance Of Lawns" of this specification section. The date of final acceptance is anticipated approximately 30 days after substantial completion presuming all Contractor maintenance operations have been vigorously performed.

4. Owner Maintenance: After final acceptance of the lawns, the Owner will maintain for 1 to 3 growing seasons to reach competitive maturity and beyond per ASTM F2060.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Source: Provide from off site, Architect approved source, when stripped, stockpiled and amended quantity is inadequate to provide four (4") inches settled depth of topsoil for all lawn areas at no additional cost to the Owner.

B. Texture and Content: Provide topsoil conforming to the following:

1. Soil texture and content:

a. Sandy loam topsoil, well drained homogeneous texture and of uniform grade, without the admixture of subsoil material. Topsoil shall be entirely free of dense material, hardpan, clay, stones over 3/4" in

diameter, sod, or any other objectionable foreign material, including but not limited to, glass, debris, toxins, hazardous wastes and chemicals (such as atrizene or muriatic acid within the past seven (7) years) that may be injurious to humans, animals and plant materials.

b. Organic Matter: Containing not less than 5% or more than 10% organic matter in that portion of a sample passing a 1/4" sieve when determined by the wet combustion method on a sample dried at 105 degrees F.

2. pH Value: Containing a pH value within the range of 6.0 to 7.0 on that portion of the sample which passes a 1/4" sieve.

3. Soluble salt content: Not higher than 500 parts per million.

4. Sieve Analysis for general lawn work: Shall be screened or rock picked to meet the following gradation:

Sieve Designation	% Passing
3/4"	100
1/4"	97-100
No. 200	20-65 (of the 1/4" sieve)

C. No lawn shall be seeded on topsoil that has been chemically treated until sufficient time has elapsed to permit dissipation of all toxic materials. The Contractor shall assume full responsibility for any loss, damage, or the inability to grow a sufficient stand of grass from seed, as indicated herein, arising from improper use of chemicals or due to failure to allow sufficient time to permit dissipation of toxic residues, whether or not such materials are specified herein.

2.2 LAWN SEED MIX

A. Provide fresh, clean, new-crop seed mixed in the proportions specified for species and variety, and conforming to Federal, State, latest American Association of Nurseryman (AAN) Standards and National Turf Evaluation Program (NTEP).

B. Acceptable material in a seed mixture other than pure live seed consists of nonviable seed, chaff, hulls, live seed of crop plants and inert matter. The percentage of weed seed shall not exceed 0.05% by weight.

C. All seed must by fresh seed. Seed that is left over from the previous year and beyond sell by date is not acceptable.

D. Grass seed shall be certified "Blue Tag" seed composed of a blend of varieties mixed in proportion by weight and tested for minimum percentages of purity and germination. Submit the proposed mixture to the Architect for approval.

E. Provide the following lawn seed mix:

1. General Lawn Type 1:

Amount by Percentage

Weight	Species or Variety	Purity	Germination
40% (Min.)	Kentucky Bluegrass Blend*	95%	85%
35% (Max.)	Fine Textured Endophytic Perennial Rye**	98%	90%
25% (Min.)	Creeping Red Fescue***	97%	85%
100%			

* Kentucky Bluegrass Blend shall contain no more than 25% of any one cultivar and always at least two (2) different cultivars. Acceptable cultivars: Rambo, Princeton-105, Wildwood, Allure, Coventry, Champagne, Northstar, Cardiff, Nimbus, Raven, SR2100, Misty, America, Brilliant, Limousine, Conni, Liberator, Apollo, NuGlade, Total, Eclipse, Unique, Impact, Midnight, Arcadia, and Serene or Architect approved equal.

** Perennial Rye Blend shall contain no more 30% of any one (1) cultivar and always at least three (3) different cultivars. Acceptable cultivars: Palmer III, Calypso II, Brightstar II, Secretariat, Monterey, Catalina, Pennant II, Premier II, Sonata, Sunshine and Ascend or Architect approved equal.

*** SR5000 is acceptable.

2. Overseeding: Seed blend shall consist of 100% Perennial Ryegrass with at least three (3) cultivars. Acceptable Perennial Ryegrass cultivars include the following: Palmer III, Calypso II, Brighstar II, Secretariat, Monterey, Catalina, Pennant II, Premier II, Sonata, Sunshine, and Ascend. The Perennial Ryegrass shall have a minimum germination percentage of 90%. The percentage of weed seed shall not exceed 0.05% and other crop seed shall not exceed 0.5% by weight of the mixture.

F. Acceptable Seed Suppliers:

United Agri Products
Steve Hyde (315) 383-5035;

Matrix Turf Solutions
Jerry Clark (315) 480-7340;

Lesco, Inc.
Will Abel (315) 437-3423;

Preferred Seed
Jack Bryant (716) 895-7333;

Or Architect approved equal.

2.3 LIMESTONE

A. Shall be ground limestone in the producer's standard bags containing not less than 85% total carbonates and conforming to the following gradations:

Sieve Designation	% Passing
No. 100	50-100

B. The lime shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use will be rejected.

2.4 TACKIFIER FOR SEEDED LAWNS

A. Shall be liquid concentrate diluted with drinkable water forming a transparent three-dimensional film-like crust permeable to water and air, containing no agents toxic to seed germination to hold straw mulch in place.

B. Standard of quality shall be Terra Tack or Architect approved equal.

2.5 FERTILIZER

A. For Starter Fertilization: Immediately prior to seeding, fertilize with a commercial starter fertilizer, granular, non-burning product, with not less than 90% organic slow acting, micro nutrients and 1% iron, guaranteed analysis commercial fertilizer. Fertilizer ratio shall be: (1-2-1). Apply at a rate of 0.33 - 0.66 lbs of nitrogen (N) per 1,000 sf.

B. For Subsequent and Final Fertilizations: Apply commercial fertilizer, poly coated granular non-burning product with not less than 90% organic slow acting, guaranteed analysis

1. For Spring and Fall Lawn Work: Fertilizer ratio shall be: (3-0-1). Apply at rate of 1.5 - 2 lbs nitrogen (N)/1,000 s.f.

2.6 MULCH FOR SEEDED LAWNS

A. Dry Application Straw: Shall be straw consisting of clean stalks of oats, wheat, rye or other approved crops well seasoned before baling which are free of noxious weed seeds and roots. Weight shall be based on 15% moisture.

B. Hydro Applications: Shall be hydromulch containing 100% wood fiber mulch. Standard of quality shall be Mat Fiber as manufactured by Mat, Inc. and distributed by Matrix Turf Solutions, (315) 468-6000 or Architect approved equal.

2.7 WATER: Free of substance harmful to lawn, other plants, humans and animals.

2.8 COMPOST

A. Compost shall contain organic matter or material of a generally humus nature capable of sustaining vegetation growth, with no foreign matter (ie. glass, plastic, etc.) or other material toxic to plant growth. It shall be free from stones, lumps, or similar objects larger than one-half inch in greatest diameter, roots, and brush. Composts derived from organic wastes such as food and agricultural residues and animals manures, and sewage sludge that meet the above requirements, and are approved by the National

Environmental Protection Agency and NYS Department of Environmental Conservation are acceptable compost sources.

B. Compost shall have the following properties:

Parameters	Range
pH	6.0 to 7.5
Moisture Content	35 to 55%
Particle Size	< 1/2"
C:N Ratio	15:1 to 30:1
Soluble Silts	< 4.0 minutes (ds)
Organic Matter Content	> 20%
Bulk Density	< 1200 lbs/cy
Foreign Matter	< 1% (dry weight)

C. Standard of quality shall be WeCare Organics, P.O. Box 785, Hillburn, NY 10931, (845) 753-2242, www.wecareorganics.com, or Architect approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify limits of lawn and other types of ground cover materials in the field with drawings. Also any imported and screened topsoil areas. Notify Architect of discrepancies prior to proceeding with lawn work.

B. Examine finish surfaces, grade, topsoil quality, and depth.

C. Do not start lawn work until unsatisfactory conditions are corrected to the satisfaction of the Architect.

3.2 SPREAD TOPSOIL

A. Limit preparation to areas which will be immediately seeded.

B. Perform topsoil spreading operations only during dry weather.

C. To insure a proper bond with the topsoil, disc, harrow, or otherwise scarify and loosen the lawn subgrade to a depth of four (4") inches before spreading topsoil.

D. Spread topsoil to ensure a minimum settled depth of four (4") inches in lawn areas.

3.3 PREPARE GENERAL LAWN AREAS

A. Perform a pH test, sieve, and nutrient analysis of the topsoil and advise the results to the Architect prior to adding limestone or other soil amendments. Soil amendments shall be uniformly incorporated into the top four (4") inches of topsoil by discing, harrowing or other approved methods.

B. Remove debris and stones 3/4" or larger by handpicking, fine tooth aluminum grading rakes, and mechanized stone picker. When topsoil has hardened, cultivate soil to a four (4") inch depth by plowing, discing, harrowing, or otherwise scarifying and loosening the topsoil.

C. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Scarify, rake, level, and roll with a light static roller as necessary to obtain true, even lawn surfaces and fill depressions as required to drain. Correct irregularities in the surface resulting from tillage operations to prevent formation of depressions or water pockets.

D. Cultivate soil to provide a firm bed of minimum of four (4") inches deep, free of clods, stones, or foreign matter over 3/4" in diameter from the top of soil. Do not move heavy objects except necessary lawn making equipment over the lawn areas after the soil is prepared unless it is again loosened and graded. Remove stones and all debris greater than one 3/4" in diameter during cultivation. Level undulations and irregularities in the surface.

E. For pH correction provide adjusted rate of application as recommended in Topsoil Test Report submittal. For low pH correction: Add ground limestone at the rate indicated by the soil test. For high pH correction: Materials and application rates shall be determined by appropriate soil tests.

F. Place starter fertilizer at the rate of 0.33 - 0.66 lbs. of nitrogen (N) per 1,000 sf. and mix into full depth of topsoil.

G. Rake area with fine toothed aluminum grading rake before placing seed to obtain a smooth surface at the proper elevation. Drag area with a wood float to level out minor humps and hollows. Beds shall have a smooth friable uniform surface, free of areas ponding water.

3.4 LAWN SEEDING

A. Notify Architect when seed bed is ready for review as specified in Job Conditions. Obtain Architect's approval of finish grade prior to seeding.

B. Seed lawns immediately after preparation of bed and Architect's approval.

C. For General Lawn:

1. Seed at the rate of 6 lbs. per 1,000 S.F.

2. Seeding shall be performed as follows: ½ rate and mechanically incorporated into the top ½" of topsoil. The remaining ½ rate shall be mechanically spread at 90 degrees to the first application and lightly rolled.

3.5 MULCHING SEEDED AREAS

A. Mulch immediately after seeding.

B. Dry Mulch Application: Place mulch by hand or by machine at a rate of one bale/1,000 s.f. to produce a light even mulch cover so that 50% of soil is visible through the mulch layer.

C. Hydro Application: Place hydromulch by machine at a rate of one bale/1,000 sq. ft. to produce a light even mulch cover so that 50% of soil is visible through the mulch layer. NOTE: Seeding with a hydroseeder is NOT acceptable.

D. Anchor mulch by thorough heavy coat of tackifier over entire area and watering.

E. Protect seed bed from washout, wind erosion, rutting and drying out. Do not use machinery that leaves ruts in the seed bed. It is the Contractor's responsibility to add or remove mulch as needed to encourage optimum seed germination and growth..

3.6 MAINTENANCE

A. Maintenance by Contractor begins as soon as lawns are seeded. Protect lawns from drought, washout and wind erosion. In general, maintain new installed lawn areas, including watering, fertilizing, core aerating, spot weeding, overseeding, mowing, applications of herbicides, fungicides, and insecticides until a full, uniform, healthy, vigorous stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Architect. Specifically:

1. Watering Seeded Lawns:

a. First Week: In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week to maintain moist soil to promptly germinate the lawn seed, preventing it from drying out, and keeping it in a healthy, growing condition until final acceptance. Lawn areas shall receive a minimum of one (1") of water per week, by natural rainfall, irrigation or a combination of both. Water daily until 2nd mowing (just enough water to keep the top ½" of soil moist, 1 time daily).

2. Second and Subsequent Weeks: Contractor shall provide water to the lawns as required to maintain adequate moisture, in the upper four (4") inches of soil, necessary for the promotion of deep root growth until final acceptance. After 2nd mowing, water two (2) times weekly until thoroughly established.

3. Protect: Protect lawn areas against trespass, vandalism and routine pedestrian traffic and Owner maintenance traffic by temporary fencing or other means.

4. Repair: Repair, rework, and overseed (as originally specified for that area) areas that have washed out, eroded, do not germinate and are vandalized or otherwise damaged. Overseeding rates are to be adjusted to 6 lbs. of seed per 1,000 s.f.

5. Mow: Initial mowing shall begin when the blade height reaches 2" and the soil will bear the weight of the lawn mower. Use mowers with low impact tires. For the first 3 mowings cut the grass blades to 1.5 inches. After that mow the grass when it reaches a height of about 3.5" to a height of about 2.5". Never remove more than 1/3 of the grass blade at any one mowing. A minimum of eight (8) to

ten (10) mowings are required (approximately once per week after the initial germination period to final acceptance). Notify the Architect of dates in writing as mowing is performed. Excess clippings shall be carefully raked so as not to remove healthy grasses, and removed.

6. Core Aerating: Between mowings three (3) and four (4), and between mowings seven (7) and eight (8) core aerate lawns about three (3") inches on center minimum three (3") inches deep to ensure aggressive root growth. This will require multiple passes at different directions to achieve 16 to 20 holes 3/4" to 1" diameter per square foot. Sweep scattered plugs off paved areas onto adjacent lawn areas. Pulverize plugs during subsequent mowing operations. Provide additional core aerating after the 10th mowing as directed by the Architect to expedite the lawn maturation process. Moisten field by thoroughly watering the topsoil profile, several days in advance of coring to facilitate proper penetration of the topsoil.

7. Fertilizer: Immediately after core aerating, between mowings three (3) and four(4), and between mowing seven (7) and eight (8) apply subsequent fertilizer at the rate of 1.5-2 lbs./1,000 s.f. Provide additional fertilizer after the 10th mowing as directed by the Architect to expedite the lawn maturation process. Apply a final fertilizer just prior to final acceptance at the same application rate.

8. Weed Control: When infestation of weeds or crabgrass develops, treat infestation by hand weeding or herbicides control appropriate to the area. Furnish and install weed chemical control as recommended by manufacturer. Herbicides controls must be acceptable to the Owner. Obtain and pay for permits. Use as directed by the manufacturer and applicable laws, codes, ordinances and regulatory requirements. Under NO circumstances is it acceptable to seed or overseed over Nutsedge, Crabgrass or other grassy/broadleaf weeds.

B. Maintenance by the Contractor continues through the certificate of substantial completion to final acceptance by the Architect as described below. Maintenance by Owner begins after final acceptance of the lawn.

3.7 STANDARDS FOR SUBSTANTIAL COMPLETION OF LAWNS: Review to determine substantial completion of lawns will be made by the Architect, upon request. Provide notification at least five (5) working days before requested review date.

A. Lawn areas will be substantially complete provided requirements, including maintenance, have been complied with. A healthy, vigorous, uniform, partially mature stand of lawn is established free of weeds, undesirable grass species, disease, and insects. With proper watering and maintenance as indicated herein, this should culminate after an approximate 60-72 day period for initial germination with average temperatures above 40°F. Grass roots shall have matured to a minimum of 1½" depth as determined by the Architect when core samples are taken.

B. Lawn areas shall not have more than 10% dead/bare spots.

C. Contractor shall provide a written copy of all maintenance activities performed up to this date.

D. The architect will prepare a written punch list of items which need correction prior to final acceptance.

3.8 STANDARDS FOR FINAL ACCEPTANCE OF LAWNS: Review to determine final acceptance of lawns will be made by the Architect, upon request. Provide notification at least five (5) working days before requested review date.

A. Lawn areas will be acceptable provided requirements, including maintenance, have been complied with. A healthy, vigorous, uniform, full stand of lawn is established free of weeds, undesirable grass species, disease, and insects. Grass roots shall have matured to a minimum of 2" depth as determined by the Architect when core samples are taken.

B. Any lawn which contains disease, more than 1% dead/bare spots, or any dead/bare area greater than one (1) square foot shall be rejected and the unacceptable area(s) repaired as originally specified at no additional cost to the Owner.

C. In the event the Contractor fails to complete the punch list items within a 30 day period with average temperatures of 40°F after the time of Substantial Completion, the Contractor shall be liable to the Owner for any additional costs including those charged by the Architect.

D. Contractor shall provide a written copy of all maintenance activities performed during the contract up to final acceptance of lawns.

3.9 CLEAN UP

During the contract and at intervals as directed by the Architect and as lawn work is completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, neat, well-draining condition.

END OF SECTION 329201

SECTION 331101 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the water distribution system is shown on the drawings.

B. The water distribution work includes, but is not limited to, the following:

1. Trenching and Backfilling
2. Piping and jointing (to five feet from exterior building face)
3. Connections to existing water system
4. Valves & Valve Box(s)
5. Concrete Thrust Blocks
6. Yard Hydrants
7. Clean Up

C. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321201 - Site Concrete Work

C. Section 331102 - Disinfection of Water System

D. Section 334001 - Storm Drainage

1.3 REFERENCES (AWWA, latest edition)

A. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; American Water Works Association (ANSI/AWWA C104/A21.4).

B. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association (ANSI/AWWA C111/A21.11).

C. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association (ANSI/AWWA C151/A21.51).

D. AWWA C502 - Dry Barrel Fire Hydrants; American Water Works Association (ANSI/AWWA C502/C502a).

E. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association (ANSI/AWWA C509/C509a).

F. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association (ANSI/AWWA C600).

G. ASTM D3350 - Polyethylene Plastics Pipe & Fittings Materials.

H. ASTM F714 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

I. NSF/ANSI 61 – Drinking Water System Components.

J. ASTM F1055 –Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.

K. ASTM D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

L. ASTM F2164 – Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure.

M. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc..

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Provide Manufacturer's Product Data (MPD) for:

1. Water pipe and joints
2. Valves and Valve Boxes
3. Yard Hydrant

B. Provide Material Certificates and samples as noted:

1. Granular Backfill: Material Certificates and sample.
2. 4,500 psi concrete: Material Certificate showing design mixes.

C. Permits, Notification, Certification, and Test Reports: Provide per 1.5C.

1.5 JOB CONDITIONS

A. Job conditions in Section 334001 apply.

B. Water distribution work shall conform to standards of applicable government authorities having jurisdiction.

C. Obtain and pay for permits and approvals required by local authorities. Copy permit to Architect.

D. Construction Review: Notify the Architect when the work is approximately 25%, 75% and 95% complete.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NYS Health Department Standards.

B. Codes and Standards: ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", comply with applicable provisions except as otherwise indicated.

1.7 TESTING

A. Notify Architect and Municipal Engineer a minimum of forty-eight (48 hrs.) hours in advance.

B. Provide materials and labor to carry out testing in the presence of the Architect and/or Municipal Engineer. Test water system with an hydrostatic pressure test for two hours in conformance with AWWA Standard C600 or ASTM F2164.

1. Do not exceed the following leakage rates per 1,000 feet of pipe, respectively, for the two hour test period at 150 psi:

Pipe Diameter	Allowable Leakage
¾"	0.124 gal.
1"	0.165 gal.
1 ½"	0.248 gal.
2"	0.331 gal.
2 ½"	0.414 gal.
4"	0.662 gal.
6"	0.993 gal.
8"	1.324 gal.
10"	1.655 gal.
12"	1.986 gal.

2. Valid test pressure shall not vary more than (+/-) 5 psi.

3. Any leakage beyond limits described shall be located and repaired. Retest system to insure adequate performance of pipe.

PART 2 - PRODUCTS

2.1 PIPING, FITTINGS, AND BACKFILL

A. Copper pipe for three quarter inch (3/4”) to two-inch (2" W) pipe shall be ASTM B88, Type K soft-tempered copper pipe, with flared fittings.

B. Backfill shall be as specified in Section 312201, 2.1, B.

C. Concrete for thrust blocks shall be 4,500 psi as specified in Section 321301, 2.1.

2.2 GATE VALVE AND VALVE BOX

A. Gate Valves - Open Counter-clockwise (left)

1. Valves shall be 125 pound flanged gate valves meeting American Water Works Association (AWWA) Standards, iron body, bronze mounted, double disc type

with removable brass seats, non-rising manganese bronze stems, and open counter clockwise.

2. Valves shall be successfully subjected to a hydrostatic pressure test of not less than four (4) times the maximum working pressure.

3. Standard of quality shall be AWWA gate valves as manufactured by Kennedy or equal approved by the local Water Authority.

4. Valves shall be compatible with the type of pipe and joint being used without the use of an adaptor.

5. Direction of Opening: Right to open or as directed by the Municipality.

B. Valve Box shall be cast iron, yoke type, adjustable for height with cast iron cover marked "Water". Boxes shall be designed for pipe in trench having a 5'-6" cover over pipe.

2.3 ACCESSORIES

A. Concrete for Thrust Restraints:

1. Portland Cement: ASTM C150, Type 1A.
2. Aggregates: ASTM C33; coarse aggregate - crushed limestone, maximum one inch (1") size; fine aggregate - clean, sharp, natural sand.
3. Water: Clean, potable.
4. Air-Entraining Admixture: ASTM C260, Darex or Architect approved equal.
5. Ready Mix Concrete: ASTM C94.
6. Minimum Concrete Strength: Compressive strength shall be greater than 4,500 psi at 28 days; minimum cement content – 6.5 bags/c.y.; 4.0 gals./bag of cement; slump from 1-1/2" to 3"; air entrainment from 5% to 8-1/2%; and flexural strength (ASTM C78) shall be greater than 650 psi at 28 days.

2.4 YARD HYDRANTS

A. Flush Yard Hydrant:

1. PVC Flushing Hydrant for below grade meter box installation; self-draining, 5'-6" (1.7m) bury depth, 2 inch (50mm) NPT inlet 2-1/2 inch (64mm) NST outlet, ball valve with valve key operation, all brass connections, schedule 80 PVC barrel.

2. Suppliers: Utility Supply of America Bluebook; Product 22584.

PART 3 - EXECUTION

3.1 CONNECTIONS TO OTHER WATER SYSTEMS

A. Connections at Buildings:

1. Locate accurately per site and plumbing drawings. Verify inverts, locations, and sizes. Notify Architect of any discrepancies immediately prior to installation.

2. Install the site water system to within five (5') feet of each building exterior. Install temporary plugs, mark above grade, and protect. Coordinate with the Plumbing Contractor.

3. The Plumbing Contractor shall be responsible for connecting the building water plumbing system to the site water system and coordinating with this Contractor.

4. Connect existing building service piping to new distribution main using smooth flexible coupling to join dissimilar pipes to provide watertight joint with low friction loss characteristics.

B. Connections to the existing water supply system:

1. Locate accurately per site drawings. Verify inverts, locations, and sizes. Notify Architect of any discrepancies prior to installation.

2. Make connections securely, watertight, and as detailed.

3.2 TRENCHING AND BACKFILL

A. See Section 312201 for additional requirements.

B. Hand trim excavation for accurate placement of pipe. Remove all stones greater than 4" diameter to a depth of at least 6" below the bottom of the pipe.

C. Form and place concrete for pipe thrust restraints at each change of pipe direction and dead ends as shown on the Contract Drawings. Place concrete to permit full access to pipe and pipe accessories. Care shall be exercised in the placement of concrete to allow disassembly of mechanical joints.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.3 INSTALLATION - PIPE

A. Maintain separation of water main from sewer piping in accordance with details shown on Contract Drawings.

B. Water pipe shall have a minimum of five and one half (5- 1/2') feet of cover as measured from the top of the pipe to finish grades. Bed pipe as detailed. Place backfill around pipes to equal depths on both sides as work progresses. When pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by other means. When water is in the trench, plugs shall not be removed until danger of water entering the pipe has passed.

C. Install pipe to indicated elevation to within tolerance of 1 inches.

D. No pipe shall be laid upon a foundation in which frost exists, nor at any time when there is a danger of the formation of ice, or the penetration of frost at the bottom of the excavation.

E. Two brass wedges shall be inserted securely between bell and spigot ends of pipes, maintaining the full watertightness of the joint.

F. Otherwise install ductile iron piping and fittings to AWWA C600.

G. Route pipe in straight line.

H. Install pipe to allow for expansion and contraction without stressing pipe or joints.

I. Install access fittings to permit disinfection of water system performed under Section 331102.

J. Compact trenches to at least ninety five (95%) percent maximum density as specified in Section 312201. Settlement shall be repaired by the Contractor at no additional cost to the Owner.

K. Install concrete cradles, saddles and thrust blocks where shown on drawings as detailed and specified in Section 321301, Part 3. Provide bracing and blocking at bends, 22-1/2 degrees or greater, tees, crosses and plugs. Block and anchor with concrete so that there will be no movement of the pipe in the joints due to internal or external pressures. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6" below the fittings of pipe, to 12" above the fittings. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be recaulked or tightened if necessary. Concrete thrust blocks shall conform dimensionally to details shown on drawings.

3.4 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover approximately one inch below surrounding finished grade. Care shall be exercised in backfilling around valve boxes to prevent displacement of box.

C. Pipe to be tapped shall be excavated and thoroughly cleaned at location to be tapped. Cleaning shall progress at a minimum of 12 inches on each side of the sleeve.

D. Set hydrants plumb and flush with finish grade.

E. Locate control valve 24 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening, do not connect drain opening to sewer. In areas where high ground water is encountered, plug drain opening at the base of the hydrant barrel and provide signage advising that the barrel is to be pumped dry after use to prevent damage from freezing.

3.5 FIELD QUALITY CONTROL

A. All new water piping and fittings shall be thoroughly flushed prior to pressure testing.

The flushing rate shall be at least 2.5 ft./sec.

B. Pressure test all new water piping and fittings using a test pressure not less than 150 psi.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest at no cost to the Owner.

D. After all work has been successfully inspected and tested, the new water piping, valves, and fittings shall be disinfected by the Contractor in accordance with AWWA C651, latest edition as specified in Section 331102 of these Specifications.

3.6 CLEAN UP

During the contract and at intervals as directed by the Architect and as the water distribution system is completed, clear the site of pipe, trench and backfill material, stone, concrete and debris. Leave the site in a clean, safe, well draining, and neat condition.

END OF SECTION 331101

SECTION 331102 - DISINFECTION OF WATER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Disinfection of site domestic and fire water lines and appurtenances specified in Section 331101.

B. Testing and reporting results.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 331101 - Water Distribution

1.3 REFERENCES

A. AWWA B300 - Hypochlorites; American Water Works Association; 1992 (ANSI/AWWA B300).

B. AWWA B301 - Liquid Chlorine; American Water Works Association; 1992 (ANSI/AWWA B301).

C. AWWA B302 - Ammonium Sulfate; American Water Works Association; 1995 (Revised) (ANSI/AWWA B302).

D. AWWA B303 - Sodium Chlorite; American Water Works Association; 1995 (Revised) (ANSI/AWWA B303).

E. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 1992 (ANSI/AWWA C651).

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Test Reports: Indicate results comparative to specified requirements.

B. Certificate: Certify that cleanliness of water distribution system meets or exceed specified requirements.

C. Disinfection report:
1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
5. Date and time of flushing start and completion.
6. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological report:
1. Date issued, project name, and testing laboratory name, address, and telephone number.

2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of NYS Department of Health.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

1.6 REGULATORY CERTIFICATION REQUIREMENTS

A. Provide certificate of compliance from authority having jurisdiction indicating approval of water system. Provide written certification from Village Public Works Superintendent that water system has been tested for leakage and sterilized and disinfected in a manner satisfactory to the Health Department having jurisdiction, but in no event less stringent than that provided for in AWWA Standard for disinfecting water mains C601, latest issue. Hypochlorites and liquid chlorines used in disinfection shall conform to most recent AWWA Standards B300 and B301. Provide certification prior to Architect issuing final acceptance. No water main or pipes shall be placed into service until test results are provided documenting that the water system is bacteriologically safe.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.2 EXECUTION

A. Provide specific water main taps located adjacent to ends of main and attach required equipment to perform the work of this Section.

B. Inject treatment disinfectant along with potable water into piping system. Chlorine shall be fed at a constant metered rate into the feed water so that the chlorine concentration will result in at least 50 milligrams per liter (parts per million) concentration. Chlorine required to produce .50 mg/l concentration per 100 feet of pipe shall be as follows: 4” - 0.33 Gal. of 1% chlorine solution, 6" - 0.73 Gal. of 1% Chlorine Solution; 8" - 1.30 Gal. After filling the main pipe with chlorine solution, open each service line and hydrant

branch to fill them with the same chlorine solution. Test the solution as it is withdrawn from each point until at least 50 mg/l concentration is obtained.

C. Maintain disinfectant in system for 24 hours. Read and record chlorine residual after the 24 hour contact time; Minimum allowable level shall be 20 ppm.

D. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water. After flushing, take 2 samples, one from the domestic service line at its connection to the building plumbing system and one from a hydrant remote from the domestic service connection. Submit these samples for bacteriological analysis. Submit test reports to the Architect. If the initial disinfection fails to produce acceptable results, the procedure shall be repeated until a satisfactory report is obtained.

E. Temporary taps shall be excavated, shut off and abandoned following satisfactory quality test results. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Test samples in accordance with AWWA C651.

3.4 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as the disinfection of water system is completed, clear the site extraneous materials and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 331102

SECTION 334001 - STORM DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the storm drainage is shown on the drawings.

B. Storm drainage work includes, but is not limited to:

1. Trenching, backfilling and compaction
2. Piping, jointing and fittings
3. Connection(s) to other storm system(s)
4. Adjusting existing storm structures and other utilities
5. Storm Water Management Trench (SMT)
6. Storm Line Cleaning and Scoping
7. Quality Control Testing and Submittals
8. Clean Up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312501 - Erosion, Sediment and Pollution Control

C. Section 312201 - Site Earthwork: For Elaboration of Shoring and Bracing, Dewatering, Backfilling, Compaction and Field Quality Control Testing.

D. Section 321201 - Asphalt Paving

E. Section 321301 - Site Concrete

F. Section 331101 - Water Distribution

1.3 REFERENCES

A. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Flow Applications.

1.4 SUBMITTALS: (See Section 311201, 1.5)

a. Manufacturer's Product Data (MPD) required for:

1. Drainage structure appurtances
2. Pipe, joints and fittings
3. Stormwater Management Trench for Pipes and Geotextiles

1.5 QUALITY ASSURANCE

A. Drainage Contractor Experience Requirements:

1. Submit business name, business owner(s) name(s), business address, telephone number, website and/or email address signed by the Contractor/Subcontractor who meets the qualifications set forth in this specification and is proposed by the Contractor to perform the Drainage for this Project.

2. Provide a list of at least four (4) Drainage work projects of comparable size, scope and quality completed successfully by the proposed Contractor/Subcontractor within the past three (3) years that includes the date completed, project Owner's name and current contact information, including telephone numbers and email addresses.

1.6 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Plan and execute piping work so that trenches are not opened for more than two hundred (200') feet in advance or left unfilled more than one hundred (100') feet behind. No overnight open excavation is permitted.

C. CERTIFICATION OF STORM SYSTEM: The storm system must be installed and certified by a licensed County Plumber when required by municipal code or state law.

D. CONSTRUCTION REVIEW: Notify the Architect when the storm system is approximately 25%, 50% and 95% complete.

1.7 SUBSTITUTIONS

A. Contractor is responsible for design of any substituted structures, systems or units in Section 334001 by a NYS licensed engineer. Submit to Architect for approval.

B. If a product is being submitted as a substitution to the specified product; the the Prime Contractor shall submit and request a product material substitution with his/her bid. The Prime Contractor shall at a minimum provide the following for review by the Architect and Owner:

1. All submittals as specified herein

2. Product comparison

3. Cost Information (including proposal of change in Contract Sum)

4. Contractor’s certification that proposed substitution complies with requirements in the Contract Documents

5. Contractor’s waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

PART 2 - PRODUCTS

2.1 BACKFILL

A. Backfill for pipes, Stormwater Management Trenches (SMT) and drainage structures shall be as specified in Section 312201.

2.2 STORM STRUCTURE APPURTENANCES

A. Precast Concrete Adjustment Rings: Shall be square or round depending on structure. Built in accordance to ASTM C478, and made of 5,000 psi concrete and reinforced steel, meeting ASTM A615 Grade 60, as manufactured by Fort Miller, Zeiser Wilbert, Jefferson Concrete or Architect approved equal.

B. Mortar: Shall be lime, cement, and clean sand, 1:1:3 measured by volume, meeting ASTM C1107.

2.3 PIPING

A. High Density Polyethylene Pipe (HDPE): Shall be heavy duty dual wall, high density polyethylene (HDPE) pipe conforming to ASTM F2648 for 4" to 60" pipe with a smooth inner wall, annular corrugations, "n" flow rating of 0.012, and HS-20 loading capability with minimum one (1') foot cover for 4" to 48" pipe and two (2') foot cover for 6-" pipe. Joint couplings for pipe shall be connected using a bell &spigot joint, meeting AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be soil tight and gaskets, when applicable, shall meet the requirements of ASTM F477. Standard of quality shall be N-12 Mega Green ST IB pipe as manufactured by Advanced Drainage Systems, Inc., 800-821 6710, or Architect approved equal.

2.4 STORM WATER MANAGEMENT TRENCH

A. 4" to 10" Pipe: Shall be flexible, heavy duty, corrugated interior and exterior, perforated (or slotted) polyethylene pipe meeting requirements ASTM F-667 for 4" to 10" diameters. Standard of quality shall be ADS with prefabricated snap fittings as manufactured by Advanced Drainage Systems, Inc., (614) 457-3051 or Architect approved equal. Size pipe(s) as noted on drawings.

B. 12" to 24" Pipe and Fittings: Shall be heavy duty polyethylene (HDPE), corrugated interior and exterior, perforated pipe meeting requirements AASHTO M252, AASHTO M294, Type C. Standard of quality shall be ADS with prefabricated fittings as manufactured by Advanced Drainage Systems, Inc., (614) 457-3051 or Architect approved equal. Size pipe(s) as noted on drawings.

C. 4" to 12" Fittings: Shall be injection molded fittings with a smooth interior and exterior meeting requirements AASHTO M252 for 4" to 10" diameters, and ASTM M294 or ASTM F2306 for 12" diameter. Standard of quality as manufactured by Advanced Drainage Systems, Inc., (614) 457-3051 or Architect approved equal. Size pipe(s) as noted on drawings.

D. Backfill: Shall be clean, washed No. 1 stone as indicated in Section 312201.

E. Soil Separation Fabric: Shall be a commercially manufactured non- woven polypropylene filter fabric. Standard of quality shall be Mirafi 140N as manufactured by TenCate or Architect approved equal.

2.5 STORM LINE CLEANING & SCOPING

A. Contractor shall provide 100 linear feet of 10", 500 linear feet of 12", 400 linear feet of 12" and 300 linear feet of 18" storm line cleaning and scoping in areas directed by the Architect and as shown on the plans.

B. Cleaning Equipment: Acceptable cleaning equipment includes, but is not limited to, rodding machines, bucket machines, hydraulic flushers, movable dams with flexible scrapers.

C. Scoping Equipment: Acceptable scoping equipment includes, but is not limited to, pipe inspection camera with pan-and-tilt, radial viewing that pans 275 degrees and rotates to 360 degrees. The camera shall have the following attributes:

1. Be operative in 100 percent humidity conditions.

2. Measure with an accurate footage counter that displays on the monitor the exact distance of the camera, to the nearest tenth of a foot, from the centerline of the starting manhole.

3. Camera with height adjustment so that the camera lens is always centered at half the inside diameter, or higher, in the pipe being televised.

4. Lighting for the camera shall be suitable to allow a clear picture of the entire pipe periphery.

5. The video camera shall be capable of showing on the digital inspection the Owner's name, project name, contractor name, date, line size and material, line identification (Owner's manhole numbers at both ends), ongoing footage counter, and slope and angle of pipe.

D. For four- and six-inch lateral internal television inspections a "push camera" shall be used to produce color DVD. Camera reel shall be equipped with a footage counter to identify approximate distances from the start of the inspection.

PART 3 - EXECUTION

3.1 CONNECTIONS TO OTHER STORM SYSTEM

A. Connections to existing Storm Systems:

1. Coordinate with the Municipality and other agencies having jurisdiction. Notify governing agency in writing a minimum of two (2) weeks prior to anticipated date of connection so that field procedures and installation can be reviewed by a representative of the Municipality. Copy letter to Architect.

2. Locate accurately per drawings. Verify inverts and sizes. Notify Architect of any discrepancies immediately, prior to installation.

3. Make connections securely, watertight and as detailed. Provide all necessary couplers and fittings to make connections.

3.2 TRENCHING AND BACKFILL

A. Reference: Refer to Section 312201 for elaboration of shoring and bracing, supporting, rock, dewatering, and backfilling.

B. Trenching:

1. Remove material encountered to the depth shown on drawings and with a maximum width of fourteen (14") inches and a minimum of nine (9") inches each side of conduit springline as detailed. Provide safe shoring, sheeting, and bracing. Remove before backfilling. Backfill excess or over excavation as described in Section 312201 to proper line and grade. Compact to 95% density.

2. When unsatisfactory soil materials are encountered at design elevations, immediately notify the Architect in writing via email. Continue as directed by the Architect. When conditions are not a result of Contractor's negligence, additional excavation may be directed by the Architect and paid for as a Change Order on a unit price basis in accordance with specification Section 312201.

C. Water: Remove from trenches; drain trenches and/or provide sump pits and pumping equipment as necessary to keep trenches stabile and dry at no additional cost to the Owner.

D. Soft Material in Trench Bottom: Dry out and stabilize or remove and replace with imported granular backfill material to achieve firm, stable foundation at no additional cost to the Owner.

E. Rock: Remove boulders and rock within one (1'-0") foot of pipe. Provide one (1'-0") foot of granular backfill between rock and conduits at no additional cost to the Owner.

F. Backfill: Conform to details on drawings and as specified. Compact backfill to a minimum 95% of optimum density.

3.3 ADJUSTING EXISTING UTILITIES

Adjust existing utilities as necessary to maintain utility service and meet finished grade conditions. Existing utilities include but are not limited to; hydrants, water valves, gas valves, electric pull boxes and manholes, storm drainage structures, cable and telephone markers, fiber optic cables, sanitary cleanouts and manholes, and guy wires.

3.4 PIPE LAYING

A. Shall be in accordance with ASTM D2321 and pipe manufacturer requirements.

B. Bed pipe in granular backfill or concrete as shown on drawings, compact under springline of pipe to assure firm support. Align pipe to line and grade given in plan and profile. Set batter boards or set by laser level.

C. Pipe joints shall be made using the flexible gaskets specified. Clean bell end of any debris and lubricate. Remove protective wrap from gasket. Do not allow lubricated section to touch dirt or backfill. Foreign matter could adhere to surface and compromise joint integrity. Push together pipes so that the gasket is firmly seated in the socket. Always push spigot end into bell, not bell end into spigot.

D. Place backfill around pipes to equal depths on both sides as work progresses.

E. Attach flared end sections as detailed to pipe outlets, draw up bolts tight to provide firm anchorage.

F. "Lamp" pipes to check for misalignment and breakage after backfilling has been completed. Replace pipes deviating more than 1/2" from line or grade at no additional cost to the Owner.

3.5 STORM WATER MANAGEMENT TRENCH

A. Use only pipe which is undamaged and flexible (have not been exposed to direct sunlight for more than six (6) months causing brittleness, cracking or splitting prior to placement). Pipe shall be stored for at least twenty-four (24 hrs.) hours in an area having a minimum temperature of fifty (50) degrees F.

B. Trenching: Remove material encountered to the depth shown on the drawings. Provide shoring, sheeting, and bracing as necessary for safety; remove before backfilling.

C. Install continuous envelope of soil separation fabric around the backfill up to subgrade of finish material. Fill stone to proper elevation and wrap top. Overlap fabric minimum twenty-four (24") inches at top and joints. Secure fabric joints to prevent separation and infiltration of adjacent materials and separation of fabric.

D. Install pipe sloped as shown on drawings.

E. Compact backfill to maximum density of adjacent materials.

3.6 STORM LINE CLEANING & SCOPING

A. Cleaning Operations:

1. Potable water withdrawal from hydrants will be allowed for utility cleaning purposes. A contractor provided hydrant meter with backflow prevention device shall be used when withdrawing water from a fire hydrant.

2. The pipe sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the utility lines and manholes.

3. Any roots which could prevent adequate internal television inspection shall be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupine, and equipment such as high-velocity jet cleaners.

4. Flows diverted during cleaning operations shall be returned to the utility system.

5. Debris accumulated during cleaning operations shall be removed from the utility and disposed offsite.

B. Inspection and Scoping:

1. If during inspection of the utility section, the wastewater flow depth exceeds 20% of the inside pipe diameter, reduce the flow depth to an acceptable level by performing the inspection during minimum flow hours, bypass pumping, plugging or by pulling the camera with swab, high velocity jet nozzle or other acceptable dewatering device.

2. Video inspections performed while floating the camera is not acceptable.

3. Documentation of Television Inspection

   a. All inspections shall be documented using a data logger and reporting system.
   b. Inspection Logs: Computer printed location records shall be kept by the Contractor and shall clearly show the location and orientation in relation to an adjacent manhole. Other points of significance such as locations and orientations or service connections, building sewers, unusual conditions, roots, cross connections, broken pipe, presence of scale and corrosion, and other discernible features shall be recorded, and a copy of such records shall be supplied to the Owner.
   c. Video Recordings: Video recordings shall include an audio track recorded by the inspection technician during the actual inspection work describing the parameters of the line being inspected (i.e. location, depth, diameter, pipe material, pipe slope, etc.), as well as describing connections, defects and unusual conditions observed during the inspection. Video recording playback shall be at the same speed that it was recorded. Once inspected, the DVDs shall be labeled and become the property of the Owner.

4. Perform inspection immediately after line cleaning.

5. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the utilities condition. In no case will the camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with the proper documentation of the utility conditions shall be used to move the camera through the utility line.

6. During the inspection, the camera shall be temporarily stopped at each defect along the line. The nature, location, and orientation of the defect shall be recorded by the contractor. Where defects are also active infiltration sources, the rate of infiltration in gallons per minute shall be estimated by the Contractor and recorded. The camera shall also be stopped at all service connections and identified by footage and clock orientation.

7. The camera operator shall slowly pan and tilt and beginning and ending manhole connections, each service connection, joints, visible defects and at pipe material transitions.

8. Inspections shall be continuous for pipe segments between manholes.

9. All videos, notes, file names, etc. shall be cross referenced to the project site plan.

10. Should at any interval during the inspection and scoping the camera becomes unmovable, non-functioning, or unresponsive it shall be the contractor's sole responsibility to retrieve the camera, at no additional cost to the Owner. Any damage done to the site or storm system retrieving the camera shall be corrected immediately by the Contractor to match existing conditions.

3.7 FIELD QUALITY CONTROL

A. Density Testing: Perform all density testing for piping trenches and structure backfill as indicated in Section 312201.

3.8 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as storm drainage is completed, clear the site of pipe, trench and backfill material, stone, concrete and debris. Leave the site in a clean, safe, well draining, neat condition.

B. Clean drainage structures, storm water management trenches and pipes: Clean out sediment, rubbish, construction debris, and foreign objects thoroughly, immediately prior to final acceptance.

END OF SECTION 334001