



*Project Manual
Volume II*

for

***Alfred – Almond Central School District
2025 Capital Project
Almond, NY***

SED # - K-12 Main Campus Building: 02-01-01-04-00-01-037

The design of this project conforms to all applicable provisions of the New York State Uniform Fire Prevention and Building Code, the Energy Conservation Construction Code of New York State, and the building standards of the New York State Education Department

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ASBESTOS ABATEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Laboratory reports with summary of bulk asbestos analysis results are available in the Architect/Certified Project Designer's office.
- B. The Contractor shall be responsible for investigating the site and verifying conditions and quantities prior to the submission of his bid. The Contractor shall not be permitted changes in the contract amount if specific variances are denied by New York State Department of Labor, Architect/Certified Project Designer, or any other agency.
- C. A site specific variance may be applied for at the Contractor's cost. Use of a site specific variance requires approval of the Asbestos Abatement Project Designer.

1.2 REGULATORY REQUIREMENTS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- B. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).
- D. NYS DEC Title 6 NYCRR Part 360 - Solid Waste Management Facilities General Requirements; current edition.
- E. NYS DEC Title 6 NYCRR Part 364 - Waste Transporters; current edition.
- F. NYS DOH Title 10 NYCRR Part 73 - Asbestos Safety Program Requirements; current edition.
- G. NYS DOL Title 12 NYCRR Part 56 - Asbestos; current edition.
- H. USEPA Title 40 CFR Part 61 - National Emissions Standards for Hazardous Air Pollutants; current edition.
- I. USEPA Title 40 CFR Part 763, Subpart E - Asbestos Containing Materials in Schools; current edition.
- J. USEPA 530-SW-85-007 - Asbestos Waste Management Guidance; current edition.

1.3 SCOPE

- A. All work of this section shall be performed in accordance with 12 NYCRR Part 56 as most currently amended unless permitted otherwise by the NY State Department of Labor, the USEPA and the Owner's Representative.
- B. The Contractor shall conform to Title 10 NYCRR Part 73 as most currently amended.
- C. Furnish all labor, materials, licenses, facilities, equipment, services, employee training and testing, permits and agreements necessary to perform the work required for asbestos removal, encapsulation and enclosure in accordance with these specifications, the latest regulations from the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Asbestos Hazard Emergency Response Act (AHERA), the State of New York, the recommendations of the National Institute of Occupational Safety and Health (NIOSH) and Standard 241 of the National Fire Protection Association (NFPA).

- D. All work shall be performed in accordance with the U.S. Environmental Protection Agency (EPA) 40 CFR Part 763, Subpart E, AHERA Regulations for Removal of Asbestos in Schools; (EPA) 40 CFR Part 61, and OSHA Title 29 CFR, Part 1910; sections 1001, 134, 1926.2 and 1926.1200. All work shall also be performed in accordance New York State Department of Health Title 10 NYCRR Part 73 and Department of Environmental Conservation Title 6 NYCRR Part 364

1.4 SUBMITTALS

- A. Pre-Work Submittals: The Contractor shall submit to the Architect/Certified Project Designer three copies of the documents listed below:
1. Resume: Shall include the following:
 - a. Contractor license issued by New York State Dept. of Labor.
 - b. The number of years engaged in asbestos removal.
 - c. Provide a list of projects performed within the past two years and include the dollar value of all projects. Provide project references to include owner, consultant, and air-monitoring firms' name, contact person, address, and phone number.
 - d. An outline of the worker training course and medical surveillance program conducted by the Contractor.
 - e. Emergency plans, including proposed work area evacuation routes and fire extinguisher locations.
- B. Citations/Violations/Legal Proceedings: Submit a notarized statement describing:
1. Any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous abatement contracts. Briefly describe the circumstances citing the project and involved persons and agencies as well as the outcome of any actions.
 2. Any Stop Work Orders issued on projects within the past two years.
 3. Any litigation or arbitration proceedings arising out of performance on past projects.
 4. Any liquidated damages assessed within the last two years.
- C. Progress Schedule:
1. Show the complete sequence of construction by activity and the sequencing of work within each building or section of the work.
 2. Show the dates for the beginning and completion of each major element of work including substantial completion dates for each work area, building, or phase.
 3. Show final inspection dates.
- D. Site Specific Variance: Submit all proposed site specific variances for this project to the Architect for review and approval.
- E. Schedule of Values: Prepare a schedule of values, as required by the General Conditions identifying the value of work, by work area, associated with each type of asbestos material included in the scope of work. Identify mobilization and administration costs separately.
- F. Notifications: Submit notifications required by federal, state, and local regulations together with proof of timely transmittal to agencies requiring the notice (e.g. certified mail return receipt).
- G. Permits: Submit copies of current valid permits required by state and local regulations, including arrangements for storage, transportation, and disposal of contaminated materials.
- H. Abatement Work Plan: Provide plans which clearly indicate all work areas (numbered sequentially) including the locations and types of all decontamination chambers, entrances and exits to the work area, type of abatement activity/technique, number and location of negative air units and exhaust including calculations, and the proposed location and construction of storage facilities and field office.
- I. Equipment: Submit manufacturer's information of vacuums, negative air pressure equipment, respirators, and air supply equipment, etc. Provide certification that all equipment meets applicable requirements of OSHA and EPA.

- J. Worker Training and Medical Surveillance: The Contractor shall submit a list of the persons who will be employed by him and his Subcontractors in the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- K. (Sub)-Subcontractors List: The abatement (Sub)-Contractor shall submit a list of all sub-Subcontractors to be used on the project.
- L. Project Supervisor: Submit the resume of the proposed Project Supervisor. Identify work history and substantiate ability to supervise this project.
- M. Rental Notifications: Submit copies of notices sent to rental suppliers informing them of the nature of the work that the Contractor intends to use the equipment for.
- N. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.
- O. Project Closeout Submissions:
 - 1. Submit copies of all waste disposal manifests, and disposal logs.
 - 2. Submit OSHA compliance air monitoring records conducted during the work.
 - 3. Submit copies of the daily progress log.
 - 4. Submit copies of the visitor's log.
 - 5. Submit Certificate of visual inspection obtained from the Project Monitor.
 - 6. Submit a list of all employees utilized on the project with social security and Asbestos Handler Certificate numbers.
 - 7. Submit copies of any required Employee Statements such as Medical Examination statement, Certificate of Worker's Release, or Employee Training Statement.
 - 8. Submit 3 copies of a description of work to be included in the Owner's AHERA Management Plan Building record. Indicate asbestos materials removed and quantities for each area(s) of abatement.

1.5 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall be on-site at all times work is in progress. If the Project Supervisor is not on-site, all work shall be stopped. The Project Supervisor must be able to read and write English fluently, as well as communicate with his workers. The Project Supervisor shall remain until the project is complete and cannot be removed without the written consent of the Owner and the Architect/Certified Project Designer.
- B. Prior to the commencement of work, the Contractor shall submit the proposed Project Supervisor's resume to the Owner and Architect/Certified Project Designer for approval. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.58 and shall have a minimum of one-year on-the-job training. This person shall hold certification as an Asbestos Project Supervisor.

1.6 ASBESTOS PROJECT MONITOR, AIR SAMPLING AND ANALYSIS FIRM

- A. An Asbestos Project Monitor, Air Sampling and Analysis firm shall be retained by the Owner to provide abatement project inspection and monitoring services and to conduct air sampling and provide laboratory analysis of air samples. This firm is responsible for ensuring that all abatement activities are in full compliance with all applicable federal, state, and local laws, rules, and regulations, and the contract documents. Air sampling and analysis required by OSHA regulations to be performed by the Contractor shall be the responsibility of the Contractor and will not be performed by the Air Sampling and Analysis Firm.

- B. The Asbestos Project Monitor shall have personnel on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any work, including mobilization and preparation, unless the Asbestos Project Monitor consultant is on-site.
- C. The Asbestos Project Monitor, and his on-site representative, 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 Asbestos Project Monitor shall have the authority to stop work when gross work practice deficiencies or unsafe practices are observed or ambient fiber concentrations outside the removal area exceed .01 f/cc or background level.
- D. The Asbestos Project Monitor shall provide the following functions:
 - 1. Inspections of Contractor's work, practices, and procedures for compliance with all regulations and project specifications. Notify the Owner/Architect of Contractor non-compliance during the project.
 - 2. Maintain a daily log on-site of all activities undertaken by the Contractor, all visitors to the site, and any unusual events.
 - 3. The inspector shall turn over copies of all daily logs, air-monitoring results, and any other reports prepared in the field to the Architect/Certified Project Designer.
 - 4. Verify daily that all workers used in the performance of the project is certified by the appropriate regulatory agency.
 - 5. Monitor the progress of the Contractor's work and report any deviations from the schedule to the Architect/Certified Project Designer.
 - 6. Monitor, verify, and document all waste load-out operations. The Project Monitor shall maintain a disposal log indicating the time, date, quantity, and destination (including hauler information) of all waste removed from the site.
 - 7. The Project Monitor shall ensure that the waste disposal procedures are being followed, including the use of container seals and the Authority's waste manifest.
 - 8. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 - 9. Verify that all materials and equipment delivered to the site are in conformance with the contract documents and approved submittals.
 - 10. Ensure that all warning signs and notices required of the owner and the Contractor are posted.
 - 11. Inspect each work area prior to abatement activities and document building damages prior to and after the abatement Contractor performs the work.
 - 12. Inspect each work area to verify total asbestos abatement in accordance with the contract documents prior to clearance air sampling.
 - 13. Attend regular meetings to discuss project related issues.
 - 14. Deliver a bound final report to the Owner within 30 days of the completion of monitoring services which contains all project monitoring and air sampling documentation, credentials, an executive summary of the activities included in the report, and a statement that confirms that all monitoring and air sampling has been completed in compliance with New York State Department of Labor and Environmental Protection Agency regulations.
 - 15. The selected monitoring company shall NOT be permitted to provide testing and/or consulting services to the selected asbestos abatement Contractor for any work on this project.
- E. The Project Monitoring services have been contracted for Monday through Friday, 8 hours per day. The time lines that have been established are based on the Owner's needs and the Contractor completing the work with sufficient manpower, supplies and organization within the scheduled time. If more hours are needed due to a lack of the Contractor's ability to meet the scheduled time lines, the cost for additional Project Monitoring and Air Sampling shall be the responsibility of the Contractor.

1.7 AIR SAMPLING REQUIREMENTS

- A. Air Sampling shall be conducted as required by New York State regulations.
- B. Unless otherwise required by applicable regulations, samples shall be analyzed by Phase Contrast Microscopy (PCM) and final clearance air samples by Transmission Electron Microscopy (TEM) as outlined by paragraphs below. Chain of Custody must be maintained for all samples.

- C. Analytical services shall be provided by a laboratory certified by the New York State Department of Health Environmental Laboratory Approval Program specifically for the analytical procedure being used.
- D. Air sampling shall be performed by an individual with at least six months experience in abatement project air sampling and shall hold certification as a New York State Asbestos Handler or Asbestos Project Air Sampling Technician as required by applicable New York State regulations.
- E. The Asbestos Project Air Sampling Technician shall maintain a log on-site of all air monitoring conducted and the results of such monitoring.
- F. The air sampling technician must have an adequate quantity of equipment required to conduct the necessary air monitoring, including a sufficient number of air sampling pumps as well as leaf blowers and fans required for aggressive clearance air monitoring.
- G. To help maintain scheduled time lines, the work is divided into work areas for air monitoring as grouped below. Each area shall have separate pre, during and post abatement monitoring.
- H. Pre-abatement air samples shall be collected before the Contractor arrives on site.
- I. During abatement samples shall be collected at locations selected by the PM/AST.
- J. Inside air samples shall be collected by the PM/AST. These samples shall not be used to satisfy the Contractor's responsibility for personal sampling.
- K. TEM and PCM final air samples shall be collected in the same locations as the pre-abatement air samples.
- L. Required Inspections - The following minimum inspections shall be conducted by the Asbestos Project Monitor. 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 Project Monitor.
 - 1. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the work areas and to documents these conditions. It shall be conducted with the owner, Asbestos Project Monitor, Contractor, and the Architect/Certified Project Designer (as appropriate) prior to release of the building to the abatement Contractor.
 - 2. Pre-Commencement Inspection: The purpose of the 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.
 - 3. Work 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 Asbestos Project Monitor during preparation and removal activities at least twice every work shift.
 - 4. Visual Clearance Inspection: The purpose of this inspection is to verify the Contractor's certification that all materials have been removed from the work area and the absence of all visible accumulations of debris in the work area. This inspection shall be conducted after encapsulation and removal of all surface plastic in the area, but before final air clearance testing. Critical barriers shall remain in place.
 - 5. Punch List Inspection: The purpose of this inspection is to verify the Contractors' certification that all work has been completed as contracted and the condition of the existing area prior to its release to the owner.

1.8 MINOR ASBESTOS ABATEMENT PROJECT (LESS THAN OR EQUAL TO 25 LINEAR FEET OR 10 SQUARE FEET)(TENT/MINI ENCLOSURES)

- A. Pre-abatement air sampling/during-abatement air sampling; In compliance with New York State Department of Labor approved specific variance.

- B. Final clearance air sampling; In compliance with New York State Department of Labor approved specific variance and New York State Education Department Final Clearance Air Sampling clarification dated August 2007:
 - 1. For areas up to Three (3) square feet or Three (3) linear feet; provide One (1) aggressive air sample inside and One (1) standard air sample outside the work area plus required blanks. Analysis by TEM.
 - 2. For areas over Three (3) square feet or Three (3) linear feet but less than Twenty-Five (25) linear feet or Ten (10) square feet; provide Five (5) aggressive air samples inside and One (1) standard sample outside the work area plus required blanks. Analysis by TEM.
- 1.9 SMALL ASBESTOS ABATEMENT PROJECT (LESS THAN 260 LINEAR FEET OR 160 SQUARE FEET, GREATER THAN 25 LINEAR FEET OR 10 SQUARE FEET)
- A. Pre-abatement sampling; Three (3) samples inside and three (3) samples outside the work area plus required blanks. Analysis by PCM
 - B. During abatement; if required, during abatement air sampling shall be in compliance with New York State Department of Labor Applicable Variance and/or approved Specific Variance. Analysis by TEM. (Minimum requirement in compliance with New York State Department of Labor approved Specific Variance and New York State Education Department Final Clearance Air Sampling clarification, dated August 2007.
 - C. Final clearance air samples;
 - 1. Five (5) aggressive air samples inside and three (3) standard samples outside the work area plus required blanks. Analysis by PCM. Minimum requirement in compliance with New York State Department of Labor approved Specific Variance and New York State Education Department Final Clearance Air Sampling clarification, dated August 2007.
 - 2. If one or both sets of samples do not meet the above stated final clearance air sample criteria, the Contractor shall re-clean the work area and a complete duplicate set of final clearance air samples shall be collected by the Project Monitor/Air sample Technician. The Contractor shall be responsible for all cost of the air sampling and subsequent analysis until all final clearance air sample criteria has been achieved.
- 1.10 LARGE ASBESTOS ABATEMENT PROJECT (260 LINEAR FEET OR 160 SQUARE FEET OR GREATER)
- A. Pre-abatement sampling; Five (5) samples inside and five (5) samples outside the work area plus required blanks. Analysis by PCM
 - B. During abatement; Five (5) samples outside the work area plus required blanks. Analysis by PCM
 - C. Final clearance air samples;
 - 1. Up to five (5) aggressive air samples inside and five (5) standard outside the work area plus required blanks. Analysis by TEM. Minimum requirement in compliance with New York State Department of Labor approved Specific Variance and New York State Education Department Final Clearance Air Sampling clarification, dated August 2007.
 - 2. If one or both sets of samples do not meet the above stated final clearance air sample criteria, the Contractor shall re-clean the work area and a complete duplicate set of final clearance air samples shall be collected by the Project Monitor/Air sample Technician. The Contractor shall be responsible for all cost of the air sampling and subsequent analysis until all final clearance air sample criteria has been achieved.
- 1.11 SCOPE OF WORK
- A. The quantities listed in the tables are for informational purposes ONLY. The Contractor shall be responsible for ALL asbestos containing materials within the work areas.
 - B. Work areas are as follows:

1. Work Area #1 – Involves the abatement of approximately 40 linear feet of asbestos containing caulk and sealants around the elementary school 1st and 2nd floor stairwell glass block windows
 2. Work Area # 2 involves the abatement of approximately 20 linear feet of asbestos containing door caulk located around the door frame of the double doors in the pool area near the scoreboard.
- C. The work shall be completed in one phase within the following schedule:
1. Work Area #1 Completed in concurrently with work area 2..
 2. Work Area #2 Completed concurrently with Work Area 1.
- D. The Asbestos Abatement Contractor shall remove existing the window and door caulk from the locations listed in the work areas above utilizing Non-friable removal methods in accordance with the requirements listed in NYS IDCR 56.
- E. Dumpster locations and lift usage shall be subject to acceptance by the Architect/Certified Project Designer.
- F. If final clearance air samples do not meet the criteria as regulated by New York State Department of Labor and the New York State Education Department, the Contractor shall re-clean the work area and a complete, duplicate set of final clearance air samples, shall be collected by the Project Monitor/Air Sampling Technician. The Contractor shall be responsible for all cost of the air sampling and subsequent analysis until all final clearance air sample criteria has been achieved.
- G. An asbestos demolition survey is available for review. The Contractor shall be responsible for the abatement of all asbestos containing materials in preparation for demolition by others. If bulk sampling is required to determine a complete abatement the Owner shall perform all testing, and all sampling costs shall be the responsibility of the Contractor.
- H. Roof mechanical shut down, if needed, shall be coordinated with the Owner and/or the Owner's representative.
- I. The Contractor shall be responsible to employ removal methods, sufficient cleaning and/or other such means, methods or equipment to provide areas free of odors, fumes, and/or irritants or residues. The Contractor shall respond and remove the cause of such odors, fumes or irritants at its own expense if notified by the Owner or Architect/Certified Project Designer, within six months of the date of substantial completion.

1.12 LICENSING AND CERTIFICATION

- A. The Contractor must have successfully completed a Contractor supervisor course approved by the EPA.
- B. The Contractor must hold a valid State of New York, Department of Labor asbestos Contractor's license. A copy of this asbestos license shall be conspicuously displayed proximate to but outside the work area during the duration of the project.
- C. The Contractor shall permit only those persons who hold valid State of New York Department of Labor asbestos handling certificates to engage in work on this project.
- D. The Contractor shall have EPA Certification as an Asbestos Contractor.

PART 2 UTILITIES

2.1 WATER:

- A. When feasible, interrupt the flow of water to areas where asbestos removal shall be conducted. This requirement shall be mandatory in areas of demolition.

- B. The Owner shall furnish access to water required for construction, at no cost to the Contractor. The Contractor shall be responsible for any plumbing work or fixtures necessary to connect to the Owner's existing system, and shall be required to provide anti-siphon devices at the connection to the Owner's water system.
- C. Contaminated water shall be treated by a several stage filter system consisting minimally of a 25 micron filter followed by a 5 micron filter and typically by a 5 micron, 50 micron and 100 micron filter series prior to disposal in a municipal sewage system. This process may only be used when not contrary to local ordinances.
- D. Coordinate with the Owner for the nearest hookup and drainage. It shall be the Contractor's responsibility to connect the water source to the location needed and to provide required drainage.

2.2 ELECTRICITY:

- A. Electricity shall be from the Owner's designated panel box, through the Contractor's power board, to the work area. The Contractor shall supply the air-monitoring firm with sufficient outlets.
- B. The Contractor shall label any circuits disabled in conjunction with the work; "TEMPORARILY DISCONNECTED DUE TO RENOVATION WORK. DO NOT ACTIVATE THESE CIRCUITS – SAFETY HAZARD".
- C. The Contractor shall supply a power board on site designed to handle the expected electrical load during the project. The power board shall be installed, tested and activated prior to any other site work for the execution of this contract. This work shall be accomplished by a properly trained and experienced electrician.
- D. Provide as required by 29 CFR 1926, temporary 120/240 Volt, single phase, three wire, 100 amp electric service with Ground Fault circuit Interrupters (GFCI) for electrical requirements for the project. No damaged electrical cords shall be allowed on site. Draw out power service from Owner's existing power panel to service the Contractor's power board. Each HEPA unit shall be circuited to a separate and unique breaker with a minimum of 15 amp. service to prevent multiple loss of negative pressure units.
- E. Provide temporary lighting with "weatherproof" fixtures for work areas including the decontamination chambers.
- F. Provide electrical service as needed by the Project Monitor and the AST (including GFCI). Minimum electrical services that are to be provided include:
 - 1. Six 15 amp. protected 3 prong outlets within the work area.
 - 2. Six 15 amp protected 3 prong outlets for work areas outside of the containment zone or area.
 - a. The Owner shall not be responsible for making available to the Contractor temporary electrical service systems.
 - b. The Contractor shall supply power and connections to maintain fire alarms and security system in non-work areas. The Contractor may also be required to provide temporary electrical service to occupied portions of the building.

PART 3 EXECUTION

3.1 WORK AREA PREPARATION

- A. The work area shall be vacated by the occupants prior to work area preparation and until satisfactory clearance air monitoring results have been achieved.
- B. Caution signs meeting the specifications of OSHA 29 CFR 1910.1001(j) shall be posted at all locations and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted that permit a person to read the sign and take the necessary protective measures to avoid exposure.

- C. Shut down and lock out electric power to all work areas. Provide temporary power and lighting and ensure safe installation of temporary power sources and equipment used where high humidity and/or water shall be sprayed in accordance with all applicable codes. All power to work areas shall be brought in from outside the area through a ground-fault circuit interrupter at the source.
- D. The personal decontamination enclosure system shall be installed or constructed prior to preparatory work in the work area and in particular before the disturbance of asbestos material. The waste decontamination enclosure system shall be installed or constructed prior to commencement of abatement activities.
- E. Heating, Ventilating and Air Conditioning (HVAC) System Isolation. Acceptable methods for HVAC system isolation shall include conformance with NYCRR Title 12, Subpart 56-8.
- F. Shutdown and isolation HVAC systems to prevent contamination and asbestos dispersal to other areas of the building or structure.
- G. Contaminated HVAC filters shall be handled and disposed of as asbestos waste material. The ducts and filter assembly shall be wet cleaned and/or HEPA vacuumed where system air samples and/or dust samples indicate asbestos contamination.
- H. Fixed objects and other items, which are to remain within the work area, shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Such objects and items shall be enclosed with two layers of at least six-mil plastic sheeting and sealed with tape.
- I. The work area shall be cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall not be permitted.
- J. Isolation barriers that seal off all openings, including but not limited to windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetrations of the work area shall be constructed using two layers of at least six mil, fire retardant plastic sheeting sealed with tape. Also, all seams in system components that pass through the work area shall be sealed. Doorways and corridors, which shall not be used for passage during work, shall also be sealed.
- K. Separation of the work area from the remainder of the work site by construction of isolation barriers shall be accomplished as follows:
 - 1. Wall shall be constructed of wood or metal framing to support barriers in all openings larger than thirty-two square feet, except where any one dimension is one foot, or less.
 - 2. A sheathing material of at least three-eighths inch thickness shall be applied to the work side of the barrier.
 - 3. Edges of the partition shall be caulked at the floor, ceiling, walls and fixtures to form an airtight seal.
 - 4. The work area side of the partition shall be covered with a double layer of at least six-mil, fire retardant plastic sheathing with staggered joints and sealed.
- L. Emergency and fire exits from the work area shall be maintained or alternate exits shall be established according to all applicable codes.

3.2 TRANSPORTATION AND DISPOSAL

- A. Applicable Regulations:
 - 1. All asbestos waste shall be stored, transported and disposed of as per, but not limited to, the following regulations:
 - a. NYS DEC 6 NYRCC part 360 and 364
 - b. USEPA NESHAPS 40 CFR 61
 - c. USEPA ASBESTOS WASTE MANAGEMENT GUIDANCE EPA/530-SW-85-007
- B. Transportation and Disposal Site:
 - 1. The Contractor's hauler and disposal site shall be subject to the approval of the Project Monitor.

2. The Contractor shall give 24-hour notification prior to removing any waste from the site. Waste shall be removed from site only during normal working hours unless otherwise specified. No waste may be taken from the site without authorization from the Project Monitor.
- C. Prior to the removal of any waste materials from the site, the Contractor shall submit a complete and valid copy of an "Industrial Waste Transporter Permit" specifically for asbestos-containing materials, pursuant to 6 NYCRR 364 for the transporting of waste. Only vehicles listed on this permit shall be allowed to transport waste materials from the site.
- D. Waste Shipment Record; Prior to the transport of any waste materials from the site, the Contractor shall submit a Waste Shipment Record (WSR) to the Project Monitor with generator and transporter sections completely filled in and signed for each day on which asbestos waste is removed from the site. Provide originally signed WSR to Project Monitor so he can make copies for records and return the originally signed WSR to transporter so that original signature of landfill agent can be entered upon delivery to landfill. This documentation shall include the amount of waste removed, in both numbers of bags or containers, which correspond to the Project Monitor's logged count and cubic yards. The WSR shall include the, name and address of the transporter, the landfill to which the waste is transported, the quantity accepted by the landfill and the signature of the landfill official who accepts the delivery. Waste Shipment Records bearing the original signature (carbon copy bearing impressions of the original signatures are acceptable) of the landfill agent receiving the waste must be received by the Owner/Architect/Certified Project Designer within 35 days of shipment. Failure to comply shall result in a detailed report being transmitted to the New York State Department of Labor and EPA-NESHAPS.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.
- B. Demolishing designated building equipment and fixtures.
- C. Demolishing designated construction.
- D. Removing designated items for Owner retention.
- E. Protecting items designated to remain.
- F. Removing demolished materials.

1.2 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 35 17 - Alteration Project Procedures: Protection of existing facilities; cutting and patching requirements.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal; earth stripping and stockpiling.
- G. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- H. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Areas for temporary construction and field offices.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.
 - 3. Indicate location of items designated for Owner retention.

- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.4 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of ten years of documented experience.
- B. Design shoring, bracing, underpinning under direct supervision of Professional Engineer experienced in design of this Work and licensed the State of New York.
- C. Conform to applicable code for demolition work, safety of adjacent structures, dust control, products requiring electrical disconnection and re-connection.
- D. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
- E. Obtain required permits from authorities having jurisdiction.

1.5 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.7 SCHEDULING

- A. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.
- B. Schedule work to coincide with new construction.
- C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owner operations.
- D. Performance of noisy, malodorous, dusty, and removal of hazardous material work:
 - 1. Will not be permitted during school hours.
 - 2. All activities must be coordinated with the Owner to ensure that programming and services will be uninterrupted by construction activities and to ensure the safety of the students and occupants.
- E. Coordinate utility and building service interruptions with Owner.
 - 1. Do not disable or disrupt building fire or life safety systems without five days prior written notice to Owner.
 - 2. Schedule tie-ins to existing systems to minimize disruption.
 - 3. Coordinate work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.8 PROJECT CONDITIONS

- A. Buildings indicated to be demolished will be vacated before start of Work.
- B. Owner assumes no responsibility for actual condition of buildings to be demolished.
- C. Hazardous Materials: Known hazardous materials will be removed before start of Work. Notify Architect/Engineer upon discovery of a hazardous material.

- D. Each contractor shall be responsible for the cutting and patching of existing surfaces as required to complete the work of their contract unless noted otherwise.
- E. Conduct demolition to minimize interference with adjacent and occupied building areas.
- F. Cease operations immediately if structure appears to be in danger and notify Architect. Do not resume operations until directed.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
 - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 4. Layout cuts in post-tensioned concrete elements to avoid cutting concrete within 12 inches of any stressing tendon. Notify Architect five days in advance of cutting post-tensioned concrete.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks or hydrants without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- E. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Verify hazardous material abatement is complete before beginning demolition.
- H. Carefully remove building components indicated to be reused.
 - 1. Mark components and packaged parts to permit reinstallation.
 - 2. Store components, protected from construction operations until reinstalled.
- I. At completion of the demolition work restore, repair or refinish all building systems, components and finishes disturbed as the result of the demolition process.

- J. Remove foundation walls and footings to minimum of two feet below finished grade .

3.2 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide sound retardant partitions of construction and in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
- E. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

3.4 SALVAGE REQUIREMENTS

- A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Carefully remove building components and equipment indicated to be salvaged.
- E. Disassemble as required to permit removal from building.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

3.5 DEBRIS AND WASTE REMOVAL

- A. Remove materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete formwork.
- B. Concrete for composite floor construction.
- C. Floors and slabs on grade.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads.
- G. Concrete curing.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.
- B. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.3 REFERENCE STANDARDS

- A. ACI PRC-213 - Guide for Structural Lightweight-Aggregate Concrete; 2014 (Reapproved 2023).
- B. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- C. ACI MNL-66 - ACI Detailing Manual; 2020.
- D. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- E. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- F. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- G. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- H. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- I. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- J. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- K. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- L. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- M. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.

- N. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- O. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- P. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2025b.
- Q. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- R. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- S. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.
- T. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- V. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- X. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2025.
- Y. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.
- Z. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- AA. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2023.
- BB. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- CC. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.
- DD. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2025.
- EE. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.
- FF. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2024.
- GG. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.
- HH. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- II. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2023.
- JJ. ASTM D2103 - Standard Specification for Polyethylene Film; 2023a.
- KK. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.
- LL. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.

MM. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
- D. Design Data:
 - 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 - 2. Identify mix ingredients and proportions, including admixtures.
 - 3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
 - 4. Submit 28 day concrete strength test data for each mix design per ACI CODE-318 requirements.
 - a. Provide a minimum of 15 concrete strength tests, where a concrete strength test is the average strength of at least two 6x12 inch or three 4x8 inch cylinders.
 - b. If 15 concrete tests are unavailable, the average strength of the concrete tests must exceed the required strength by 1200psi for up to 5000 psi mix concrete.
- E. Samples: Submit samples of underslab vapor retarder to be used.
- F. Reinforcing Placement Drawings: Comply with requirements of ACI MNL-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices, supporting & spacing devices. Indicate quantities of reinforcing steel and welded wire fabric.
- G. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- H. Reports: Submit certified copies of mill test report of reinforcement materials analysis.
- I. Test Reports: Submit report for each test or series of tests specified.
- J. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

1.5 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements for requirements.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.6 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.1 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Steel.
 - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.2 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Fiber Reinforcement: Alkali-resistant polypropylene monofilament complying with ASTM C1116/C1116M, 24 ksi minimum tensile strength. Mixing rate per manufacturer's recommendations.
 - 1. Fiber Length: 0.75 inch, nominal.
 - 2. Products:
 - a. Fibermesh 150 by Propex Concrete Systems: www.fibermesh.com
 - b. FRC Mono 150 by FRC Industries: www.frcindustries.com
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Coarse Aggregate Maximum Size: In accordance with ACI CODE-318.
- C. Lightweight Aggregate: ASTM C330/C330M.
- D. Fly Ash: ASTM C618, Class F. Loss on ignition requirement waived if used in flowable fill concrete mix.
- E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.
- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Products:
 - a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
 - b. Poly-America; Husky Yellow Guard Class A 15-mil Vapor Barrier: www.yellowguard.com/#sle.
 - c. Stego Industries, LLC; Stego Wrap 15-mil: www.stegoindustries.com/#sle.
 - d. Tex-Trude, LP; Xtreme Vapor Barrier (15-mil): www.tex-trude.com/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
 - 2. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
 - 3. Flowable Products:
 - a. Euclid Chemical Company; NS GROUT: www.euclidchemical.com/#sle.
 - b. Five Star Products, Inc; Five Star Fluid Grout 100: www.fivestarproducts.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, nonmetallic aggregate, and activator.
 - 1. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch.

2.6 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
 - 1. Complying with ASTM C881/C881M and of Type required for specific application.
 - 2. Products:
 - a. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
 - b. Kaufman Products Inc; SurePox HM Class B: www.kaufmanproducts.net/#sle.
 - c. SpecChem, LLC; SpecPox 1000, SpecPox 2000, SpecPox 3000, or SpecPox 3000FS: www.specchemllc.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
- D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
 - 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 - 2. Height: To suit slab thickness.

- E. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric filler strip with Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum cover plate, of longest manufactured length at each location, flush mounted; color as selected.

2.7 CURING MATERIALS

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- B. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
- C. Moisture-Retaining Sheet: ASTM C171.
 - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
 - 2. Non-staining cotton fabric, weighing not less than 8 oz/per square yd, bonded to prevent separation during handling and placing.
- D. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
- E. Water: Potable, not detrimental to concrete.

2.8 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Proportioning Structural Lightweight Concrete: Comply with ACI PRC-213 recommendations.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- E. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

2.9 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
 - 1. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

- A. See Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify requirements for concrete cover over reinforcement.

- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- C. Remove water from areas receiving concrete before concrete is placed.
- D. Verify that forms are clean and free of rust before applying release agent.
- E. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- F. Wet sticking anchor rods shall not be permitted.
- G. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- H. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- I. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.
 - 2. Lap Vapor Barrier over footings and seal to foundation walls.
 - 3. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 - 4. Seal all penetrations (including pipes) with pipe boot and tape.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Notify testing laboratory and Architect not less than 24 hours prior to commencement of placement operations.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.5 SEPARATE FLOOR TOPPINGS

- A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

- B. Place required dividers, edge strips, reinforcing, and other items to be cast in.
- C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
- D. Place concrete floor toppings to required lines and levels.
 - 1. Place topping in checkerboard panels not to exceed 20 feet in either direction.
- E. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.6 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for compliance with specified tolerances.
- B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 35; F(L) of 25, on-grade only.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
 - 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
- C. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155/E1155M, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- D. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value.
- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.7 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 2. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot nominal.

3.8 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.9 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI CODE-318 and applicable code.

- C. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- D. Provide free access to concrete operations at project site and cooperate with appointed firm.
- E. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- F. Concrete Inspections:
 - 1. Continuous Placement Inspection: Inspect for proper installation procedures.
 - 2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
- G. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172/C172M.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, field cured.
 - 3. Sample concrete and make one set of four cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 5,000 sf of surface area for slabs and walls.
 - 4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
 - 5. Make one additional cylinder during cold weather concreting, and field cure.
- H. Field Testing:
 - 1. Slump Test Method: ASTM C143/C143M.
 - 2. Air Content Test Method: ASTM C173/C173M.
 - 3. Temperature Test Method: ASTM C1064/C1064M.
 - 4. Measure slump and temperature for each compressive strength concrete sample.
 - 5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- I. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39/C39M.
 - 2. Test Acceptance: In accordance with ACI CODE-318 and applicable code.
 - 3. Test one cylinder at 7 days.
 - 4. Test two cylinders at 28 days.
 - 5. Retain one cylinder for 56 days for testing when requested by Architect.
 - 6. Dispose remaining cylinders when testing is not required.
- J. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- K. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.10 PATCHING

- A. Allow Architect to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.
- C. Patch imperfections as directed by Architect in accordance with ACI CODE-318.

3.11 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12 PROTECTION

- A. If cold weather provisions of ACI PRC-306 are required:
 - 1. Protect fresh concrete from freezing by heating the ground and forms to minimum temperatures of ACI PRC-306.
 - 2. Thermally protect the fresh concrete the following durations
 - a. Concrete footings/walls - 48 hours after placement
 - b. Concrete piers - 72 hours after placement.
 - c. Concrete slabs on grade - 72 hours after placement.
- B. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 41 00
PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Precast Concrete Pool Bleachers

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: For connection anchor placement.
- B. Section 12 66 13 - Telescoping Bleachers: For plastic seat connection

1.3 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- E. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).
- I. IAS AC157 - Accreditation Criteria for Fabricator Inspection Programs for Reinforced and Precast/Prestressed Concrete; 2024, with Editorial Revision (2025).
- J. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 2021.
- K. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.
- L. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a pre-installation conference one week prior to commencing work of this section.
 - 1. Discuss limitations, if any, on field cutting of openings.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.
- C. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions. Indicate locations and details of anchorage devices to be embedded in or attached to structure of other construction and relationship to adjacent materials and sealed by a professional engineer licensed in the state which the project is located.
- D. Samples: Submit two samples, 6 by 6 inch in size, illustrating surface finish treatment and color.
- E. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.
- F. Designer's (NYS licensed professional engineer) Qualification Statement.
- G. Fabricator's Qualification Statement.
- H. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design precast concrete members by a Professional Structural Engineer experienced in design of precast concrete and licensed in the State of New York.
- B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience. Assumes responsibility for engineering structural precast concrete units to comply with performance requirements. This includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the state which the project is located.
- C. Erector Qualifications: Company specializing in erecting products of this section with minimum three years of documented experience. A precast erector shall be qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the jobsite. Submit a current Certificate of Compliance furnished by PCI.
- D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.
- B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- C. Protect members to prevent staining, chipping, or spalling of concrete.
- D. Mark each member with date of production and final position in structure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Structural Precast Concrete:

1. Any manufacturer holding a PCI Group C Plant Certification for the types of products specified; see www.pci.org/find/manufacturer.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PRECAST UNITS

- A. Precast Structural Concrete Units: Comply with PCI MNL-116, PCI MNL-120, PCI MNL-123, PCI MNL-135, ACI CODE-318, and applicable codes.
 1. Design components to withstand dead loads and design loads in the configuration indicated on drawings and as follows:
 - a. Floor Assembly: 100 pounds per square foot live load, 120 pounds per linear foot..
 - b. Maximum Allowable Deflection of Floor Assemblies: $1/360$ of span , cambered to achieve flat surface under dead load.
 2. Calculate structural properties of framing members in accordance with ACI CODE-318.
 3. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

2.3 MATERIALS

- A. Cement: Portland type, conforming to ASTM C150, Type II, minimum of 4,000 psi.
- B. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirements and PCI MNL-116.

2.4 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
- B. Steel Welded Wire Reinforcement: ASTM A1064/A1064M plain type or deformed type; in flat sheets; unfinished.

2.5 FABRICATION

- A. Comply with fabrication procedures specified in PCI MNL-116.
- B. Maintain plant records and quality control program during production of precast members. Make records available upon request.
- C. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on Drawings.
- D. Provide required openings with a dimension larger than 10 inches and embed accessories provided under other sections of the specifications, at indicated locations.
- E. Weld steel fabrications in accordance with AWS D1.1/D1.1M. Weld reinforcing steel in accordance with AWS D1.4/D1.4M. do not tack weld reinforcing.

2.6 FINISHES

- A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.
- B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- C. Finish members to PCI MNL-116 Finish A grade.
- D. Exposed-to-View Finish: Normal plant finish with fins and protrusions removed, ground edges and ends, flat face surfaces.

2.7 ACCESSORIES

- A. Connecting and Supporting Devices; Anchors and Inserts: Plates, angles, items cast into concrete, items connected to steel framing members, and inserts complying with PCI MNL-123 and as follows:
 - 1. Material: Carbon steel complying with ASTM A36/A36M.
 - 2. Finish: Prime painted, except where device surfaces will be in contact with concrete or will require field welding.
- B. Bolts, Nuts and Washers: Corrosion resistant chromium-nickel type.

2.8 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Provide mix design for concrete.
- B. Test samples in accordance with applicable ASTM standard.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

3.2 PREPARATION

- A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.3 ERECTION

- A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- B. Align and maintain uniform horizontal and vertical joints, as erection progresses.
- C. Maintain temporary bracing in place until final support is provided. Protect members from staining.
- D. Provide temporary lateral support to prevent bowing, twisting, or warping of members.
- E. Adjust differential camber between precast members to tolerance before final attachment.
- F. Install bearing pads.
- G. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12.
- H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.
- I. Secure units in place. Perform welding in accordance with AWS D1.1/D1.1M.
- J. Weld reinforcing steel in accordance with AWS D1.4/D1.4M. Do not tack weld reinforcing.

3.4 TOLERANCES

- A. Erect members level and plumb within allowable tolerances.
- B. Comply with PCI MNL-135 for erection tolerances, except as specifically amended below.
 - 1. Plan Location from Building Grid Datum: Plus or minus 1/4 in.in 10 feet and 3/8 in. in 100 feet, non-cumulative.
 - 2. Maximum Jog in Alignment of Matching Ends: Plus or minus 1/4 inch.

3. Exposed Joint Dimension: Plus or minus 1/4 inch.

- C. When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise Architect/Engineer. Execute modifications as directed.

3.5 PROTECTION

- A. Protect members from damage caused by field welding or erection operations.
B. Provide non-combustible shields during welding operations to protect adjacent work.

3.6 CLEANING

- A. Clean weld marks, dirt, or blemishes from surface of exposed members.
B. Do not use cleaning materials or processes that could change the appearance of exposed finishes or damage adjacent materials.
C. Perform cleaning procedures according to precast concrete fabricators recommendations. Protect other work from staining damage due to cleaning operations.

END OF SECTION

SECTION 03 54 00
CAST UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment.
 - 1. Use cementitious type at all locations.

1.2 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.
- B. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCE STANDARDS

- A. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2021.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, mixing instructions, environmental limitations, and installation instructions.
- C. Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section with minimum three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.7 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.

- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.
- C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cementitious Underlayment:
 - 1. ARDEX Engineered Cements; ARDEX V 1200: www.ardexamericas.com/#sle.
 - 2. CMP Specialty Products; Level-1 with AS-100 Primer: www.cmpsp.com
 - 3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
 - 4. Sika Corporation ; Product Sikafloor Level 50.www.sikaconstruction.com

2.2 MATERIALS

- A. Cast Underlayments, General:
 - 1. Comply with applicable code for combustibility or flame spread requirements.
- B. Cementitious Underlayment: Blended cement mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
 - 1. Flexural Strength: Minimum 1000 psi after 28 days, tested per ASTM C348.
 - 2. Density: 125 pounds per cubic foot, nominal.
 - 3. Final Set Time: 1-1/2 to 2 hours, maximum.
 - 4. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inch.
 - 5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.
- C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
- E. Primer: Manufacturer's recommended type.
- F. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.

2.3 MIXING

- A. Site mix materials in accordance with manufacturer's instructions.
- B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.
- C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.1 EXAMINATION

- A. See Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

- A. Concrete: Mechanically prepare steel troweled concrete to create a textured surface necessary to achieve the best bond; acceptable methods include bead blasting and scarifying. Do not use acid etching.
- B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- C. Vacuum clean surfaces.
- D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.
- E. Close floor openings.

3.3 APPLICATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Pump or pour material onto substrate. Do not retemper or add water.
 - 1. Pump, move, and screed while the material is still highly flowable.
 - 2. Be careful not to create cold joints.
 - 3. Wear spiked shoes while working in the wet material to avoid leaving marks.
- C. Place to thickness indicated on Drawings or as required to achieve finished floor elevation, with top surface level to 1/16 inch in 10 ft.
- D. For final thickness over 1-1/2 inches, place underlayment in layers. Allow initial layer to harden to the point where the material has lost its evaporative moisture. Immediately prime and begin application of the subsequent layer within 24 hours.
- E. Place before partition installation.
- F. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.
- G. If a fine, feathered edge is desired, initial preparation per manufacturers recommendations and steel trowel the edge after initial set, but before it is completely hard.

3.4 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.
- B. Air cure in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field inspection and testing, as specified in Section 01 40 00 - Quality Requirements.
- B. Placed Material: Agency will inspect and test for compliance with specification requirements.

3.6 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 05 11
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

1.2 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Installation of mortar and grout.

1.3 REFERENCE STANDARDS

- A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
- B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
- C. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2024.
- D. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- E. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- F. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- G. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- H. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- I. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2025.
- J. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.
- K. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2024.
- L. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- M. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2022.
- N. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.
- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

- D. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C 270 and test and evaluation reports per ASTM C 780 for aggregate ratio and water content, air content, consistency, and compressive strength.
- E. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.6 FIELD CONDITIONS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

- A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials or made from factory premixed dry materials with addition of water only.
- B. Mortar Mix Designs: ASTM C270, Property Specification.
 - 1. Masonry below grade and in contact with earth: Type S.
 - 2. Exterior, Loadbearing Masonry: Type S.
 - 3. Exterior, Non-loadbearing Masonry: Type N.
 - 4. Interior, Loadbearing Masonry: Type S.
 - 5. Interior, Non-loadbearing Masonry: Type N.
- C. Grout Mix Designs:
 - 1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; mix in accordance with ASTM C476.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 2. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; mix in accordance with ASTM C476.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.2 MATERIALS

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Color: To match mortar color of existing building.
 - 2. Water repellent mortar for use with water repellent masonry units.

- B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
- C. Portland Cement: ASTM C150/C150M.
 - 1. Type: Type I - Normal; ASTM C150/C150M.
 - 2. Color: Standard gray.
- D. Masonry Cement: ASTM C91/C91M.
 - 1. Type: Type N; ASTM C91/C91M.
- E. Hydrated Lime: ASTM C207, Type S.
- F. Mortar Aggregate: ASTM C144, standard masonry type.
- G. Grout Aggregate: ASTM C404, coarse.
- H. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): To be used to match color of existing mortar.
 - 2. Manufacturers:
 - a. Solomon Colors; Solomon Colors Concentrated A, H, and X Series:
www.solomoncolors.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Water: Clean and potable.
- J. Bonding Agent: Latex type.

2.3 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper only within two hours of mixing.
- E. Use mortar within two hours after mixing at temperatures of 90 degrees F or two-and-one-half hours at temperatures under 50 degrees F.

2.4 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
- C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.1 PREPARATION

- A. Apply bonding agent to existing concrete surfaces.

- B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Install grout in accordance with TMS 402/602 and ASTM C476.
- C. Work grout into masonry cores and cavities to eliminate voids.
- D. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.
- E. Do not displace reinforcement while placing grout.
- F. Remove excess mortar from grout spaces.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 40 00 - Quality Requirements.
- B. Test and evaluate mortar mix in accordance with ASTM C780 procedures.
- C. Test and evaluate grout mix in accordance with ASTM C1019 procedures.
- D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518/E518M; perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements.
- B. Section 04 05 11 - Masonry Mortaring and Grouting.
- C. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- F. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
- G. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
- H. ASTM C129 - Standard Specification for Dry-Cast Nonloadbearing Concrete Masonry Units; 2025.
- I. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2025.
- J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2024.
- K. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- L. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2025).

- M. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.
- N. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- O. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- P. BIA Technical Notes No. 18A - Accommodating Expansion of Brickwork; 2019.
- Q. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls; 2025.
- R. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
 - 1. Include control and expansion joint locations.
- D. Samples: Submit two samples of facing brick units to illustrate color, texture, and extremes of color range. Brick must match the range of color, texture, and size of the existing brick or as selected by Architect.
- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Handle and store pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Manufacturers:
 - 1. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - a. Southern Tier Concrete Products.
 - b. Dagostino Building Blocks.
 - c. York Building Products, Inc.
 - d. Substitutions: Section 01 60 00 - Product Requirements.
- B. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C90, normal weight.
 - 3. Nonloadbearing Units: ASTM C129.
 - a. Normal weight.

2.2 BRICK UNITS

- A. Manufacturers:
 - 1. Basis of Design Belden Brick: www.beldenbrick.com/#sle.
 - 2. Glen-Gery Brick: www.glengery.com.
 - 3. Substitutions: See section 01 60 00 - Product Requirements.
- B. Facing Brick: ASTM C216, Type FBX, Grade SW.
 - 1. Color and Texture: Equal amounts of the following brick colors.
 - a. Concord Clear by Bowerston Shale
 - b. Concord Blend by The Belden Brick Company
 - 2. Nominal size: Modular.
 - 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.3 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 04 05 11.

2.4 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - 2. WIRE-BOND www.wirebond.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.

1. Type: Truss or ladder.
 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss, ladder, or tab, with adjustable ties or tabs spaced at 16 in on center.
 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
 3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
 4. Vertical adjustment: Not more than 1 1/4 inches.
 5. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.
- F. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
- G. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
- H. Masonry Concealed Top of Wall Anchors: PTA tube with expansion filler to provide lateral shear resistance without transferring compressive load to masonry wall below.
1. Sheet Metal: Hot-dipped Galvanized, ASTM A153, B2 Class B
 2. Rod: Hot-dipped Galvanized, ASTM A153, B2
 3. PTA Tube: Manufactured from clear butyrate; tested in conformance with ASTM D542, ASTM D149, ASTM D696 and ASTM D257.
 4. Anchor shall be placed in fully grouted masonry core.
 5. Product: Hohmann & Barnard, Inc.: PTA 420 HS
- I. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 3. Vertical adjustment: Not less than 3-1/2 inches.

2.5 FLASHINGS

- A. At Elevator Addition: Metal Flashing Materials:
1. Prefabricated Metal Flashing: Smooth fabricated 12 oz/sq ft copper flashing for thru-wall conditions.
 - a. Manufacturers:
 - 1) Cheney Flashing Company: www.cheneyflashing.com/#sle.
 - 2) Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
- B. At Pool Renovation: Membrane Non-Asphaltic Flashing Materials:
1. Composite Polymer Flashings - Self-Adhering: Composite PVC with Elvaloy KEE; 40 mil thick with pressure-sensitive adhesive and release paper.
 - a. Physical Properties:
 - 1) Elongation: 225% (ASTM D412)
 - 2) Tensile Strength: 875 psi (ASTM D412)
 - 3) Tear Strength: 270 psi (ASTM D624)

- 4) Low Temperature Flexibility: -25 degrees F Pass (ASTM D146)
- 5) Water Absorption: Less than 0.1% (ASTM D471)
- 6) Color: As selected by Architect from manufacturer's full range
- 7) Compatibility with Urethane and Silicone sealant
- 8) UV stable
- b. Cloaked Flashing System: Standard or customized three-dimensional shapes (cloaks) as required to form a complete flashing system with preformed corners, end dams, level changes, other special shapes and seaming materials; all provided by flashing sheet manufacturer.
- c. Accessory Flashing Materials: Flashing manufacturer's standard adhesive, primer and mastic products for bonding flashing sheets to cloaks and to substrates.
 - 1) 4 inch minimum overlap is required
- d. Termination Bar: Provide termination bar and sealant at all areas where flashing is not tucked into the mortar joint of the block back-up wall.
- e. Manufacturers:
 - 1) Hyload, Inc: www.hyload.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.

2.6 ACCESSORIES

- A. Preformed Building Expansion Joints: High performance engineered silicone seating system that combines a factory cured silicone seal fused to a cellular polyurethane / polyester binary backer block creating a monolithic seal material. Provide with corner and tee accessories, fused joints.
 1. Manufacturers:
 - a. MM Systems: Product ESS-150
 - b. Substitution: See Section 01 60 00 - Product Requirements
- B. Preformed Control Joints: Closed cell Neoprene sponge material. Provide 3/8 inch wide by maximum lengths available. Provide corner and tee accessories, fused joints.
 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. WIRE-BOND: www.wirebond.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 1. Dove Tail Mortar Diverter: Panels designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Mortar Net Solutions: www.mortarnet.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- D. Weeps:
 1. Type: Molded PVC grilles, insect resistant.
 2. Color(s): As selected by Architect from manufacturer's full range.
 - a. Manufacturers:
 - 1) Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- E. Cavity Vents:
 1. Type: Molded PVC grilles, insect resistant.
 2. Color(s): As selected by Architect from manufacturer's full range.
 - a. Manufacturers:
 - 1) Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials. All material cleaning shall be done as recommended by material supplier.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running, unless shown otherwise in contract documents.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Common with Flemish every 6th course to match existing building
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.4 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.
- B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.6 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor retarder adhesive.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.
- D. Install cavity wall vents in veneer at 16 inch o.c. horizontally at top of exterior walls and below windowsills.

3.7 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHER MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 24 inches horizontally and 16 inches vertically.

3.8 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.9 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
 - 1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
 - 2. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.

- 3. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
 - 2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
 - 3. Do not splice reinforcing bars.
 - 4. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
 - 5. Place and consolidate grout fill without displacing reinforcing.
 - 6. Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 6 inch bearing on each side of opening.

3.11 GROUTED COMPONENTS

- A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web unless noted otherwise on contract documents.
- B. Lap splices minimum 48 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.12 CONTROL AND EXPANSION JOINTS

- A. Locate control and expansion joints as indicated on drawings and in accordance with recommendations of BIA Technical Notes No. 18A.
 - 1. Where joint locations are not indicated, or discrepancy exists between indicated joints and BIA recommendations, notify Architect for approval prior to proceeding.
- B. Do not continue horizontal joint reinforcement through control or expansion joints.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Form expansion joint as detailed on drawings.

3.13 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, grounds, and ductwork. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
 1. The agency shall monitor the proportioning, mixing, and consistency of mortar and grout; the placement of mortar, grout and masonry units; and the placement or reinforcing steel for compliance with the contract documents.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
- E. The agency shall prepare one set of prisms for testing at 7 days and one set for testing at 28 days. Tests are to be conducted by the agency for each 3,000 square feet of wall installed, but not less than two tests.

3.17 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.18 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- B. Protect base of walls from mud and mortar splatter.
- C. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.
- D. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural cast stone.
- B. Units required are:
 - 1. Exterior wall units, including coping, lintels, sills, quoins, and surrounds.
 - 2. All items indicated on drawings.

1.2 RELATED REQUIREMENTS

- A. Section 04 05 11 - Masonry Mortaring and Grouting: Mortar for setting cast stone.
- B. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.

1.3 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.
- D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2025.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- I. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.
- J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2025.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
 - 1. Include one copy of ASTM C1364 for Architect's use.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Mortar Color Selection Samples.

- E. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.
- F. Source Quality Control Test Reports.
- G. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.
- H. Provide signed and sealed calculations by Engineer registered in the State of New York for all cast stone anchors for review.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
 - 2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
 - 3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
 - 1. Approved mock-up will become standard for appearance and workmanship.
 - 2. Mock-up may remain as part of the completed work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Architectural Cast Stone:
 - 1. Any current producer member of the Cast Stone Institute.
 - 2. RockCast Division of Reading Rock Inc.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
 - 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
 - 4. Color: Starbuck manufactured by RockCast, a Division of Reading Rock, Inc.
 - 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 - 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
 - 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.

2.3 MATERIALS

- A. Portland Cement: ASTM C150/C150M.
 - 1. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.
- E. Admixtures: ASTM C494/C494M.
- F. Water: Potable.
- G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
 - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.4 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Maintain records and quality control program during production of cast stone units. Make records available upon request.
- C. Test compressive strength and absorption of specimens selected at random from plant production.
 - 1. Test in accordance with ASTM C642.
 - 2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.
 - 3. Submit reports of tests by independent testing agency, showing compliance with requirements.

- D. Inspect and test for color variation.
- E. Visually inspect color differences between fabricated units and approved sample in accordance with ASTM D1729.
- F. Make completed cast stone available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least seven days before inspection is allowed.
- G. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Owner at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
 - 1. Drench cast stone components with clear, running water immediately before installation.
 - 2. Set units in a full bed of mortar unless otherwise indicated.
 - 3. Fill vertical joints with mortar.
 - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.3 CLEANING

- A. Keep cast stone components clean as work progresses.

3.4 PROTECTION

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural steel framing members, support members.
- B. Base plates, shear stud connectors, expansion joint plates, and anchors.
- C. Grouting under base plates.

1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Coordination and Project Conditions

1.3 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2025).
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- G. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2022.
- H. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.
- I. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.
- J. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel; 2021.
- K. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2024.
- L. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.
- M. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.
- N. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2024.
- O. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.
- P. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

- Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- T. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- U. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- V. SSPC-SP 3 - Power Tool Cleaning; 2024.
- W. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

1.5 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Maintain one copy of each document on site.
- C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience with current AISC Quality Management Systems (QMS) Certification, Certified Building Fabricator, BU.
 - 1. Non AISC certified companies are acceptable with the following requirements:
 - a. A special inspector hired by the owner will be required to observe all fabrication of the structural steel for this project.
 - b. The cost for the special inspection fees incurred during fabrication shall be reimbursed to the owner by the contractor.
- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- F. Shop Painter: Company specializing in performing Work of this section with minimum 3 years documented experience with the following current AISC Certification:
 - 1. Sophisticated Paint Endorsement - Enclosed (P1)
 - 2. Sophisticated Paint Endorsement - Covered (P2)
 - 3. Sophisticated Paint Endorsement - Outside (P3)
- G. Welders and Welding Procedures: AWS D1.1 Structural Welding Code - Steel, qualified within previous 12 months.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
- E. Steel Plate: ASTM A514/A514M.
- F. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
- G. Headed Anchor Rods: ASTM F1554 Grade 36, plain.
- H. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Sliding Bearing Plates: Teflon coated.
- K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
- C. Fabricate connections for bolt, nut, and washer connectors.

2.3 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
 - 1. Color: Gray
- C. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating. Galvanize after fabrication.
- D. All exterior exposed steel to be galvanized.
- E. Galvanizing for Fasteners, connectors and Anchors
 - 1. Hot-dipped Galvanizing: ASTM A153/A153M.
 - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.4 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Shop test bolted and welded connections as specified for field quality control tests.

- C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.
 - 1. Verify bearing surfaces are at correct elevation.
 - 2. Verify anchor rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on shop drawings.
- D. Field connect members with threaded fasteners; torque to required resistance. Tighten to snug tight for bearing type connections.
- E. Do not field cut or alter structural members without approval of Architect.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.3 TOLERANCES

- A. See Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- C. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing, and 01 45 33 - Code-Required Special Inspections and Procedures.
- B. Bolted Connections: Inspect in accordance with AISC specifications.
 - 1. Visually inspect all bolted connections.
 - 2. For Direct Tension Indicators, comply with requirements of ASTM F959/F959M. Verify that gaps are less than specified in Table 2.
- C. Welded Connections: Inspect welds in accordance with AWS D1.1/D1.1M.
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Visually inspect all welds.
 - 3. Radiographic testing performed in accordance with ASTM E94/E94M. Performed when directed by Architect/Engineer.

4. Ultrasonic testing performed in accordance with ASTM E164. Perform on all full penetration welds.
 5. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 6. Magnetic particle inspection performed in accordance with ASTM E709. Performed when directed by Architect/Engineer.
- D. Correct defective bolted connections and welds.

END OF SECTION

SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.
- B. Supplementary framing for floor and roof openings greater than 18 inches.

1.2 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel Framing: Superstructure framing.
- B. Section 05 31 00 - Steel Decking: Support framing for openings less than 18 inches in decking.
- C. Section 05 50 00 - Metal Fabrications: Non-framing steel fabrications attached to joists.
- D. Section 03 30 00: Placement of anchors for casting into concrete.
- E. Section 04 20 00: Placement of anchors for embedding into masonry.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- D. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- E. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- F. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Provide shop drawings consisting of a framing plan and details developed by the steel joist manufacturer indicating standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
 - 1. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design calculations for each special joist designation (indicated as "SP" on the drawings) shall be submitted with shop drawings.
 - a. The special joists shop drawings and design calculations shall be designed and detailed by a professional engineer licensed to practice in the State of New York. Submittals shall bear their seal and signature.
 - b. Standard SJI designations shall be designed to the SJI specified design loads and need not be submitted.
- C. Joist Manufacturer's SJI Accreditation Certificate.

1.5 QUALITY ASSURANCE

- A. Design Responsibility: The design of the steel joist and associated connections shall be in accordance with applicable codes, regulations, and performance requirements herein provided, and shall be the sole responsibility of the steel joist manufacturer.
- B. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of New York.
 - 1. Comply with applicable codes for submission of design calculations, shop drawings, and erection drawings as required for acquiring permits.
 - 2. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.
- C. The Joist Manufacturer shall be certified by the Steel Joist Institute to engage in the design, manufacturing and distribution of steel joists and accessories.
 - 1. Joists manufactured by a non-certified shop may be provided. During production these joists require special inspections. The special inspections shall be provided at the cost of the contractor.
- D. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 (five) years documented experience.
- E. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 (five) years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Steel Joists:
 - 1. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
 - 2. New Columbia Joist Co.

2.2 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom and top chord extensions as indicated.
 - 2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standard.
 - 3. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
 - 4. Finish: Shop primed.
- B. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, Type 1, Red Oxide.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

- A. Furnish bottom and top chord extensions as indicated on drawings.

- B. Fabricate to achieve end bearing requirements.
- C. If joist splice is required:
 - 1. Provide field welded splice connection at exposed conditions.
 - 2. Provide bolted splice connection where ceilings are to be installed.

2.4 FINISH

- A. Shop prime joists and supplementary framing members.
 - 1. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete.
 - 2. Galvanize steel ledge angles, galvanize after fabrication.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.
- C. Galvanizing: Provide minimum 2.0 oz/sq ft galvanized coating to ASTM A123/A123M requirements.
- D. Galvanizing for Fasteners, Connectors and Anchors:
 - 1. Hot-Dipped Galvanizing: ASTM A153/A153M
 - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum

2.5 SOURCE QUALITY CONTROL

- A. Provide shop testing and analysis of steel components.
- B. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions
- B. Verify existing conditions prior to beginning work.

3.2 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- D. Position and field weld joist chord extensions and wall attachments as detailed.
- E. Install supplementary framing for floor and roof openings greater than 18 inches.
- F. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of Architect/Engineer and joist manufacturer.
- H. After erection, prime welds, damaged shop primer, damaged galvanizing, and surfaces not shop primed, except surfaces specified not to be primed or in contact with concrete.

3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances
- B. Maximum Variation From Plumb: 1/4 inch.
- C. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting and balancing
- B. Field inspect members, connections, welds and tightening of high strength bolts in slip-critical connections.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof deck.
- B. Composite floor deck.
- C. Metal form deck.
- D. Supplementary framing for openings up to and including 18 inches.
- E. Bearing plates and angles.
- F. Acoustical insulation in roof deck flutes.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete topping over metal deck; placement of anchors for bearing plates in precast concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors for bearing plates embedded in unit masonry assemblies.
- C. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.
- D. Section 05 21 00 - Steel Joist Framing: Support framing for openings larger than 18 inches and shear stud connectors.
- E. Section 05 50 00 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.3 REFERENCE STANDARDS

- A. ASCE 3 - Standard Practice for the Construction and Inspection of Composite Slabs.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- F. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022a.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).
- I. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

- J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Certificates: Certify that products furnished meet or exceed specified requirements.
- D. Submit manufacturer's installation instructions.

1.5 PERFORMANCE REQUIREMENTS

- A. Design metal deck in accordance with SDI 29 Design Manual.
- B. Perform Work in accordance with ASCE 3 for composite decks.

1.6 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Cut plastic wrap to encourage ventilation.
- C. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Deck Manufacturers:
 - 1. United Steel Deck: www.unitedsteel.com
 - 2. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
 - 3. Epic Metals Corporation: www.epicmetals.com
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
 - 1. Calculate to structural working stress design and structural properties specified.
 - 2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
 - 3. Maximum Vertical Deflection of Roof Deck: 1/240 of span.
 - 4. Maximum Vertical Deflection of Form Deck: 1/360 of span.
- B. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating conforming to ASTM A924/A924M.
 - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.

3. Structural Properties:
 - a. Section Modulus: As indicated on drawings.
 - b. Span Design: Multiple.
 4. Minimum Base Metal Thickness: 20 gauge, 0.0359 inch unless noted otherwise on drawings.
 5. Nominal Height: 1-1/2 inch.
 6. Profile: Fluted; SDI WR.
 7. Formed Sheet Width: 36 inch.
 8. Side Joints: Lapped.
 9. Flute Sides: plain vertical face
- C. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating conforming to ASTM A924/A924M.
 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 3. Structural Properties:
 - a. Section modulus: As indicated on drawings.
 4. Span Design: Multiple.
 5. Minimum Base Metal Thickness: 22 gage, 0.0299 inch unless noted otherwise on drawings.
 6. Nominal Height: As indicated on drawings.
 7. Formed Sheet Width: 36 inch.
 8. Side Joints: Lapped.
 9. Flute Sides: diagonally ribbed for improved concrete bond
- D. Metal Form Deck: Corrugated sheet steel:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating conforming to ASTM A924/A 924M.
 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 3. Minimum Metal Thickness, Excluding Finish: 22 gage unless noted otherwise on drawings.
 4. Section Modulus: As indicated on drawings.
 5. Span Design: Multiple
 6. Nominal Height: As indicated on drawings. 9/16 inch
 7. Formed Sheet Width: 32 inch.
 8. Side Joints: Lapped.
 9. Flute Sides: Plain vertical face

2.3 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel unfinished.
- B. Welding Materials: AWS D1.1/D1.1M.
- C. Fasteners: Galvanized hardened steel, self tapping.
- D. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- F. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.
- G. Acoustical Insulation: Glass fiber type, minimum 3 lb/cu ft density; profiled to suit deck. Spacers to support the acoustical insulation above the bottom flat area of the deck to facilitate field painting.
- H. Sheet Steel: ASTM A653, Grade 33 Structural Quality; with G90 galvanized coating conforming to ASTM A924

2.4 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gage thick sheet steel; of profile and size as indicated on drawings; finished same as deck.
- B. Cant Strips: Formed sheet steel, 20 gage, .0359 inch minimum thickness, 45 degree slope, 3-1/2 inch nominal width and height, flange for attachment.
- C. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.
- D. Floor Drain Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On concrete and masonry surfaces provide minimum 4 inch bearing.
- C. On steel supports provide minimum 1-1/2 inch bearing.
- D. Fasten deck to steel support members at ends and intermediate supports as indicated on drawings.
- E. Mechanically fasten or weld male/female side laps as indicated on drawings.
- F. Weld deck in accordance with AWS D1.3/D1.3M.
- G. At deck openings from 6 inches to 18 inches in size, provide 2 by 2 by 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- H. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- I. At floor edges, install wet concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- J. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- K. Close openings above walls and partitions perpendicular to deck flutes with double row of foam cell closures.
- L. Seal deck joints, laps, ends and penetrations with sealant to achieve permanent air seal consistent with air barrier system specified in Section 07 25 00.
- M. Place metal cant strips in position and fusion weld.
- N. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- O. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

- P. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.3 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Formed steel stud exterior wall and interior wall framing.
- B. Formed steel joist and purlin framing and bridging.

1.2 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.
- C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 - 1. Indicate stud layout.
 - 2. Describe method for securing studs to tracks and for bolted framing connections.
- D. Steel Framing Industry Association (SFIA) Certification:
 - 1. Design Data:
 - a. Shop drawings signed and sealed by a professional structural engineer.
 - 2. Design calculations sufficient to demonstrate compliance with design criteria; signed and sealed by a professional structural engineer.

- E. Manufacturer's Installation Instructions: For lateral-force resisting systems, indicate welding procedure specifications.
- F. Manufacturer's Qualification statement.
- G. Mill Certifications: Submit mill certifications for steel delivered to site. Certify steel bare metal thickness in 0.001 inch, yield strength, tensile strength, total elongation in 2 inch or 8 inch gage length, chemical analysis and galvanized coating thickness.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State of New York.
- B. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing the types of products specified in this section, and with minimum 3 years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Structural Framing:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE: www.marinoware.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Connectors:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE: www.marinoware.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Design Requirements: Design cold-formed framing systems, components and connectors to withstand specified design loads in compliance with ICC (IBC), ASCE 7, AISI S100, and AISI S240.

2.3 MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.

2.4 STRUCTURAL FRAMING COMPONENTS

- A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.
 - 1. Stud Spacing: 16" o.c. maximum
 - 2. Provide components fabricated from ASTM A1011/A1011M Designation SS (structural steel).
- B. Joists: AISI S240; manufactured, engineered open-web steel joists.

2.5 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

- B. Plates, Gussets, Clips: Formed Sheet Steel, thickness determined for conditions encountered; finish to match framing components.
- C. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements; Coordination and project conditions.
- B. Verify that substrate surfaces and building framing components are ready to receive work.
- C. Verify rough-in utilities are in proper location.

3.2 INSTALLATION - GENERAL

- A. Install structural members and connections in compliance with ASTM C1007.

3.3 INSTALLATION OF STUDS

- A. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- B. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.
- C. Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.
- D. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- E. Install intermediate studs above and below openings to align with wall stud spacing.
- F. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.
- G. Attach cross studs or furring channels to studs for attachment of fixtures anchored to walls.
- H. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- I. Touch-up field welds and damaged corrosion protected surfaces with primer.

3.4 INSTALLATION OF JOISTS AND PURLINS

- A. Make provisions for erection stresses. Provide temporary alignment and bracing until permanent bracing and attachments are installed.
- B. Place joists at 12 inches on center; not more than 2 inches from abutting walls, and connect joists to supports using fastener method.
- C. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.
- D. Locate joist end bearing directly over load-bearing studs or provide load distribution on top of stud track.
- E. Provide web stiffeners at reaction points.
- F. Touch-up field welds and damaged galvanized surfaces with primer to match shop coatings.

3.5 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated steel, metal, and metal items including:
 - 1. Lintels
 - 2. Structural supports for miscellaneous attachments

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. NOMMA Guideline 1 - Joint Finishes
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- K. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.5 QUALITY ASSURANCE

- A. Finish joints in accordance with NOMMA Guideline 1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Steel Plates: ASTM A 36/A 36M.
- D. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A 653, Grade 33 Structural quality with galvanized coating.
- F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- G. Bolts, Nuts, and Washers:
 - 1. Bolts: ASTM F3125; Type 1
 - 2. Nuts: ASTM A 563 heavy hex type
 - 3. Washers: ASTM F 436; Type 1
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, Type 1, complying with VOC limitations of authorities having jurisdiction.
 - 1. Color: Gray
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED ITEMS

- A. Lintels: Steel sections, size and configuration as detailed on drawings, length to allow 8 inches minimum bearing on both sides of opening.
 - 1. Galvanized and Prime paint, one coat
- B. Other Structural Supports: Steel sections, shape and size as indicated on drawings required to support applied loads with maximum deflection of 1/240 of the span; prime paint, one coat.
- C. Anchor bolts: ASTM F 1554; Grade 36, weldable, straight shape, Furnish with nut and washer; unfinished.
- D. Exterior Stair Nosings: 4 inch Wide Cast aluminum with intergrate abrasive treads. Model #801 (Poured Concrete stairs) Model 801SP (Poured concrete-filled steel pan stairs) as manufactured by American Safety Tread Company Inc. Color: Natural Metal Finish.

2.4 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items as specified in drawings.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements; minimum 2.0 oz/sq ft coating thickness.
- G. Galvanizing for Fasteners, Connectors and Anchors: Hot-Dipped Galvanizing to ASTM A 153/A 153M.

2.5 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions and surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story or for every 12 ft in height whichever is greater, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.5 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Prefabricated ship ladders.

1.2 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; Current Edition.
- B. 29 CFR 1926.1053 - Ladders; Current Edition.
- C. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- H. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- J. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- N. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).
- P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Executed warranty.
- D. Specimen warranty.
- E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.5 QUALITY ASSURANCE

- A. Design ladder under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

1.6 WARRANTY

- A. Manufacturer Warranty: Provide 5-year manufacturer warranty for material and workmanship. Complete forms in Owner's name and register with manufacturer.
- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Bolts, Nuts, and Washers: ASTM A307, plain.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.2 PREFABRICATED LADDERS

- A. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 - 2. Materials: Carbon steel; Grade 36, minimum.

3. Finish: Painted.
 - a. Alaco Ladder Company; M Series Ships Ladder: www.alacoladder.com/#sle.
4. Manufacturers:
 - a. ErectaStep, a SixAxis company; ErectaStep - Ships Ladder: www.erectastep.com/#sle.
 - b. O'Keeffe's Inc; Model 520: www.okeeffes.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 FINISHES - STEEL

- A. Prime Painting: Two coats.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.3 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof-mounted curbs.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Concealed wood blocking, nailers, and supports.

1.2 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- B. Section 07 72 00 - Roof Accessories: Prefabricated roof curbs.
- C. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. PS 20 - American Softwood Lumber Standard; 2025.
- F. SPIB (GR) - Standard Grading Rules; 2021.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit technical data on wood treatment.
- C. Samples: For rough carpentry members exposed to view, submit two samples, 6 by 6 inch in size illustrating wood grain, color, and general appearance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.

2.3 EXPOSED DIMENSION LUMBER

- A. Sizes: Nominal sizes as indicated on drawings.
- B. Surfacing: S4S.
- C. Moisture Content: S-dry or MC19.

2.4 PRESSURE-PRESERVATIVE TREATMENT (PPT)

- A. Manufacturers:
 - 1. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com/#sle.
 - 2. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.
- C. Factory-treat wood members in accordance with AWP A U1 and use category indicated.
- D. Kiln-dry wood after treatment with waterborne preservative to maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- E. Fabricate to maximum extent possible before treatment.
- F. Label preservative-treated wood with marking as required by AWP A U1 and ICC (IBC). Unless otherwise permitted by standard U1 and building code, include the following markings: AWP A U1, accredited inspection agency mark, treating plant identification, type of preservative, preservative retention, and permitted end use.
- G. Field Treatment for Cuts and Holes in Preservative-Treated Wood: Comply with AWP A M4.

2.5 ACCESSORIES

- A. Metal and Finish of Fasteners:
 - 1. Preservative-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws - general use: Type 304 stainless steel.
 - 2. High Humidity Wood Locations: Hot-dip galvanized steel complying with ASTM A153/A153M.
 - 3. Untreated Wood: Unfinished steel.
 - 4. Masonry Anchors: Toggle bolt type for anchorage to hollow masonry.
 - 5. Fasteners for roof replacements must be included in the Singly-Ply Roofing membrane manufacturer's warranty to meet uplift pressures determined in accordance with the Applicable Code using a basic wind speed of 120 MPH.
- B. Anchors: Toggle bolt type for anchorage to hollow masonry.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.3 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Provide nonstructural framing and blocking to support the following:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Other wall- or ceiling-mounted items indicated on drawings.

3.4 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.5 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.6 CLEANING

- A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 18 00
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Steel hardware and attachment brackets.

1.2 REFERENCE STANDARDS

- A. AITC 110 - Standard Appearance Grades for Structural Glued Laminated Timber; 2001.
- B. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection; 2005.
- C. AITC 117 - Standard Specifications for Structural Glued Laminated Timber of Softwood Species; 2010.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- G. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2021a.
- H. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2021a.
- I. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2024).
- J. ASTM D3737 - Standard Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam); 2018
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- M. AWWA U1 - Use Category System: User Specification for Treated Wood; 2025.
- N. SPIB (GR) - Standard Grading Rules; 2021.
- O. UL (FRD) - Fire Resistance Directory; Current Edition.

1.3 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.
- B. Submit representative samples of wood species indicated in the grade and finish specified for Architect's review and acceptance.
- C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings.
 - 1. Submit design calculations signed and sealed by design engineer.

2. Small scale plans and elevations showing all members, joints and methods of assembly.
 3. No materials shall be fabricated prior to the review and acceptance of the Shop Drawings by the Architect and Structural Engineer.
- D. Where Contract Drawings indicate delegated design responsibility:
1. All design shall provide the required stability and resistance to loads indicated on Contract Drawings.
 2. All Shop Drawings and calculations shall bear the seal of the registered Professional Engineer responsible for their production.

1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- B. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with AITC A190.1.
- C. Erector Qualifications: Company specializing in erection of products of the type specified with three years documented experience, and approved by manufacturer.
- D. Glue Laminated Timber Structural Capacities: Determine in accordance with ASTM D3737.
- E. Quality Mark: Each Glue Laminated Timber shall be marked with the AITC or APA/EWS Quality Mark and accompanied with an AITC or APA/EWS Certificate of Conformance to indicate conformance with ANSI/ AITC A190.1, inspected by AITC. Only timbers specified to be surfaced on all four sides for appearance requirements shall not be grade marked, but shall be accompanied by an AITC Certificate of performance. Place AITC mark on timber surfaces which will not be exposed in completed work.

1.5 GUARANTEE

- A. All workmanship and materials shall be guaranteed in accordance with the provisions in the General Conditions.
- B. AITC or APA/EWS Conference Certificate required.
1. In the absence of a Conformance Certificate, a notarized guarantee in writing from the manufacturer is required.
- C. The furnishing of the guarantee shall be a condition precedent to final payment.

1.6 MEASUREMENTS

- A. The General Contractor shall obtain and verify all measurements and conditions at the building as required for the proper installation of his work. He shall be responsible for the accuracy and fit of the various parts of his work and the proper building-in of same and coordination of all the other trades.
- B. The Field Erector of the structural glulam materials must visit the site before start of installation to check out site conditions, general layout and verify the site is ready to receive materials.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect members to AITC requirements for individually wrapped.
- B. Leave individual wrapping in place until finishing occurs.
- C. If members are stored, they must be protected from the elements.
1. Stack members on blocks well off the ground, and separate with wood strips so air can circulate around each member.
 2. Store stacks under roof or cover top and sides with tarp.

3. Puncture bottom side of wrap to allow accumulated moisture to drain.
- D. Wrap should remain on members until they are erected, however if wrap has been torn or partially removed during storage or erection, it should be completely replaced or entirely removed to prevent uneven discoloration of wood by sunlight.
- E. If wrapping cannot be removed upon completion of installation phase, it becomes the responsibility of the General Contractor to arrange to remove wrapping when it no longer serves a useful purpose, including protection from the weather, sunlight, soiling, and damage from work of other trades.
 1. Coordinate wrapping removal with finish work. Retain wrapping where it can serve as a painting shield.
 2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber: Softwood lumber conforming to SPIB (GR) grading rules with 12 percent maximum moisture content before fabrication.
 1. Species: Southern Yellow Pine
 2. Combination Symbol: 24F-V3
- B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.
- C. Bolts: ASTM F3125/F3125M, Type 1 heavy hex high strength bolts and ASTM A563 (ASTM A563M) nuts; hot-dip galvanized to meet requirements of ASTM A153/A153M, matching washers.
- D. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
- E. Wood Sealer: Manufacturer's standard penetrating sealer.

2.2 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWWA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify sufficient end bearing area.

3.2 PREPARATION

- A. Coordinate placement of bearing items.

3.3 ERECTION

- A. Lift members using properly rated, industrial nylon, non marring slings to prevent visible damage.
- B. Provide temporary bracing and anchorage to hold members in place until permanently secured.
- C. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.
- D. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

GLUED-LAMINATED CONSTRUCTION

3.4 TOLERANCES

- A. Framing Members: 1/4 inch maximum from true position.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Finish carpentry items: Exterior Wood Door Frames
- B. Shop finishing.

1.2 RELATED REQUIREMENTS

- A. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.
- G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on wood treatment.
 - 2. Provide instructions for attachment hardware and finish hardware.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Exterior Woodwork Items:
 - 1. Door Casings, trims, and Moldings: Hardwood; prepare for stain finish.
- D. Factory-Fabricated Exterior Wood Door Frames:
 - 1. Species: Same as Door.

2.2 LUMBER MATERIALS

- A. Hardwood Lumber: Solid Maple species, Plain/Flat sliced sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.

2.3 SHEET MATERIALS

- A. Particleboard: ANSI A208.1; Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.4 PLASTIC LAMINATE MATERIALS

- A. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, CL20 for cabinet liner surfaces, BK20 for undecorated backing sheets, PF42 for post forming.
- B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.
- C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.5 FASTENINGS

- A. Fasteners: Of size and type to suit application; no finish in concealed locations and Hot dipped galvanized steel for high humidity finish in exposed locations.
- B. Concealed Joint Fasteners: Threaded steel.

2.6 ACCESSORIES

- A. Veneer Edge Band: Standard wood veneer edge band matching face veneer.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Solvent base, tinted to match surface finish color.
- D. Grommets: Plastic material for cut-outs. Provide 2" diameter grommet and grommet cover at maximum spacing of 5'-0"O.C. Exact location to be verified by the Owner.

2.7 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
- C. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- D. Shop prepare and identify components for book match grain matching during site erection.
- E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- G. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.8 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
- E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- D. Install components with nails, screws and bolts as indicated . Where not indicated provide fastener type to suit application and with least visibility.
- E. Install prefinished paneling with full bed contact adhesive applied to substrate.

END OF SECTION

SECTION 07 05 53
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping

1.3 REFERENCE STANDARDS

- A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- C. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.
- D. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 FIELD CONDITIONS

- A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.
- B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Partition Identification Labels:
 - 1. Fire Wall Signs, Inc: www.firewallsigns.com/#sle.
 - 2. Safety Supply Warehouse, Inc: www.safetysupplywarehouse.com/#sle.
 - 3. Stencil Ease: www.stencilease.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
- B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.
- C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint or permanent ink and a code compliant stencil.
- D. Location: On fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions; within concealed space where there is an accessible concealed floor, floor-ceiling, or attic space.
- E. Languages: Provide sign markings in English.
- F. Format: Whether adhered or applied, identification shall include, at a minimum:
 - 1. Lettering: Not less than three inches in height with a minimum 3/8 inch stroke, in contrasting color.
 - 2. Wording shall include, as applicable:
 - a. Wall Type, i.e FIRE BARRIER or SMOKE BARRIER, or similar.
 - b. Fire Resistance Rating, i.e. ONE HOUR, TWO HOUR, or similar.
 - c. PROTECT ALL OPENINGS.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

- A. Locate markings as required by ICC (IBC).
 - 1. No more than fifteen feet from end of each rated wall.
 - 2. No more than thirty feet interval measured horizontally along the rated wall or partition.
 - 3. Rated walls shall be identified on each side.
- B. Install adhered markings in accordance with manufacturer's instructions.
 - 1. Where adhered markings are used, a suitable Class A backer, permanently attached to the wall, may be used when wall surface would preclude adhesion.
- C. Install applied markings in accordance with manufacturer's instructions.
- D. Install neatly, with horizontal edges level.
- E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Board insulation at cavity wall construction and perimeter foundation wall.
- B. Batt insulation in interior wall construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers

1.3 REFERENCE STANDARDS

- A. ASTM C240 - Standard Test Methods for Testing Cellular Glass Insulation Block; 2021.
- B. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- I. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.5 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Insulation Inside Masonry Cavity Walls: Polyisocyanurate board.
- C. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.2 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded polystyrene board cellular type surface; with the following characteristics:
 - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
 - 5. All Extruded Polystyrene Board Insulation shall be HFC free.
 - 6. Board Thickness: As noted on drawings.
 - 7. Board Edges: Square.
 - 8. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
 - 9. Products:
 - a. Dow Chemical Company: www.dowbuildingsolutions.com/#sle.
 - b. Kingspan Insulation LLC: www.trustgreenguard.com/#sle.
 - c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
- B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
 - 1. Classifications:
 - a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
 - 1) Class 1 - Non-reinforced core foam.
 - 2) Compressive Strength: 16 psi, minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; 9.0, minimum, at 75 degrees F.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Water Vapor Permeance: 1.2 perm, maximum, at 1 inch thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
 - 5. Board Size: 48 inch by 96 inch.
 - 6. Board Thickness: Refer to drawings
 - 7. Board Edges: Square.
 - 8. Products:
 - a. Dow Chemical Company: www.dowbuildingsolutions.com/#sle.
 - b. Rmax Inc; ECOMAXci FR: www.rmax.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 3. Formaldehyde Content: Zero.
 - 4. Thickness: As indicated on drawings.
 - 5. Facing: Unfaced.
 - 6. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.

- b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.
 - d. Knauf Insulation: www.knaufinsulation.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 ACCESSORIES

- A. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.
- B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
 - 1. Tape seal joints.
 - 2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
 - 1. Three continuous beads per board length.
- C. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
 - 1. Install boards horizontally from base of foundation to top of insulation.
 - 2. Butt boards tightly, with joints staggered from insulation joints.

3.3 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure insulation fasteners to substrate at following frequency:
 - 1. Six (6) per insulation board.
- B. Adhere a 6 inches wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
 - 1. Extend sheet full height of joint.
- C. Install boards to fit snugly between wall ties.

1. Place membrane surface facing out, and tape seal board joints.
- D. Install boards horizontally on walls.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- F. Place 6 inches wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

3.4 BATT INSTALLATION

- A. Install in interior wall spaces without gaps or voids. Do not compress insulation.
- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- D. Metal Framing: Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water-resistive barriers.

1.2 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation: Weather barrier installed in conjunction with batt insulation.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.3 DEFINITIONS

- A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.
- B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.4 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.6 MOCK-UPS

- A. Construct weather barrier mock-up, 4 feet long by 4 feet wide.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.7 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.1 WATER-RESISTIVE BARRIERS

- A. Description: Materials installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly. Primary materials include self-adhered membranes; accessory materials include flashings and seam tapes.
- B. Self-adhered Water-Resistive and Air Barrier: 0.040 inch (40 mils) thick membrane consisting of a 5-mil aluminum-faced polymer sheet laminated to a styrene-butadiene-styrene modified asphalt adhesive
 - 1. Location: With-in cavity walls and at above ground exterior walls
 - 2. Air Permeance: 0.000 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - 3. Water Vapor Permeance: .08 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
 - 4. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 60 days of weather exposure.
 - 5. Puncture Resistance: 48 lbf in accordance with ASTM E154
 - 6. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 - 7. Seam and Perimeter Tape: As recommended by sheet manufacturer.
 - 8. Products:
 - a. Henry a Carlisle Company: CCW 705 .
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Water-Resistive Barrier Membrane: 60-mil self0adhering sheet membrane consisting of rubberized asphalt laminated to polyethylene.
 - 1. Location: Outer surface of Elevator Addition foundation wall
 - 2. Permeance: 0.05 perms, when tested in accordance with ASTM E96/E96M.
 - 3. Puncture Resistance: 60lb minimum (ASTM 154)
 - 4. Products:
 - a. MiraDRI 860/861 by Henry.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Drainable Barrier Sheet: Nonwoven and nonperforated polypropylene material with 1/16 inch gap created by spacers providing drainage space.
 - 1. Location: Outer surface of Pool exterior foundation wall
 - 2. Width: 5 feet, minimum.
 - 3. Water Vapor Permeance: 19 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
 - 4. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
 - 5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 - 6. Seam and Perimeter Tape: As recommended by sheet manufacturer.

2.2 ACCESSORIES

- A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch nominal thickness.

- C. Flexible Flashing: Self-adhering sheet flashing complying with ASTM D1970/D1970M; waive slip resistance requirement if not installed on roof.
 - 1. Width: 4 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions comply with requirements of this section.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Apply sealants within recommended temperature range in accordance with manufacturer's installation instructions.
- C. Mechanically Fastened Sheets:
 - 1. Install sheets in shingle fashion to shed water; align horizontally.
 - 2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
 - 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
 - 4. Attach to framed construction with fasteners extending through sheathing into framing, and space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
 - 5. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
 - 6. Where stud framing rests on concrete or masonry substrate, extend lower edge of barrier sheets at least 4 inches below bottom of framing and seal to substrate with sealant or approved mounting tape.
 - 7. Install water-resistive barrier over jamb flashings.
 - 8. Install head flashings under water-resistive barrier.
 - 9. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- D. Self-Adhered Sheets:
 - 1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
 - 2. Lap sheets shingle-fashion to shed water and seal laps airtight.
 - 3. Upon placement of sheets, firmly press onto substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
 - 4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
 - 5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
 - 1. Allow access to work areas and staging.

2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
 3. Do not cover work of this section until testing and inspection is accepted.
- C. Do not cover installed water-resistive barriers until required inspections have been completed.
- D. Obtain approval of installation procedures from water-resistive barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.5 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 31 10
SYNTHETIC SHINGLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Plastic shingles with slate appearance and texture.
- B. Flexible sheet membranes for eave protection and underlayment.
- C. Metal flashing.

1.2 RELATED REQUIREMENTS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim: Edge and cap flashings.

1.3 REFERENCE STANDARDS

- A. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- C. ASTM D3161/D3161M - Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020 (Reapproved 2025).
- D. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2025.
- E. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021a.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- G. NRCA (RM) - The NRCA Roofing Manual; 2025.
- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, fastening methods and locations, and installation details.
- C. Selection Samples: Submit color chips representing manufacturer's full range of available shingle colors and finishes.
- D. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Mock-Up: Provide a mock-up for evaluation of shingle installation workmanship, including typical eave, rake, valley, and ridge details.
 - 1. Mock-Up Size: 4 by 4 feet, minimum.
 - 2. Do not proceed with remaining work until workmanship has been approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
 - 4. Approved mock-up may be retained as part of this work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials with labels intact in manufacturer's 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 local authorities having jurisdiction.

1.8 FIELD CONDITIONS

- A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide Manufacturer's Standard Warranty:
 - 1. Materials: Warrant shingles for 50 years against breakage or deterioration that results in leaks under normal weather and use conditions.
 - 2. Installation: Warrant total roof system, including underlayments, flashings, and other roof components for two years against water penetration.

PART 2 PRODUCTS

2.1 SYNTHETIC SHINGLES

- A. Synthetic Shingles, Slate Texture: Shingles manufactured from 100 percent virgin plastic and approximating the appearance of traditional, natural slate.
 - 1. Fire Resistance: ASTM E108, Class A.
 - 2. Profile: Upper surface mimics appearance of natural slate, with integral alignment guides and nail holes.
 - 3. Width: 12 inches, nominal.
 - 4. Length: 18 inches, nominal.
 - 5. Thickness at Butt Edge: 1/2 inch, nominal.
 - 6. Coursing: Straight.
 - 7. Color and Pattern: To be selected by Architect from manufacturer's full range.
 - 8. Products:
 - a. DaVinci Roofscapes, LLC: www.davinciroofscapes.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 SHEET MATERIALS

- A. Underlayment: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil, 0.040-inch total thickness, with strippable treated release paper and polyethylene sheet top surface.

2.3 METAL FLASHING

- A. Metal Flashing: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, and other flashing indicated.
 - 1. Form flashings to profiles as indicated on drawings.
 - 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 - 3. Hem exposed edges of flashings minimum 1/4 inch on underside.
 - 4. Coat concealed surfaces of flashings with bituminous paint.
- B. For Base Bid Roof Repair: Copper Flashing: ASTM B370, cold rolled 16 oz/sq ft thick; natural finish.
- C. For Alternate Roof Replacement: Galvanized Steel Flashing: Prefinished and galvanized steel sheet, 26-gauge, 0.0179-inch minimum thickness, G90/Z275 hot-dipped galvanized; color as selected.

2.4 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8-inch head diameter, 12 gauge, 0.109 inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667/F1667M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning this work.
- B. Verify that deck is of sufficient thickness to accept fasteners.
- C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.
- D. Verify roof openings are correctly framed.
- E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- C. Broom clean deck surfaces before installing underlayment or eave protection. Remove debris, loose fasteners, and other protrusions from deck surface.

3.3 INSTALLATION

- A. Eave Protection Membrane:
 - 1. Install eave protection membrane from eave edge to minimum 4 feet up-slope beyond interior face of exterior wall.
- B. Underlayment:

1. Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches; stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.
2. Items Projecting Through or Mounted on Roof: Weather lap and seal watertight with plastic cement.

C. Metal Flashing:

1. Weather lap joints minimum 2 inches and seal weathertight with plastic cement.
2. Secure in place with nails at 6 inches on center. Conceal fastenings.
3. Items Projecting Through or Mounted on Roofing: Flash and seal weathertight with plastic cement.

D. Shingles:

1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
2. Place shingles in coursing pattern and with maximum weather exposure as indicated to produce double thickness over full roof area, and provide double course of shingles at eaves.
3. Project first course of shingles 3/4 inch beyond fascia boards.
4. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
5. Provide weathertight installation.

3.4 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.5 PROTECTION

- A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 42 13.19
INSULATED METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Factory-assembled metal panel system for walls, with trim, related flashings and accessory components.

1.2 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer documentation on tested structural, thermal, and fire resistance capabilities of assembled panel.
- C. Shop Drawings: Indicate dimensions, panel profile and layout, spans, joints, construction details, methods of anchorage, and method and sequence of installation.
- D. Design and Performance Data: Indicate panel profile and dimensions.
- E. Manufacturer's Installation Instructions: Indicate special handling criteria.
- F. Manufacturer's qualification statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.5 MOCK-UPS

- A. Construct mock-up, 4 feet long by 4 feet wide, including panels and sub-girts.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

1.7 FIELD CONDITIONS

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal plate wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Insulated Metal Wall Panels:
 - 1. Kingspan Insulated Panels: www.kingspan.com/#sle.
 - 2. Metl-Span, a Division of NCI Group, Inc: www.metlspan.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE / DESIGN CRITERIA

- A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.
 - 1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 2. Accommodate tolerances of building structural framing.
- B. Performance Requirements:
 - 1. Thermal Performance: Provide thermal resistance through entire system; R-value of 15, minimum.
 - 2. Structural Performance: Design and size to withstand all dead loads and wind loads caused by positive and negative wind pressure acting normal to plane of panel.
 - a. Verify structural performance in accordance with ASTM E330/E330M, using test pressure 1.5 times design wind pressure, with 10 seconds duration of maximum load.
 - 3. Movement: Accommodate the movement caused by the following without damage to system, components, or deterioration of seals:
 - a. Normal movement between system components.
 - b. Seasonal temperature cycling.
 - c. Deflection of structural support framing,

2.3 COMPONENTS

- A. Wall Panels: Exterior and interior metal sheet skin, factory-assembled, with rock wool insulation; exterior and interior sheet interlocking at edges, fitted with continuous gaskets.
 - 1. Panel Width: 36 inch.
 - 2. Profile: Quadcore Optimo manufactured by Kingspan; vertical panels.
 - 3. Panel Thickness: 3 inch.
 - 4. Exterior Sheet: Pre-finished galvanized steel, 24 gauge, 0.0235 inch minimum base metal thickness; non-embossed.
 - 5. Interior Sheet: Galvanized steel, 24 gauge, 0.0235 inch minimum base metal thickness.
 - 6. Fabricate panels in longest practicable lengths.
 - 7. Exterior Finish: Polyvinylidene fluoride (PVDF) coating;
 - a. IMP #1: Driftwood
 - b. IMP #2: Taupestone
 - 8. Interior Finish: Polyvinylidene fluoride (PVDF) coating; manufacturer's standard (not visible)

- B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; factory-fabricated mitered to required angles in one continuous piece with minimum 18 inch returns.
- C. Trim, Closure Pieces, Expansion Joints, Caps, Flashings, Fascias, and Infills: Same material , thickness and finish as exterior sheets; factory-fabricated to required profiles; fabricated in longest practicable lengths.
 - 1. Exposed Fasteners: Not permitted.
 - 2. Profiles: To suit system.

2.4 MATERIALS

- A. Precoated Galvanized Steel Sheet: ASTM A653/A653M, Commercial Steel (CS) or Forming Steel (FS), with G90/Z275 coating; continuous-coil-coated with acrylic primer coat, silicone polyester top coat, and polyester washcoat for panel back.
- B. Foamed-in-Place Insulation: Urethane type.
- C. Gaskets: Manufacturer's standard type suitable for use with panel system, permanently resilient; ultraviolet and ozone resistant; color as selected by Architect.
- D. Panel Sealants: Manufacturer's standard type suitable for use with installation of panel system; non-staining, skinning, non-shrinking, non-sagging, ultra-violet and ozone resistant; color as selected by Architect.

2.5 ACCESSORIES

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that structural framing is ready to receive panel system.

3.2 PREPARATION

- A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.3 INSTALLATION

- A. Install panel system on walls in accordance with manufacturer's instructions.
- B. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.
- C. Locate panel joints over supports.
- D. Use concealed fasteners unless otherwise approved by Architect.
- E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.4 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

3.5 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove site cuttings from finish surfaces.

- C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Elastomeric roofing membrane, adhered conventional application.
- B. Insulation, flat and tapered.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Cover boards.
- F. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 RELATED REQUIREMENTS

- A. Section 05 31 00 - Steel Decking: Placement of acoustical insulation for deck flutes.
- B. Section 07 25 00 - Weather Barriers
- C. Section 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings, reglets.

1.3 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- D. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).
- E. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2024.
- F. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- I. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).
- J. UL 1256 - Standard for Fire Test of Roof Deck Constructions; 2018.
- K. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated counterflashings installed under other sections.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation.
- D. Samples for Verification: Submit two samples 6 by 6 inches in size illustrating insulation.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- B. All products including substrate boards, vapor retarders, insulation, fasteners, fastening plates and edgings must be manufactured and/or supplied by the roofing system manufacturer and covered by the warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.8 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Correct defective work within a two year period after Date of Substantial Completion.
- C. Provide 30 year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
 - 1. Warranty shall be a non-prorated, full system warranty with no dollar limit and shall include, but not limited to the following:
 - a. Wind warranty coverage up to 90 MPH, three second gust at 33 feet above ground level.
 - 1) Certification is required with submittals indicating the manufacturer has reviewed and agreed to such wind coverage.
 - b. Membrane material warranty on the field membrane.
 - c. Puncture resistance.
 - d. Signed by Manufacturer of primary roof materials and their authorized installer.
 - 2. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. EPDM Membrane Materials:
 - 1. Carlisle SynTec Systems; Sure-Tough EPDM: www.carlisle-syntec.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation:
 - 1. Carlisle SynTec: www.carlisle-syntec.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROOFING - UNBALLASTED APPLICATIONS

- A. Elastomeric Membrane Roofing: Single ply membrane, fully adhered, over vapor retarder and insulation.
- B. Roofing Assembly Requirements:
 - 1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.
 - 2. The specified roofing assembly must have been successfully tested by a qualified testing agency to resist the design uplift pressures calculated according to:
 - a. ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"
 - b. American Society of Civil Engineers (ASCE 7)
 - c. Applicable Building Code
 - 3. Insulation Thermal Resistance (R-Value): 5.7 per inch, minimum LTTR; provide insulation of thickness required to attain a minimum R-Value of 30.
- C. Acceptable Insulation Types - Constant Thickness Application:
 - 1. Minimum 2 layers of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application:
 - 1. Tapered polyisocyanurate board.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); internally reinforced with fabric or scrim; complying with minimum properties of ASTM D4637/D4637M.
 - 1. Thickness: 0.090 inch (90 mil).
 - 2. Color: Black.
 - 3. Tensile Strength: 1415 psi, minimum, measured in accordance with ASTM D412.
 - 4. Tear Strength: 150 lbf per inch, measured in accordance with ASTM D624.
 - 5. Brittleness Temperature: -49 degrees F, measured in accordance with ASTM D746.

ELASTOMERIC MEMBRANE ROOFING

- B. Seaming Materials: Minimum 6 inch seam tape.
- C. Vapor Retarder: Vapor retarder is a minimum 40 mil composite sheet consisting of a self-adhering rubberized asphalt membrane. The underlayment board shall be primed with Low VOC CCW-702 Primer or CCW Cav-Grip in accordance with manufacturer's specifications. Vapor retarder must have a perm rating of 0.05 or less as per ASTM E96/E96M. Vapor retarder must be rated by the manufacturer as a temporary roof with an allowable exposure to the elements for 90 days.
- D. Flexible Flashing Material: Same material as membrane.
 - 1. Thickness: 90 mil.
 - 2. Tensile Strength: 1,415 psi.
 - 3. Elasticity: 50 percent with full recovery without set.
 - 4. Color: Black.
- E. Liquid Flashing Material; Carlisle SynTec or approved equal:
 - 1. VapAir Seal Flashing Foam.
 - 2. LiquiSeal Flashing Fleece.
 - 3. LiquiSeal Liquid Flashing Resin.
 - 4. All components of liquid flashing system to be from a a single source manufacturer and be compatible with roofing membrane and design intent.

2.4 DECK SHEATHING AND COVERBOARD

- A. Deck Sheathing and Coverboard: 1/2" thick Deck sheathing and 3/8" thick coverboard shall be an impact resistant, non-structural, fiber reinforced gypsum panel manufactured with a 95% certified recycled content, with moisture and mold resistance throughout the panel core and surface; manufactured to conform to ASTM C1278.
 - 1. Manufacturers:
 - a. Carlisle SynTec: Securock.
 - b. Or Approved Equal.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289, and meeting UL 1256, component of a Class A Roof System.
 - 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
 - 2. Board Size: 48 by 48 inches.
 - 3. Board Thickness: 3.0 inch.
 - 4. Tapered Board: Slope as indicated; minimum thickness 1/2 inch; fabricate of fewest layers possible.
 - 5. Board Edges: Square.

2.6 ACCESSORIES

- A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to galvanized steel flanges.
- B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- C. Membrane Adhesive: As recommended by membrane manufacturer.

- D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- F. Insulation Adhesive: Two part low rise foam.
- G. Sealants: As recommended by membrane manufacturer.
- H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Roofing membrane manufacturer's standard.
 - 2. Size: 30 by 30 inches.
 - 3. Surface Color: Black.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 PREPARATION - METAL DECK

- A. Install preformed acoustical glass fiber insulation strips in roof deck flutes in accordance with manufacturer's instructions; see Section 05 31 00.
- B. Install deck sheathing on metal deck.
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.
- C. Mechanically fasten sheathing to roof deck, 1 fastener every 2 sq. ft. in field & perimeter & 1 per 1 sq. ft. in the corners..
 - 1. Surfaces to receive vapor barrier must be clean and dry.
 - 2. Prime all surfaces to receive vapor retarder. Prime in accordance with manufacturer's specifications.
 - 3. Prime only areas receiving vapor barrier on the same day. Reprime if area becomes dirty.

3.3 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

- A. Apply rubberized asphalt self adhering vapor retarder to sheathed deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Apply vapor barrier from low point to high point, in a single fashion, so that laps will shed water.
 - 2. Overlap all edges 2 1/2 inches minimum. End laps shall be staggered.
 - 3. Place membrane carefully so as to avoid wrinkles and fishmouths.
 - 4. Immediately after installation, roll with a 100-150 pound weighted steel roller.
 - 5. Extend vapor retarder under cant strips and blocking to deck edge.
 - 6. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

- B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- C. Attachment of Insulation:
 - 1. Embed first layer of insulation in adhesive beads 4" on center in accordance with roofing and insulation manufacturers' instructions.
- D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes for support.
- G. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- H. Secure all insulation, staggering all joints, to the vapor retarder with adhesive in accordance with the manufacturer's specifications in beads 4" on center.
- I. Insulation adhesive must have a nominal free-rise core density of 2.2 pounds per cubic foot, and be a 2 part low rise foam adhesive with 100% adhesion.
- J. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
- K. Do not apply more insulation than can be covered with membrane in same day.

3.4 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles, air pockets or tears. Place sheet into place without stretching.
- B. Allow the membrane to relax for approximately 1/2 hour before bonding.
- C. Fold the sheet back onto itself so half of the underside of the membrane is exposed.
- D. Shingle joints on sloped substrate in direction of drainage.
- E. Fully Adhered Application: Apply adhesive to substrate at rate of manufacturer's published instructions gal/square Fully embed membrane and substrate in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- F. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.
- G. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.
- H. Membrane Splicing: 6 inch pre-applied splice tape is required. All details and splice procedures shall be performed to meet or exceed the specified warranty requirements.
 - 1. Overlap adjacent sheets and mark a line 1/2 inch out from the top sheet.
 - 2. Fold the top sheet back and clean the dry splice area (minimum 6 inches wide) of the membrane with primer as required by the membrane manufacturer.
 - 3. Apply primer to the EPDM sheet. Press membrane and tape onto the sheet using hand pressure.
 - 4. Remove the release film and press the top sheet onto the tape using hand pressure.
 - 5. Roll the seam toward the splice edge with a 2 inch wide steel roller.
 - 6. Splice intersections are to be overlaid with 6" x 6" and 12"x12" T joint cover plates.
- I. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 6 inches onto vertical surfaces. Install expansion joints at locations where structures as separate
 - 2. Fully adhere flexible flashing over membrane and up to termination bars. Install counterflashings and seal.

- 3. Do not extend membrane or membrane flashing over existing masonry weep holes or through wall flashing.
- J. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.
- K. Around roof penetrations, seal flanges and flashings with flexible flashing.
- L. Install roofing expansion joints where indicated. Make joints watertight.
 - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- M. Coordinate installation of roof drains and sumps and related flashings.

3.5 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.6 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 54 20

PVC KEE MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fully Adhered PVC KEE (Ketone Ethylene Ester) membrane roof system
- B. Gypsum Cover Board
- C. Tapered insulation
- D. Membrane Flashings
- E. Roofing cant strips and stack boots

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 – Rough Carpentry: Wood nailers.
- B. Section 07 62 00 – Sheet Metal Flashing and Trim: Counterflashing and scuppers
- C. Section 07 71 00 – Roof Specialties: Counterflashing and roof edge treatments

1.3 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.
 - 2. ASTM D4434 Standard Specification for PVC Sheet Roofing
 - 3. ASTM D 751 Test Methods for Coated Fabrics
 - 4. ASTM D5019 - Standard Specification for Reinforced Non-Vulcanized Polymeric Sheet Used in Roofing Membrane.
 - 5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
 - 7. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
 - 8. ASTM E119 – Test Methods for Fire Tests of Building Construction and Materials.
 - 9. FM DS 1-28 – Wind Design; Factory Mutual Research Corporation; 2007.
- B. FM Global:
 - 1. FM DS 1-28 – Wind Design; Factory Mutual Research Corporation; 2007
- C. Intertek Testing Services:
 - 1. ITS (DIR) – Directory of Listed Products; current edition.

- D. National Fire Protection Association:
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- E. National Roofing Contractors Association:
 - 1. NRCA - The NRCA Roofing and Waterproofing Manual.
- F. Underwriters Laboratories Inc.:
 - 1. UL - Fire Resistance Directory.
 - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 790 - Tests for Fire Resistance of Roof Covering Materials.
 - 4. UL 1897 - Uplift Tests for Roof Covering Systems.

1.4 PERFORMANCE REQUIREMENTS

- A. Roof Assembly Classification: FM Class 1 Construction, windstorm classification of 1-90 in accordance with FM DS 1-28.
- B. UL 790: Class A Fire Hazard Classification.
- C. Conform to applicable code for roof assembly fire hazard requirements.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate setting plan for tapered insulation, joint and termination detail conditions, conditions of interface with other materials. Indicate membrane layout and seam locations.
- B. Product Data: Submit characteristics on membrane materials, adhesive, seaming materials, flashing materials, insulation and vapor retarders.
- C. Samples: Submit two, 6x6 inch in size illustrating insulation and membrane.
- D. Manufacturer's Installation Instructions: Submit special precautions required for seaming membrane.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- F. Specimen Warranty; For approval
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

- B. Installer Qualifications: Company specializing in performing the work in this section:
 - 1. With minimum ten years documented experience

1.8 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing Work of this section.
- B. Review preparation and installation procedures and coordinating and scheduling required with related Work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply roofing membrane during inclement weather ambient temperatures below 40 degrees F or above 95 degrees F without proper weather protection.
- B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 COORDINATION

- A. Coordinate Work with installation of associated roof penetrations and metal flashings, as work of this section proceeds.

1.12 WARRANTY

- A. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 25 years after date of Substantial Completion
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 25 years from Date of Substantial Completion.
 - 2. Warranty wind speed: 90 MPH 3 second gusts.
 - 3. For repair & replacement, include costs of both material & labor in warranty.

PART 2 PRODUCTS

2.1 SINGLE PLY ROOFING – Fully Adhered with Mechanically Fastened Base Layer

- A. Manufacturers:
 - 1. Carlisle SynTec (Basis of Design: Sure-Flex Adhered Roofing System)
 - 2. Versico
 - 3. Fibertite Roofing Systems

2.2 COMPONENTS

- A. Membrane: Nominal 60-mil PVC KEE membrane. Membrane must be a KEE HP 661 PVC or a KEE 741 with the quantity of KEE 741 being a nominal 36% by weight.
- B. Color: White
- C. Seaming Materials: Heat welded as recommended by membrane manufacturer.
- D. Adhesive: Low VOC PVC Bonding Adhesive.
- E. Contour Ribs @ Pool Roof: Standing seam ribs to be applied every 24" O.C. Ribs to be hot air welded to KEE PVC membrane per manufacturer's recommendation.
- F. Gypsum Overlayment and Underlayment board: 1/2" Securock Gypsum Fiber Board by USG
- G. Insulation: ASTM C1289, Type II, Class I, Grade 2 faced rigid cellular polyisocyanurate roof insulation, with the following characteristics:
 - 1. Board Density: 1.8 lb/cu ft.
 - 2. Board Size: 48x96 inch.
 - 3. Board Thickness: tapered 1/8", 1/4" & 1/2" per 1'-0", minimum system R-value of R-30.
 - 4. Board Edges: square.
 - 5. Flame Spread: ASTM E84, 25 max.
 - 6. Compressive Strength: Minimum 20 psi.
 - 7. Allowable manufacturers of products for this section include, but are not limited to:
 - a. Carlisle SynTec Systems (Basis of design)
 - b. Versico
- H. Flexible Flashings: Same PVC KEE material as membrane, provide reinforced flashings supplied by manufacturer of membrane.
 - 1. Color: Match color of membrane.
- I. Termination Bar: 1" wide and .098" thick extruded aluminum with pre-punched holes at 6" on center.
- J. Counter flashings: metal, as specified in Section 07 62 00.
- K. Prefabricated Roof Specialties: As specified in Section 07 71 00.

2.3 ACCESSORIES

- A. Sheathing Fasteners: Appropriate for purpose intended and approved by Factory Mutual and system manufacturer; length required for thickness of material.
- B. Insulation Adhesive: Adhesive appropriate for purpose intended and approved by Factory Mutual and system manufacturer. Insulation adhesive to be a 2 part low rise foam adhesive installed in beads 4" O.C. in the field, perimeter, and corners.
- C. Sealants: As recommended by membrane manufacturer.
- D. Strip Reglet Devices: Aluminum; maximum possible lengths per location, with attachment flanges.
- E. Walkway Pads: 24" x 24" walk pads hot welded to roof membrane.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify surfaces and site conditions are ready to receive Work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains valleys, or eaves, and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Confirm dry deck by moisture meter with moisture content acceptable to roofing manufacturer.
- F. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips wood nailing strips and reglets are in place.

3.2 INSTALLATION

- A. Insulation Application:
 - 1. Mechanically fasten roof underlayment board one per 2 square feet, fully adhere first layer of insulation to underlayment in accordance with manufacturer's instructions but no less than beads 4" on center.
 - 2. Adhere second layer of insulation with joints staggered minimum 6 inches from joints of first layer in accordance with manufacturer's instructions but no less than beads 4" on center.
 - 3. Attachment to meet Factory Mutual I-90 standards.
 - 4. Place constant thickness first layer and tapered thickness insulation second layer to required slope pattern
 - 5. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
 - 6. Cut boards to slope for distance of 24 inches back from roof drains for positive drainage.

7. Apply no more insulation than can be covered with membrane in same day.
8. Fully adhere roof overlayment board in accordance with manufacturer's instructions but no less than beads 4" on center.

B. Membrane Application:

1. Apply membrane in accordance with manufacturer's instructions.
2. Apply adhesive according to manufacturer's recommendation.
3. Roll out membrane, free from air pockets, wrinkles, or tears. Firmly press sheet into place without stretching.
4. Attach sheet to substrate except those areas directly over or within 3 inches of control or expansion joint.
5. Overlap edges and ends and seal by heat welding, minimum 3. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
6. Shingle joints on sloped substrate in direction of drainage.
7. Extend membrane onto vertical surfaces 8 inches min., over metal cant dam at roof edge and over top of curbs.
8. Apply lap sealant at exposed edges of splices if require by the manufacturer.
9. Seal membrane around roof penetrations and perimeter.

C. Flashings And Accessories (Basis of Design – Carlisle):

1. Apply flexible flashings to seal membrane to vertical elements. Fabricate roofing control and expansion joints to isolate roof into areas as indicated on Drawings. Make joints watertight. Expansion joint details as per Carlisle details TP U-3A or TP U-3B or similar.
2. Coordinate installation of roof drains sumps and related flashings as per Carlisle detail TP U-6B
3. Seal flashings and flanges of items such as pipes penetrating membrane as per Carlisle Detail TP U-8A
4. Follow manufacturer's typical flashing procedures for all base of wall flashings as per Carlisle details as per TP U-12A or TP U-12A.1
5. Follow manufacturer's typical flashing procedures for all curbs as per Carlisle detail TP U-5A.
6. Perimeter edge metal and flashing must be as per Carlisle detail TP U-1E or equal, with a .050 standard Kynar finish fascia.

3.3 WALKWAY PADS

- A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the drawing. Complete an acceptable membrane seal in accordance with the manufacturer's requirements
- B. Hot air weld walkway material to the membrane in accordance with the manufacturer's specifications.

3.4 DAILY SEAL

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

- B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

3.5 FIELD QUALITY CONTROL

- A. Require site attendance of roofing and insulation materials' manufacturers daily during installation of the Work.

3.6 CLEANING

- A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- B. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. Repair or replace defaced or disfigured finishes caused by Work of this section.
- D. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect building surfaces against damage from roofing work.
- B. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, gutters, and downspouts.
- B. Sealants for joints within sheet metal fabrications.

1.2 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- F. CDA A4050 - Copper in Architecture - Handbook; Current Edition.
- G. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples, 6 by 6 inches in size, illustrating metal finish color.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Perform work in accordance with ANSI/SPRI/FM 4435/ES-1 requirements for pull-off resistance to design wind pressure as defined by applicable local building code.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Sheet Metal Flashing and Trim:
 - 1. ALUCOBOND by 3A Composites USA: www.alucobondusa.com/#sle.
 - 2. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 3. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

2.3 PREFINISHED ALUMINUM SHEETS

- A. Description: Factory-applied topcoat systems applied to aluminum flat sheet substrates prior to fabrication by coil coating; topcoat systems consist of primers and organic topcoats on exposed side and backing coats on unexposed side.
- B. Aluminum Sheet Substrates: ASTM B209/B209M, alloy and temper as recommended by manufacturer for application.
- C. Superior Performance Organic Coating System: Comply with AAMA 2605 for aluminum preparation, pretreatment, primer and finish coat system; provide thermally cured 70-percent PVDF fluoropolymer systems.
- D. Application: Gutters, Downspouts, and Scuppers.
 - 1. Base Metal Thickness: 0.050 inch, minimum.
 - 2. Coating System: High-performance organic coating system.
 - 3. Color: As selected by Architect from manufacturer's full colors. To match fascia color.

2.4 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing membrane. Return and brake edges.

2.5 GUTTERS AND DOWNSPOUTS

- A. Seamless Gutters: SMACNA (ASMM) Rectangular profile.
- B. Downspouts: Profile as indicated.

- C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with ICC (IPC).
- D. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- E. Seal metal joints.

2.6 FLASHING

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.7 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer Type: Zinc chromate.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Fenestration Perimeter Flashing Attachments: Two-piece flashing receiver and clip of extruded aluminum, at least 0.045 inch thick, for attaching flashing at perimeter of exterior wall fenestration openings.
 - 1. Provide flashing receiver profile appropriate for flashing applications.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install scuppers to lines and levels indicated on Drawings. Seal top of reglets with sealant
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.3 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

- D. Exterior Flashing Receivers: Install in accordance with manufacturer's recommendations, and in proper relationship with adjacent construction, and as follows:
- E. Seal metal joints watertight.
- F. Secure gutters and downspouts in place with concealed fasteners.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured roof specialties, including copings, fascias, and gravel stops.
- B. Roof control and expansion joint covers.

1.2 RELATED REQUIREMENTS

- A. Section 07 53 00 - Elastomeric Membrane Roofing – Fully Adhered
- B. Section 07 72 00 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- C. NRCA (RM) - The NRCA Roofing Manual; 2025.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two appropriately sized samples of coping and gravel stop.
- E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.5 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish manufacturer's material and labor warranty to cover degradation of material finish.
 - 1. Term: Ten years after Date of Substantial Completion.
 - 2. Coverage: include color fading due to exposure to weather.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. Carlisle Syntec Systems: www.carlislesyntec.com.
 - 2. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 3. Metal-Era Inc: www.metalera.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Control and Expansion Joint Covers:
 - 1. Construction Specialties, Inc; Roof Covers: www.c-sgroup.com/#sle.
 - 2. Metal-Era Inc: www.metalera.com/#sle.
 - 3. MM Systems Corp: www.mmsystemscorp.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

- A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Fascia, and edge securement for roof membrane. Concealed continuous heavy duty extruded aluminum cleat with snap-on aluminum fascia; internal splice piece at joints of same material, thickness and finish as fascia; concealed stainless steel fasteners.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
 - 4. Finish: 70 percent polyvinylidene fluoride (PVDF).
 - 5. Color: As selected by Architect from manufacturer's custom range.
 - 6. Products:
 - a. Carlisle Syntec Systems; Securedge 2000HG: www.carlislesyntec.com.
 - b. Hickman Edge Systems; Terminedge HG: www.hickmanedgesystems.com/#sle.
 - c. Metal-Era Inc; Anchor-Tite HG: www.metalera.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners. Include special supports spaced at 32 inches on center.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
 - 4. Finish: 70 percent polyvinylidene fluoride.
 - 5. Color: As selected by Architect from manufacturer's custom range.
 - 6. Products:
 - a. Carlisle Syntec Systems; Securedge 400 Coping: www.carlislesyntec.com.
 - b. Metal-Era Inc; Leak Tite: www.metalera.com.
- C. Control and Expansion Joint Covers: Composite construction of 6-inch wide flexible EPDM flashing of black color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch. Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.
- D. Reglet and Counterflashings:
 - 1. .040 extruded aluminum reglet with .032 formed aluminum counter flashing with stainless steel spring clips at 16" o.c. and stainless steel wind clips at 32" o.c.
 - a. Finish of both reglet and counterflashing to be kynar paint.
- E. Pipe Boots: Provide boot of material compatible with new roof system.
 - 1. Provide retrofit boot for existing pipes.
 - 2. Products: Pipe boot (new roof system) and retrofit pipe seals (existing roof system)
- F. Multi-Pipe Portal System: Provide curb or base flange with rubber cap which will accept the size and number of pipes and/or conduit required. Materials are to be compatible with new roof system.

1. Product: Provide boot similar to Quadraseal by Portals Plus, Inc.

2.3 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.4 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Fasteners: Stainless Steel with same finish as flashing metal & soft neoprene washers (no exposed fasteners). Fasteners for roof replacements must be included in the Singly-Ply Roofing membrane manufacturer's warranty to meet uplift pressures determined in accordance with the applicable Building Code.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
- B. Field verify dimensions of metal fascia and coping. Verify adequate coverage of existing blocking and wall surface. Minimum of 2 inch lap required.

3.2 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Conform to SMACNA Architectural Sheet Metal Manual drawing details.
- E. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- F. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- G. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof hatches.
- B. Snow guards.

1.2 RELATED REQUIREMENTS

- A. Section 07 71 00 - Roof Specialties: Other manufactured roof specialty items.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.
- B. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- C. FM (AG) - FM Approval Guide; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 ROOF HATCHES

- A. Roof Hatch Manufacturers:
 - 1. Bilco Company: www.bilco.com/#sle.
 - 2. Nystrom, Inc: www.nystrom.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Hatches: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
 - 1. Style: Provide flat metal covers unless otherwise indicated.
 - 2. Mounting Substrate: Provide frames, curbs, and safety railing suitable for mounting on EPDM membrane roof.
 - 3. Thermally Broken Hatches: Provide insulation within frame and cover.
 - 4. For Ships Ladder Access: Single leaf; 30 by 54 inches.

2.2 SNOW GUARDS

- A. Roof Membrane Fence Type Snow Guards: Base plate attached on top of PVC roof membrane and anchored to roof deck with mounting bracket that supports double tube snow guard.
 - 1. Base Plate: Stainless steel plate with holes for mounting with anchor bolts through membrane to roof deck.
 - 2. Bracket: Powder coated Aluminum mounting bracket bolted to base plate.
 - 3. Tube: Aluminum.
 - a. Outside Diameter, Round: 1 inch, nominal.
 - b. Tube Finish: Powder coated with color to match roof.
 - c. Tube Couplings: Manufacturer's standard material.
 - d. End Collars and Caps: Manufacturer's standard material.
 - 4. Base Plate Patch Flashing: At least 6 by 8 inches, and complying with roofing membrane manufacturer's requirements for patch flashing.
 - 5. Placement: As recommended by manufacturer.
 - 6. Products:
 - a. Alpine SnowGuards; PP115 Pipe-Style Snow Guard: www.alpinesnowguards.com/#sle.
 - b. Rocky Mountain Snow Guards, Inc: www.rockymountainsnowguards.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.4 CLEANING

- A. Clean installed work to like-new condition.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 RELATED REQUIREMENTS

- A. Section 01 35 17 - Alteration Project Procedures: Cutting and patching.
- B. Section 07 05 53 - Fire and Smoke Assembly Identification.

1.3 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
- D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a, with Editorial Revision (2024).
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- F. ITS (DIR) - Directory of Listed Products; Current Edition.
- G. FM (AG) - FM Approval Guide; Current Edition.
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- J. UL (DIR) - Online Certifications Directory; Current Edition.
- K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. With minimum ten years documented experience installing work of this type.

1.6 MOCK-UPS

- A. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- B. If accepted, mock-up will represent minimum standard for this work.
- C. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.7 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop.
 - 2. A/D Fire Protection Systems Inc: www.adfire.com.
 - 3. Hilti, Inc: www.us.hilti.com.
 - 4. RectorSeal, a CSW Industrials Company: www.rectorseal.com/firestop-solutions/#sle.
 - 5. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 6. United States Gypsum Co.
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- C. Fire Ratings: Refer to drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.4 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

- A. Concrete and Concrete Masonry Walls and Floors:
 - 1. Head-of-Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor:
 - a. 2 Hour Construction: UL System HW-D-0755; 3M Co.; FireDam Spray 200.
- B. Gypsum Board Walls:
 - 1. Head-of-Wall Joints at Concrete Over Metal Deck:
 - a. 1 Hour Construction: UL System HW-D-0101, 3M Co.; FireDam Spray 200.

2.5 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

- A. Blank Openings:
 - 1. In Floors or Walls:
 - a. 2 Hour Construction: UL System C-AJ-0032; USG Inc.; Firecode Compound.
- B. Penetrations Through Floors or Walls By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-1081; USG Inc.; Firecode Compound.
 - 2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System C-AJ-22015; Rectorseal Sealant.
 - 3. Electrical Cables Not In Conduit:
 - a. 3 Hour Construction: UL System C-AJ-3231; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - b. 2 Hour Construction: UL System C-AJ-3045; USG Inc.; Firecode Compound.
 - 4. Insulated Pipes:
 - a. 2 Hour Construction: UL System C-AJ-5002; 3M Company FS-195+ / CP 25WB+
 - 5. HVAC Ducts, Uninsulated:
 - a. 2 Hour Construction: UL System C-AJ-7036; Rectorseal Sealant

2.6 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Blank Openings:
 - 1. 1 Hour Construction: UL System W-L-0031; 3M Company CP 25WB+
- B. Penetrations By:
 - 1. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-1001; 3M Company CP 25WB+
 - 2. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 1 Hour Construction: UL System W-L-2088; 3M Company CP 25WB+ / FB-3000 WT
 - 3. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - b. 1 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
 - c. 1 Hour Construction: UL System W-L-3195; 3M Company CP 25WB+
 - 4. Insulated Pipes:
 - a. 1 Hour Construction: UL System W-L-5039; 3M Company CP 25WB+
 - 5. HVAC Ducts, Insulated:
 - a. 1 Hour Construction: UL System W-L-7082; Rectorseal Sealants.

2.7 FIRESTOPPING SYSTEMS

- A. Manufacturers:
 - 1. A/D Fire Protection Systems, Inc. .
 - 2. Dow Corning Corp. .
 - 3. Hilti Corp. .
 - 4. 3M fire Protection Products .
 - 5. Rectorseal Corp.
 - 6. United States Gypsum Co. .
 - 7. Substitutions: Section 01 60 00 - Product Requirements .
- B. Firestopping:
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements.
- B. See Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- C. Inspect installed firestopping for compliance with specifications and submitted schedule.
- D. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.5 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 87 00
SMOKE CONTAINMENT BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated elevator door smoke containment transparent curtains.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. FM (AG) - FM Approval Guide; Current Edition.
- D. ICC-ES AC77 - Acceptance Criteria for Smoke-Containment Systems Used with Fire-Resistance-Rated Elevator Hoistway Doors and Frames and at the Intersection of Elevator Lobby and Corridor; 2021.
- E. ITS (DIR) - Directory of Listed Products; Current Edition.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- H. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.
- I. UL (DIR) - Online Certifications Directory; Current Edition.
- J. UL 10D - Standard for Safety Fire Tests of Fire Protective Curtain Assemblies; Current Edition, Including All Revisions.
- K. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- L. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical literature describing product components, connections, operation details, and required electrical equipment.
- C. Shop Drawings: Submit shop drawings that include elevations, sections, details and dimensions, materials, finishes, anchorage methods, and hardware locations for specified smoke containment curtains.
- D. Evaluation Service Reports: Submit report.
- E. Manufacturer's installation instructions.

- F. Field Quality Control Submittals: Report of field testing.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Operating and Maintenance Manuals: Submit complete set of manuals describing materials, devices, and procedures required in operation and maintenance of specified protective curtain systems.
- J. Executed warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1-year manufacturer material and labor warranty from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 ELEVATOR DOOR SMOKE CONTAINMENT SYSTEM MANUFACTURERS

- A. Non-Fire-Rated Elevator Door Smoke Containment Transparent Curtain Systems:
 - 1. Cookson, part of CornellCookson, LLC; SmokeShield Elevator Model ERF10: www.cooksondoor.com/#sle.
 - 2. Smoke Guard, Inc, a CSW Industrial Company: www.smokeguard.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ELEVATOR DOOR SMOKE CURTAIN CONTAINMENT SYSTEMS

- A. Elevator Door Smoke Curtain Containment Systems:
 - 1. Smoke and Draft Control: Self-closing or automatic-closing protective curtains in accordance with NFPA 80 and NFPA 105.
 - 2. Maximum Air Leakage: 3 cfm/sq ft of door opening at 0.10 in-wc pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - 3. Non-Fire-Rated:
 - a. Coated Fabric Curtains: Woven, reinforced, and coated fabric curtain with high visibility see-through panel.
 - 1) Flame spread index of 25 or less and smoke developed index of 50 or less when tested in accordance with ASTM E84.
 - 2) Provide pressure sensitive electrical switch located on curtain with word OPEN located on each side of curtain.
 - b. Provide positive reseal at entire perimeter of curtain after each opening or egress function.
 - c. Edge Retention: Provide curtains mechanically interlocked to guide channel providing complete curtain reseal after each cycle.
 - d. Comply with UL 10D. Provide listing label affixed to assembly.
 - 4. Refer to drawings for layout and additional requirements.
 - 5. Elevator Door Egress from Deployed Curtain Containment System: Comply with ICC-ES AC77 requirements.

6. Comply with ADA Standards.

2.3 COMPONENTS

- A. Roller Assembly: Horizontal structural support with minimal deflection of protective curtain assembly and sized to incorporate motor drive unit.
- B. Hood Assembly: Totally enclosed curtain and roller assembly with approved smoke seals, and removable cover plates to allow access to curtain rollers.
 1. Enclosure: Galvanized steel, with manufacturers standard finish. Color to be White
 2. Mounting: Flush with ceiling.
 3. Height and Depth: As indicated on drawings.
- C. Mounting Brackets: Painted metal plates and brackets as required for supporting hood assembly.
 1. Mounting: As indicated on drawings.
- D. Vertical Guide Assemblies: Guide rails to secure curtain during deployment and operation, with positive mechanical curtain retention.

2.4 OPERATIONAL CONTROLS

- A. Operator, Controls, Actuators, and Safeties: Provide products listed by FM (AG), ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
 1. Operable curtain that deploys within 10 seconds upon actuation signal from fire alarm system, local smoke detector, sprinkler alarm system, or loss of electric power to unit with listed releasing device. Comply with UL 864.
- B. Electric Motor: Inboard motor including gearbox assembly complying with NFPA 70.
 1. Power Supply: Provide connection to building's 120 VAC power supply for drive-control system.
 2. Mounting: Roller assembly mounted.
 3. Motor Voltage: 24 VDC.
 4. Descent Speed: 6 inches per second, minimum; 24 inches per second, maximum.
- C. Test Feature: Provide simple and easily accessible switch feature to test and confirm correct function of curtain.
- D. Fail-Safe Release Device:
 1. When release mechanism's power is interrupted by alarm condition, curtain automatically self-closes.
 2. Upon restoration of power and with cleared alarm condition, curtain release mechanism resets to open position.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify areas of installation and conditions, with installer present, comply with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions for proper installation of this work.
- B. Correct unsatisfactory conditions before proceeding with installation.

3.2 INSTALLATION

- A. Install system in accordance with manufacturer's written installation instructions.
- B. Install anchorage devices to securely fasten hood assembly to substrate and building framing without distortion or stress.

- C. Install conduit and wiring from disconnect to unit components. Coordinate installation of electrical service; see Section 26 05 33.13 and Section 26 05 83.
- D. Coordinate fire alarm system and smoke detector connection; see Section 28 46 21.16

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide services of manufacturer's field representative to observe installation, conduct field testing and inspection, and submit report.
- C. Provide testing and inspection for the following:
 - 1. Verify deployment of protective curtain upon signal from fire alarm system or local smoke detectors.
 - 2. Verify protective curtain deploys properly by gravity upon damage to control panel or loss of power, possibly caused by emergency situation.

3.4 CLEANING

- A. Remove labels and visible markings from protective curtain components.

3.5 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for closeout submittals.
- B. Demonstration: Demonstrate proper operation of system to Owner's designated personnel.
 - 1. Use operating and maintenance manual as reference during demonstration.
 - 2. Conduct walking tour of project.
 - 3. Describe function, operation, and maintenance of each component.

3.6 MAINTENANCE

- A. Provide a separate maintenance contract for periodic inspection and performance analysis of elevator door smoke-containment protective curtain assemblies in accordance with NFPA 105 and NFPA 80 for one year from Date of Substantial Completion.
- B. Indicate services, obligations, conditions, and terms for agreement period and for renewal options.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

1.3 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
- B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
 - 9. Certification by manufacturer indicating that product complies with specification requirements.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- H. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- I. Manufacturer's qualification statement.
- J. Installer's qualification statement.
- K. Executed warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver sufficient samples to manufacturer for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- E. Field Quality Control Plan:
 - 1. Visual inspection of entire length of sealant joints.
 - 2. Field testing agency's qualifications.
 - 3. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
- C. Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Nonsag Sealants:
 - 1. Dow: www.dow.com/#sle.
 - 2. Hilti, Inc: www.hilti.com/#sle.
 - 3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Sealants:
 - 1. Dow: www.dow.com/#sle.
 - 2. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints:
 - a. Seal exterior joints unless indicated on drawings to not be sealed.
 - b. Seal the following joints:
 - 1) Wall expansion and control joints.
 - 2) Joints between doors, windows, and other frames or adjacent construction.
 - 3) Joints between different exposed materials.
 - 4) Openings below ledge angles in masonry.
 - 2. Interior Joints:
 - a. Do not seal interior joints indicated on drawings as not sealed.
 - b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 - 2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
 - 3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
 - d. Joints where sealant installation is specified in other sections.
 - e. Joints between suspended ceilings and walls.
- B. Exterior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
 - 1. Type 1 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
- D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.3 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 61 16.
- B. Colors: As selected by Architect from full range of colors

2.4 NONSAG JOINT SEALANTS

- A. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: To be selected.
- B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.

2.5 SELF-LEVELING JOINT SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's standard range.
 - 4. Service Temperature Range: Minus 40 to 180 degrees F.
 - 5. Provide slope grade sealant at all sloped pavement up to 12%.
 - 6. Products:
 - a. Pecora Corporation: www.pecora.com/#sle.
 - b. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - c. Sika Corporation: usa.sika.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Sealant Backing Rod, Open-Cell Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type O.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.
- C. Sealant Backing Rod, Bi-Cellular Type:
 - 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
 - 2. Size: 25 to 50 percent larger in diameter than joint width.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install bond breaker backing tape where backer rod cannot be used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

SECTION 08 06 71
DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section references specification sections relating to commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors.
 - 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical and access control door hardware.
 - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
 - 4. Automatic operators.
 - 5. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Door Hardware".
 - 2. Division 08 Section "Automatic Door Operators".
 - 3. Division 28 Section "Integrated Access Control Hardware Devices".
- D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.

- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
 - 1. Section 08 71 00 – Door Hardware.
- C. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. PE - Pemko
 - 3. SU - Securitron
 - 4. RO - Rockwood
 - 5. SA - SARGENT
 - 6. NO - Norton Rixson
 - 7. RX - Rixson
 - 8. OT - Other

Hardware Sets

Set: 1.0

Doors: 29-1

2 Continuous Hinge	DFM-SLF-HD1 PT		PE 087100
2 Electric Power Transfer	EL-CEPT	BSP	SU 087100 ⚡
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA 087100
1 Rim Exit Device	11 12 56-SN200-8804 BIPS-0E Less Pull	BSP	SA 087100 ⚡
1 Rim Exit Device, Exit Only	12 55 56 8810 EO	BSP	SA 087100 ⚡
1 Cylinder	11 980C1	BSP	SA 087100
2 Pull	RM5277-36 Mtg-Type 12XHD	BSP	RO 087100
2 Concealed Overhead Holder/Stop	6-x36	BSP	NO 087100
2 Surface Closer	9500	BSP	NO 087100
1 Gasketing	Provided by Frame Manufacture		OT
2 Sweep	3452-BSP-NB		PE 087100
1 Threshold	273x224-BSP-FGT MSES25SS		PE 087100
3 ElectroLynx Harness	QC-C1500P		MK 087100 ⚡
2 ElectroLynx Harness	QC-C**** x Length Required		MK 087100 ⚡
2 Position Switch	DPS - M / W-BK (SPDT)		SU 087100 ⚡
1 Power Supply	AQL4-R8E1		SU 087100 ⚡
1 Wiring Diagram	Elevation and Point to Point as Specified		OT

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

System Operational Narrative:

- Doors normally closed and secure.
- Access by valid credential presentation retracting latches for a pre-determined time limit and then relocking.
- Egress always free for immediate exit.
- Request-to-Exit sensors allows exit without alarm condition.
- Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
- Latches remain projected/locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 2.0

Doors:

2 Continuous Hinge	DFM-SLF-HD1 PT		PE	087100	
2 Electric Power Transfer	EL-CEPT	613E	SU	087100	⚡
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA	087100	
1 Rim Exit Device, Exit Only	53 55 56 8810 EO	US10BE	SA	087100	⚡
1 Rim Exit Device, Storeroom	11 53 55 56 8804 Less Pull	US10BE	SA	087100	⚡
1 Cylinder	11 980C1	US10B	SA	087100	
2 Pull	RM5277-36 Mtg-Type 12XHD	US10B	RO	087100	
2 Concealed Overhead Holder/Stop	6-x36	690	NO	087100	
1 Surface Closer	9500 x Top Jamb Mounted	690	NO	087100	
1 Automatic Opener	6021/6031x D	690	NO	087100	⚡
2 Astragal	29326-10BE-NB TKSP		PE	087100	
1 Gasketing	Provided by Frame Manufacture		OT		
1 Threshold	273x224-10BE-FGT MSES25SS		PE	087100	
1 Card Reader	Provided by Security Contractor		OT		
3 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	087100	⚡
2 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK	087100	⚡
2 Door Switch	505 - wall mount		NO	087100	⚡
2 Position Switch	DPS-M-BK		SU	087100	⚡
1 Power Supply	AQL4-R8E1		SU	087100	⚡
1 Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

System Operational Narrative:

- Doors normally closed and secure.
- Presentation of valid credential at card reader retracts exit device latch bolts allowing ingress.
- Door position switches to monitor and report open / closed status of opening to buildings access control system.
- Exit devices equipped with request to exit switches at rails to shunt door monitoring upon egress.

- Free egress at all times.
- Fail-secure.

Activating actuator switch retracts latch bolt of exit device, if locked, and initiates automatic operator cycle.

Activating exterior actuator switch initiates cycle of automatic operator if the latch bolt is in the retracted position (push /pull operation).

After hours - access by valid use of card reader outside / automatic operator will only operate if card reader is authorized first.

Set: 3.0

Doors: [A111-1](#), [A111-2](#)

2 Continuous Hinge	DFM-HD1 PT		PE	087100	
2 Electric Power Transfer	EL-CEPT	BSP	SU	087100	⚡
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA	087100	
1 Rim Exit Device	11 56-SN200-8804 BIPS-0E Less Pull	BSP	SA	087100	⚡
1 Rim Exit Device, Exit Only	55 56 8810 EO	BSP	SA	087100	⚡
1 Cylinder	11 980C1	BSP	SA	087100	
2 Pull	RM5277-36 Mtg-Type 12XHD	BSP	RO	087100	
2 Concealed Overhead Holder/Stop	6-x36	BSP	NO	087100	
2 Surface Closer	9500	BSP	NO	087100	
1 Astragal	29326-BSP-NB TKSP		PE	087100	
1 Gasketing	303AS		PE	087100	
1 Rain Guard	346-BSP		PE	087100	
2 Sweep	3452-BSP-NB		PE	087100	
1 Threshold	273x224-BSP-FGT MSES25SS		PE	087100	
3 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	087100	⚡
2 ElectroLynx Harness	QC-C**** x Length Required		MK	087100	⚡
2 Position Switch	DPS-M-BK		SU	087100	⚡
1 Power Supply	AQL4-R8E1		SU	087100	⚡
1 Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

System Operational Narrative:

- Doors normally closed and secure.
- Access by valid credential presentation retracting latches for a pre-determined time limit and then relocking.
- Egress always free for immediate exit.
- Request-to-Exit sensors allows exit without alarm condition.
- Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
- Latches remain projected/locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 4.0

Doors: [02-1](#)

6 Hinge, Full Mortise, Hvy Wt	T4A3386	CPC (SS)	MK 087100	
2 Electric Power Transfer	EL-CEPT	630	SU 087100	⚡
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA 087100	
1 Rim Exit Device	CPC 11 56-SN200-8804 BIPS-0E ETL	US32D	SA 087100	⚡
1 Rim Exit Device, Dummy	CPC 55 56 8810 ETL	US32D	SA 087100	⚡
1 Cylinder	11 980C1	US26D	SA 087100	
2 Surface Closer	9500SS	689	NO 087100	
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100	
2 Wall Stop	406/409	US32D	RO 087100	
1 Gasketing	Provided by Frame Manufacture		OT	
3 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK 087100	⚡
2 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK 087100	⚡
2 Position Switch	DPS-M-BK		SU 087100	⚡
1 Power Supply	AQL4-R8E1		SU 087100	⚡
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

System Operational Narrative:

- Doors normally closed and secure.
- Access by valid credential presentation retracting latches for a pre-determined time limit and then relocking.
- Egress always free for immediate exit.
- Request-to-Exit sensors allows exit without alarm condition.
- Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
- Latches remain projected/locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 5.0

Doors: 02-2

6 Hinge, Full Mortise, Hvy Wt	T4A3386	CPC (SS)	MK 087100	
2 Electric Power Transfer	EL-CEPT	630	SU 087100	⚡
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA 087100	
1 Rim Exit Device	CPC 11 12 56-SN200-8804 BIPS-0E ETL	US32D	SA 087100	⚡
1 Rim Exit Device, Dummy	CPC 12 55 56 8810 ETL	US32D	SA 087100	⚡
1 Cylinder	11 980C1	US26D	SA 087100	
2 Concealed Overhead Holder/Stop	6-x36	630	NO 087100	
2 Surface Closer	9500SS	689	NO 087100	
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100	
1 Gasketing	Provided by Frame Manufacture		OT	
3 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK 087100	⚡
2 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK 087100	⚡
2 Position Switch	DPS-M-BK		SU 087100	⚡
1 Power Supply	AQL4-R8E1		SU 087100	⚡
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Perimeter and meeting stile gasket by door / frame manufacturer.

System Operational Narrative:

- Doors normally closed and secure.
- Access by valid credential presentation retracting latches for a pre-determined time limit and then relocking.
- Egress always free for immediate exit.
- Request-to-Exit sensors allows exit without alarm condition.
- Door position switches provide open/closed monitoring to both access control system and intrusion alarm service.
- Latches remain projected/locked (fail secure) in event of power loss. Key override cylinder for emergency access.

Set: 6.0

Doors: 31-1, 31-2

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US10	MK 087100
2 Surface Vert Rod Exit, Classroom	11 NB-8713 ETL	US10	SA 087100
2 Surface Closer	9500	691	NO 087100
2 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
2 Wall Stop	406/409	US10	RO 087100
2 Silencer	608 / 609		RO 087100

Notes:

Set: 7.0

Doors: 01-2, 01-3

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US10	MK 087100
2 Surface Vert Rod Exit, Classroom	11 NB-8713 ETL	US10	SA 087100
2 Surface Closer	CLP9500	691	NO 087100
2 Mag Hold Open	998M	691	RX 087100
2 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
2 Silencer	608 / 609		RO 087100

Notes:

Set: 8.0

Doors: 01-1

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US10	MK 087100
2 Surface Vert Rod Exit, Passage	12 NB-8715 ETL	US10	SA 087100
2 Surface Closer	9500	691	NO 087100
2 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
2 Wall Stop	406/409	US10	RO 087100
1 Astragal	S772C		PE 087100
1 Gasketing	S88BL		PE 087100

Set: 9.0

Doors: A141-1

6 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Flush Bolt	2845 / 2945	US10	RO 087100
1 Dust Proof Strike	570	US10	RO 087100
1 Storeroom/Closet Lock	11 10XG04 LL	US10	SA 087100
1 Coordinator	2672	Black	RO 087100
2 Mounting Bracket	2601D	Black	RO 087100
1 Surface Overhead Holder/Stop	10-x36	691	NO 087100
2 Surface Closer	9500	691	NO 087100
2 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
1 Wall Stop	406/409	US10	RO 087100
1 Astragal	S772C		PE 087100
1 Gasketing	S88BL		PE 087100

Notes:

Set: 10.0

Doors: 135-1

3 Hinge, Full Mortise	TA2314	CPC (SS)	MK 087100
1 Storeroom/Closet Lock	CPC 11 8204 LL	US32D	SA 087100
1 Surface Closer	9500SS	689	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100
1 Wall Stop	406/409	US32D	RO 087100
1 Gasketing	Provided by Frame Manufacture		OT

Set: 11.0

Doors: 137-3, 137-4, 140-3, 140-4

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Storeroom/Closet Lock	11 10XG04 LL	US10	SA 087100
1 Surface Closer	9500	691	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
1 Wall Stop	406/409	US10	RO 087100
3 Silencer	608 / 609		RO 087100

Notes:

Set: 12.0

Doors: 146-1

3 Hinge, Full Mortise	TA2314	CPC (SS)	MK 087100
1 Office/Entry Lock	CPC 11 8205 LL	US32D	SA 087100
1 Surface Closer	9500SS	689	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100
1 Wall Stop	406/409	US32D	RO 087100
1 Gasketing	Provided by Frame Manufacture		OT

Set: 13.0

Doors: 134A-1

3 Hinge, Full Mortise	TA2314	CPC (SS)	MK 087100
1 Office/Entry Lock	CPC 11 8205 LL	US32D	SA 087100
1 Concealed Overhead Holder/Stop	6-x36	630	NO 087100
1 Surface Closer	9500SS	689	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100
1 Wall Stop	406/409	US32D	RO 087100
1 Gasketing	Provided by Frame Manufacture		OT

Set: 14.0

Doors: 137-2, 140-2

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Classroom Lock	11 10XG37 LL	US10	SA 087100
1 Surface Closer	9500	691	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
1 Wall Stop	406/409	US10	RO 087100
1 Gasketing	S88BL		PE 087100

Notes:

Set: 15.0

Doors: 024-1, 051-1, 133-1, 217-1

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Classroom Lock	11 10XG37 LL	US10	SA 087100
1 Surface Overhead Holder/Stop	10-x36	691	NO 087100
1 Surface Closer	9500	691	NO 087100
1 Mag Hold Open	998M	691	RX 087100
1 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
1 Gasketing	S88BL		PE 087100

Notes:

Set: 16.0

Doors: 024C-1, 051C-1, 133A-1, 133B-1, 133C-1, 133D-1, 137A-1, 137B-1, 140A-1, 140B-1, 146A-1, 146B-1, 146C-1, 217A-1, 217B-1, 217C-1, 217D-1, A141A-1

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Privacy Lock	V33 10XU65 VSLL	US10	SA 087100
1 Wall Stop	406/409	US10	RO 087100
3 Silencer	608 / 609		RO 087100

Set: 17.0

Doors: 024A-1, 024B-1, 051A-1, 051B-1

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Privacy Lock	V33 10XU65 VSLL	US10	SA 087100
1 Concealed Overhead Holder/Stop	6-x36	691	NO 087100
3 Silencer	608 / 609		RO 087100

Set: 18.0

Doors: 2A-1

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Passage Latch	10XU15 LL	US10	SA 087100
1 Surface Closer	9500	691	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
1 Wall Stop	406/409	US10	RO 087100
3 Silencer	608 / 609		RO 087100

Notes:

Set: 19.0

Doors: 137-1, 140-1

3 Hinge, Full Mortise	TA2714	US10	MK 087100
1 Pull Plate	BF 111x70B	US10	RO 087100
1 Push Plate	70C-RKW	US10	RO 087100
1 Surface Closer	9500	691	NO 087100
1 Kick Plate	K1050 10" high CSK BEV	US10	RO 087100
1 Wall Stop	406/409	US10	RO 087100
3 Silencer	608 / 609		RO 087100

END OF SECTION

08 06 71

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.
- B. Fire-rated hollow metal frames for non-hollow metal doors.

1.2 RELATED REQUIREMENTS

- A. Section 08 14 16 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.
- B. Section 08 71 00 - Door Hardware: Hardware, silencers, and weatherstripping.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- I. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- K. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- M. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Samples: Submit one sample of frame metal, 2 by 2 inches, showing factory finishes, colors, and surface textures.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollow Metal Frames with Integral Casings:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Hollow Metal Frames: Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of side hinged doors.
- B. Design Pressure (DP): In accordance with ASCE 7.
- C. Refer to Door and Frame Schedule on drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.
- D. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
- E. Accessibility: Comply with ICC A117.1 and ADA Standards.

- F. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- G. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 1. Fabricate frames with hardware reinforcement plates welded in place.
 - a. Hinge: Minimum 7 gauge x 1 5/8 x 10 inches.
 - b. Lock Strike: Minimum 14 gauge x template requirements.
- H. Zinc Coating for Units Subject to Corrosive Conditions: Components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise.

2.3 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - 2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inches above floor at 45 degree angle.
 - 3. Frame Finish: Factory primed and field finished.
- B. Fire-Rated Door Frames: Full profile/continuously welded type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - 2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").
 - 3. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
 - 4. Frame Finish: Factory primed and field finished.

2.4 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.5 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- B. Anchors:
 - 1. Stud Wall: Steel stud anchor.
 - 2. New Masonry: Adjustable masonry strap anchor.
 - 3. Existing Masonry: Counter sunk screw with sleeve.
 - a. Counter sunk fasteners shall be covered with a suitable hard setting filling compound, sanded and finished to match frame.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 71 00.

3.4 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush wood doors; flush configuration; fire rated and non-rated.

1.2 RELATED REQUIREMENTS

- A. Section 08 12 13 - Hollow Metal Frames.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- C. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- D. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Full size door sample: Contractor to furnish one complete door unit at each project location to be randomly core sampled. Door to be selected by Architect in field. Door to be sampled would have similar hardware type to other doors to be provided.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- B. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.

- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Forte Opening Solutions: www.forteopenings.com/#sle.
 - 2. VT Industries, Inc: www.vtindustries.com/#sle.

2.2 DOORS AND PANELS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.

2.3 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.4 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Same species as face veneer.
 - 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.
 - 3. Veneer to be hot press applied to core.

2.5 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
2. Provide solid blocking for other throughbolted hardware.
- C. Fit door edge trim to edge of stiles after applying veneer facing. No exposed cross banding.
- D. Bond edge banding to cores.
- E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- G. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
- B. Factory finish doors in accordance with approved sample. Stain color to match existing
- C. Seal door top edge with same sealer to match door facing.

2.7 ACCESSORIES

- A. Glazing Stops for non-rated doors: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.
- B. Glazing Stops for secured non-rated doors: Rolled steel channel shape, 18 gauge, 0.047 inch; no exposed fasteners on non-secure side, painted - color by Architect
- C. Glazing Stops for Fire Rated Doors: Metal as required by manufacturer to achieve fire rating. Painted - color by Architect

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 1. Install fire-rated doors in accordance with NFPA 80 requirements and to requirements for fire rating label by UL or WH. Follow manufacturer's installation instructions for positive pressure doors.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.3 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 08 14 33
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wood doors, stile and rail design; fire rated and non-fire rated.

1.2 RELATED REQUIREMENTS

- A. Section 06 20 00 - Finish Carpentry: Wood door frames.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, and cutouts for glazing.
- D. Samples: Submit two samples of door veneer, 6 by 6 inches in size illustrating wood grain, stain color, and sheen.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Accredited participant in specified certification program prior to commencement of fabrication and throughout duration of project.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Quality Certification:

1. Provide labels or certificates indicating that installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
2. Provide designated labels on shop drawings as required by certification program.
3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver, and store doors in accordance with quality standard specified.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Stile and Rail Wood Doors:
 1. Architectural Concepts, LLC: www.archconceptsllc.com/#sle.
 2. Forte Opening Solutions: www.forteopenings.com/#sle.
 3. VT Industries, Inc: www.vtindustries.com/#sle.
 4. Simpson Door Company.
 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 DOORS

- A. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.
- B. Exterior Doors: 2-1/4 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints; water repellent treated. Transparent finish.

2.3 DOOR AND PANEL FACINGS

- A. Veneer Facing for Transparent Finish: White Oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
- B. Adhesive: Type I - Waterproof.

2.4 DOOR CONSTRUCTION

- A. Astragals for Double Doors: Wood, custom shaped, overlapping and recessed at face edge, specifically for double doors.
- B. Panels: Flat, 1/2" thick to match existing.
- C. Match existing door details; routed rails, applied mouldings, panel stops, 2-1/4" thickness
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

- F. Cut and configure exterior door edge to receive recessed weatherstripping devices. Provide edge clearances in accordance with referenced quality standards.

2.5 FINISHES

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System as recommended to match existing.
 - b. Stain: Custom to match existing, As selected by Architect.
 - c. Sheen: Match existing.
- B. Factory finish doors in accordance with approved sample to match existing species, wood grain, cut, and stain.

2.6 ACCESSORIES

- A. Wood Door Frames: See Section 06 20 00.
- B. Glazing: See Section 08 80 00.
- C. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standards.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Machine cut for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.3 TOLERANCES

- A. Comply with specified quality standard for fit, clearance, and joinery tolerances.
- B. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inch surface area.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

SECTION 08 16 13
FIBERGLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass doors.
- B. Fiberglass door frames.
- C. Fiberglass borrowed lite frames.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. ITS (DIR) - Directory of Listed Products; Current Edition.
- F. IBC 2603.4.1.7 - Standard for Plastic Foam Insulation in Non-Rated Swinging Doors.
- G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- H. UL (DIR) - Online Certifications Directory; Current Edition.
- I. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.
 - 1. Provide details of core, stile and rail construction, trim for lites and all other components.
 - 2. Include details of finish hardware mounting.
- C. Shop Drawings: Indicate layout and profiles; include assembly methods.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.
- D. FRP Face Sheet Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.
- E. Door Corner Sample: Submit corner cross sections, 10 inch by 10 inch in size, illustrating face sheets, core, framing, finish, joints, fasteners, accessory items (lites, integral hardware) and quality of workmanship for approval prior to fabrication.
- F. Maintenance Data: Include instructions for repair of minor scratches and damage.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 10 years of documented experience. Provide comprehensive list of completed projects of similar building type and size as this project with submittal package.
- B. The manufacturer or his representative shall be available for consultation to all parties engaged in the project including instruction to installation personnel.
- C. Unless otherwise indicated, obtain FRP doors and frames from a single company specializing in the type of construction required so that there will be undivided responsibility for the specified performance of all component parts including glazing for FRP doors and factory installation of door hardware.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
1. Store at temperature and humidity conditions recommended by manufacturer.
 2. Do not use non-vented plastic or canvas shelters.
 3. Immediately remove wet wrappers.
- C. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.8 FIELD CONDITIONS

- A. Do not install doors until structure is enclosed.
- B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide written warranty signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the Owner, any doors, frames or factory hardware installation against failure in materials or workmanship within the warranty period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering and defects in hardware installation. The minimum time period of warranty is ten (10) years from Date of Substantial Completion .

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Pultruded Fiberglass Reinforced Plastic (FRP) Doors and Frames:
 - 1. Special-Lite, Inc: Door model: AF-100, Frame model: AF-150 www.special-lite.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Fiberglass Composite Doors:
 - 1. Chem Pruf; P Series: www.chem-pruf.com.
 - 2. FRP Architectural Doors, Inc.; CF34: www.frparch.com.
 - 3. Special-Lite, Inc; AF-220 Sandstone: www.special-lite.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 DOOR AND FRAME ASSEMBLIES

- A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
 - 1. Physical Endurance: Swinging door cycle test to ANSI/SDI A250.4, Level A (1,000,000 cycles) minimum; tested with hardware and fasteners intended for use on project.
 - 2. Screw-Holding Capacity: Tested to 890 pounds, minimum.
 - 3. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
 - 4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
 - 5. Chemical Resistance: Resist degradation due to exposure to tap water and distilled water.
 - a. Chlorine-treated moisture in air.
 - 6. Sizes: As indicated on drawings.
 - 7. Clearance Between Door and Frame: 1/8 inch, maximum.
 - 8. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch, maximum.
 - 9. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.
 - 10. Provide frame anchors that allow for variation in rough opening size; field cutting of doors or frames to fit is not permitted.
- B. Fire-Rated Doors and Frames: Comply with fire-ratings as indicated on drawings.
 - 1. Tested in accordance with ICC (IBC) for positive pressure or UL 10C.
 - 2. ITS (DIR) or UL (DIR) listed and labeled.
 - 3. Visible seals when doors are open or closed is not permitted.
 - 4. Provide mineral fiber or intumescent core as required for fire-rating as indicated.
 - 5. Manufacturer to supply smoke/draft and intumescent gasketing to meet positive pressure requirements.

2.3 COMPONENTS

- A. Doors: Heavy-duty Corrosion Resistant Commercial Fiberglass Door.
 - 1. Type: As indicated on drawings, including swinging doors.
 - 2. Thickness: 1-3/4 inch, nominal.
 - 3. Core Material: Polyurethane closed-cell foam.
 - 4. Core Material: Mineral fiber, fire-rated doors, 18 pcf minimum density.
 - 5. Construction:
 - a. Pultruded as single monolithic fiberglass reinforced plastic (FRP) panel.
 - 6. Door Panel Configuration: As indicated on drawings.
 - 7. Subframe and Reinforcements: Fiberglass pultrusions; no metal or wood.
 - 8. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.
 - 9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.

- B. Frames: Profiles and dimensions as indicated on drawings.
 - 1. Profiles: As indicated on drawings.
 - 2. Door Stop: 5/8 inch wide, by 1-7/8 inches deep.
 - 3. Non-Fire-Rated:
 - a. Fiberglass pultrusions with factory finish.
 - 4. Fire-Rated: Provide frames bearing labels to match doors.
 - a. Fiberglass pultrusions with factory finish
 - 5. Mullions: Removable, fiberglass centerpost; 2 inches wide by 5-3/4 inches deep, nominal.
 - 6. Hardware Cut-outs: Provide continuous backing or mortar guards of same material as frame, with watertight seal.
 - 7. Frame Anchors: Stainless steel, Type 304; provide three anchors in each jamb for heights up to 84 inches with one additional anchor for each additional 24 inches in height.
 - 8. Reinforcing: Provide manufacturer's standard reinforcing at hinge, strike, and closer locations.
- C. Transom and Opaque Side Panels: Same construction as doors.

2.4 FINISHES

- A. Abuse resistant engineered surface with protective coating and through-molded color.
 - 1. Door and Frame Texture: Smooth
 - 2. Color: As selected by Architect from manufacturer's full line of colors.

2.5 ACCESSORIES

- A. Stops for Glazing: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.
 - 1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
 - 2. Glazed Openings: Provide removable stops on interior side.
 - 3. Fire-Rated Doors: Provide stop kit listed by labeling authority.
 - 4. Opening Sizes and Shapes: As indicated on drawings.
- B. Glazing: See Section 08 80 00.
 - 1. Allow for thermal expansion on exterior units.
 - 2. Glazing shall be factory glazed into doors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Remove existing doors and frames, and dispose of all removed materials in accordance with local authorities having jurisdiction.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Clean and prepare substrate in accordance with manufacturer's directions.
- D. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.
- B. Install fire-rated assemblies in accordance with NFPA 80.
- C. Install door hardware as specified in Section 08 71 00.
- D. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.
- E. Set thresholds in continuous bed of sealant and backseal.
- F. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.
- G. In stud walls, install frames prior to building walls; anchor frames to studs using concealed anchors.
- H. Separate aluminum and other metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- I. Provide thermal isolation where components penetrate or disrupt building insulation. Coordinate attachment and seal of perimeter air and vapor retarder materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Repair or replace damaged installed products.

3.4 ADJUSTING

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.

1.2 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Openings in masonry.
- B. Section 09 21 16 - Gypsum Board Assemblies: Openings in partitions.
- C. Section 09 91 23 - Interior Painting: Field paint finish.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- D. ITS (DIR) - Directory of Listed Products; Current Edition.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- F. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, fire resistance listings, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.
- E. Project Record Documents: Record actual locations of each access unit.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Access door and frame units, fire-rated and non-fire-rated, in wall and ceiling locations.
 - 1. Provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring operation behind inaccessible finished surfaces.
 - 2. Coordinate exact locations with various trades to assure proper placement of access doors and panels.
- B. Wall-Mounted Units:
 - 1. Location: As indicated on drawings, and additional locations as required.
 - 2. Panel Material: Steel.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- C. Fire-Rated Wall-Mounted Units:
 - 1. Location: As indicated on drawings, and additional locations as required.
 - 2. Wall Fire-Rating: To match rating of assembly in which unit is installed .
 - 3. Panel Material: Steel.
 - 4. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.
- D. Ceiling-Mounted Units:
 - 1. Location: As indicated on drawings, and additional locations as required.
 - 2. Panel Material: Steel.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2 WALL- AND CEILING-MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Cendrex, Inc: www.cendrex.com/#sle.
 - a. Wall- and Ceiling-Mounted Units: Cendrex AHD, flush door, face frame, hinged.
 - b. Fire-Rated Ceiling-Mounted Units: Cendrex PFI-00 Fire-Rated Insulated Access Door with Exposed Flange.
 - 3. Karp Associates, Inc: www.karpinc.com/#sle.
 - 4. Milcor, Inc: www.milcorinc.com.
 - 5. Nystrom, Inc: www.nystrom.com/#sle.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Style: Exposed frame with door surface flush with frame surface.
 - a. Gypsum Board Ceiling Mounting Criteria: Use drywall bead type frame.
 - 2. Door Style Non-rated: Single thickness with rolled or turned in edges.
 - 3. Door Style Fire-Rated: Double-skinned hollow panel, insulated.
 - a. Insulation: Non-combustible mineral wool.
 - 4. Frames: 16-gauge, 0.0598-inch minimum thickness.
 - 5. Single Steel Sheet Door Panels: 16 gage, minimum thickness.
 - 6. Double-Skinned Hollow Steel Sheet Door Panels: 20 gage, .0359 inch, minimum thickness, on both sides and along each edge.
 - 7. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
 - b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.

8. Steel Finish: Primed.
9. Factory Primed: Polyester powder coat.
10. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Continuous piano hinge.
 - c. Latch/Lock: Screw driver slot for quarter turn cam latch.
 - d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings with plane of door and panel face aligned with adjacent finished surfaces. Secure rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.
- D. Install fire rated units in accordance with NFPA 80 and requirements for fire listing.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.2 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.
- B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

1.3 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2025.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- K. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.

- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Submit NFRC 100 - CMA Bid Report for the project showing compliance with the project thermal requirements at time of initial submission. Bid report shall be based on NFRC test sizes utilizing project specific glazing.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of New York.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Single Source Requirement: Unless otherwise indicated, obtain aluminum doors and storefront from a single company specializing in the type of construction required so that there will be undivided responsibility for the specified performance of all component parts. Manufacturer to fabricate storefront frames to greatest extent allowing for minimal field fabrication.
- D. Hardware Attachment Fasteners: All hardware to be attached using machine fasteners only. Use of thread forming fasteners is not acceptable.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Warrant doors, storefront frames and factory supplied hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation and deterioration in finish or construction in excess of normal weathering.
- C. Hardware Attachment: The workmanship and materials involved with the installation of hardware by the door manufacturer is guaranteed to be free of defects. Door Manufacturer shall install all hardware, except door closers. Hardware supplied with doors and frames shall be covered by the hardware manufacturer's standard warranty.

D. Warranty Terms:

1. Provide ten year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
2. Provide ten year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
3. Provide Ten year warranty on attachment of factory installed hardware.
4. Cover complete system for failure to meet requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Aluminum-Framed Storefronts:

1. EFCO, a Pella Company: www.efcocorp.com.
2. Kawneer North America: www.kawneer.com/#sle.
3. Special-Lite: www.special-lite.com.
4. Tubelite, Inc: www.tubeliteinc.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Glazing Position: center.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
3. Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
4. Finish Color: As selected by Architect from manufacturer's standard line.
5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
10. Thermal Performance: Installed system shall conform to the following minimum standards:
 - a. Fabricator will be required to thermally model each head, sill and jamb, including adjacent construction, using thermal computer modeling software by an NFRC certified simulator to conform to the following:
 - 1) Inside air temperature of 72 degrees F at 30 percent RH and an outside air temperature of -10 degrees F with a 15 mph wind speed.
 - b. An NFRC Component Modeling Approach (CMA) generated label certificate shall be provided by the manufacturer. The label certificate shall be project specific and will contain the thermal performance ratings of the manufacturer's framing combined with the specified glass, and the glass spacer used in the fabrication of the glass, at NFRC standard test size as defined in NFRC 100.

B. Performance Requirements

ALUMINUM-FRAMED STOREFRONTS

1. Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load or loads based on 120 mph wind speed, whichever is greater.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
3. Overall U-Value Including Glazing: .36 Btu/ sq ft per hour per degree F, maximum, based on glass/spacer per specification section 08 80 00, and based on NFRC 100 sizes. Labeled and certified by manufacturer.
 - a. Provide CMA NFRC Label certificate at close out of project.
 - b. Provide CMA Bid Report as submittal prior to release to verify compliance.
 - c. All testing shall be completed using specified glazing.
 - d. CMA Report is for framing only, not the entrance doors.

2.3 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Flush.
 3. Door stops: Supply screw applied door stops of .625-inch height with pile weather strip. At closer shoe location provide ½-inch solid aluminum bar stock for secure hardware attachment.
 4. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel members as required.
 5. Supply expansion mullions as required to accommodate seasonal expansion and contraction of systems.
 6. Manufacturer to fabricate storefront frames to greatest extent possible.
- B. Swing Doors: Glazed aluminum.
 1. Thickness: 1-3/4 inches.
 2. Face Sheet Thickness: 0.125 inches.
 3. Top Rail: 6 1/2 inches wide.
 4. Vertical Stiles: 4 3/4 inches wide.
 5. Bottom Rail: 10 inches wide.
 6. Mid-Rail: 8 inches wide.
 7. Glazing Stops: Exterior glass stop shall vandal resistant integral to stiles and rails. Interior glass stop shall be screw applied.
 8. Meeting stiles of pairs: Manufacturers full height adjustable astragal.
 9. Corner Joinery: Supply corner joint consisting of two piece mortise and tenon type physically interlocked. Provide full-width 3/8 inch galvanized steel tie rods secured with locking hex nuts at each horizontal rail.
 10. Finish: Same as storefront.
- C. Preformed Aluminum Trim Covers: Provide preformed aluminum trim at new exterior frames where new frames meet existing construction to achieve a finished look. Dimensions to be verified in the field.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M); 6063 alloy, T5 temper typical. 6061 alloy, T6 temper for extruded structural members.
- B. Sheet Aluminum: ASTM B 209 (ASTM B209M); 5005 alloy, H15 or H34 temper.

- C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- D. Fasteners: Stainless steel.
- E. Exposed Flashings: 0.062 inch thick aluminum sheet; finish to match framing members.
- F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- G. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.
- H. Self-sticking labels compliant with Industrial Code Rule No. 47: Transparent glass doors, fixed adjacent transparent glass sidelights and full height window systems shall be marked in two areas on the glass surface thereof. One such area shall be located at least 30, but not more than 36 inches and the other at least 60, but not more than 66 inches above the ground. The marking design shall be at least four inches in diameter if circular or four inches in its least dimension if elliptical or polygonal. or shall be at least 12 inches in horizontal dimension if the marking is less than four inches in its least dimension. In no event shall the vertical dimension of any marking including lettering be less than one and one-half inches in height.

2.5 FINISHES

- A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.6 HARDWARE

- A. Other Door Hardware: See Section 08 71 00.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Door Bottom: Manufacturer to supply and install concealed adjustable dual brush door bottom with up to 5/8 inch adjustment.
- D. Adjustable Astragal: Manufacture to supply and install adjustable full height astragal for pairs of doors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.

- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

- A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

3.5 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.

3.7 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 45 00
TRANSLUCENT WALL AND ROOF ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sandwich panel translucent wall system.
- B. Sandwich panel translucent roof system.

1.2 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers: Sealing perimeter frame to water-resistive barrier installed on adjacent construction.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between perimeter frame and adjacent construction.

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA CWM - Curtain Wall Manual; 2019.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- E. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.
- F. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2017.
- G. ASTM D1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics; 2021.
- H. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, panel configuration, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, weep drainage network, expansion and contraction joint locations and details, and required field welding.

- D. Design Data: Show structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Designer's qualification statement.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with AAMA CWM.
- B. Designer Qualifications: Design structural support framing components under direct supervision of Professional Structural Engineer experienced in design of this work and licensed in the State of New York.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle work of this section in accordance with AAMA CW-10.

1.7 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and after installation of sealants.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within 10 period commencing on Date of Substantial Completion.
- C. Manufacturer Warranty: Provide 10 manufacturer warranty against failure of insulated translucent sandwich panels, including excessive deflection, defects in accessories, and other components. Complete forms in Owner's name and register with manufacturer.
- D. Manufacturer Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish; include provision for replacement of units with excessive cracking, peeling, and adhesion failure of finish. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Sandwich Panel - Translucent Wall Systems:
 - 1. Kalwall: www.kalwall.com/#sle.
 - 2. Basis of Design: Kingspan Light + Air, LLC; 4" thermally broken Uniquad: www.kingspanlightandair.us/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 DESIGN CRITERIA

- A. System Design: Design and size assemblies and their components to withstand dead loads and live loads caused by snow, hail, and positive and negative wind loads acting on plane of panel without damage or permanent set.
 - 1. Regulatory Requirements: Comply with applicable code criteria for loads, including seismic loads.
 - 2. Design Loads: As indicated on S-drawings.

2.3 PERFORMANCE REQUIREMENTS

- A. Deflection: Limit panel mullion deflection to L/60 with full recovery of glazing materials.
- B. System Assembly: Accommodate without damage to system, components or deterioration of seals; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; deflection of structural support framing, tolerance of supporting components, shortening of building concrete structural columns.
- C. Air Leakage: Less than 0.06 cfm/sf of sloped glazed area, measured in accordance with ASTM E283/E283M at differential pressure of 1.57 psf across assembly.
- D. Water Leakage: None, when measured in accordance with ASTM E331 at a test pressure difference of 2.86 psf.
- E. Expansion/Contraction: System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components.
- F. System Internal Drainage: Drain water entering joints, condensation occurring in framing system, or migrating moisture occurring within system, to the exterior by a weep drainage network.
- G. Fabricate to prevent vibration harmonics, thermal movement transmitted to other building elements, and loosening, weakening, or fracturing of attachments or components of system.

2.4 SYSTEMS

- A. General: Shop-fabricated, factory-prefinished facade and roof systems consisting of various types of translucent assemblies, internal and external framing components, accessories, related flashings, anchorages, and attachments.

2.5 ASSEMBLIES

- A. Sandwich Panel Assemblies: Bonded to both sides of structural extruded aluminum grid with manufacturer's standard pattern; exposed surfaces of exterior sheet chemically and permanently treated to protect against surface erosion and extreme weather conditions.
 - 1. Panel Length and Width: As indicated on drawings
 - 2. Panel Assembly Thickness: 4 inches
 - 3. Aluminum framing members to be thermally broken with interior section insulated from exterior section.
 - 4. Sandwich Panel Insulation: Manufacturer's standard translucent type, with substantive thermal and acoustical properties.
 - 5. Sandwich Panel Face Sheets: Fiberglass reinforced polymer (FRP).
 - a. Type: Flat panel.
 - b. Exterior Face Sheet: Translucent, and smooth.
 - 1) Color: Clear Matte.
 - 2) Thickness: 0.070 inch, minimum.
 - c. Interior Face Sheet: Translucent, and smooth.
 - 1) Color: Clear Matte.
 - 2) Thickness: 0.045 inch, minimum.
 - 6. Performance:
 - a. Center of Glazing U-Value: 0.23 Btu/hr sq ft degrees F maximum.

- b. Overall Light Transmittance (LT): 0.16 - 0.02 percent, nominal.
- c. Overall Solar Heat Gain Coefficient (SHGC): 0.15 - 0.06, nominal.

2.6 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fiberglass Reinforced Polymer Sheets: Ultraviolet (UV) protected.
 - 1. Tensile Strength: 23,000 psi, minimum, when tested in accordance with ASTM D638.
 - 2. Flexural Modulus: 1,100,000 psi, minimum, when tested in accordance with ASTM D790.
 - 3. Light Transmittance, Clear, Transparent Sheet: 92 percent, minimum, determined in accordance with ASTM D1003.

2.7 FABRICATION

- A. Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, and ensure proper installation and dynamic movement of perimeter seals.
- B. Accurately fit and secure joints and corners. Make joints flush and hairline.
- C. Locate fasteners and attachments to ensure concealment from view.

2.8 FINISHES

- A. Aluminum Materials:
 - 1. Superior Performing Organic Coatings: AAMA 2605; multiple coat, thermally cured polyvinylidene fluoride system.
 - 2. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining water-resistive barrier materials are ready to receive translucent wall and roof assemblies; see Section 07 25 00.

3.2 SURFACE PREPARATION

- A. Where aluminum contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- B. Where aluminum contacts concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.3 INSTALLATION

- A. Install translucent panel system with cells vertical in accordance with manufacturer instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

- E. Install sill flashings.
- F. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

3.4 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down interior and exterior surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths; remove dirt from corners and wipe surfaces clean.

3.5 PROTECTION

- A. Protect finished work from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.
- B. Factory glazing.
- C. Operating hardware.
- D. Insect screens.

1.2 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Steel lintels.
- B. Section 06 10 00 - Rough Carpentry: Rough opening framing.
- C. Section 07 25 00 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.
- D. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

- G. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).
- H. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2023.
- I. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2017 (Reapproved 2023).
- J. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- K. NFRC 100 - Procedures for Determining Fenestration Product U-Factors and Solar Heat Gain Coefficients at Normal Incidence.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
- D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- E. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- G. Submit NFRC 100 - CMA Bid Report for the project showing compliance with the project thermal requirements at time of initial submission. Bid report shall be based on NFRC test sizes utilizing project specific glazing.

1.5 QUALITY ASSURANCE

- A. Aluminum Windows: Fabricate window assemblies in accordance with AAMA 101 for types of windows required.
- B. Insulated Glass: Fabricate insulated glass units in accordance with GANA (formerly FGMA) Glazing Manual.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of AAMA CW-10.

- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

- A. Section 01 60 00 - Product Requirements
- B. Do not install sealants when ambient temperature is less than 40 degrees F.
- C. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Manufacturer Warranty: Provide 15 -year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Other Acceptable - Aluminum Windows Manufacturers:
 - 1. EFCO: www.efcocorp.com.
 - 2. YKK AP America Inc: www.ykkap.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ALUMINUM WINDOWS

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
 - 1. Frame Depth: 3-1/2 inch.
 - 2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
 - 3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 6. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.
 - 7. Thermal Performance: Installed system shall conform to the following minimum standards:
 - a. Fabricator will be required to thermally model each head, sill and jamb, including adjacent construction, using thermal computer modeling software by an NFRC certified simulator to conform to the following:
 - b. Inside air temperature of 72 degrees F at 30 percent RH and an outside air temperature of -10 degrees F with a 15 mph wind speed.

- c. An NFRC Component Modeling Approach (CMA) generated label certificate shall be provided by the manufacturer. The label certificate shall be project specific and will contain the thermal performance ratings of the manufacturer's framing combined with the specified glass, and the glass spacer used in the fabrication of the glass, at NFRC standard test size as defined in table 4-3 in NFRC 100.
- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Double; clear; transparent.
 - 3. Exterior Finish: Superior performing organic coatings.
 - 4. Interior Finish: Superior performing organic coatings.

2.3 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 - 1. Performance Class (PC): AW.
 - 2. Performance Grade (PG): 40, with minimum design pressure (DP) of 40.10 psf.
- B. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- C. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 for Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
- D. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf.
- E. Air Leakage: 0.1 cfm/sq ft maximum leakage per unit area of outside window frame dimension when tested in accordance with ASTM E283/E283M.
- F. Condensation Resistance Factor of Frame: 58, measured in accordance with AAMA 1503.
- G. Overall Thermal Transmittance (U-value): .36, maximum, including glazing, measured on window sizes required for this project. Based on glass/ spacer per Section 08 80 00, and based on NFRC 100.

2.4 COMPONENTS

- A. Frames;; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
- B. Subframe (Receptor System): .070 inch minimum thickness extruded aluminum, 6065 T6; one piece full width or height of opening.
- C. Sills: .094 inch thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill end.
- D. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
 - 1. Hardware: Spring loaded steel pins; four per screen unit.
 - 2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
 - 3. Frame Finish: Same as frame and sash.
 - 4. Screens at rescue windows shall be hinged or sliding and shall be operable from the inside with one hand, and without the use of a key or other device.
- E. Fasteners: Stainless steel.
- F. Glazing Materials: See Section 08 80 00.

- G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.5 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.6 FINISHES

- A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 25 00.

3.2 PRIME WINDOW INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill and sill end angles.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install glass and infill panels in accordance with requirements; see Section 08 80 00.

3.3 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.4 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.5 CLEANING

- A. Remove protective material from factory finished aluminum surfaces.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
 2. Electromechanical door hardware.
 3. Automatic operators.
 4. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 01 Section "General Conditions".
 2. Division 06 Section "Rough Carpentry"
 3. Division 08 Section "Hollow Metal Doors and Frames".
 4. Division 08 Section "Flush Wood Doors".
 5. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 6. Division 26 Section "Electrical"
- D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.
1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 2. ICC/IBC - International Building Code.
 3. NFPA 70 - National Electrical Code.
 4. NFPA 80 - Fire Doors and Windows.
 5. NFPA 101 - Life Safety Code.
 6. NFPA 105 - Installation of Smoke Door Assemblies.
 7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
 8. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

- b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.
- 1.6 DELIVERY, STORAGE AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.

- b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
- 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
- 5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 - 1. Manufacturers:
 - a. Hager Companies (HA).
 - b. Pemko (PE).

2.4 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 - 1. Manufacturers:

- a. Pemko (PE) - EL-CEPT Series.
 - b. Securitron (SU) - EL-CEPT Series.
- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 - 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.
 - 2. Manufacturers:
 - a. Hager Companies (HA) - Quick Connect.
 - b. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 5. Manufacturers:
 - a. Rockwood (RO).
 - b. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 - 1. Manufacturers:
 - a. Rockwood (RO).
 - b. Trimco (TC).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.6 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 1. Manufacturers:
 - a. Sargent Manufacturing (SA).
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Match Facility Standard.
- C. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- D. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
- E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

- a. Medeco (MC).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

- a. Sargent Manufacturing (SA) - 8200 Series.

2.9 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

- a. Meets ANSI/BHMA A156.41 for single motion egress.
- b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.

- c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - d. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 in-lb. abusive locked lever torque with no entry while maintaining egress.
 - e. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
 - f. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.
 - g. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
 - h. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.
 - i. Status indicators inside, outside, or on both sides of doors as specified with high visibility red/green or red/white icons to display locked or unlocked state in the rose.
 - j. Ten-year limited warranty for mechanical functions.
2. Manufacturers:
- a. dormakaba BEST (BE) - 9K Series.
 - b. Sargent Manufacturing (SA) - 10X Line.
 - c. Schlage (SC) - ND Series.

2.10 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as

- required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.12 INTEGRATED WIRED OUTPUT EXIT DEVICES - MULTI-CLASS READER

- A. Integrated Wired Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated card reader with or without keypad option, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
 2. Integrated reader supports the following credentials:
 - a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
 - b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
 - c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
 - d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
 - e. NFC-enabled mobile phones
 - f. PIN code only or PIN + credential with keypad option
 3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
 4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
 5. Competitor Alternates Allowed Option: Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.
 6. Manufacturers:
 - a. Corbin Russwin (RU) - ED5000 SN Series.
 - b. Sargent Manufacturing (SA) - SN200/SN210 80 Series.

2.13 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use.

- Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Norton Rixson (NO) - 9500 Series.
 - c. Sargent Manufacturing (SA) - 281 Series.

2.14 ELECTROHYDRAULIC DOOR OPERATORS

- A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up to 250 pounds and 48" wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48" wide. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide operators with features as follows:
 - a. Non-handed with push and pull side mounting.
 - b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
 - c. Activation by push button, hands-free or radio frequency devices.
 - d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
 - e. Two-year limited warranty.
 - f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
 - 1) Simple setup with no app required.
 - 2) View status and make adjustments without removing the cover.

- 3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
 - g. Mounting backplate to simplify and speed up installation.
2. Operators shall have the following functionality:
 - a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
 - b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
 - c. Infinite Hold Open: Door will hold open at set position until power is turned off.
 - d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
 - e. Open Delay: Delays operator opening for locking hardware.
 - f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
 - g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
 - h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
 - i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
 - j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
3. Manufacturers:
 - a. Norton Rixson (NO) - 6000 Series.

2.15 ARCHITECTURAL TRIM AND ACCESSORIES

- A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1" less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.
 1. Provide protective trim with functions and features as follows:
 - a. Meets ADA requirements for smooth bottom door surfaces.
 - b. UL Classified options for use on fire-rated doors up to 3 hours.
 - c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.
 - d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
 - e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
 - f. Fasteners included; adhesive-backed options available for select models.

- g. Ten-year limited warranty.
- 2. Manufacturers:
 - a. Rockwood (RO).

2.16 DOOR STOPS AND HOLDERS

- A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Manufacturers:
 - a. Rockwood (RO).
- B. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Manufacturers:
 - a. Norton Rixson (NO).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies 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 according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. Pemko (PE).

2.18 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 1. Manufacturers:
 - a. Alarm Controls (AK) - CP1-1026 Series.
 - b. Securitron (SU) - DPS Series.
- B. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 1. Power supplies shall meet all functions and features as specified herein.
 - a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
 - b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
 - c. Enhanced surge immunity for input/output protection
 - d. Separate, dedicated battery charging circuit to keep locks cooler.
 - e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
 - f. Instant auto-switch to battery on AC loss.
 - g. Expandable up to 16 outputs in the standard enclosure
 - h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
 - i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
 - j. Lifetime replacement, no-fault, no questions asked warranty.
 2. Manufacturers:

- a. Securitron (SU) - AQL Series.

2.19 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 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.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

Refer to Section 08 06 71, Door Hardware Sets, for hardware sets.

END OF SECTION 08 71 00

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.2 RELATED REQUIREMENTS

- A. Section 07 25 00 - Weather Barriers.
- B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.
- C. Section 08 14 16 - Flush Wood Doors: Glazed lites in non-rated doors.
- D. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.
- E. Section 08 51 13 - Aluminum Windows: Glazing provided by window manufacturer.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.
- H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- I. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.
- L. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 10 by 10 inch in size of glass units, showing coloration and design.
- E. Certificate: Certify that sealed insulated glazing units meet or exceed specified requirements.
 - 1. Submit NFRC 100- CMA Bid Report for the project showing compliance with the project thermal requirements at time of initial submission. Bid report shall be based on NFRC test sizes utilizing project specific glazing.
- F. Installer's Certificate: Certify that glass furnished without identification label is installed in accordance with Construction documents and applicable code.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.7 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
- C. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Guardian Industries Corp: www.sunguardglass.com.
 - 2. Solar Seal Company; www.solarseal.com.
 - 3. Vitro Architectural Glass: www.vitroglazings.com
- B. Laminated Glass Manufacturers:
 - 1. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
 - 2. Oldcastle Building Envelope: www.obe.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: In accordance with ASCE 7.
 - a. Positive Design Pressure: 20 psf.
 - b. Negative Design Pressure: 20 psf.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7
 - 4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 5. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. Water-Resistive Barriers: See Section 07 25 00.
 - 2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
 - 3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 - 4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Heat-Strengthened float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.4 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Glass: Any of the manufacturers specified for float glass.
- B. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 - 3. Spacer Color: Black.
 - 4. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 - 5. Purge interpane space with dry air, hermetically sealed.
- C. Type IG-A - Insulating and Safety Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Space between lites filled with argon.
 - 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Solarban 70 Low-E film, on #3 surface.
 - 5. Total Thickness: 1 inch.
 - 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.24, nominal.
 - 7. Visible Light Transmittance (VLT): 60 percent, nominal.
 - 8. Solar Heat Gain Coefficient (SHGC): 0.38 percent, nominal.
 - 9. Glazing Method: Dry glazing method, tape and gasket spline.
- D. Type IG-B - Insulating Glass Units: Translucent glazing.
 - 1. Applications: Exterior glazing as indicated on drawings.
 - 2. Space between lites filled with Aerogel.
 - 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Self-cleaning type, on #1 surface.
 - c. Coating: Light diffusing veil, on #2 surface.
 - 4. Metal edge spacer.
 - 5. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Light diffusing veil, on #3 surface.
 - 6. Total Thickness: 1.75 inch.
 - 7. Thermal Transmittance (U-Value): 0.2, nominal.
 - 8. Visible Light Transmittance (VLT): 23 percent, nominal.
 - 9. Solar Heat Gain Coefficient (SHGC): .21 percent, nominal.
 - 10. Product:
 - a. Basis of Design: Advanced Glazings LTD - Solera S R5 + Aerogel
 - b. Or Approved Equal.

2.5 GLAZING UNITS

- A. Type SG - Monolithic Safety Glazing: Non-fire-rated.
 - 1. Applications:
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 - 2. Glass Type: Fully tempered safety glass as specified.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch, nominal.

2.6 ACCESSORIES

- A. Setting Blocks: Neoprene, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color to match frame.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.4 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 81 00
FIRE RATED GLASS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire rated and safety rated glass for installation in steel frames and vision panels for fire rated doors.
- B. Fire-rated/temperature-rise glass and framing system.

1.2 RELATED SECTIONS:

- A. Section 07 92 00 - Joint Sealants: Sealant and back-up materials.
- B. Section 08 14 16 - Flush Wood Doors: Glazed lites in fire rated doors.
- C. Section 08 71 00 – Door Hardware.
- D. Section 08 80 00 - Glazing.

1.3 REFERENCES

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials used in Buildings - Safety Glazing Specifications and Methods of Test.
- B. ASTM E119 - Standard Test Method for Fire Tests of Building Construction and Materials.
- C. GANA - FGMA Sealant Manual.
- D. GANA - Glazing Manual.
- E. GANA PCR for Flat Glass: UN CPC 3711 Product Category Rule for Environmental Product Declarations.
- F. NFPA 80 - Standard for Fire Doors, Fire Windows.
- G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- H. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.
- I. UL 9 - Fire Tests of Window Assemblies
- J. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
- K. UL 10B – Fire Tests of Window Assemblies.
- L. UL 263 - Fire Resistance Ratings
- M. CPSC 16 CFR, Part 1201 - Consumer Product Safety Standard - Safety Standard for Architectural Glazing.

1.4 SUBMITTALS

- A. Section 01 30 00 - Administrative Requirements, for Submittal procedures.
- B. Shop Drawings: Show dimensioned plans, elevations and details for doors, frames, and hardware components as shown on drawings and schedules. Provide templates for the location of embeds and anchor locations required any adjoining work.

- C. Product Data: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation instructions.
- D. Samples:
 - 1. Provide 12-inch square samples for each type glass specified.
 - 2. Provide manufacturer's color charts showing full range of powder coating colors for framing.
- E. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- F. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.
- G. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.
- H. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing aluminum glazing systems with minimum ten years of documented experience.
- B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- D. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 252, ASTM E119. Assemblies must be factory-welded or come complete with factory-installed mechanical joints and must not require job site fabrication.
- E. Fire-Rated Window Assemblies: Assemblies 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 according to ASTM E119 and NFPA 257.
 - 1. Window assemblies with ratings of less than 60 minutes may be tested in accordance with NFPA 257, UL 9, CAN4-S106 Standard Test Methods.
- F. Certification: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. Door assemblies shall be tested to the acceptance criteria of ASTM E2074-00, NFPA 252, UL 9, UL 10-C Standard Methods of Fire Tests of Door Assemblies.
 - 2. Window assemblies shall be tested to the acceptance criteria of NFPA 257, UL 10-B, UL 10-C Standard methods for Fire Tests of Window Assemblies.
 - 3. Wall assemblies shall be tested to the acceptance criteria of ASTM E119, UL 263 Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 4. An approved independent testing laboratory equal to UL shall conduct fire test

- G. Listings and Labels -Fire Rated Assemblies: Under current follow-up service by an approved independent agency maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.
- H. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.
- I. Door assemblies shall be marked with the hourly rating followed by the letter "S". The letter "S" indicates air leakage resistance testing conformance to UBC 7-2 Parts I and II.
- J. Regulatory Requirements: Comply with provisions of the following:
 - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1 as follows:
 - 2. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - 3. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 4. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

1.6 PRE-INSTALLATION MEETING

- A. Section 01 30 00 - Administrative Requirements: Preinstallation meeting.
- B. Convene minimum one week before starting Work of this section.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer. For details on storage and product handling, please contact Manufacturer and request information on storage and product handling.
- B. Deliver materials to specified destination in manufacturer or distributor's packaging undamaged, complete with installation instructions.
- C. Store off ground, under cover, protected from weather and construction activities.
- D. Do not expose fire rated glass to temperatures greater than 120 degrees or less than minimum 40 Degrees F during storage and transportation.
- E. Do not expose the non-PVB side of glass to UV light.
- F. Store sheets of glass vertically. DO NOT lean.

1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Provide the Manufacturer's limited five year warranty from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 FIRE RATED GLASS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following manufacturers:
 - 1. Safti First; www.safti.com.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.
- B. Fire Rated Glazing Type FRG -1:

1. Basis of Design: SAFTIFIRST, a division of O'Keeffe's Inc.; SuperClear 45-HS-LI.
2. Wireless, optically clear tempered glazing material for use in impact safety rated 20-min.doorlite applications. Provides smoke and flame barrier.
3. Properties:
 - a. Fire Rating Testing: Fire rating tested and listed by Underwriters Laboratories; tested in accordance with NFPA 252, UL 9, UL 10C and ASTM E 2074
 - 1) Fire Rating: 45 minutes (with hose stream test) for door, windows, sidelites.
 - b. Thickness: 3/4 inch (19mm).
 - c. Weight: 9.0 lbs/sf
 - d. Approximate Visible Light Transmission: 90 percent.
 - e. Impact Safety Performance: ANSI Z97.1 and CPSC 16CFR1201 (CAT I & II).
4. Labeling: Each piece of fire-rated glazing shall be permanently labeled with the Manufacturer's, Warnock Hersey, and/or, Underwriters Laboratories' Logos on sizes up to 3325 sq. inches. Label is also to include name of product, fire rating period, safety glazing standards, and date of manufacture.
5. Framing System: Standard fire rated doors.

2.2 ACCESSORIES

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.
- B. Glazing Compound: DAP 33 putty.
- C. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
 1. Dow Corning 795 - Dow Corning Corp.
 2. Silglaze-II 2800 - General Electric Co.
 3. Spectrem 2 - Tremco Inc.
- D. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.3 FABRICATION

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirement.
- B. Fabrication Dimensions: Fabricate fire rated assembly to approved dimensions. Guarantee dimensions where practicable within required tolerance.
- C. Framing System: Furnish frame assemblies pre-welded.
 1. Field splice frames too large for shop fabrication or shipping or to fit in available building openings.
 2. Fit with manufacturer approved fasteners.
 3. Knock-down door perimeter frames are not permitted.
- D. Fabrication Dimensions: Fabricate fire rated assembly to dimensions verified in field.
- E. Obtain approved Shop Drawings prior to fabrication.

2.4 FINISHES

- A. Comply with NAAMM's (National Association of Architectural Metal Manufacturers) "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish frames after assembly.
- C. Protect finishes on exposed surfaces from damage by applying a removable, temporary protective cladding before shipping.
- D. Appearance of Finished Work: Variations in appearance of adjacent frame sections are acceptable. Noticeable variations in the same piece are not acceptable.
- E. Color-Coated Finish: Apply manufacturer's standard powder coating finish system complying with AAMA 2603 applied to factory-assembled frames before shipping, complying with manufacturer's written instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify openings for glazing are correctly sized and within acceptable tolerance.
- C. Examine glass framing, with glazier present, for compliance with the following.
 - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 - 2. Minimum required face or edge clearances.
 - 3. Observable edge damage or face imperfections.
- D. Do not proceed with glazing until unsatisfactory conditions have been corrected.
- E. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
 - 1. Glazing Sealants: Comply with FGMA and ASTM C1193.
 - 2. Fire Rated Openings: Comply with NFPA 80.
- B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.
- C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.
- D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

- E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.
- F. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
- G. Place glazing tape on free perimeter of glazing in same manner described above.
- H. Install removable stop and secure without displacement of tape.
- I. Install in vision panels in fire-rated doors to requirements of NFPA 80.
- J. Install so that appropriate UL markings remain permanently visible.

3.4 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels, and clean surfaces.
 - 1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 - 2. Bullet resistant glazing materials with sensitive protect surface applied film on exterior surface. Do not use any of the following:
 - a. Steam jets.
 - b. Abrasives.
 - c. Strong acidic or alkaline detergents, or surface-reactive agents.
 - d. Detergents not recommended by manufacturer.
 - e. Detergent above 77 degrees F (25 degrees C).
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. 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 by glass manufacturer.

3.5 REPAIR AND TOUCH UP

- A. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
 - 1. Such repairs shall match original finish for quality or material and view.
 - 2. Repairs and touch-up not visible from a distance of 5 feet (1.5 m). Owner and Architect to approve.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Carpet tile.
 - 2. Thin-set ceramic tile and stone tile.
 - 3. Resinous Matrix Terrazzo.
 - 4. Wood athletic floor refinishing.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall include, in base bid, specified remediation work of all interior concrete floor slabs receiving floor coverings outlined below. If such remediation is indicated as not necessary following testing agency's report, a contract modification will be issued.
 - 2. Remedial Floor Coating to include in base bid at:
 - a. Existing concrete slabs receiving adhesively applied flooring.
 - b. Existing concrete slabs receiving Resinous Matrix Terrazzo.
 - c. New concrete slabs receiving Resinous Matrix Terrazzo.
 - d. Existing concrete slabs receiving Wood athletic flooring.
 - 3. Remedial Floor Coating not included in base bid at:
 - a. New concrete slabs receiving adhesively applied flooring where Moisture Vapor Reduction Admixture (MVRA) is integral in the new slab.
 - b. Existing concrete slabs receiving thin-set applied flooring, including but not limited to ceramic, quarry, and stone tile.
 - c. New concrete slabs receiving thin-set applied flooring, including but not limited to ceramic, quarry, and stone tile.
- F. Patching compound.
- G. Remedial floor coatings.

1.2 RELATED REQUIREMENTS

- A. Section 01 22 00 - Unit Prices: Bid pricing for remediation treatments not required.
- B. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.
- D. Section 03 30 00 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.
- E. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.
- F. Section 03 54 00 - Cast Underlayment: Self-leveling underlayment applied as remediation treatment.

COMMON WORK RESULTS FOR FLOORING PREPARATION

1.3 PRICE AND PAYMENT PROCEDURES

- A. Unit Price for Remedial Floor Coating: Include the cost of the floor coating in the base bid; state on the bid form the unit price deduct per square foot for the floor coating, in the event such remediation is not required.

1.4 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- E. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings; 2018.
- F. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- I. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.6 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Visual Observation Report: For existing floor coverings to be removed.
- C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- D. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 - 1. Manufacturer's qualification statement.
 - 2. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.
 - 3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 - 4. Manufacturer's installation instructions.
 - 5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.
- E. Testing Agency's Report:

1. Description of areas tested; include marked up floor finish plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

F. Adhesive Bond and Compatibility Test Report.

G. Copy of RFCI (RWP).

1.7 PERFORMANCE REQUIREMENTS

- A. Manufacturer must provide Independent lab test reports documenting performance per the following:
1. ASTM E96/E96M, Water Vapor Transmission (wet method) Performance shall be documented by an independent testing laboratory at a minimum of 97% water vapor transmission reduction compared to untreated concrete.
 2. ASTM E96/E96M - Perm Rating - Standard Test Method for Water Vapor Transmission of Materials – Perm Rate results must not exceed 0.1 Perms.
 3. ASTM D1308; Insensitivity to alkaline environment up to, and including, pH 14. A 14 day test is required with no degradation of sample reported.
 4. Certify acceptance and exposure to continuous topical water exposure after final cure.

1.8 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.
 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.10 FIELD CONDITIONS

- A. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use, maintained 48 hours prior to and during testing. If this is not possible, use the following guidelines:
- B. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- C. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 3. Products:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. CMP Specialty Products; Prepstar: www.cmpsp.com.
 - c. TEC Specialty Products LLC; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating, Two-Component: Single-layer coating resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.
 - 1. Material: Comply with ASTM F3010.
 - 2. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 - 3. Water Vapor reduction system shall be a single coat, stand alone system with no requirements for additional components such as sand broadcast for adhesion of flooring systems.
 - 4. System must reduce Calcium Chloride readings of up to 25lbs/1000 ft²/24 hrs by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%.
 - 5. Products:
 - a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
 - b. CMP Specialty Products; Lockdown: www.cmpsp.com.
 - c. Koster American Corporation; VAP I 2000: www.kosterusa.com/#sle.
 - d. Or as approved by manufacturer of flooring system.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:

- a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 2. Preliminary cleaning.
 3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 6. Specified remediation, if required.
 7. Patching, smoothing, and leveling, as required.
 8. Other preparation specified.
 9. Adhesive bond and compatibility test.
 10. Protection.
- B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 2. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.4 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.5 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.6 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
 - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
 - 2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
 - 3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.7 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Comply with recommendations for preparation and application in accordance with ASTM F3010.
- D. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors to a Concrete Surface Profile (CSP) #3 or #4 and clean surfaces with an industrial vacuum cleaner and remove all residues from the substrate. Grinding is allowed only in areas not accessible by shot blasting. Remove ALL defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, Shot blast bee bees, etc. Repair all cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with Manufacturer's recommendations. If concrete additives such as chlorides or any other soluble compounds that may contaminate surfaces have been used in the concrete mix do not use this product on that floor without written approval from manufacturer. Reinforcing fibers that are visible after shot blasting must be removed and vacuumed leaving no fibers left on the concrete surfaces. Provide an uncontaminated, sound surface. DO NOT ACID ETCH!
- E. Repair concrete prior to moisture vapor reduction system installation by using MVRS manufacturer's approved concrete repair materials. Comply with all requirements as listed in Manufacturer's technical data information. Consult with vapor reduction manufacturer.

COMMON WORK RESULTS FOR FLOORING PREPARATION

- F. Ensure surfaces to be treated with moisture vapor reduction system have NOT previously been treated with other materials such as underlayments, screeds, penetrating sealants, silicates, etc. If this is the case, consult with the Manufacturer's Representative prior to any application of moisture vapor reduction system.
- G. Any testing for concrete deficiencies or contamination such as alkali silica reaction, untreated silicates, organic residue, etc. is recommended and is the responsibility of the Building owner.
- H. Shot blast a small test area and review surface profile with the finished flooring applicator.
- I. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- J. Do not fill expansion joints, isolation joints, or other moving joints.

3.8 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. The Owner's Special Inspector shall verify proper adhesion of flooring adhesives, coatings, and leveling compounds to the final vapor reduction coating system for acceptability. Contact Manufacturer's Representatives for recommendations.
- B. Comply with requirements and recommendations of floor covering manufacturer.

3.9 APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.
- B. Allow to cure a minimum of 12 hours before installing flooring system.

3.10 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.
- B. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Acoustic insulation.
- D. Cementitious backing board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 21 00 - Thermal Insulation: Acoustic insulation.
- C. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

1.3 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.
- E. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- G. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- H. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- I. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- J. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).

- K. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).
- L. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- M. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- N. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.
- O. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- P. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- Q. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- R. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
- S. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.
- T. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2024.
- U. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2025.
- V. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2025.
- W. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- X. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).
- Y. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- Z. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- AA. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- BB. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024c.
- CC. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- DD. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.
- EE. GA-224 - Installation of Predecorated Gypsum Board; Gypsum Association; 2008.
- FF. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2025.
- GG. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.
- HH. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least ten years of documented experience.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies (Tested rating determined in accordance with ASTM119) with rating as indicated on drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. Marino: www.marinoware.com/#sle.
 - 3. MBA Studs: www.mbastuds.com
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C-shaped with knurled or embossed faces.
 - 2. Minimum Base Metal Thickness: 18 mils; 0.018 inch, or as required to meet design or code requirements.
 - 3. Runners: U shaped, sized to match studs.
 - 4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
 4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
 - a. Products:
 - 1) ClarkDietrich; MaxTrak Slotted Deflection Track: www.clarkdietrich.com/#sle.
 - 2) Marino; Slotted Track: www.marinoware.com/#sle.
 - 3) MBA Building Supplies; Slotted Slip Track: www.mbastuds.com/#sle.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.

2.3 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: www.certainteed.com/#sle.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 4. USG Corporation: www.usg.com/#sle.
- B. Gypsum Wallboard - General
1. All gypsum wallboard incorporated into the Work, whether indicated or not, shall comply with all of the following:
 - a. Thickness: 5/8 inch.
 - b. Core: Type X, UL or WH listed.
 - 1) Exception: Where Fire Resistance Rating requires Type C.
 - c. Core and Face: Moisture and mold resistant, with a mold resistance score of 10, when tested in accordance with ASTM D3273.
- C. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at all locations.
 4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 5. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
 6. Mold-Resistant, Paper-Faced Products:
 - a. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.
 - d. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
 7. Glass Mat Faced Products:
 - a. Georgia-Pacific Gypsum; DensArmor Plus: www.gpgypsum.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Interior Extreme Fire-Shield Gypsum Panel: www.goldbondbuilding.com/#sle.

GYPSUM BOARD ASSEMBLIES

- c. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Regular 1/2 in. (12.7 mm): www.usg.com/#sle.
- D. Backing Board For Wet Areas: One of the following products:
 - 1. Application: Surfaces behind tile in wet areas including shower ceilings and team seating ceilings, tub and shower surrounds in pool, pool walls, locker rooms, team seating alcoves, and toilet rooms.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 5/8 inch.
 - b. Products:
 - 1) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
 - 4. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
 - b. Products:
 - 1) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
- E. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
 - 1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Glass Mat Faced Products:
 - a. CertainTeed Corporation; GlasRoc Shaftliner Type X: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant): www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Shaftliner: www.goldbondbuilding.com/#sle.
 - d. USG Corporation; Sheetrock Brand Glass-Mat Liner Panels Mold Tough 1 in. (25.4 mm): www.usg.com/#sle.

2.4 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
 - 1. Flame Spread Index: 25 or less, and Smoke Developed Index: 450 or less when tested in accordance with ASTM E84.
 - 2. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 - 3. Formaldehyde Content: Zero.
 - 4. Facing: Unfaced.
 - 5. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - d. Knauf Insulation: www.knaufinsulation.com.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rolled zinc, unless noted otherwise.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
 - 3. Products:

- a. Same manufacturer as framing materials.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 3. Joint Compound: Drying type, vinyl-based, ready-mixed.
 - 4. Joint Compound: Setting type, field-mixed.
- E. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
 - 1. Products:
 - a. CertainTeed Corporation; Level V Wall and Ceiling Primer/Surfer with M2Tech: www.certainteed.com/#sle.
 - b. USG Corporation; USG Sheetrock Brand Tuff-Hide Primer-Surfer: www.usg.com/#sle.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that project conditions are ready to receive work and opening dimensions are as indicated on shop drawings to commence.

3.2 EXISTING WORK

- A. Extend existing gypsum board installations using materials and methods as specified.
- B. Repair and remodel existing gypsum board assemblies which remain or are to be altered.

3.3 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging. Provide extended leg ceiling runners with compressible fire rated fill.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

- E. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
- F. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.
- G. Blocking: Install wood blocking for support of:
 - 1. Wall-mounted cabinets.
 - 2. Plumbing fixtures.
 - 3. Toilet partitions.
 - 4. Toilet accessories.
 - 5. Wall-mounted door hardware.
 - 6. Wood frame opening.
 - 7. Or any other materials requiring blocking. Coordinate blocking requirements with other contractors.

3.4 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place two beads continuously on substrate before installation of perimeter framing members.
 - 2. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, rough-in boxes, and other equipment. Do Not seal penetrations scheduled to receive firestopping.

3.5 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
 - 1. Use screws when fastening gypsum board to metal furring or framing.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated:
 - 1. Use gypsum backing board for first layer, placed perpendicular to framing or furring members, with ends and edges occurring over firm bearing. [Use fire rated gypsum backing board for fire rated partitions and ceilings.]
 - 2. Place second layer parallel to framing or furring members.
 - 3. Offset joints of second layer from joints of first layer.
 - 4. Treat cut edges and holes in moisture resistant gypsum board with sealant.
- D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
 - 1. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- F. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- G. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
- H. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

- I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.6 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces, complying with ASTM C840, GA-216, manufacturer's instructions, and as indicated.
 - 1. Not more than 30 feet apart for exposed interior linear construction.
 - 2. Not more than 25 feet where ceramic wall tile is installed on an interior wall.
 - 3. Not more than 12 feet where ceramic wall tile is installed on an exterior wall, in direct sunlight or wet conditions.
 - 4. Where control joints are required at or near door, window, or other openings, place control joint above jamb or corner of opening, not to exceed the maximum distance between control joints.
 - 5. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.7 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive satin, semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
 - 6. Level 0: Surfaces indicated to be finished in later stage of project.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.8 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Tile for stairs.
- D. Ceramic accessories.
- E. Non-ceramic trim.
- F. Accessory materials.

1.2 RELATED REQUIREMENTS

- A. Section 03 54 00 - Cast Underlayment: Hydraulic and cementitious underlayments where required by TCNA (HB) or TCNA (HB-GP) method specified.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- D. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.
- E. Section 13 11 00 - Swimming Pools: Tile Markings and Lane Targets.

1.3 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.
 - 1. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
 - 2. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.
 - 3. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.
 - 4. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.
 - 5. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2023.
- B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- C. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.
- D. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

- E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.
- F. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Submit two sets of samples of the following for color selection or verification of color and finish variations:
 - 1. Tile products.
 - 2. Threshold, trims, and accessories.
 - 3. Grouts.
 - 4. Sealants.
- E. Certificate: Certify products of this section meet or exceed specified requirements.
- F. Master Grade Certificate: Submit for each type of tile, signed by the tile manufacturer and tile installer.
- G. Installer's qualification statement.
 - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation; www.tile-assn.com/#sle
 - 2. Submit documentation of completion of apprenticeship and certification programs.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than 2 of each type.

1.6 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements for closeout procedures.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
 - a. Accredited Five-Star member of NTCA or Trowel of Excellence member of TCAA.
 - 2. Installer Certification:

- a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
 - b. Apprenticeship Program: Installer has achieved Journeyworker status through an apprenticeship from the International Union of Bricklayers and Allied Craftworkers (IUBAC) or a U.S. Department of Labor (DOL)-recognized program.
 - c. Advanced Certifications for Tile Installers (ACT): Certification in installation of membranes, mortar bed (mud) floors, mortar (mud) walls, shower receptors, large format tile, gauged porcelain tile/panels/slabs, and grouts.
 - d. International Masonry Training and Education Foundation (IMTEF): Supervisor Certification Program (SCP).
- C. Warranty: Installer of work contained in this Section to warrant installation for minimum of 1 year from date of completion for defects in workmanship.

1.8 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct tile mock-up where directed by Architect, incorporating all components specified for the location.
 - 1. Minimum size of mock-up shall be determined by Architect.
 - 2. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. See Section 01 60 00 - Product Requirements requirements for product storage and handling requirements.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 FIELD CONDITIONS

- A. Provide lighting level of 80 fc measured mid-height at substrate surface.
- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile:
 - 1. American Olean Corporation: www.americanolean.com/#sle.
 - 2. Dal-Tile Corporation: www.daltile.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Setting Materials:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 - 2. LATICRETE International, Inc: www.laticrete.com/#sle.
 - 3. Mapei Corporation: www.mapei.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Grout:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 - 2. LATICRETE International, Inc: www.laticrete.com/#sle.
 - 3. Mapei Corporation: www.mapei.com/#sle.

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4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Floor Tile: Provide tile for flooring applications with minimum wet Dynamic Coefficient of Friction (DCOF) of 0.42 when tested in accordance with ANSI A326.3.

2.3 TILE

- A. Unglazed Ceramic Mosaic Tile, Type FT-1,2: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 2 by 2 inch, nominal.
 3. Color(s): As indicated on drawings.
 4. Shape: Square.
 5. Edges: Cushioned.
 6. Surface Finish: Slip resistant.
 7. Mounted Sheet Size: 12 by 24 inches.
 8. Trim Units: Matching cove and build up cove shapes in sizes indicated on drawings, Type CB-3,6.
 9. Products:
 - a. Dal-Tile Corporation; Keystones: www.daltile.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Unglazed Ceramic Mosaic Tile, Type FT-3,6,7: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 2 by 2 inch, nominal.
 3. Color(s): As indicated on drawings.
 4. Shape: Square.
 5. Edges: Cushioned.
 6. Surface Finish: Slip Resistant.
 7. Pattern: Refer to Custom Mix Detail drawings for pattern details.
 8. Mounted Sheet Size: 12 by 24 inches.
 9. FT-3:
 - a. File #: P26033086.
 - b. SAP #: 6010550679.
 - c. Colors: 50% D138 Golden Granite, 33% D209 Navy Speckle, 177% D181 Mustard.
 - d. Mark: Custom Ptrn. 2x2, 750624863, D00022SKT260048.
 - e. Made to order, 8-12 week lead time.
 10. FT-6:
 - a. File #: P26033086.
 - b. SAP #: 6010550679.
 - c. Colors: 25% D160 Cornsilk, 25% D209 Navy Speckle, 25% D169 Waterfall, 25% D181 Mustard.
 - d. Mark: Custom Ptrn. 2x2, 750624863, D00022SKT260048.
 - e. Made to order, 8-12 week lead time.
 11. FT-7:
 - a. File #: P26033086.
 - b. SAP #: 6010550679.
 - c. Colors: 44% D138 Golden Granite, 44% D209 Navy Speckle, 12% D169 Waterfall.
 - d. Mark: Custom Ptrn. 2x2, 750624863, D00022SKT260048.
 - e. Made to order, 8-12 week lead time.
 12. Basis of Design Products:
 - a. Dal-Tile Corporation; Keystones: www.daltile.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Unglazed Ceramic Mosaic Tile, Type FT-4,5: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 2. Size: 1 by 1 inch, nominal.
 3. Color(s): As indicated on drawings.

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4. Shape: Square.
 5. Edges: Cushioned.
 6. Surface Finish: Slip Resistant.
 7. Mounted Sheet Size: 12 by 24 inches.
 8. Products:
 - a. Dal-Tile Corporation; Keystones: www.daltile.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Glazed Ceramic Wall Tile, Type WT-5,7: ANSI A137.1, standard grade.
1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: 4 by 4 inch, nominal.
 3. Edges: Cushioned.
 4. Surface Finish: Glossy.
 5. Color(s): As indicated on drawings.
 6. Pattern: As indicated on drawings.
 7. Trim Units: Matching bullnose and cove shapes in sizes indicated, Type CB-1, TR-4 .
 8. Products:
 - a. Dal-Tile Corporation; Color Wheel Collection - Classic: www.daltile.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Glazed Ceramic Wall Tile, Type WT-6: ANSI A137.1, standard grade.
1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: 4 by 4 inch, nominal.
 3. Edges: Cushioned.
 4. Surface Finish: Glossy.
 5. Color: As indicated on drawings.
 6. Pattern: As indicated on drawings.
 7. Trim Units: Matching bullnose shapes in sized indicated on drawings., Type TR-3.
- F. Glazed Ceramic Wall Tile, Type WT-4: ANSI A137.1, standard grade.
1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: 3 by 6 inch, nominal.
 3. Edges: Cushioned.
 4. Surface Finish: Glossy.
 5. Color: As indicated on drawings.
 6. Pattern: As indicated on drawings.
 7. Trim Units: Matching bullnose and cove shapes in sized indicated on drawings., Type TR-2.
 8. Products:
 - a. Dal-Tile Corporation; Color Story Collection - Wall: www.americanolean.com
 - b. Substitutions: See Section 01 60 00-Product Requirements.
- G. Glazed Ceramic Wall Tile, Type WT-1,2: ANSI A137.1, standard grade.
1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: 12 by 24 inch, nominal.
 3. Edges: Square.
 4. Surface Finish: High gloss, Fluted. As Scheduled.
 5. Color(s): As indicated on drawings.
 6. Pattern: As indicated on drawings.
 7. Trim Units: Matching Jolly (S1/212J) shapes in sizes indicated, Type TR-1.
 8. Products:
 - a. Dal-Tile Corporation; Luminique: www.daltile.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Glazed Ceramic Wall Tile: Type WT-3: ANSI A137.1, standard grade.
1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: 12 by 24 inch, nominal.
 3. Edges: Square.
 4. Surface Finish: Smooth, Glossy.

5. Color: Custom, made to order. American Olean Glaze used on Daltile Luminique Ceramic wall tile (refer to schedule for color detail).
6. Lead Time: 8-12 weeks.
7. Pattern: As indicated on drawings.
8. Trim Units: Cove shapes in sizes indicated on finish key, coordinating with field tile, Type CB-2,4,5.
9. Products:
 - a. Daltile Corporation, American Olean; Luminique & Color Story Wall: www.daltile.com, www.americanolean.com.
 - b. Substitutions: See Section 01 60 00-Product Requirements.

2.4 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.
 1. Manufacturers: Same as for tile.
- B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 1. Thickness: As required by installation and to comply with ADA Regulations.
 2. Applications:
 - a. Transition between floor finishes of same heights.
 3. Products:
 - a. Schluter-Systems; Schiene: www.schluter.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 2. Products:
 - a. Mapei Corporation; Adesilex P10 Mosaic & Glass Tile, Polymer Additive Keraply (for submerged application): www.mapei.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
 1. Applications: Use this type of bond coat where large tile formats are utilized.
 2. Products:
 - a. Mapei Corporation; Ultralite Mortar: www.mapei.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Products:
 - a. Mapei Corporation; Ultracolor Plus FA: www.mapei.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 1. Applications: Where indicated.
 2. Color(s): As scheduled. Refer to Finish Key

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3. Products:
 - a. Mapei Corporation; Kerapoxy CQ: www.mapei.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, modified silane polymer, or urethane sealant; moisture- and mildew-resistant type.
 1. Applications: Between tile and plumbing fixtures and bleachers.
 2. Color: As selected by Architect from manufacturer's full line.
 3. Products:
 - a. Mapei Corporation; Mapesil T Plus: www.mapei.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Epoxy Grout Haze Remover: Water based gel for vertical and horizontal surfaces.
 1. Products:
 - a. STONETECH, a division of LATICRETE international, Inc; STONETECH Epoxy Grout Haze and Coating Stripper: www.laticrete.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.8 ACCESSORY MATERIALS

- A. Waterproofing and Slab Crack Isolation Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Crack Resistance: No failure at 1/8 inch gap, minimum; comply with ANSI A118.12.
 2. Fluid or Trowel Applied Type with Embedded Reinforcing Fabric:
 - a. Material: Synthetic rubber.
 - b. Thickness: 25 mils, minimum, dry film thickness.
 - c. Products:
 - 1) Mapei Corporation; Mapelastic AquaDefense: www.mapei.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Backer Board: Cementitious type; See Section 09 21 16 - Gypsum Board Assemblies.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.
- C. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- D. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- E. Verify that sub-floor surfaces, in areas with floor drains, are pitched uniformly to drains at 1/4 inch per foot nominal if not indicated on the drawings.
 1. Exception: Where tile is installed in areas of previously removed floor covering, and the sub-floor does not meet the stated pitch, build up thinset during installation to provide a positive pitch to drains of 1/8" per foot, minimum in all directions.
- F. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).

1. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.2 PREPARATION

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.
- C. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
- D. Scarify existing glazed structural block prior to installation of wall tile.
- E. Place thresholds and edge strips at exposed tile edges.
- F. Mix or shuffle all tile for intended installation area, inc

3.3 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2" width is used.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
 1. Tile joint width shall be as recommended by manufacturer for the individual tile type indicated, however, tile joint shall be no less than 1/8, 1/16 inch, as needed, unless otherwise noted.
 2. Refer to drawings for special grout joint layout.
- E. Form internal angles square and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Maintain specified positive pitch to all floor drains in all directions.
- H. Install non-ceramic trim in accordance with manufacturer's instructions.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Control and Expansion Joints:
 1. Keep control and expansion joints free of mortar, grout, and adhesive.
 2. Provide interior control joints in tiled surfaces at 20'-25' in each direction.
 3. Provide exterior control joints in tiled surfaces at 8'-12' in each direction.
 4. Provide interior control joints in tiled surfaces exposed to direct sunlight or moisture at 8' to 12' in each direction.
 5. Provide movement joints where tile work abuts restraining surfaces, including perimeter walls, dissimilar floors, curbs, columns, pipes, door and window frames and where changes occur in backing materials.
 6. Joints through tilework directly over structural joints must never be narrower than the structural joint.
 7. Apply sealant to joints.
- K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

- L. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.
- M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
- N. When installation requires varying tile thickness due to patterning, build up thinset so that the entire installation is flush.
- O. Seal all sanded and unsanded grout, with the exception of epoxy grout, per grout manufacturer's installation instructions.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, on ground, with standard grout, unless otherwise indicated on drawings.
 - 1. Where waterproofing membrane is indicated on drawings, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout, on ground.
 - 2. Where epoxy bond coat and grout are indicated on drawings, install in accordance with TCNA (HB) Method F131.

3.5 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244C, using membrane at toilet rooms and locker rooms.
- B. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.
- C. Over interior concrete and masonry, install in accordance with TCNA (HB) Method W202I, thin-set with dry-set or latex-Portland cement bond coat.

3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final Cleaning.
- B. Clean tile and grout surfaces per manufacturer's recommendations.

3.7 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit traffic over finished floor surface for 4 days after installation.
- C. Protect installed tile from damage due to subsequent construction until Date of Substantial Completion.

3.8 SCHEDULES

- A. Refer to Finish Key and Schedules.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).
- D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.
- E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.
- F. CHPS (HPPD) - High Performance Products Database; Current Edition.
- G. Cisca (AC) - Acoustical Ceilings: Use and Practice; 1999.
- H. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, mechanical and electrical items installed in the ceiling, and indicate method of suspension where interference exists. Submit shop drawings for all custom shapes, clouds, and ceiling formations illustrating understanding of Architect's intent. Notify Architect in writing of any conflicts or dimensional changes.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6 x 6 inch size illustrating material and finish of acoustical units.

- E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.
 - 3. Extra Exposed Grid: Quantity equal to 2 percent of total installed.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work specified in this section with minimum five years documented experience.
- C. Conform to CISCA (AC) requirements.
- D. Single Source Responsibility: To obtain combined warranty for the suspension system and the acoustical panel, color match or ceiling panel and suspension system compatibility, all acoustical panel and suspension system components shall be produced and supplied by one manufacturer. Materials supplied by more than one manufacturer are not acceptable.
- E. Source quality control:
 - 1. Test reports: Manufacturer will provide test certification for minimum requirements as tested in accordance with applicable industry standards and/or to meet performance standards specified by various agencies.
 - 2. Changes from system: System performance following any substitution of materials or change in assembly design shall be certified by the manufacturer.
 - 3. All ceiling panel cartons must contain UL label for acoustical compliance.
 - 4. All suspension system cartons must contain UL label for load compliance per ASTM C635.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements.
- B. Storage:
 - 1. Panels: Storage time of materials at the job site should be as short as possible and environmental conditions should be as near as possible to those specified for occupancy.
 - 2. Suspension System: Store in manner that will prevent warping, scratches and damage of any kind.
- C. Handling: Handle in such manner to ensure against racking, distortion, or physical damage of any kind.
- D. Damaged or deteriorated materials shall be removed from the premises.

1.8 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.9 WARRANTY

- A. Provide written warranty executed by the manufacturer, agreeing to repair or replace acoustical ceiling products that fail within the warranty period. Failures include, but are not limited to:
 - 1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 - 2. Grid System: Rusting and manufacturer's defects.
 - 3. Warranty Period:
 - a. Acoustical panels: Ten years from date of substantial completion.
 - b. Grid: Ten years from date of substantial completion.
 - c. Combined single source panel and grid: Thirty years from date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. VOC Content: As specified in Section 01 61 16.
 - 2. VOC Content: Certified as Low Emission by one of the following:
 - a. Product listing in UL (GGG).
 - b. Product listing in CHPS (HPPD).
 - 3. Inherently resistant to humidity, sag, mold, and mildew.
- B. Acoustical Panels, Type ACT-1: Painted mineral fiber Type XII, with the following characteristics:
 - 1. Application(s): Toilet Rooms.
 - 2. Classification: ASTM E1264 Type III.
 - 3. Size: 24 by 24 inches.
 - 4. Thickness: 1 - 1/4 inch.
 - 5. Thermal Storage Capacity: 50 btu/sf ASTM C1784.
 - 6. Surface Texture: Smooth.
 - 7. Light Reflectance: 0.88 percent, determined in accordance with ASTM E1264.
 - 8. NRC: .75, determined in accordance with ASTM E1264.
 - 9. Panel Edge: Square. Lay-in.
 - 10. Color: As indicated on drawings.
 - 11. Suspension System: Exposed grid.
 - 12. Products:
 - a. Armstrong World Industries, Inc; ULTIMA: www.armstrongceilings.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Acoustical Panels, Type ACT-2: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 1-3/4 inch.
 - 4. Light Reflectance: 85 percent, minimum, determined in accordance with ASTM E1264.
 - 5. NRC: 0.90, determined in accordance with ASTM E1264.
 - 6. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
 - 7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 8. Indoor Air Quality Certified to SCS-105 v4.2-2023.
 - 9. Panel Edge: Square. Lay-in.

10. Color: White.
11. Suspension System: Exposed grid.
12. Products:
 - a. Armstrong World Industries, Inc; CALLA High NRC: www.armstrongceilings.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dip galvanized steel grid and cap.
 1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 2. Profile: Tee; 15/16 inch face width.
 3. Finish: Baked enamel.
 4. Color: White.
 5. Products:
 - a. Armstrong World Industries, Inc.; PRELUDE, PRELUDE XL 15/16": www.armstrongceilings.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636/C 636M, ASTM E 580/E 580M (seismic regulations), and manufacturer's instructions, and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. Overlap and rivet corners.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- J. Where installing sheet metal trim between two overlapping ceiling planes, provide a StrongBack Support (SB-12) as an attachment point for the lower ceiling plane. Span entire length of connection.

3.4 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. For some pattern edge details, if perimeter panels must be cut smaller, the cut edge must be field-rabbeted, or the wall angle must be lowered by reveal depth.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- G. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

3.7 SCHEDULE

- A. Refer to drawings for Finish Key and Schedule

END OF SECTION

SECTION 09 64 30
WOOD FLOOR REFINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Site Refinishing of Wood Gymnasium Flooring including Game Lines and Logos.
- B. Ventilated Cove Base.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 11 66 23 - Gymnasium Equipment: Anchorage and mounting for equipment.

1.3 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
- B. MFMA (PUR) - Performance and Uniformity Rating Sport Specific Standards; current edition.
- C. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements for coordination and preinstallation meeting requirements.
- B. Coordination:
 - 1. Coordinate work of this section with other trades, including but not limited to installers requiring lifts on the existing floor and mechanical work involving air handling equipment.
 - 2. Coordinate work of this section with new floor mounted equipment or anchorage specified in Section 11 66 23 - Gymnasium Equipment.
- C. Preinstallation Meetings: Convene minimum one week prior to commencing work of this section. Include all other affected trades. Review installation procedures including procedures for acclimation of flooring materials.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets for all floor finish materials, including fillers, sealers, paints, and finishes.
- C. Installation instructions including product limitations and special requirements.
- D. Shop Drawings: Provide complete layout indicating court lines, location, design, size and color game markings for approval of Architect and Owner.
- E. Samples: Submit two samples of sealers, paint, and finishes illustrating range of colors and sheens available for selection.

- F. Verification Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on wood substrate of same species being refinished, 6 by 12 inch in size.
- G. Manufacturer's Certification: Submit certification that floor finish materials meet federal and state VOC regulations.
- H. Manufacturer's Qualifications statement.
- I. Installer's Qualifications statement.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, suggested schedule for cleaning, stripping, and re-finishing, stain removal methods, and polishes and waxes.

1.7 QUALITY ASSURANCE

- A. Perform Work of this section in accordance with MFMA (SPEC) and MFMA (PUR)- Maple Flooring Manufacturer's Association.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- C. Installer: Company specializing in performing work of this section with minimum five years documented experience.
 - 1. The Contractor shall be an MFMA Mill Accredited Installation Company with MFMA Accredited Installers on-site for the duration of the refinish.

1.8 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

1.9 FIELD CONDITIONS

- A. Resurfacing of an existing floor system shall not commence until all masonry, finish and/or wet trades, such as, concrete, painting, tile and overhead mechanical trades are complete. The building must be enclosed and weather tight.
- B. Permanent heat, light and ventilation shall be installed and operating before, during and after the resurfacing is complete.
- C. Do not refinish when temperature is below 50 degrees F or above 90 degrees F.
- D. Maintain ambient and substrate temperature within specified range 24 hours before, during, and 72 hours after installation of finish.
- E. Prior to and during installation, the Contractor shall verify that the dew point is at least 5 degrees Fahrenheit less than the substrate and air temperature.
- F. Provide ambient lighting level of 50 ft candles, measured at floor surface.

1.10 WARRANTY

- A. Provide floor finish and game marking warranty against defects and premature finish failure for two years after substantial completion date.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Gymnasium Wood Floors:
 - 1. Bona: www.bona.com.
 - 2. Buckeye International Inc.: www.buckeyeinternational.com.
 - 3. Duraseal: www.duraseal.com.
 - 4. Or Approved Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.2 FLOOR FINISH - GENERAL

- A. Finishes:
 - 1. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 2. Provide finishes from the same manufacturer to the greatest extent possible.
 - 3. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

2.3 FLOOR FINISH SYSTEMS

- A. Gymnasium Wood Floors:
 - 1. Two coat(s) sanding sealer.
 - 2. Minimum one coat paint for game lines and logos. Second coat may be required for some colors and patterns.
 - 3. Three coat(s) finish.

2.4 ACCESSORIES

- A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.
 - 1. Abrasive pads shall be synthetic type; steel wool shall not be used.
- B. Wood Plugs: Round shape, of same species and grain orientation as flooring.
- C. Ventilated Cove Base:
 - 1. Color: As scheduled.
 - 2. Height: As scheduled.
 - 3. Manufacturer:
 - a. Tarkett Flooring; Johnsonite Vent Cove: www.tarkett.com.
 - b. Substitutions: See Section 01 60 00-Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Wood: 15 percent, measured in accordance with ASTM D4442.
- D. Do not begin application of stains and finishes until substrates have been properly prepared.

3.2 PREPARATION

- A. Remove all cover plates and accessories subject to damage during sanding operations.
- B. Mask off adjacent surfaces before beginning sanding.
- C. Coordinate work of this section with installation of new products and systems. Ensure all other trades have completed work in the area of refinishing.

3.3 INSTALLATION - GYMNASIUM WOOD FLOOR FINISHES

- A. Remove existing gym floor finish in its entirety, including all floor mounted tape, game markings and logos and any other surface mounted accessories.
- B. Sand flooring with an appropriate power sander to smooth even finish with no evidence of existing finish, game lines or sander marks. Sand transitions to existing finish surfaces smooth. Use smaller hand held power sanders in areas not accessible by larger sanding units.
- C. Take precautions to contain dust. Remove dust by vacuum.
- D. Conduct post-sanding inspection, notify Architect immediately if any wood plank floors have splintered or cracked. Do not finish floors that until unsatisfactory conditions are addressed.
- E. Finishing: Apply finish in accordance with manufacturer's instructions.
 - 1. Apply first sealer coat, allow to dry, then buff lightly with synthetic abrasive pads to remove irregularities. Vacuum clean and wipe with tack cloth before applying succeeding coat.
 - 2. Apply second sealer coat in same manner as first coat and prepare for successive finishes.
 - 3. Apply colored game lines, logos, and floor markings as shown on Approved Shop Drawings.
 - 4. Apply finish coat(s), allowing sufficient drying time between coats. Lightly buff between coats and vacuum clean and tack cloth before applying succeeding finishes.
 - 5. Reinstall all cover plates and accessories.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Clean and polish entire floor surfaces in accordance with MFMA - Maple Flooring Manufacturer Association.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Prohibit traffic on floor finish for one week after installation.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient base.
- B. Installation accessories.

1.2 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.3 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Field verify actual measurements before fabrication; indicate recorded measurements on shop drawings. Indicate floor patterns, colors and seaming plan.
- D. Verification Samples: Submit two samples, 12" x 12" illustrating color and pattern for each resilient flooring product specified.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Wall Base: 15 linear feet of each type and color.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience and approved by flooring manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 60 00 - Product Requirements for additional storage and handling requirements.
- B. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- C. Store all materials off of the floor in an acclimatized, weather-tight space.
- D. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.7 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.8 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements for closeout procedures.
- B. Furnish 10 percent of installed vinyl tile flooring and base, 5 percent of installed linoleum flooring and 5 percent of rubber flooring of each type and color specified. Deliver all required overage and maintenance stock to owner's specified location prior to start of installation.
- C. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials and suggested schedule for cleaning, stripping and re-waxing.

PART 2 PRODUCTS

2.1 RESILIENT BASE

- A. Resilient Base - Type RB-1: ASTM F1861, Type TV, vinyl, thermoplastic; style as scheduled.
 - 1. Manufacturers:
 - a. Tarkett Flooring; Traditional Vinyl Wall Base: www.tarkett.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
 - 3. Height: 4 inch.
 - 4. Thickness: 1/8 inch.
 - 5. Length: Roll.
 - 6. Color: As indicated on drawings.
 - 7. Accessories: Premolded external corners and end stops.

2.2 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- C. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface. Fill excessive low areas with self leveling flowable fill. Reduce ridges or bumps by grinding.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate to remove adhesives, coatings or contaminants that will inhibit adhesion of the new floor system. Use chemical treatment or bead blast as dictated by the existing conditions and as recommended by the flooring manufacturer .
- E. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.

3.4 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.
- E. Reveal Base: Miter all corners.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final Cleaning.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Clean, seal and maintain in accordance with manufacturer's instructions.

3.6 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed construction.
- B. Prohibit traffic on resilient flooring for 48 hours after installation.
- C. Upon completion of installation, protect resilient flooring in traffic areas with heavy duty kraft paper.

3.7 SCHEDULE

- A. Refer to Finish Keys and Schedules

END OF SECTION

SECTION 09 66 23
RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Epoxy matrix terrazzo with ground and polished finish, to match existing where indicated on plans.
- B. Divider strips.
- C. Precast epoxy terrazzo wall base, to match existing where terrazzo flooring is being reinstalled.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete subfloor with steel trowel finish.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between terrazzo work and adjacent construction and fixtures.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

- A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- B. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position; 2018.
- C. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.
- D. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
- C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.
- D. Samples: Submit two samples, 12 inch by 12 inch in size illustrating each color, chip size and variation, chip gradation, matrix color, and typical divider strip.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com unless more stringent requirements are specified.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.

1. Minimum ten years of documented experience.
 2. Associate member firm of the National Terrazzo and Mosaic Association, Inc.
- C. Surface Burning Characteristics: When tested in accordance with ASTM D635, the Epoxy terrazzo shall comply with the following value: Self-Extinguishing, extent of burning 0.25 inches maximum. ASTM D648, Critical radiant flux, 1.0.
- D. Installer Qualifications: Company specializing in performing the type of work specified in this section.
1. Minimum ten years of documented experience.
 2. Approved by matrix manufacturer.
 3. Contractor member of the National Terrazzo and Mosaic Association, Inc.
- E. Single Source Responsibility: To obtain combined warranty for the installed flooring system from manufacturer; obtain primary epoxy terrazzo flooring system materials including membranes, primers, moisture vapor primers, resins and hardening agents from a single manufacturer with proof of NTMA membership. Obtain aggregates, divider strips, sealers and cleaners from source recommended by primary materials manufacturer.
- F. Warranty: Installer to warrant installation for two years upon completion of work in this Section for defects in workmanship.

1.6 MOCK-UP

- A. Section 01 40 00 - Quality Requirements: Requirements for mock-up.
- B. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 10 by 10 feet.
- C. Locate where directed by Architect..
- D. Mock-up may remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Products Requirements: Product storage and handling requirements.
- B. Store terrazzo materials in a dry, secure area.
- C. Maintain optimal storage temperature of between 50 and 80 degrees F.
- D. Keep products away from fire or open flame.

1.8 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meetings.
- B. Convene minimum one week prior to commencing work of this section.
- C. Obtain samples of existing terrazzo to create a custom match mix.

1.9 FIELD CONDITIONS

- A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.
- B. Maintain ambient and substrate temperature within specified range 72 hours before, during, and 72 hours after installation of flooring.
- C. Prior to and during installation, the terrazzo contractor shall verify that the dew point is at least 5 degrees Fahrenheit less than the slab and air temperature.
- D. Provide ambient lighting level of 50 ft candles, measured at floor surface.

1.10 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate placement of terrazzo divider strips with location of mechanical and electrical access covers, floor mat frames, and other items built in to terrazzo.
- C. Coordinate verified samples with architect once the desired color is achieved. Submit samples for final sign-off.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Terrazzo & Marble Supply Companies; Terroxy Resin Systems: www.tmsupply.com. or Equal
- B. Other Acceptable Manufacturers - Resinous Matrix Terrazzo Flooring:
 - 1. Key Resin Company; Key Epoxy Terrazzo System: www.keyresin.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors:
 - 1. Thickness: 3/8 inch, nominal.
 - 2. Color(s): Match existing.
- B. Wall Base: Precast epoxy terrazzo.
 - 1. Thickness: Same as floors.
 - 2. Color(s): Match existing.
 - 3. Aggregate Type and Size: Same as floors.

2.3 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
 - 1. Mix Proportions: As required to match appearance of existing terrazzo floor and base/
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- C. Aggregate: As required to match appearance of existing terrazzo floor and base.
- D. Precast Epoxy Terrazzo Units: Fabricate to sizes and profiles to match existing.

2.4 ACCESSORIES

- A. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Primer: 100% solids epoxy primer as manufactured by epoxy matrix manufacturer is required.
- E. Crack Bridging Membrane: 100% solids, flexible epoxy installed at 40 mils thickness.

- F. Patching and Fill Material: 100% epoxy fill and selected aggregates as recommended by epoxy matrix manufacturer.
- G. Base Cap, Base Divider Strip, and Separator Strip: Match divider strips.
- H. Anchors and Reinforcement for Precast Units: As recommended by manufacturer for type of installation.
- I. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.
 - 1. Products:
 - a. Terrazzo & Marble Supply Companies; T-Rx: www.tmsupply.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.
- C. Saw cutting of concrete control joints must be done between 12 and 24 hours after placement of the structural concrete and at a frequency and depth meeting ACI recommendations.
- D. New slab on grade concrete to have an efficient moisture vapor barrier directly under the concrete slab. Moisture vapor barrier shall not be punctured and shall be sealed with a vapor barrier grade flashing tape at all terminations, penetration and seams.
- E. Do not begin terrazzo work until concrete substrate has wet cured 28 days, minimum.
- F. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- G. Verify that wood subfloors have 12 percent maximum moisture content.
- H. Cementitious Subfloor Surfaces: Verify that substrates are ready for terrazzo flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 09 05 61.
 - 2. Obtain instructions if test results are not within limits recommended by terrazzo flooring manufacturer.
- I. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions to obtain a CSP within a range of 3 to 5.
- C. Prepare concrete surfaces according to ICRI 310.2R.
- D. Apply primer in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install divider and control joint strips in adhesive setting bed without voids below strips or mechanically anchor strips as required to attach strips to substrate.

- B. Install control joint strips straight and flat to locations indicated.
- C. Install divider strips according to pattern approved on shop drawings.
- D. Install base and border divider and control joint strips to match floor pattern.
- E. Install terminating cap strip at top of base; attach securely to wall substrate.
- F. Place terrazzo mix over substrate to thickness indicated.
- G. Expansion-Joint (isolation) strips: Separate double L-Type, positioned back to back with a minimum 1/8" to 1/4" width between. Fill areas between strips with semi flexible joint filler. Filler to match adjacent terrazzo matrix. Match material, thickness and color of the dividers strips and depth required for topping thickness indicated.
- H. Detail strip layout according to NTMA Guidelines.
- I. Anchor precast units as indicated on drawings.
- J. Install precast units using specified setting material.

3.4 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Produce terrazzo finish surface to match approved mock-up, with 70 percent chip exposed.
- C. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust to a 120 grit finish prior to grouting.
- D. Cleanse: Clean the floor with water and rinse. Remove excess rinse water by wet vacuum and repeat process if necessary to remove all water and grinding dust. Allow the floor to completely dry before continuing with grouting.
- E. Apply grout to fill voids exposed from grinding.
- F. Remove grout coat by grinding, using a fine grit abrasive.
- G. Hand grind vertical and curved surfaces similarly.
- H. Final finish using successive grits down to 200 - 250 grit abrasive to achieve desired final appearance.

3.5 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.
- C. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final Cleaning.
- B. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.
- C. Immediately after terrazzo has dried, apply a minimum of 2 coats of sealer in accordance with manufacturer's instructions.
- D. Polish surfaces in accordance with manufacturer's instructions.

3.7 SCHEDULE

- A. Refer for Finish Key and Schedules on Drawings for mix design, including but not limited to: aggregate type, size and color for each finish specified.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered, and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- C. Section 09 65 00 -Resilient Flooring: Base finish and termination edging of adjacent floor finish.

1.3 REFERENCE STANDARDS

- A. CRI 104 - Standard for Installation of Commercial Carpet; 2018.
- B. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.
- D. Samples: Submit three carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Submit three, two inch long samples of edge strip.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum 5 years experience.

1.6 CLOSEOUT SUBMITTALS

- A. See Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: submit maintenance procedures, recommended maintenance materials and suggested schedule for cleaning.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum two week prior to commencing work of this section.

1.8 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements for general requirements for mock-up.
- B. Construct carpet tile mock-up of each product type, incorporating all components specified for the location including transitions and trims.
 - 1. Minimum size of mock-up is 6 x 6 foot.
 - 2. Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - 3. Approved mock-up may remain as part of the Work upon Architect approval.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver carpeting materials in original mill protective wrapping with mill register numbers and tags attached. Maintain wrappers and protective covers in place until carpet is ready for installation.
- B. Deliver all required overages and maintenance stock to Owner's specified location prior to beginning installation.
- C. Store materials inside, protected from weather, moisture and soiling.

1.10 EXTRA MATERIALS

- A. See Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Supply 5 percent of carpet of each type, color, and pattern specified.

1.11 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 48 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Interface, Inc; Step Repeat Collection: www.interface.com/#sle.
 - 2. Milliken & Company: www.milliken.com/#sle.
 - 3. Forbo Flooring Systems; Coral Brush Tiles: www.forbo.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Tile Carpeting, Type CPT-1: Tufted, Cut Pile, Walk Off Matt System.
 - 1. Product: Coral Brush Tile manufactured by Forbo Flooring Systems.
 - a. Or Approved Equal.
 - 2. Tile Size: 19.69" x 19.69" inch, nominal.
 - 3. Backing system: Everfort Vinyl
 - 4. Yarn system: Regenerated ECONYL® polyamide
 - 5. Construction: Tufted 5/32" cut pile
 - 6. Flammability (Radiant Panel ASTM-E-648): Class A
 - 7. Nominal Total Weight: 4,100 g/m²
 - 8. Lightfastness (AATCC 16E): ≥ 5.0 at 80 hours

9. Color: Refer to Finish Key .
10. Installation Method: Monolithic

- B. Carpet Tile Type CPT-2 Tufted Walk Off Matt, manufactured in one color dye lot
 1. Product: Step Repeat Collection manufactured by Interface.
 - a. Or Approved Equal.
 2. Tile Size: 19.69 x 19.69 inch, nominal.
 3. Backing system: GlasBac Tile
 4. Yarn manufacturer: Aquafil
 5. Yarn system: 100% Recycled Content Type 6 Nylon
 6. Color System: 100% Solution Dyed
 7. Construction: Tufted Pattern Loop
 8. Lifetime Antimicrobial: Intersept
 9. Soil Stain Protection: Protekt
 10. Tufted Yarn Weight: 26 oz
 11. Color: Refer to Finish Key.
 12. Installation Method: Quarter Turn.

2.3 ACCESSORIES

- A. Sub-Floor Filler: type recommended by flooring material manufacturer.
- B. Moldings and Edge Strips: Rubber, color as selected by architect.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.
- D. Ventilate installation area during installation and for 72 hours after installation.
- E. Maintain minimum 70 degrees F ambient temperature 72 hours prior to, during and 24 hours after installation.
- F. Precondition: All of the carpet shall be spread in a room on site 14 days prior to actual installation with the room preconditioned at a minimum of 70 degree F with humidity between 35% to 65%.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Do not mix carpet from different cartons unless from the same dye lot.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

3.4 SCHEDULE

- A. Refer to Finish Key and Schedules.

END OF SECTION

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vinyl Wallcovering

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS

- A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of each wall covering, 12 by 12 inch in size illustrating color, finish, and texture. Verify image and substrate with Interior Designer/Architect/Owner.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
 - 3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

- B. Provide image full height, illustrating installed wall covering and joint seaming technique.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.1 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 - 2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.
- B. Wall Covering - Type WC-1,2:
 - 1. Comply with ASTM F793/F793M, Category V, Type II.
 - 2. Total Weight: 21 ounces per linear yard.
 - 3. Roll Width: 54 inch.
 - 4. Face: Textured PVC-Vinyl.
 - 5. Inks: UV-LED inks with minimal VOC's containing naturally-derived monomers and oligomers.
 - 6. Overcoating: Wallmax Coating required for high durability, metal free UV cured matte finish. Manufacturer's standard coating with fire retardancy, anti-microbial, mold and mildew resistant properties.
 - 7. Backing: Osnaburg backed embossed PVC-Vinyl with UV-LED inks.
 - 8. Weight: 20 oz. per lineal yard.
 - 9. Color: Architect to provide artwork.
 - 10. Surface Texture: Lightly textured.
 - 11. Fire and Smoke:
 - a. ASTM E84, Class A.
 - b. NFPA 286 Corner Burn Test, Class A.
 - 12. Basis of Design:
 - a. Surface Materials; Level IMO Vinyl Wallcovering: www.surfacematerials.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- E. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.2 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- E. Vacuum clean surfaces free of loose particles.

3.3 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering. Let contact adhesive set tack free.
- C. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- D. Butt edges tightly.
- E. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.4 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.5 SCHEDULES

- A. Refer to Finish Key and Schedule.

END OF SECTION

SECTION 09 84 30
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sound-absorbing wall panels.
- B. Mounting accessories.

1.2 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting.

1.3 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout and fabric orientation.
- D. Verification Samples: Fabricated samples of each type of panel, wrapped in specified fabric; 12 by 12 inch, showing construction, edge details, and fabric covering.
- E. Manufacturer's qualification statement.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than 3 of each type.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

1.8 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional mock-up requirements.
- B. Construct mock-up of acoustical units at location as indicated by Architect.
 - 1. Minimum mock-up dimensions; 96 by 96 inches.
 - 2. Mock-up may remain as part of work.

PART 2 PRODUCTS

2.1 FABRIC-COVERED SOUND-ABSORBING UNITS

- A. Manufacturers:
 - 1. Carnegie; Xorel Artform Square Tile: www.carnegiefabrics.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. General:
 - 1. Prefinished, factory assembled fabric-covered panels.
 - 2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- C. Fabric-Covered Acoustical Panels for Walls:
 - 1. Panel Core: Manufacturer's standard 100% PET (at least 60% recycled) core.
 - a. Facing: 1/16-inch high-impact, impact-resistant and tackable surface laminated to core.
 - 2. Sound Absorption: Noise Reduction Coefficient (NRC) of .80 when tested in accordance with ASTM C423 for Type A mounting, per ASTM E795.
 - 3. Panel Size: 20 inches by 20 inches.
 - 4. Panel Thickness: 2 inches rPET-core.
 - 5. Core NRC: at least .80 at 2 inch thickness.
 - 6. Edges: Perimeter edges reinforced by a formulated resin hardener.
 - 7. Corners: Radiused.
 - 8. Fabric:
 - a. AWP-1; Xorel Meteor 6427-2003.
 - 1) Backing: Unbacked, water, solvent, and bleach cleanable.
 - 2) Content: 100% IFR Xorel®.
 - 3) Acoustics: NRC of at least .90 when wrapped around 2" thick panel.
 - 4) Color: As indicated on Finish Key.
 - 5) Warranty: 10 years.
 - b. AWP-2; Xorel Nebula 6149-25.
 - 1) Backing: Unbacked, water and bleach cleanable.
 - 2) Content: 100% Xorel® (25% Biobased PE, 75% PE).
 - 3) Acoustics: NRC of at least 1.05 when wrapped around 2" thick panel.
 - 4) Color: As indicated on Finish Key.
 - 5) Warranty: 10 years.
 - 9. Mounting Method: Direct applied with adhesive.

2.2 FABRICATION

- A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
 - 1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.

- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.3 ACCESSORIES

- A. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with shop drawings.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 - 1. Plumb and level.
 - 2. Flatness.

3.3 CLEANING

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.4 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Prime surfaces to receive wall coverings.
 - 4. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Glass.
 - 9. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

1.3 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.
- E. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
- F. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- H. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- I. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- J. SSPC-SP 3 - Power Tool Cleaning; 2024.
- K. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- L. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, and repair of painted and finished surfaces.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. 6 CRR-NY, Chapter III, Subpart A.
 - c. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
 - 1) Opaque, Flat: 50 g/L, maximum.
 - 2) Opaque, Nonflat: 100 g/L, maximum.
 - 3) Opaque, High Gloss: 150 g/L, maximum.

- d. Architectural coatings VOC limits of the State of New York.
- 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Colors: As indicated on drawings.
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Plaster and Stucco: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean concrete according to ASTM D4258. Allow to dry.
 3. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- H. Concrete Floors and Traffic Surfaces: Remove contamination, using alkaline based cleaners where required, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- J. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.
- K. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.7 SCHEDULE - PAINT SYSTEMS: ALL MATERIALS ARE BASED ON SHERWIN WILLIAMS UNLESS NOTED OTHERWISE.

- A. Concrete Block (Area F & G):
 - 1. One coat Preprite Block Filler (B25) DFT- 8.0. (MPI #4)
 - 2. Two coats SuperPaint Air Purifying Technology (A86) @ 1.8 MDFT
- B. Concrete Floors (Lt. - Med. Duty):
 - 1. Unpainted Floors:
 - a. One coat ArmorSeal 8100 Water Based Epoxy Floor Coating (B70 Series) reduced with one pint of water per gallon@ 2.0-4.0 DMFT.
 - b. Two coats ArmorSeal 8100 Water Based Epoxy Floor Coating (B70 Series) unreduced @ 2.0-4.0 MDFT per coat.
- C. Steel and Metal - Steel access doors and frames, hollow metal doors and frames, all new removable mullions, stair railings, hollow metal Windows frames, existing painted fire extinguisher cabinets:
 - 1. One coat Pro Industrial Pro-Cryl Primer (B66-1300 Series) @ 1.9-3.8 MDFT.
 - 2. Two coats DTM Acrylic Semi-Gloss Coating (B66-200) @ 2.5-5.0 MDFTper coat.
- D. Galvanized Metal: Exposed miscellaneous metal, exposed ducts, conduits, mechanical and electrical devices.
 - 1. One coat DTM Acrylic Primer/Finish (B66W1) @ 2.5-5.0 MDFT. (MPI #134)
 - 2. Two coats DTM Acrylic Semi-Gloss Coating (B66-200) @ 2.5-4.0 MDFT per coat. (MPI #153)
- E. Steel - Exposed steel lintels:
 - 1. One coat Pro Industrial Pro-Cryl Primer (B66-1300 Series) @ 1.9-3.8 MDFT.
 - 2. Two coats Sher-Cryl HPA High Performance Acrylic, (B66-300 Series) @ 2.5-4.0 MDFT.
 - 3. Application: Preparation and prime coat is to be applied including previously primed in factory by steel fabricator.
- F. Gypsum Board: Finish surfaces exposed to view.
 - 1. All interior drywall gypsum board wall surfaces for a painted finish. (Spot prime all areas containing joint compound with primer first)
 - a. Walls and ceilings: One coat Pro Mar 200 Zero VOC Primer (B28) DFT- 1.0. (MPI #50).
 - b. Walls: Two coats SuperPaint Air Purifying Technology (A86) @ 1.8 MDFT
 - c. Ceilings: Two coats SuperPaint Air Purifying Technology (A86) @ 1.8 MDFT
- G. Plaster: Finish surfaces exposed to view.
 - 1. All interior plastered wall surfaces for a painted finish. (Spot prime all areas containing raw plaster with primer first)
 - a. Walls and ceilings: One coat Pro Mar 200 Zero VOC Primer (B28) DFT- 1.0. (MPI #50).
 - b. Walls: Two coats SuperPaint Air Purifying Technology (A86) @ 1.8 MDFT
 - c. Ceilings: Two coats SuperPaint Air Purifying Technology (A86) @ 1.8 MDFT
- H. New Wood Doors: Refer to appropriate door specification for required factory finish.

3.8 SCHEDULE - PAINT SYSTEMS: ALL MATERIALS ARE BASED ON PITTSBURGH PAINTS UNLESS NOTED OTHERWISE.

- A. Concrete Block:
 - 1. One coat Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI. (MPI #4)
 - 2. Two coats Pure Performance Paint & Primer in One Interior Semi-Gloss 9-510XI Series.
- B. Concrete Floors (Lt. - Med. Duty):
 - 1. One coat Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200XI. (MPI #99)
 - 2. Two coats Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200XI. (MPI #99)
- C. Steel and Metal - Steel access doors and frames, hollow metal doors and frames, all new removable mullions, stair railings, hollow metal Windows frames, existing painted fire extinguisher cabinets:
 - 1. One coat Pitt-Tech Plus DTM Industrial Primer/Finish 4020.

2. Two coats Pitt-Tech Plus EP DTM Acrylic, Semi-Gloss 90-1610 Series.
- D. Galvanized Metal: Exposed miscellaneous metal, exposed ducts, conduits, mechanical and electrical devices.
 1. One coat Pitt-Tech Plus DTM Industrial Primer/Finish, 4020.
 2. Two coats Pitt-Tech Plus EP DTM Acrylic, Semi-Gloss 90-1610 Series. (MPI #153)
- E. Steel - Exposed steel lintels:
 1. One coat Pitt-Tech Plus DTM Industrial Primer/Finish 4020.
 2. Two coats Pitt-Tech Plus EP DTM Acrylic Gloss 90-1510.
- F. Gypsum Board: Finish surfaces exposed to view.
 1. All interior drywall gypsum board wall surfaces for a painted finish. (Spot prime all joints and spots with primer first)
 - a. Walls and ceilings: Two coats Pure Performance Interior Latex Primer, 9-900.
 - b. Walls: Two coats Pure Performance Paint & Primer in One Interior Eggshell 9-310XA Series. (MPI #144)
 - c. Ceilings: Two coats Pure Performance Paint & Primer in One Interior Eggshell 9-310XA Series. (MPI #144)
 - d. Exception: Where topcoat is indicated or scheduled as white, provide Latex Paint + Primer, Eggshell 13-310 Series.
- G. Plaster: Finish surfaces exposed to view.
 1. All interior plastered wall surfaces for a painted finish. (Spot prime all joints and spots with primer first)
 - a. Walls and ceilings: Two coats Pure Performance Interior Latex Primer, 9-900.
 - b. Walls: Two coats Pure Performance Paint & Primer in One Interior Eggshell 9-310XA Series. (MPI #144)
 - c. Ceilings: Two coats Pure Performance Paint & Primer in One Interior Eggshell 9-310XA Series. (MPI #144)
 - d. Exception: Where topcoat is indicated or scheduled as white, provide Latex Paint + Primer, Eggshell 13-310 Series.
- H. New Wood Doors: Refer to appropriate door specification for required factory finish.

3.9 SCHEDULE

- A. Refer to Finish Key and Schedule on Drawings.

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. High performance coatings.
- B. Surface preparation.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 91 23 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.3 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- E. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
- C. Samples: Submit two samples 8 by 8 inch in size illustrating colors indicated for verification.
- D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Coating Materials: 1 gallon of each type and color.
 - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document that applies to application on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 10 years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- C. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- D. Restrict traffic from area where coating is being applied or is curing.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Only materials (primers, coatings, etc.) listed in the latest edition of the MPI (APL) are acceptable for use on this project.
- B. High-Performance Coatings:
 - 1. Sherwin-Williams Company: www.protective.sherwin-williams.com/industries/#sle.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 HIGH PERFORMANCE PAINT SYSTEMS

- A. POOL AREAS & LOCKER ROOMS, CONCRETE WALLS
 - 1. 1st ct. S-W Loxon Block Surfacers LX01W0200 ((16.0 mils wet, 8.8 mils dry)
 - 2. 1-2 cts. S-W Pro Industrial Waterbased Catalyzed Epoxy B73 Series (5.0 mils wet, 2. mils dry)
- B. POOL AREAS & LOCKER ROOMS: MASONRY – (CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted, Stucco).

HIGH-PERFORMANCE COATINGS

1. 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
 2. 2nd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy Eg-Shel, B73- Series.
 3. 3rd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy Eg-Shel, B73- Series (5 mils wet, 2.0 mils dry per coat).
- C. POOL AREAS: STEEL – (ceilings, duct work/pool areas)
1. 1st Coat - S-W Pro Industrial Pro Cryl Primer B66 Series (5.0 mils wet, 1.9 mils dry)
 2. 1-2 Coats.S-W Pro Industrial Waterbased Catalyzed Epoxy B73-Series (5 mils wet, 2.0 mils dry)
- D. POOL AREAS: STEEL/ALUMINUM (railings, hollow metal frames & doors)
1. 1st Coat. S-W Pro Industrial Pro Cryl Primer B66 Series (5.0 mils wet, 1.9 mils dry)
 2. 2 Coats. S-W Waterbased Alkyd Urethane Enamel B53 Series (4.0 mils wet, 1.4 mils dry)

2.3 HIGH-PERFORMANCE COATINGS

- A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
1. Abrasion Resistance: 32.5 mg loss, when tested in accordance with ASTM D4060, CS17 wheel, 1000 cycles, 500g load.
 2. Scrub Resistance: 8000 cycles, when tested in accordance with ASTM D2486.
 3. Water Vapor Permeance (US): Tested in accordance with ASTM D1653, Test Method B, Condition A.
 - a. Gloss: 12.12 grains/(hr ft squared in Hg).
 - b. Eg-Shel: 10.04 grains/(hr ft squared in Hg).

2.4 TOP COAT MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
1. Volatile Organic Compound (VOC) Content:
 - a. Provide coatings that comply with the most stringent requirements specified in the following:
 - 1) 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2) Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings: www.otcair.org.
 - (a) Opaque, Flat: 50 g/L, maximum.
 - (b) Opaque, Nonflat: 150 g/L, maximum.
 - (c) Opaque, High Gloss: 250 g/L, maximum.
 - (d) Varnishes (Glu-Lam Beams): 350 g/L, maximum.
 - b. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
 2. Colors: As indicated.
- B. Shellac: Pure, white type.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.2 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Existing Painted and Sealed Surfaces:
 - 1. Strip existing paint and coatings from surface.
 - 2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.
- E. Concrete:
 - 1. Prepare surface as recommended by coating manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- F. Masonry:
 - 1. Prepare surface as recommended by coating manufacturer.
- G. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

3.3 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Wood: Prior to priming patch with filler to produce smooth, even surface.
- C. Concrete: Prior to priming, patch with masonry filler to produce smooth surface.
- D. Concrete Masonry: Apply masonry filler to thickness required to fill holes and produce smooth surface; minimum thickness of 30 mils.

3.4 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for general requirements for field inspection.

3.6 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.7 PROTECTION

- A. Protect finished work from damage.

END OF SECTION

SECTION 10 11 43
VISUAL DISPLAY WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Large format graphic panels.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.3 REFERENCE STANDARDS

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- C. ASTM D1735 - Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus; 2021.
- D. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.
- E. ASTM D2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics; 2022.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's published data on panels and anchorage devices.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
- D. Samples: Final scratch-off sample of smaller sized panel to illustrate print quality, colors, finishes, and mounting mechanism.
- E. Panel schedule in manufacturer's format for verification of graphic image and copy.
- F. Approval drawings showing materials, construction detail, lay-out, size, graphic and mounting methods.
 - 1. All panels, layout, and graphics shall be approved by Owner prior to fabrication.
- G. Manufacturer's Qualification Statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer specializing in manufacturing the products specified in this section with minimum five years experience. Obtain from one source and a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package to prevent damage or deterioration during shipment, handling, storage and installation. Products should remain in original packaging until removal is necessary. Store products flat in a dry, indoor location.

1.7 WARRANTY

- A. Provide manufacturer's warranty against defects in materials and workmanship for minimum 5 years.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. 3Form; Varia, Costom Printing: www.3-form.com.
- B. Or Architect approved equal.
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PANELS

- A. General
 - 1. Formable, interlayered resin panel, 40% pre-consumer recycled content.
 - a. Laminated images will not be accepted.
 - 2. ASTM D2843 Smoke Density: Less than 75.
 - 3. ASTM D635 Flame Spread: CC1, minimum.
 - 4. ASTM D1929 Self-Ignition Temperature: Greater than 650°F.
 - 5. Panels shall not harbor bacteria and shall withstand use of hospital grade disinfectants.
- B. Materials
 - 1. Fabricated of recycled PETG resin (94%), virgin PETG resin (3.9%), polyurethane bonding layer (1.1%), and decorative interlayers (0.7%).
- C. Graphics
 - 1. All images shall have a minimum resolution of 300 dpi and 25% of the enlarged image size.
 - 2. Images, graphics, and copy shall be provided by Owner, unless noted otherwise.
 - 3. The direct print shall be first surface with protective overlay to prevent damage from moisture, UV, scratches and strong cleaning agents.
 - 4. All panels shall be protected following printing by a UV, chemical- and scratch-resistant overlay to preserve color and protect against damage.
- D. Panel Size: As indicated on Drawings.

2.3 ACCESSORIES

- A. Mounting Hardware
 - 1. All panels shall be provided with appropriate mounting hardware.
 - 2. Panels shall be capable of removal from wall to facilitate painting or cleaning.
 - 3. Panels shall be equipped with a locking mechanism to secure panel to wall. Mechanism shall be hidden from view.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.

- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
- C. Examine panels for defects, damage and compliance with specifications. Installation shall not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. General: Installation locations shall be in accordance with approved shop drawings. Locate where indicated using mounting methods in compliance with manufacturer's written instructions:
 - 1. The Contractor shall coordinate installation schedules with the Owner and Construction Manager.
 - 2. Installation shall be performed by manufacturer's personnel trained and certified in manufacturer's methods and procedures.
 - 3. The contractor shall submit a CAD generated location plan noting the location of all graphic panels.
 - 4. Panels shall be level, plumb, and at locations indicated with panel surfaces free from defects.
 - 5. Upon completion of the work, contractor shall remove unused or discarded materials, containers and debris from site.

END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dimensional letter signage.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Allowances:
 - 1. See Section 01 21 00 - Allowances for cash allowances affecting this section.
 - 2. Include cash allowance for purchase and delivery but not installation.

1.3 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
- D. Selection Samples: Submit one sample of each color available in product line for selection.
- E. Samples: Submit samples of size required for project, indicating sign material, style, font, color selected, and method of attachment.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package dimensional letter signs as required to prevent damage before installation.
- B. Store under cover and elevated above grade.

1.7 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.2 DIMENSIONAL LETTERS

- A. Acrylic Letters:
 - 1. Material: Formable resin panels.
 - 2. Thickness: As indicated on drawings.
 - 3. Letter Height: 10 inches.
 - 4. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - 5. Finish: As selected by Architect from manufacturer's full range.
 - 6. Color: As selected.
 - 7. Mounting: manufacturer's standard mounting method.
 - 8. Construction: Laser cutting - laser polished edges.
 - 9. Basis of Design Product:
 - a. 3Form; Varia, Applied Lettering: www.3-form.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 ACCESSORIES

- A. Letters to be mounted as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

3.3 CLEANING, PROTECTION AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet interior and 10 feet exterior.

- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- C. Dispose of construction debris.

3.4 SCHEDULE

- A. Refer to Signage Schedule, Signage Type Schedule and Drawings for sizes, locations and layout of signage types, sign text copy and graphics.

END OF SECTION

SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.

1.2 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Concealed steel support members.
- B. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- C. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.3 REFERENCE STANDARDS

- A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.
- D. ANSI A117.1 - America National Standard- Accessible and Usable Buildings and Facilities.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall, floor, and ceiling supports, door swings.
- C. Samples: Submit two samples of partition panels, 6 by 6 inch in size illustrating panel finish, color, and sheen.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

1.6 WARRANTY

- A. Manufacturer to supply a written warranty covering all components against breakage corrosion and delamination for a period of 25 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com/#sle.
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Privacy Toilet Compartments for Changing Rooms: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Color: Single color as selected from manufacturer's full range of colors.
- B. Doors:
 - 1. Thickness: 1 inch.
 - 2. Width: 24 inch.
 - 3. Width for Handicapped Use: 36 inch, out-swinging.
 - 4. Height: 72 inch.
- C. Panels:
 - 1. Thickness: 1 inch.
 - 2. Height: 72 inch.
- D. Pilasters:
 - 1. Thickness: 1 inch.
 - 2. Width: As required to fit space; minimum 3 inch.

2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
 - 1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Stainless steel; continuous type.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hinges: Stainless steel; satin finish.
 - 1. Continuous-type hinge, self closing.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with occupancy indicator latch and housing.
 - 2. Door Strike and Keeper to be continuous privacy type
 - 3. Provide stainless steel door pull for doors.
- G. Stainless Steel Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Electric hand/hair dryers.
- D. Diaper changing stations.

1.2 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).
- F. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.
- I. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Samples: Submit two samples of each accessory, illustrating color and finish.
- D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc (ASI): www.americanspecialties.com.
 - 2. Bobrick Washroom Equipment, Inc.: www.bobrick.com
 - 3. Bradley Corporation: www.bradleycorp.com/#sle.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Electric Hand/Hair Dryers:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Excel Dryer: www.exceldryer.com/#sle.
 - 3. World Dryer Corporation: www.worlddryer.com/#sle.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- C. Provide products of each category type by single manufacturer.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide 3 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

- A. Waste Receptacle: Stainless steel, freestanding style with swing top.
 - 1. Liner: Removable seamless stainless steel receptacle.
 - 2. Minimum capacity: 13 gallons.
 - 3. Provide (1) for each Single-use Toilet Room and (2) for each Pool Locker Room
- B. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
 - 1. Size: As scheduled.
 - 2. Shelf: Stainless steel; gauge and finish to match mirror frame, turned down edges, welded to frame; 5 inches deep, full width of mirror.
- C. Grab Bars: Stainless steel, smooth surface.
 - 1. Heavy Duty Grab Bars: Floor supports are not acceptable.

- a. Push/Pull Point Load: Minimum 1000 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.125 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.
 - d. Products:
 - 1) American Specialties, Inc; 3800 Series: www.american-specialties.com.
 - 2) Substitutions: Section 01 60 00 - Product Requirements.
- D. Combination Sanitary Napkin/Tampon Dispenser with Disposal: Stainless steel, surface-mounted.
1. Door: Seamless 0.05 inch door with returned edges and tumbler lock.
 2. Cabinet: Fully welded, 0.03 inch thick sheet.
 3. Operation: No charge; no coin slots.
 4. Identify dispensers slots without using brand names.
 5. Minimum capacity: 15 napkins and 20 tampons.
 6. Products:
 - a. American Specialties, Inc: www.americanspecialties.com/#sle.
 - b. Substitutions: Section 01 60 00 - Product Requirements.

2.5 ELECTRIC HAND/HAIR DRYERS

- A. Electric Hair Dryers as depicted on drawings as Note 7: Traditional fan-in-case type, with swivel nozzle.
1. Operation: Pushbutton on, timer off.
 2. Mounting: Wall-mounted - surface.
 3. Cover: Stainless steel with brushed finish.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
 4. Air Velocity: 7,300 linear feet per minute, minimum, at full power.
 5. Heater: 2100 w, minimum, at full power.
 6. Total Wattage: 2300 W, maximum.
 7. Runtime: Non-adjustable, 30 seconds.
 8. Supply Voltage: 120 V, single phase, 60 Hz, nominal.
 9. Warranty: 10 years.
 10. Electric Hair Dryer Products:
 - a. World Dryer Corporation; DA5-973: www.worlddryer.com/#sle.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- B. Electric Hand Dryers as depicted on drawings as Note 11: Traditional fan-in-case type, with downward fixed nozzle.
1. Operation: Automatic, sensor-operated on and off.
 2. Mounting: Wall-mounted - surface.
 3. Cover: Stainless steel with brushed finish.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
 4. Runtime: 60 seconds.
 5. Airflow: 63.6 CFM
 6. Supply Voltage: 120 V, single phase, 60 Hz, nominal.
 7. Warranty: 5 years.
 8. Electric Hand Dryer Products:
 - a. American Specialties, Inc; Model 0197-1-92.
 - b. Substitutions: Section 01 60 00 - Product Requirements.
 - 9.

2.6 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Provide one stations to be installed at location per Architect.
 2. Material: Polyethylene.
 3. Mounting: Surface.

4. Color: As selected.
5. Minimum Rated Load: 250 pounds.
6. Products:
 - a. Rubbermaid Commercial Products; FG781988 Baby Changing Station Vertical: www.rubbermaidcommercial.com/#sle.
 - b. Saniflow Hand Dryer Corporation; Babymedi Horizontal: www.saniflowcorp.com/#sle.
 - c. Substitutions: 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section 06 10 00 for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 1. Grab Bars: As indicated on drawings.

3.4 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking.
- B. Section 09 21 16 - Gypsum Board Assemblies: Execution requirements for placement of rough-in frame for cabinets.
- C. Section 09 91 23 - Interior Painting.

1.3 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; Current Edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2026.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Manufacturer's Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.5 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
 - 2. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
 - 3. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 4. Larsen's Manufacturing Co..
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FIRE EXTINGUISHERS

- A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated on drawings.
- B. Dry-Chemical-Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 - 1. Class: A.
 - 2. Size: 5 lb.
 - 3. Temperature Range: Minus 40 to 120 degrees F.

2.3 FIRE EXTINGUISHER CABINETS

- A. Fire-Rated Cabinet Construction: One-hour fire rated.
 - 1. Steel; double wall or outer and inner boxes with 5/8-inch thick fire barrier material.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat square edge, with 2-inch wide face.
 - 3. Provide cabinet enclosure with right-angle inside corners and seams and with formed perimeter trim and door stiles.
- C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch. Provide satin finish pull handle.
- D. Door Glazing: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing. Formed in a bubble shape to allow full 180 degree visibility.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.
- F. Fabrication: Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
 - 1. See Section 09 91 23 for field painting.
- H. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

- A. Fire Blanket: Fire retardant treated wool; red, 62 x 84 inch size.
- B. Fire Blanket Cabinet: Drop type with folded blanket, surface mounted.
- C. Extinguisher Brackets: Formed steel, chrome-plated.
- D. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

- A. Verify dimensions, tolerances, and interfaces with other work.

- A. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

3.2 EXAMINATION

- A. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.
- B. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 42 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.
- E. Position cabinet signage at left of cabinet.
- F. Provide a cabinet, extinguisher and accessories at 75' maximum along the length of the corridors.
- G. Portable fire extinguishers (Surface Mounted Units): Install wall bracket by securely anchoring to masonry wall or wood blocking within a stud wall. Place extinguisher in bracket.

END OF SECTION

SECTION 10 51 26
PLASTIC LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic lockers.
- B. Locker benches.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete base construction.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Solid Plastic Lockers:
 - 1. Scranton Products; Duralife Series: www.scrantonproducts.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 LOCKER APPLICATIONS

- A. Athletic Lockers: Solid plastic lockers, free-standing for base indicated on drawings.
 - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 2. Width: 15 inches.
 - 3. Depth: 15 inches.
 - 4. Height: 60 inches.
 - 5. Locker Configuration: Single and Two tier.
 - 6. Fittings: Size and configuration as indicated on drawings.
 - a. Upper shelf.

- b. Hooks: One double prong.
- 7. Ventilation: Perforated side panels and doors.
- 8. Locking: Padlock hasps, for padlocks provided by Owner.
- B. ADA Pool Locker Benches: Stationary type; bench top of Solid White Oak, stain as selected by Architect; aluminum pedestal.
 - 1. Height: 18 inch.
 - 2. Length: As shown on drawings
- C. Pool Locker Bench Support Brackets: Welded structural steel wall recess mount bench support brackets; pre-drilled for bench top material attachment and for wall anchorage as detailed on drawings
 - 1. Bench top material: Solid White Oak, stained as selected by Architect
 - 2. Height: 18 inch.
 - 3. Depth: 16 inch.
 - 4. Load Capacity per Bracket: 400 pounds.
 - 5. Finish: Field Painted.
 - 6. Bracket Spacing: 36 inches on center, maximum. Project-specific spacing to be determined based on field measurements.

2.3 SOLID PLASTIC LOCKERS

- A. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Lockers: Factory assembled, made of solid plastic panels, tested in accordance with NFPA 286, homogenous color throughout.
 - 1. Material: Solid high density polyethylene (HDPE).
 - 2. Locker Door and Body Construction: Manufacturer's standard for selected product.
 - 3. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
 - 4. Provide filler strips where indicated, securely attached to lockers.
 - 5. Door Color: To be selected by Architect.
- C. Hinges: Full height of locker, manufacturer's standard heavy duty type.
- D. Coat Hooks: High impact plastic.
- E. Number Plates: Provide rectangular shaped aluminum plates.
- F. Locks: Locker manufacturer's standard type indicated above.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Install end panels, filler panels, and sloped tops.
- F. Install fittings if not factory installed.

- G. Replace components that do not operate smoothly.

3.3 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basketball backboards, goals, and support framing.
- B. Wall mounted protection pads.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.
- B. Section 05 12 00 - Structural Steel Framing: Structural members supporting basketball systems.
- C. Section 05 21 00 - Steel Joist Framing: Building framing supporting backstops.
- D. Section 05 50 00 - Metal Fabrications: Secondary structural members supporting gymnasium equipment.
- E. Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- C. NCAA (BR) - Men's and Women's Basketball Rules and Interpretations; current edition.
- D. NFHS (Guide) - Court and Field Diagram Guide; current edition.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.
- G. International Basketball Federation: FIBA-Official Basketball Rules for Men and Women.
- H. Underwriters Laboratories Inc.: UL - Electrical Construction Equipment Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.
- C. Preinstallation Meeting: Convene minimum one week prior to commencing work of this section.
- D. Coordination:

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Electrical characteristics and connection locations.
 - 2. Fire rating certifications.
 - 3. Manufacturer's installation instructions.
 - 4. Colors available.
 - 5. Submit general construction, component connections and details, wiring diagram and electrical equipment.
- C. Shop Drawings: For custom fabricated equipment indicated, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.
 - 1. Shop drawings and calculations shall be signed and sealed by Professional Engineer, licensed in the State of New York.
 - 2. Plan of gymnasium at 1/8" scale. Indicate size and location of backstops and mat hoists.
 - a. Show operable backstops in fully extended and retracted positions.
 - 3. Indicate operator locations and mounting details. Include wiring diagrams for electric operators and controls.
 - 4. Indicate magnitude and location of loads imposed on building framing.
- D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.
- E. Samples: Submit samples of wall pad coverings and roll-up curtain fabrics in manufacturer's available range of colors.
- F. Operating and maintenance data for each operating equipment item.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Include the following:
 - 1. Description of method of operation and motor control system.
 - 2. Parts catalog with complete list of replacement parts.
 - 3. Lubrication requirements and frequency, and periodic adjustments required.
 - 4. Schematic wiring diagrams of installed electrical equipment.
- C. Certificates: Affidavit, signed by the Company field advisor and notarized, certifying that the equipment meets the contract requirements and is operating properly.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified with minimum 10 years of experience.
- C. Manufacturer shall be represented by a local agency to provide maintenance and service of specified equipment.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached. Inspect for damage.

- B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
- C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.9 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Gymnasium Equipment:
 - 1. Draper, Inc: www.draperinc.com/#sle.
 - 2. Porter Athletic Equipment Company: www.porterathletic.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 GENERAL REQUIREMENTS

- A. See drawings for sizes and locations, unless noted otherwise.
- B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
 - 1. NFHS (Guide) - National Federation of State High School Associations sports rules.
- C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.
- D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
- E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.
- F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.3 BASKETBALL

- A. Basketball System: Backstop assembly, backboard, and goal.
 - 1. Provide system components from a single source manufacturer for design and functional compatibility.
 - 2. Manufacturers:
 - a. Draper, Inc: www.draperinc.com/#sle.
 - b. Porter Athletic Equipment Company: www.porterathletic.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
 - 1. Framing: Fully welded Center strut; forward folding; front-braced framing.
 - a. Support steel and fittings anchored to overhead structural framing members with adjustable hangers for precise plumbing of backstop.
 - b. Heavy structural steel weldment at center strut for goal direct-through-backboard attachment to eliminate strain on backboard.
 - c. Brace assembly shall lock in place upon deployment, and be automatically released by cable hoist during retraction.

2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
 - a. Hoist shall be capable of holding backstop at any position.
 - b. Motor: 3/4 hp with key switch control.
 - 1) Provide key switches master keyed to school's system. Gang one half of total switches together in two locations (one each side of the folding partition). Coordinate switches with operable partition contractor.
 3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
 4. Framing Color: As selected from manufacturer's standard selection.
- C. Backboards: Tempered glass, rectangular shaped.
1. Conform to all NCAA (BR) and NFHS (Guide) requirements.
 2. Frame: Brushed aluminum edge, steel mounting.
 3. Dimensions: 42 inches high by 72 inches wide
 4. Markings: Integrally manufactured.
 5. Provide safety padding for bottom edge of backboard.
 6. Provide mounting kit.
 7. Color: As selected from manufacturer's standard selection.
- D. Breakaway Goals: Steel rim, mounted to backboard, with attached nylon net; complete with shock absorption feature and mounting hardware.
1. Regulation 5/8 inch cold drawn alloy steel, formed to 18 inch inside diameter ring. Inside diameter of ring shall be positioned 6 inches from face of backboard.
 2. Rim shall be rigidly braced by means of formed, die cut steel braces on underside for maximum support.
 3. Net Attachment Device: Tube-tie.
 4. Finish: Powder coat orange.

2.4 WALL PADDING

- A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
 2. Flammability: Comply with NFPA 286.
 3. Covering: Vinyl Laminated Nylon Material, mildew and rot resistant; stapled to back of board.
 - a. Cover material shall have a certificate of flame resistance from the State of California (registered fabric No. F-140). The cover material shall be non-tear vinyl with a rip resistant quality utilizing industrial polyester filament yarn.
 - b. Color:
 - c. Texture: Embossed leather-look.
 - d. Custom Graphics: At High School Gymnasium, To be supplied by Owner.
 - e. Fabric Weight: 14 oz/sq yd, minimum.
 4. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf nominal density.
 5. Foam Thickness: 2 inches.
 6. Backing Board: Oriented strand board.
 - a. Thickness: 7/16 inch, minimum.
 7. Panel Dimensions: 24 inches wide by 72 inches long, including nailing/fastening margins.
 8. Mounting: Removable; Z-clips fixed to wall and to padding.
 9. Manufacturers:
 - a. Draper, Inc; EcoVision Class A Fire Retardant Wall Pads: www.draperinc.com.
 - b. Porter Athletic; Fire Safe Wall Pad: www.gillporter.com/porter.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.
- E. Verify building structural frame and wall surfaces are ready to receive equipment.
- F. Verify finishing operations, including painting, are complete before installing equipment.

3.2 INSTALLATION

- A. Install in accordance with contract documents approved shop drawings and manufacturer's instructions.
- B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.
- C. Install equipment rigid, straight, plumb, and level.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.
- F. Separate dissimilar metals to prevent electrolytic corrosion.
- G. Install backstops in accordance with NCAA and NFHS requirements.
- H. Coordinate installation schedule with the schedules of other trades to ensure orderly and timely progress of the total work.
- I. Assemble components furnished loose for field assembly.
- J. Install backboards plumb, level, and parallel to basketball court end line.
- K. Placement of equipment relating to floor groove lines shall be coordinated with work under gymnasium flooring section.
- L. Install goals level and at elevation indicated on Drawings.
- M. Secure wall pads to block wall with 1/2" diameter bolt. Bolts staggered; (1) maximum spacing 18" O.C. Bolt holes neatly drilled.
- N. Touch up damaged finishes to match shop finish.

3.3 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.
- D. Adjust limit switches to prevent damage to equipment.

3.4 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.5 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

3.6 DEMONSTRATION

- A. Manufacturer's Representative shall demonstrate operation and maintenance of all units, winches and backboard height adjustment.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall-hung counters.
- B. Solid Surface wall caps.

1.2 RELATED REQUIREMENTS

- A. Section 09 30 00 - Tiling: Tile for commenting platform.
- B. Section 22 40 00 - Plumbing Fixtures: Sinks for solid surface lavatories with integral sinks fabricated from same material.

1.3 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 21 00 - Allowances.

1.4 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. See Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.6 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation . combined with shop drawings of solid surface material and cutting/sealing details.
 - 1. Indicate dimensions, edge profiles, and cut outs as needed.
- D. Verification Samples: For each finish product specified, minimum size 4 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Installer's qualification statement.

- G. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Natural Stone Institute (NSI) Accredited Natural Stone Fabricator; www.naturalstoneinstitute.org/#sle.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's 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 local authorities having jurisdiction.

1.9 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.

PART 2 PRODUCTS

2.1 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting self-supporting over structural members.
 - 1. Flat Sheet Thickness (countertop @ Score Booth): 1-1/2 inch, minimum, (half wall cap and column wrap cap): 1 inch minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Acorn Engineering; Neo-Metro: www.neo-metro.com.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements. Product selected as substitute must also be able to match sinks specified in Section 22 40 00.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Solid Surface Product (SSM-1): Polymer Resin.
 - 1) Color: Cotton Tail
 - 2) Surface Finish: Matte
 - 3) Manufacturer:
 - (a) Morris Group International; Corterra Solid Surface: www.morrisgroupint.com
 - 3. Other Components Thickness: 1/2 inch, minimum.
 - 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 - 5. Fabricate in accordance with manufacturer's standard requirements.

2.2 MATERIALS

- A. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- B. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 ACCESSORIES

- A. Powder Coated Steel Fixed Countertop Support Brackets:
 - 1. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 - 2. Color: White.
 - 3. Manufacturer:
 - a. Centerline Brackets: www.countertopbracket.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements. Steel brackets must have capabilities to be powder coated as used in a natatorium setting.

2.4 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Provide solid wood blocking at all walls and countertops connected to brackets.

3.3 INSTALLATION

- A. Securely attach countertops to wall face and half-wall tops using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

- A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 66 13
TELESCOPING BLEACHERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Telescoping bleachers at Gymnasium.
- B. Electric motor operators, controls, and internal wiring.
- C. Seats at Pool Precast Concrete Bleachers

1.2 RELATED REQUIREMENTS

- A. Section 26 05 83 - Wiring Connections: Connection of electric motors and controls.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- C. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.
- D. ASTM D2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics; 2022.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- H. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).
- I. ICC 300 - Standard on Bleachers, Folding and Telescopic Seating, and Grandstands; 2017.
- J. NFPA 102 - Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures; 2021.
- K. PS 1 - Structural Plywood; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage handling and requirements.
 - 3. Installation methods.
- C. Shop Drawings: Complete layout with dimensions, seat heights, row spacing and rise, aisle widths and locations, points of connection to substrate, assembly dimensions, and material types and finishes.
 - 1. Provide drawings customized to this project.
 - 2. Include Professional Engineer's seal on each sheet.

3. Wiring Diagrams: Show locations of motors, electrical wiring, and rough-in connections.
4. Graphics Layout Drawings: Indicate pattern of contrasting seat colors.
- D. Selection Samples: For each material for which color selection is required, submit samples, 2 by 2 inches in size, illustrating colors and finishes available.
- E. Verification Samples: For each custom colored finish, submit samples of actual finish or product, for verification of color selection.
- F. Operation and Maintenance Data: Manufacturer's operation and maintenance instructions, including annual inspection and maintenance and bi-annual inspection by a Professional Engineer or manufacturer factory service personnel.
- G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Manufacturer's installation crew.
- C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M, AWS D1.3/D1.3M, and no more than 12 months before the start of scheduled welding work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store, in original packaging, under cover and elevated above grade.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion. Replace parts that fail under normal use at no extra charge to Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Telescoping Bleachers:
 1. Basis of Design: Interkal LLC; Contour Seat Modules: www.interkal.com/#sle.
 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 TELESCOPING BLEACHERS

- A. Telescoping Bleachers: Factory assembled tiered benches that retract horizontally into depth approximately the same as a single row depth, with fixed seats mounted on leading edge of platforms.
 1. Provide a design certified by a licensed Professional Engineer licensed in the State of New York.
 2. Provide a design that has been in use for at least 5 years; submit documentation.
 3. Design to comply with applicable requirements of NFPA 102, ICC 300, and requirements of code authorities having jurisdiction; where conflicts between requirements occur, comply with whichever is more stringent.

4. Design with solid fascia (riser) or seat fronts that conceal interior mechanisms when fully retracted, fitting tightly enough to prevent climbing up face; at front row provide key locked, hinged fascia (skirt) to cover gap between seat riser/fascia and floor.
 5. Standard Extension: Top row fixed to floor, adjacent to wall, forward extension (away from wall); attachment to wall acceptable.
 6. Wheelchair Spaces: Permanent open spaces at locations indicated on drawings in compliance with ADA Standards.
 7. Cutouts: Fit units to irregular wall surfaces, columns, pilasters, roof drain leaders, and other obstructions; take field measurements prior to fabrication.
 8. Operation: Motor operated.
- B. Design Loads: Design to withstand the following loading conditions:
1. Live Load on Structural Supports: 100 psf, minimum, of gross horizontal projection.
 2. Live Load on Seats and Walking Surfaces: 120 pounds per linear foot.
 3. Lateral Sway Stress on Structural Supports: 24 pounds per linear foot of seat plank.
 4. Perpendicular Sway Stress on Structural Supports: 10 pounds per linear foot of seat plank.
- C. Dimensions:
1. See drawings for overall dimensions.
 2. Rows: 7.
 3. Rise Per Row: 11-1/2 inches.
 4. Row Depth: 24 inches.
 5. Seat Height Above Tread: 6 inches.
- D. Structural Supports: Steel; manufacturer's standard wheeled carriages supporting each tier separately, with moving parts permanently lubricated and metal parts cushioned to prevent metal-to-metal contact during operation.
1. Design so that each row carriage so that it will individually support the design loads and is self supporting when fully assembled without dependence on platform panels or boards, seats, or fascia.
 2. Diagonal Bracing: Structural steel bracing, beginning no later than row 3, attached from carriage to riser to prevent sway. Capable of supporting loads of 1000 pounds of compression or tension forces.
 3. Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M.
 4. Bolting: Use lock-washers or locknuts.
 5. Wheels: Minimum 3-1/2 inch diameter by 1-1/8 inch wide, with non-marring rubber tires; ball, roller, or oil-impregnated metal bearings; minimum of 2 wheels at each floor support.
 - a. Axles: 0.5 inch, minimum for all wheels.
 6. Finish: Manufacturer's standard enamel or powder coating.
 7. Row Locking: Automatically mechanically lock each carriage to adjacent carriages when fully extended.
 8. Unlocking: Automatically unlock all rows before engaging retraction mechanism.
- E. Propulsion: Friction power, integral electro-mechanical propulsion to open and close telescopic seating.
1. Two friction drive roller assemblies per section, integral to both first row column assemblies. Roller assemblies shall include two 6 inch diameter x 2-1/2 inch wide cast drive wheels with 45-durometer rubber covering.
 2. Roller assemblies shall be separated by 7 feet, minimum, per section, and linked together by continuous steel drive shaft for simultaneous operation.
- F. Motor Operation: Traction wheels, with non-marring rubber covering, using motor adequately sized for the purpose.
1. Provide UL listed electrical components and wiring.
 2. Controls: Start, Stop, Forward, and Reverse in a single control unit.
 3. Control Station: Removable twist-lock plug-in low-voltage pendant station, with first-row plug-in location for each motor.
 4. Limit Switches: Automatically stop operation when unit has reached fully open or fully closed position.

5. Provide all wiring internal to bleacher units, to junction box located where indicated; ensure that wiring is not energized except during operation.
6. Electrical Characteristics: 120V, single phase, 60 Hz; 1/2 HP, minimum.
7. Provide access to motor from front side of bleachers; a hinged front skirt or hinged section at least 30 inches wide is acceptable.

2.3 SEAT AND PLATFORM COMPONENTS

- A. Seat/Fascia Assembly: Continuous, molded UV-stabilized high-density polyethylene plastic, seat minimum 1 inch thick, textured finish, homogeneous color throughout; approximately 18 inch long, 10 inch deep sections independently removable with tongue-and-groove or rabbeted interlock at end joints.
 1. Shape: Ergonomically contoured, with internal ribs spaced for natural flexibility; rear edge cantilevered to provide toe room of not less than 3 inches; no openings to trap debris.
 2. Fire Retardance: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929; smoke developed index of 450 or less, when tested in accordance with ASTM E84, or 75 or less when tested in thickness intended for use in accordance with ASTM D2843; and burning extent of 1 inch or less when tested in thickness intended for use in accordance with ASTM D635.
 3. Provide end caps of same material and finish on each exposed end.
 4. Supports: Internal steel reinforcement of each seat segment bolted to platform nose member; minimum two bolts per segment.
 5. Seat and Row Numbers: Provide recessed pockets and number plates.
 6. Color: As selected by Architect from manufacturer's standard range.
 7. Provide at Gymnasium and Pool Bleachers and attach to precast concrete bleacher system
 - a. Provide for two colors to form pattern as indicated on Drawings.
- B. Platform, Tread, and Step Structure: Plywood continuously supported on front and rear with side joints squarely seated in aluminum "H" beams.
 1. Plywood: PS 1, 5-ply polyethylene-overlaid douglas fir or southern pine, Grade C-C.
 2. Plywood Thickness: 19/32 inch, minimum.
 3. Front (Nose), Rear, and Intermediate Supports: Steel channel or tube, hot-dipped galvanized.
 4. Provide end caps of same material and finish on each exposed end.
 5. Deck Supports: Structural steel, 11 gauge, minimum, spaced no greater than 60 inches on center.
 - a. Each deck support not attached to a vertical post shall have an integral nylon roller to reduce friction and prevent binding.
 6. Nose Beam: One-piece formed steel, G60/Z275 hot-dipped galvanized, 13 gauge, minimum.
 7. Rear Riser: One-piece formed steel, minimum, G60/Z275 hot-dipped galvanized, 14 gauge, capable of capturing rear of footrest panel.
 8. Splice Plates: Sections shall be joined by splice plates of same type and thickness material being joined, 18 inches long, minimum, attached by through bolts. At rear riser, four bolts each side of joint, at nose beam, two bolts each side of joint.
 9. At aisles provide permanently attached intermediate steps of same construction and finish.

2.4 HANDRAILS AND RAILINGS

- A. Provide the following railings:
 1. Aisle Handrails: Single post self-storing railing segment mounted in center of aisle at every other row beginning at row 2.
 2. End of Row Guardrails: Self-storing, at open ends of sections beginning at row 2.
 3. Height: 42 inches above adjacent platform or tread.
- B. Design handrails and railings to withstand the following loads:
 1. Concentrated Load on Handrails: 200 pounds in any direction.
 2. Concentrated Load on Guardrails: 200 pounds in any direction along top rail.
 3. Live Load on Handrails: 50 pounds per linear foot, applied in any direction.
 4. Live Load on Guardrails:

TELESCOPING BLEACHERS

- a. Horizontal: 50 pounds per linear foot, applied at the guardrail height.
- b. Vertical: 100 pounds per linear foot, applied vertically to top of guardrail.
- C. Railing Construction: Round steel pipe or tube, with formed elbows at corners and caps at ends of straight runs.
 - 1. Steel: 1-1/2 inch minimum outside diameter, with 11 gauge, 0.12 inch minimum wall thickness; textured powder coat epoxy finish.

2.5 ACCESSORIES

- A. Fillers and Closures:
 - 1. Top Row: Provide seat level rear filler panels to close openings between top row seat and wall; finish to match platforms.
 - 2. Sides of Extended Units: Vinyl curtains.
 - 3. Vinyl Curtains: 18 ounce vinyl with grommets; color as selected from manufacturer's standard palette.
- B. Fasteners: Provide hardware and fasteners in accordance with manufacturer's recommendations; S.A.E. Grade 5 or better.
- C. Anchorage: As indicated on drawings; provide hardware in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are consistent with those on the shop drawings.
- B. Verify that electrical rough-ins have been installed and are accessible.
- C. Verify finishing operations, including painting and floor finishing are complete and sufficiently cured before installation proceeds.
- D. Do not begin installation until substrates have been properly prepared and area has been cleared of obstructions.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Protect flooring and wall finishes from potential damage by work of this section.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Do not field cut or alter seats, fascia, or structural members without approval.
- C. Provide manufacturer's field representative to inspect completed installation.

3.4 ADJUSTING

- A. Lubricate, test, and adjust each moving assembly to ensure proper operation in compliance with manufacturer's recommendations.

3.5 CLEANING

- A. Clean exposed and semi-exposed assembly surfaces.
- B. Touch up finishes on damaged or soiled areas.

3.6 CLOSEOUT ACTIVITIES

- A. Demonstration and Training: Provide manufacturer's field representative to demonstrate to and train Owner's operating personnel in proper operation of equipment.
 - 1. Location: On site using installed equipment.
 - 2. Time: As agreed between Owner and Contractor.

3.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 13 11 00
SWIMMING POOLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cast-in-Place concrete swimming pools with Marcite plaster finish and pool accessories.

1.2 RELATED REQUIREMENTS

- A. Section 09 30 00 - Tiling: Pool deck surface finish, coping, and gutter.
- B. Section 22 51 00 - Swimming Pool Plumbing Systems.

1.3 REFERENCE STANDARDS

- A. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
- C. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- D. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement; 2024.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories.
- C. Shop Drawings: Indicate pool layout, configuration, and dimensions.
- D. Manufacturer's Installation Instructions: Indicate special installation procedures.
- E. Designer's Qualification Statement.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Operation Data: Provide operating instructions.
- I. Maintenance Data: Provide maintenance instructions, maintenance schedules.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design pool tank structural components under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State of New York.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Swimming Pool:
 - 1. Paddock Industries, Inc: www.paddockpool.com/#sle.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for pools and associated equipment.

2.3 SCOPE

- A. The Work includes, but is not limited to the following:
 - 1. Draining of the entire pool is by Owner prior to the start of the project
 - 2. Cover all ventilation ducts.
 - 3. Remove the existing entire concrete pool as indicated on drawings.
 - 4. Provide new 4 lane concrete pool and ADA ramp with all accessories as indicated on drawings
 - 5. Provide new VGB compliant main drain frame and grates.
 - 6. Provide new tile markings as indicated on drawings.
 - 7. Provide all new "Marcite" interior. Marcite to be hand applied. Use of plaster pump is strictly prohibited.
 - 8. Thoroughly clean entire pool area, remove temporary plugs, provide new hydrostatic valves and fill pool.

2.4 PRODUCTS

- A. Marcite Interior Finish:
 - 1. Job Conditions
 - a. Apply plaster in swimming pool only when ambient temperature is above 40 degrees F and below 90 degrees F, and protect applied plaster from rapid drying until curing is completed and pool is filled with water.
 - 2. Material
 - a. Portland Cement: ASTM C150/C150M, Type 1 white Portland cement.
 - b. Aggregates for Pool Plaster Finish Coat: White marble dust uniformly graded within the following limits, all passing the No. 30 sieve:
 - 1) No. 30: Minimum 0, Maximum 0.
 - 2) No. 50: Minimum 25, Maximum 50.
 - 3) No. 100: Minimum 75, Maximum 90.
 - 4) No. 200: Minimum 90, Maximum 100.
 - c. Water: Clean, fresh, from domestic potable water source.
 - 3. Proportions and Mixing:
 - a. Materials and specified on a volume basis and shall be measured in approved containers which will insure that the specified proportions will be controlled and accurately maintained during the progress of work. Measuring materials with shovels (shovel count) is not permitted.
 - b. White Marble Pool Plaster Finish Coat: Mix finish in proportion of one part by volume of white Portland cement to not more than two parts by volume of aggregates (specified with marble dust).

- c. Mixing: Perform mixing in approved mechanical mixers of the type in which quantity of water can be controlled accurately and uniformly. Avoid excess mixing to prevent hasty solution of cement and discard plaster that has begun to set up.
 - 4. Preparation of Surfaces:
 - a. Clean base surfaces of projections, dust loose particles, grease, bond breakers, and foreign matter; make sufficiently rough to provide a strong mechanical bond. Wash entire concrete pool shell with an acidic solution with in 24 hrs of plastering. Do not apply plaster directly to the surfaces of masonry or concrete that are coated with any acidic solution compound or similar agent until compound or agent is completely removed by water blasting. Thoroughly wash entire surface with 2,000 psi high pressure water immediately prior to plastering. Wet cementitious base surface with a fine fog water spray to produce a uniformly moist condition and check screeds, pool equipment, and accessories for correct alignment before plastering is started.
 - 5. Application of Plaster:
 - a. General: Apply finish plaster to minimum 1/2 inch thickness at any and all locations. Apply finish plaster by hand only, to ensure required minimum thickness. Control fluidity of plaster to have a slump not exceeding 2-1/2 inches when tested using a 2" by 4" by 6" high slump cone. Perform slump testing throughout the process.
 - b. Workmanship: Apply finish plaster in two coats by "double back" method with second coat being applied as soon as the first is tamped and initially floated. Work plaster to screeds at intervals from 5 feet to 8 feet on straight surfaces.
 - 6. Curing: Keep plaster damp until pool is filled. Prevent damage and staining of plaster.
- B. Alternate #6: Provide 1" x 1" tile conforming to ANSI A137.1 to the entire pool surface, all walls and floor. Color to be selected by Architect and different from lane markings.
- C. Tile Markings and Lane Targets:
- 1. The tile markings for the swimming pool shall be 1" x 1" tile conforming to ANSI A137.1.
 - a. Setting Material
 - 1) Portland cement: ASTM C150/C150M, Type 1.
 - 2) Sand: ASTM C144.
 - 3) Water: Clean and potable.
 - b. Grouting Material
 - 1) Floors and Wall: Commercial white color sanded Portland Cement Type.
 - 2) Products:
 - (a) Bostik Hydroment.
 - (b) Custom.
 - (c) Jamo.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify excavation surfaces are clean, smooth, and without voids or irregularities.
- B. Verify grounding of electrical and metallic components before shotcreting.

3.2 INSTALLATION - ACCESSORIES

- A. Install pool accessories and fittings in accordance with component manufacturer's instructions.

END OF SECTION

SECTION 13 11 46
SWIMMING POOL EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pool Equipment and Accessories.
- B. Pool Timing Equipment.

1.2 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping and Specialties: Piping, valves, and fittings.

1.3 COORDINATION

- A. All Prime Contractors, whether specifically indicated or not, shall coordinate with all other Trades for placement of pool equipment, including but not limited to, those occupying common space.
 - 1. Include the Architect and Owner as required for location and placement of pool equipment above grade.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on accessories, and all materials specified.
- C. Shop Drawings: Indicate pool layout, configuration, equipment locations, dimensions, and utility rough-in locations.
- D. Manufacturer's Installation Instructions: Indicate special installation procedures.
- E. Installer's Qualification Statement.
- F. Maintenance Data: Provide maintenance instructions, maintenance schedules .

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years of documented experience.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Timing and Scoreboard System:

1. Contractor shall warrant completed system installation for one year from date of Substantial Completion.
2. Manufacturer shall further warrant the following components for period indicated from Substantial Completion:
 - a. Titanium Deck Plates: Five years.
 - b. Display board/scoreboard, and touchpads: Three years.
 - c. Starting System: Two years.
 - d. All other components including computers: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Kiefer Aquatics: www.kiefer.com.
- B. Paddock Industries, Inc: www.paddockindustries.com.
- C. Recreonic, Inc.: www.recreonics.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.2 REGULATORY REQUIREMENTS

- A. Comply with applicable codes for pools and associated equipment.

2.3 SWIMMING POOL EQUIPMENT

- A. Fast Track Starting Platforms:
 1. The platform shall be side mounted and have a 24 inch wide x 32 inch long stainless steel top with non-slip solid surface.
 2. Backstroke starting bar, mounted flush with front edge of platform and two additional vertical backstroke grips made of stainless steel positioned 15 inches on center.
 3. Lane numbers will be visible from all four sides of platform.
 4. On top of starting platform shall be equipped with side rails made from 1 inch O.D. stainless steel tube welded to 1/8 inch stainless steel plate.
 5. Mounted to side rails will be a removable "wedge" made of 12 gauge, stainless steel with a 45 degree incline on the surface facing forward to pool. Front surface shall have a non-slip surface. The wedge will use spring loaded plunger pins to lock securely into place. Single mechanism will be used to retract both pins simultaneously with one hand for ease of adjustment. Wedge shall slide uninhibited along guide rails on sides of platform.
 6. Color: As selected by Architect from manufacturer's full range of colors with custom logos.
 7. Products:
 - a. Paddock Industries; Model 4912 Fast Track Starting Platform Stainless Steel Type 316L.
 - 1) Quantity: 4.
 - b. Paddock Industries; 4912-A anchors with 19 inch spacing.
- B. Wave Quelling Racing Lanes
 1. Racing lane markers consisting of individual wave reducing float segments measuring 6 inches in diameter strung on vinyl plastic covered aircraft type stainless steel to form a continuous line. Manufacturer's standard attachment clip on each end for installation and removal.
 2. Length: 25 yards with 15 feet at each end in solid color with alternating 1 foot sections of contrasting colors in between.
 - a. Color(s): As selected by Architect from manufacturer's standard line.
 3. Provide storage reels on rollers for storage of the racing lines.
 4. Products:
 - a. Kiefer Aquatics; Wave Eater II.
 - 1) Quantity: Five.

SWIMMING POOL EQUIPMENT

- b. Kiefer Aquatics; Model 210300 Racing Lane Storage Reel.
 - 1) Quantity: Two.
- C. Line Anchors
 - 1. Recessed stainless steel cup anchors. Anchors are to be installed in from face of stainless steel gutter system at pool water level.
 - 2. Product:
 - a. Recreonics: 14-505.
 - b. Quantities:
 - 1) For Racing Lines: Ten.
 - 2) For Life Line Attachment: Two.
- D. Life Line
 - 1. Blue and white polyethylene rope, 3/4 inch diameter, length to fit installed conditions.
 - 2. Floats: Five inches in diameter by nine inches long multi-compartment polyurethane with chlorine inhibitors. Floats shall be self locking on the line to prevent movement along line spaced a maximum of 5 foot on center.
 - 3. Cast bronze metallic bodies with heavy chrome plate on all surfaces secured to line at each end for attachment to line anchors.
 - 4. Product:
 - a. Recreonics; No. 12-380 Safety Line Kit.
 - b. Recreonics; No.14-456 Rope Hook.
 - c. Quantity: One.
- E. Storage Benches
 - 1. Heavy duty 3/16" fiberglass panels forming benches with bottom panel.
 - a. All hardware to be stainless steel.
 - b. Hinged lid with no locking hasp
 - c. Color: White
 - d. Outer Dimension: 85"w X 20"d X 18"h
 - e. Inner Dimension: 79"w X 15.5"d X 15"h
 - f. Weight: 70lbs
 - g. Quantity: 8 total
 - h. Provide matching end panels to meet configuration detailed on drawings.
 - 2. Product:
 - a. Recreonics, Inc; Model 718: www.recreonics.com.
 - b. Quantity: As indicated on drawings.
- F. Rescue Tubes
 - 1. Vinyl coated NBR Foam with through strap of nylon webbing and snap closures. Attached nylon webbing 5.5 foot towline.
 - 2. Dimensions: 40 inches long x 6 inches wide x 4 inches thick.
 - 3. Color: Red.
 - 4. Product:
 - a. Kiefer Aquatics; 112N.
 - 1) Quantity: Four each.
- G. Backstroke Marker Posts
 - 1. Type 304 stainless steel 1.90 inches o.d. x .06 inches wall 88 inch high backstroke marker posts with removable caps and flags.
 - 2. Product:
 - a. Paddock No. 4905 with No. 4815 stanchion.
 - 1) Quantity: Four each.
- H. Recall Marker Posts
 - 1. Low carbon stainless steel recall posts 5'-4" high, 1.90" o.d. x .065" wall.
 - 2. Product:
 - a. Paddock No. 4905-R, complete with stanchion anchors and 1/4" recall rope.
 - 1) Quantity: Two each.

- I. Rails
 - 1. California Style Grab Rails, deck mounted, 1.9 inch o.d. x 0.83 inch thick Type 304 stainless steel, complete with deck anchors and escutcheon plates.
 - 2. Product:
 - a. Paddock No. 4497-C
 - b. Quantity: 2 pairs.
- J. Portable Lifeguard Chair
 - 1. Type 304 stainless steel construction from welded 1.90 inch x 0.065 inch tubing.
 - 2. Molded fiberglass seat with swivel.
 - 3. Permanently attached wheels that disengage when stand is in place and engage by lifting opposite end for movement.
 - 4. Height: 4'-6"
 - 5. Product:
 - a. Recreonics; Model 12-501.
 - b. Quantity: 1 each.
- K. Diving Board and Stand
 - 1. Aluminum springboard; 16 foot with slip-resistant finish.
 - a. Underside protected from direct contact with fulcrum by rubber channels.
 - 2. Multi-component stand for mounting springboard 1.09 yard above water level.
 - a. Constructed of heavy duty aluminum castings with epoxy powder coating.
 - 1) Ladder assembly
 - (a) Wide steps with replaceable slip resistant treads.
 - (b) Hard-anodized, forged aluminum hinges mounted to anchor plate for attachment of rear of springboard.
 - 2) Fulcrum assembly
 - (a) Adjustable fulcrum point on geared carriage mounted to main support assembly.
 - (b) Adjusts manually by hand from pool deck or by foot from springboard.
 - 3) Main support assembly
 - (a) Support base for fulcrum assembly and extensions for handrail attachment.
 - 3. Double stainless steel handrails on both sides from ladder assembly and past the main support assembly.
 - 4. Products:
 - a. Board: Duraflex International; Model 66-231-326: www.duraflexinternational.com.
 - b. Stand: Duraflex One-Meter Stand.
 - c. Quantity: 1 each.
- L. Rescue Poles
 - 1. Aluminum Telescoping Pole with Fiberglass Snap-on Life Hook.
 - 2. Length: 8 foot retracted; 16 foot extended.
 - 3. Product:
 - a. Kiefer Aquatics: TS11224RB and ALH01BU: www.kiefer.com.
 - b. Quantity: 1 each.
- M. First Aid Cabinet
 - 1. Full Stainless Steel construction with dual latch closure.
 - 2. Four interior shelves and interior door pockets; empty.
 - 3. Include handle for portability, and accommodations for wall mounting.
 - 4. Dimensions: 15.125 inch wide, 5.125 inch deep, 21.125 inch high.
 - 5. Product:
 - a. Axiom Medical; Model #ML28835: www.axiommedicals.com.
 - b. Quantity: 1 each.
- N. Spine Board
 - 1. Marine grade plywood board with hardwood runners, finished with exterior grade polyurethane. Complete kit to include head immobilizer, velcro head and four body straps.
 - 2. Size: 78 inches long x 20 inches wide.
 - 3. Product:

- a. Recreonics: CJ Aquatics Prowood 1000 Rescue Board Package.
- b. Quantity: One each.

2.4 POOL TIMING EQUIPMENT

A. Basis of Design Manufacturer

- 1. Colorado Time Systems, Inc: www.coloradotime.com.
 - a. Product model numbers are that of the BOD manufacturer, and provided as quality reference for comparison.
- 2. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
 - a. Alternate manufacturers shall be capable of providing a complete system with compatible connectivity and functionality as the specified system.

B. Timing System

- 1. Timer shall be a standalone unit with physical connections to timing inputs. Timer shall be controlled by user interface device (computer) via network connection.
- 2. Timer user interface (computer) shall be supplied with all necessary software to time and score swimming in compliance with the appropriate sanctioning body(ies): World Aquatics, NCAA, YMCA, USA Swimming, and National Federation of High Schools. One laptop must be provided per timer (Legacy solution).
- 3. Timing System shall:
 - a. Accept inputs for up to 12 lanes for a parallel wiring installation.
 - b. Time to a user-selectable resolution from 1 second to .001 second. It shall take starts and finishes from the near end and/or far end of the pool. It shall accept inputs from the start system, touchpads, up to three manual backup times per lane, and relay judging platforms.
 - c. Run off of a 12 Volt power supply connected to a standard 110/240 VAC outlet and will automatically switch to (and display on screen of connected interface device) internal battery source power, in case of line power failure without affecting the continuity and accuracy of the timing system.
 - d. Interface to single- and multi-line scoreboard and shall post immediate results to scoreboard in "Lane" or "Place" order. The timer shall also have the capability to pull race results from memory and post those results to the scoreboard in "Lane" or "Place" order.
 - e. Capable of communicating wirelessly with CTS wireless scoreboards (2.4GHz) using wireless communication.
 - f. Include internal clock calendar with self-sustaining battery to time/date stamp all results.
 - g. Meet acceptable safety standards. Shall be ETL approved, or equivalent.
 - h. Display complete race status. The interface shall be capable of functioning as a miniature scoreboard displaying information simultaneously for all active lanes including lane number, current length in race or final place, split or finish time, relay judging status indicator, and backup time and backup button status.
 - i. . Store all race data, including near and far end splits, to internal memory for later recall to facilitate meet management connectivity and printing. Printed reports shall include cumulative and subtractive splits as well as relay judging times.
 - j. Provide backup time via push button provided on a per lane basis should swimmer fail to trigger touchpad or touchpad fails to register. Timer to be capable of accepting up to three backup button times per lane.
 - k. Relay judging automatically compares the touchpad hit of an incoming swimmer with the starting swimmer's time of departure from the optional relay judging platform. Results display both "plus" and "minus" takeoff times and can be printed and stored in race memory.
 - l. Communicate with meet management peripheral software on a two-way "handshake" basis, enabling the meet manager's resident computer to query the timer's memory via the network at any time for any race results.
 - m. The system's Automatic Event Sequencer shall be capable of accepting downloaded event order from meet management software or NFHS standard event line-up.
 - n. Automatically flag timing discrepancies (in the user interface, on the results printouts, and in stored memory) greater than .30 seconds between touchpad and backup times.
 - o. Have touchpad delay feature with ability to program delays from 1 to 99 seconds.

- p. The software shall permit operation of essential functions including Lane Off/On, Finish Arm, Split Arm, and Print Results directly from the main screen to ensure speed and simplicity of operation during critical race times. The interface shall permit the operator to insert a backup time when required (edit) or to disqualify (DQ), automatically posting it to the scoreboard, and provide automatic re-ranking of results. Any corrections generated by the operation (edit or DQ) shall be clearly identified on the results printouts.
 - q. Permit the operator to correct for an erroneous touch by adding/subtracting a touchpad hit to correct the lengths completed. The interface shall not permit the operator to finish a race in any lane; timers including such a function are unacceptable because they permit the possibility of cheating.
 - r. Include electronic beeper and LED signaling to indicate touchpad, backup button, and relay judging inputs. Timers which do not allow the user to configure (enable/disable) this feature are unacceptable.
 - s. Timer connectivity shall include:
 - 1) USB (Type A) port for external storage.
 - 2) USB (Type B) port for meet management connectivity.
 - 3) USB (Type B) port for user interface computer connectivity.
 - 4) Ethernet port for network connectivity.
 - 5) Wireless 2.4GHz for CTS wireless scoreboard connectivity.
 - 6) Three independent scoreboard output ports.
 - 7) Redundant near and far end connections timing inputs (touchpads, backup button, relay judging platforms) for up to 12 lanes.
 - 8) Start system connection directly to timer.
 - 9) External DC power port.
 - t. Be capable of updating internal software/firmware via Internet connection.
 - u. Timer software must have the ability to adjust the intensity of LED scoreboard brightness.
 - v. When recalled from memory, race distance and descriptions are automatically selected for the operator.
4. Printouts shall be on a printer connected to the timer user interface. Printout of race results shall be switch selectable in "Lane" or "Place" order, or both. A single keystroke shall print touchpad and backup button times. Printout shall include race number, event/heat number, event description to facilitate meets, and time & date stamp for each race. The system will allow the user to select any of 8 different data to be printed. Printout of relay judging to include both "plus" and "minus" takeoff times for each leg of the relay.
5. Product
- a. Model GEN7LEGACY SWIM TIMER.
 - 1) Quantity: One.
- C. Swim Timing Start System
- 1. Automated audio or visual timing start system capable of driving up to 20 individual lane/block speakers, or 2 underwater/aux speakers, relay judging platform strobe lights, and deck side start indicators with microphone.
 - 2. Portable metal non-corrosive enclosure, mounted on included tripod.
 - 3. The system shall have external connections for speedlights/additional external visual indicator/strobe light(s), Visual Start Sequence Controller, start output and speaker output.
 - a. User configurable outputs for speaker, strobes, and tones via onboard help menus on LCD screen.
 - 4. Battery operated with status indicator; rechargeable with external power supply.
 - 5. Products:
 - a. Model SSE - Champion Elite Start System with TR-3 Tripod.
 - 1) Quantity: One each.
 - b. Model CMP-WP25 foot jumper cable to wall plate.
 - 1) Quantity: One.
- D. Visual Start Sequencing System
- 1. Includes one External Visual Indicator per lane, VSS Controller, push button, connection cables, harness, splitter and carrying case.
 - 2. User configurable to function as lane indicator or strobe.

3. Product:
 - a. Model EVI-SYS-6 - External Visual Indicator.
 - 1) Quantity: One set.
- E. Speakers
 1. Underwater PVC and EPDM watertight construction speakers.
 - a. UL approved for low voltage underwater applications with 180dB sonic output.
 - b. Connects directly to Swim Timing Start System.
 - c. Product:
 - 1) Model SP-UND.
 - (a) Quantity: Two each.
 2. Auxiliary Speakers
 - a. 40 watt 8 ohm
 - b. Product:
 - 1) Model SP-125.
 - (a) Quantity: Two each.
- F. Wall Plate & Accessories
 1. Termination point for connections between deck cables, timers, start system, scoreboards, and other wall plates.
 2. Capable of connecting 50 wire military type connectors through a single connector, to prevent accidental disconnection.
 3. Mounts to 12 x12 inch junction box, finished flush to wall. Mount no closer than 18 inches above finished floor.
 4. Products:
 - a. Model WLP-A -Wallplate, Basic Timing.
 - 1) Quantity: Two each.
 - b. Model CHI-25-CPUA -Cable, Wallplate to Timing Console, 25 foot.
 - 1) Quantity: One.
 - c. cModel CMP-WP25-Cable, Champstart to wall plate, 25 foot.
 - 1) Quantity: One.
- G. Touchpad System
 1. Gutter hung all plastic exterior with uniform fine grit non-abrasive surface to prevent slippage.
 - a. Field verify gutter dimensions prior to fabrication.
 2. Dimensions: 78 inches wide by 22 inches tall x 0.366 inches thick.
 3. Contrasting colors with black end-wall cross pattern.
 4. System to include touchpads, 6-lane wiring harness, pushbuttons, touchpad meter and vacuum pump, and integratable with the timing system.
 - a. Provide addition
 5. Products
 - a. Model TP-78G -Aquagrip gutterhung touchpads.
 - 1) Quantity: Eight.
 - b. Custom gutter brackets -Special size Touchpad brackets.
 - 1) Quantity: Eight.
 - c. Model CAD-TP/P -Touchpad caddy for gutter hung touchpads.
 - 1) Quantity: One.
 - d. Model PB-6 - Pushbuttons.
 - 1) Quantity: Fourteen total.
- H. Relay Judging Platform
 1. Pressure sensitive platform to electrically indicate when a swimmer has left the starting block in relation to the incoming swimmer's touch of the touchpad.
 - a. Accuracy to be within 1/100th of a second.
 2. Non-skid surface to prevent slippage.
 3. Mounted or strapped to starting blocks.
 4. Platforms to include Speedlights; LED lights that flash with the start signal for competitive swimming competitions.

5. Product
 - a. Model RJPLD-2432 -CTS Relay Judging Platform with built-in LED Light for Start Reaction.
 - 1) Quantity: Six each.
 - b. Model CAD-RJPL-2 - Relay Judging Platform Caddy. Holds up to 10 platforms.
 - 1) Quantity: One each.
- I. In-Deck Plates
 1. Cover plate permitting plug-in connection for touchpads, back-up buttons, relay judging, start lights and speakers, and start signals.
 2. Resistant to pool water exposure, profiled to shed water, with titanium plug-in contacts.
 3. Titanium deckplates require a 4 x 4 inch junction box, mounted that deck plate shall be flush with deck tile.
 4. Product: Model TDP-200.
 - a. Quantity: Six each.
- J. Backstroke Start Device
 1. Self-retracting anti-slip backstroke wedge with 10 degree angle.
 2. Starting block mounted by anchor or strap.
 3. Product
 - a. Model 143081-C.
 - 1) Quantity: Six each.
- K. Scoreboard
 1. Full matrix full color LED scoreboard with a computer controller with the DisplayLink plus software.
 2. Display Includes:
 - a. Full color LED scoreboard with computer controller.
 - b. Mounting hardware and data/fiber cable up to 500'.
 - c. Display shall be comprised of red, blue, and green LEDs to form pixels.
 - d. Display shall be capable of 281 trillion shades of color.
 3. Display should be capable of 16-bit video processing, four levels of dimming capability, and allow for Gamma correction. Display brightness shall be adjustable up to 3000 nits.
 4. The display shall have built in graphics and animation capability with Windows based software. Graphics and animation shall have the capacity of being displayed on the entire matrix. All MS Windows fonts shall be compatible with the display.
 5. Display will allow for front service access.
 6. Each pixel shall be comprised of 3 LEDS, 1R1PG1B through hole.
 7. Display shall have 8MM pixel spacing center to center.
 8. Capable of being used with compatibility of Gen7 timer system.
 9. Displays swimming, diving, water polo, pace clock, and synchronized swimming functions, competitor's names, full matrix graphics and animation, live video, and has advertising capabilities.
 10. Active dimensions: 6.72' high X 12.6' wide.
 11. Total dimensions: 7.38' high X 13.26' wide.
 12. Indoor, full color, live video capable.
 13. Display shall include 3% critical spare parts.
 14. UL/CUL Certified Components.
 15. Operating temperature shall be -10°C - 40°C (14°F - 105°F).
 16. Humidity tolerance shall be 0% - 95%.
 17. Power requirements: 120 VAC, 2 amp per module, maximum.
 18. Provide facility name panels.
 - a. Artwork or copy furnished by Owner prior to order.
 19. Products
 - a. Model Colorado Time Systems LED Video Display
 - 1) Quantity: One.
- L. Scoreboard Software
 1. Operates LED matrix displays.

2. Receives data from Colorado Time Systems swim timers and multisport controllers.
3. Receives data from 3rd party Meet Management software.
4. Displays standard graphics formats (JPG, GIF, BMP, PNG).
5. Playback of standard digital video (AVI, MPG, WMV).
6. Allows creation of custom data templates with sport-specific information.
7. Stores Name and Team information for up to 12 lanes for an infinite number of events and heats.
8. Supports any Windows font as well as custom CTS bitmap (pixel-mapped) fonts.
9. Multiple options for displaying Team Scores and Full Event Results (standalone or in conjunction with Meet Management Software).
10. Quick message feature allows user-driven dynamic messaging.
11. Provides user ability to schedule automatic display of templates and graphics, with recurrences.
12. Runs on Windows software.

M. Diving Scoring System Software

1. Diving Scoring System Software shall support standard and synchronized scoring.
 - a. Accept five judges' input scores and compute award based upon proper formulas for five judges. Software shall be operable with either remote judges' terminals or manual input of flash card scores.
 - b. System must be expandable to use up to fifteen judges scoring terminals.
 - c. Permit display of the lead diver number, current diver number, dive number, degree of difficulty, judges' scores and diver's calculated award and total score.
 - d. Permit entry of all diving data into non-volatile memory for storage or receive data from meet management computer without additional modifications. Data shall include diver number, round number, dive number, and position. Degree of difficulty shall be automatically calculated based upon dive number per current World Aquatics/USD/NCAA/High School regulations. Dive degree of difficulty can also be manually input.
 - e. Automatically recall the diver with round number, dive number and DD using minimal keystrokes. Systems which require live entry of dive information are unacceptable.
 - f. Permit storage of diver's point totals and provide ranking of the divers at the end of each round.
 - g. Permit editing of judges' scores if required by meet officials.
 - h. Provide an output for computer data handling of diving events.
 - i. Permit two point deduction from the judges' scores and zero points for a failed dive. Such changes shall be clearly shown on the printout.
 - j. Printout shall provide preliminary data, diver ranking by rounds, and results of individual dives with judges' scores.
 - k. Judges' terminals shall be housed in sealed, water-resistant, shockproof housing.
 - l. The terminals shall provide a signal to inform the judge that the diving console has requested a score. Signal shall cease when an appropriate score is transmitted. They shall also allow each judge to input a score with a minimum of keystrokes, review that score via a built-in LCD display, and correct a score if needed before transmitting to the Judging Software.
 - m. The Software shall provide a switchable mode for sending data to the scoreboard display.
 - 1) Mode- Automatic- In this mode the software must send the judges scoring information to the display with no software operator interaction.
 - 2) Mode- Hold for Authorization – In this mode the software must receive authorization from a referee terminal or an assistant referee terminal prior to sending the scoring data to the display.
2. Remote judging terminal and interface shall be as follows:
 - a. Interface hub shall plug into the PC via USB 2.0 or greater
 - b. Judges terminals shall include a quick release mating connector for connection to the Diving Cable Breakout Box.
 - c. Judges' terminals shall include rugged communications cable to connect to the diving interface box. Cable should be removable for easy cost effective replacement of the cable.
 - d. Judges' terminals shall utilize sealed keyboards with a 128x64 Pixel Backlit LCD display suitable for indoor and sunlight readability.
 - e. Judges terminal LCD must be capable of displaying:

- 1) Divers Name.
 - 2) Divers Team or Country Name.
 - 3) Scores of other judges once the scores have been accepted.
 - 4) Dive and Dive Degree of Difficulty.
 - 5) Terminal Number so they can be easily identified to the judge.
 - f. Judges terminals shall include a request change button to notify the software that the judges input is requesting permission to correct the submitted score.
 - g. Judges terminals must be able to be assigned as a Referee's terminal or Assistant Referee's terminal allowing the device to control when the judging data is transmitted to the scoreboard display.
 - h. Product
 - 1) Model JT-01 - Judging Terminals with associated cables.
 - (a) Quantity: Five.
 - 2) Model IH-01 - Interface Hub Box with associated cables.
 - (a) Quantity: One.
 - 3) Model CB-01 - Cable Breakout Boxes with associated cables.
 - (a) Quantity: Two.
 - 4) Software to be installed on Owner provided Windows laptop.
- N. Slim Pace Clock with Time of Day Function
1. Four digit Slim pace clock with integrated real time of day chip.
 2. Red or amber LED digits shall be 13 inches high.
 3. Integrated 2.4GHz wireless with 12 operating channels to eliminate interference and synchronize time automatically with other slim pace clocks within the facility.
 4. Digits and circuitry must be conformal coated to protect against corrosion.
 5. LED digits must have variable intensity setting.
 6. Able to be used for either pace clock or time of day clock (hours and minutes or minutes and seconds).
 7. Enclosure: Powder-coated aluminum.
 8. High gain flush mount patch antenna will be mounted on an LED digit and protected by a Lexan cover to prevent breakage by errant balls and/or weather.
 9. Dimensions: 19.25 inches H x 42.25 inches W x 2.8 inches D.
 10. Controlled by a segment timer (WHC-2) for training purposes.
 11. Wall mounted for indoor or outdoor use.
 12. Products
 - a. Model SP-1400 - Slim Pace Clock.
 - 1) Quantity: Two.
 - b. Model K-TRIM-8 - Cord Cover Kit.
- O. Wireless Handheld Controller for Segment Timer
1. Wireless handheld controller shall allow operator to program:
 - a. Up to 10 programmable sets.
 - b. Reps
 - 1) Up to 50 programmable reps for each set.
 - 2) Hours can be set from 0 – 99.
 - 3) Minutes can be set from 0 – 99.
 - 4) Seconds can be set from 0 – 99.
 - 5) Each rep can be set to count up or count down.
 - 6) Beep can be programmed from 0 – 9 seconds.
 2. Capable of operating 2.4GHz slim pace clocks.
 3. Capable of selecting a specific wireless scoreboard address to send data to.
 4. Run on (2) AA alkaline or rechargeable batteries.
 5. Have an operating distance up to 1,000 feet
 6. Display must be transfective LCD screen that is easily readable in all environments from darkness to bright sunlight.
 7. Operate on 2.4GHz wireless and be FCC, CE, and RoHS compliant.
 8. Product:
 - a. Model WHC-1 - Wireless Handheld Scoreboard Controller.

1) Quantity: Two.

P. Pace Clock

1. Portable pace clocks with four 10 inch LED digits (red or amber), with minimum of 15 LED intensity settings, and the capability to adjust the LED intensity via the selectable dial.
2. Pace Clock Pro electronic training device shall be provided, enabling swimmers to perfect their starts, relay exchanges, and turn speeds.
3. Capability of being programmed by a handheld console (UPC-C) for pacing functions.
4. Pace clock/shot clock shall operate on AC power or two internal rechargeable 12 volt Lead Acid batteries. The internal battery will automatically be recharged while the clock is plugged in to the external power supply.
5. Pace clock shall have a battery life of 6 hours/internal rechargeable battery.
6. Capability of being located anywhere on the deck or mounted on a wall.
7. Pace clock shall have 5 ports to operate in conjunction with the following Colorado Time Systems equipment: push button(s), relay judging platforms, start system, and two touchpads.
8. Capable of connecting to other PC-PRO clocks with a wired connection.
9. Pace clock shall be capable of performing 15 training modes:
 - a. Lap counter.
 - b. Simple pace clock.
 - c. Pace clock with cumulative splits.
 - d. Pace clock with lap splits.
 - e. Relay exchanges.
 - f. Start reaction.
 - g. Turn speed.
 - h. Breakout time.
 - i. Start reaction & breakout time.
 - j. Five single-lane timing modes.
 - k. Mid-race timing.
10. Product
 - a. Model PC-PRO - Pace Clock
 - 1) Quantity: One.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify surfaces are clean, smooth, and without voids or irregularities.

3.2 INSTALLATION - ACCESSORIES

- A. Install pool accessories and fittings in accordance with component manufacturer's instructions.

END OF SECTION

SECTION 14 24 00

MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATOR

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified.

Elevator work includes:

1. Standard pre-engineered hydraulic passenger elevators.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Operation and control systems.
4. Jack(s).
5. Accessibility provisions for physically disabled persons.
6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
7. Materials and accessories as required to complete the elevator installation.

- B. Related Divisions/Sections:

1. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
2. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
3. Division 5 Metals:
 - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
4. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
5. Division 26 Electrical:
 - a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
 - b. Emergency power supply, transfer switch and auxiliary contacts.
 - c. Heat and smoke sensing devices.
 - d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
6. Division 22 Plumbing
 - a. Sump pit and oil interceptor.
7. Division 23 Heating, Ventilation and Air Conditioning
 - a. Heating and ventilating hoistways and/or control room.

- C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.

2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand

frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.

25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

1.2 SUBMITTALS

- A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.
- B. Shop drawings:
 - 1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 - 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 - 3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 - 4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- E. Metal Finishes: Upon request, standard metal samples provided.
- F. Operation and maintenance data. Include the following:
 - 1. Owner's manuals and wiring diagrams.
 - 2. Parts list, with recommended parts inventory.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
 - 1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
 - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:

1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. Building Code: National.
3. NFPA 70 National Electrical Code.
4. NFPA 80 Fire Doors and Windows.
5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
6. Section 407 in ICC A117.1, when required by local authorities

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:

1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
2. Arrange for inspections and make required tests.
3. Deliver to the Owner upon completion and acceptance of elevator work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.5 PROJECT CONDITIONS

- A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.6 WARRANTY

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.7 MAINTENANCE

- A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.

2. 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.
3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hydraulic Elevator Manufacturers
 1. Basis of Design: TK Elevator's Endura Machine Room-Less Hydraulic Elevator.
 2. Otis Elevator Company: www.otis.com
 3. Schindler Elevator Corporation: www.schindler.com
 4. Substitutions: See section 01 60 00 – Product Requirements

2.2 MATERIALS, GENERAL

- A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD.
- B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.
- C. Steel:
 1. Shapes and bars: Carbon.
 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
 3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture's standard selections.
- D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture's standard selections.
- E. Flooring by others.

2.3 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- D. Guides: Slide guides shall be mounted on top and bottom of the car.

- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed in a sealed steel casing having sufficient clearance space to allow for alignment during installation. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..
- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper viscosity grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)
- I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform "flooded pit operation", which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.
- J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.4 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
 - 1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
 - 2. An oil hydraulic pump.
 - 3. An electric motor.
 - 4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. 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.

- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
- 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.
 - 1. Relief valve shall be 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.
 - 2. Up start and stop valve shall be 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.
 - 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 - 4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
 - 5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
 - 6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
 - 7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
 - 8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.5 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
 - 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
 - 2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.
 - 3. Typical door & frame finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.
- B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

- C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details
- D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
 - 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 - 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
 - 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.6 PASSENGER ELEVATOR CAR ENCLOSURE

- A. Car Enclosure:
 - 1. Walls: Cab type TKS, reinforced cold-rolled steel. Walls shall be finished with factory applied powder coat.
 - 2. Reveals and frieze: Not Applicable
 - 3. Canopy: Cold-rolled steel with hinged exit.
 - 4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
 - 5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
 - 6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - a. Door Finish: Stainless steel panels: No. 4 brushed finish.
 - b. Cab Sills: Extruded aluminum, mill finish.
 - 7. Handrail: Provide 2' flat metal bar on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
 - 8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
 - 9. Protection pads and buttons: Not required
- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.7 DOOR OPERATION

- A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
 2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
 3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
 4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
 5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
 6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
 7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
 8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.8 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Provide Auxiliary Operating Panel
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
- E. Special Equipment:
Limited Access Operation: Keyswitch and card reader space.(card reader by others)
- F. Digital Services: Cloud-based IoT monitoring system comes standard with these options:

Remote Monitoring with Application Programming Interface (API) Integration

ADA Phone - Code Compliant Cellular Connectivity

A17.1 2019 Code - Enhanced Communications

Smart Device Elevator Calling with occupant app API integration

2.9 CONTROL SYSTEMS

- A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
- B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
 - 1. Access to main control board and CPU
 - 2. Main controller diagnostics
 - 3. Main controller fuses
 - 4. Universal Interface Tool (UIT)

5. Remote valve adjustment
 6. Electronic motor starter adjustment and diagnostics
 7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
 8. Operation of auxiliary pump/motor (secondary hydraulic power source)
 9. Operation of electrical assisted manual lowering
 10. Provide male plug to supply 110VAC into the controller
 11. Run/Stop button
- C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- D. Emergency Power Operation: (Battery Lowering 10D-0C) When the loss of normal power is detected, a battery lowering feature is to be activated. The elevator will lower to a predetermined level and open the doors. After passengers have exited the car, the doors will close and the car will shutdown. When normal power becomes available, the elevator will automatically resume operation. The battery lowering feature is included in the elevator contract and does not utilize a building-supplied standby power source.
- E. Digital Services:
- Cloud-based IoT Monitoring System (standard): Contractor shall provide a cloud-based IoT (internet of things) monitoring system capable of tracking door movements and timing, trips, power cycles, car calls, out-of-service events and modes. This observation will continue 24/7 and it shall be capable of providing service technicians a minimum of three recommended solutions for defined failure events and automatically dispatch service technicians in the event of failure(s) while sending notifications to end users of changes in their equipment's state via both email and mobile device. Access to IoT and related equipment data and status will be made available in both a web portal and mobile application secured by password and username with at least two-factor authentication. Finally, this system must be self-contained and not require internet provision by others.
- Along with the monitoring system, options are available.
- Remote Monitoring with Application Programming Interface (API) Integration: Contractor shall provide a portal and mobile device application (app) that communicates relevant service and operational information such as elevator operational status, open service call tickets, call ticket history and performance and service history. This system shall provide a REST application programming interface (API) capable of transmitting relevant information from the cloud-based IoT monitoring system. This data includes equipment operational status, door movements, service and maintenance history, traffic statistics and failure alerts.
- ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at

a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

A17.1 2019 Code – Enhanced Communications: For jobs installed under enforcement of 2018 International Building Code or ASME A17.1-2019/CSA B44:19 Safety Code, contractor will provide a video camera necessary for viewing the elevator cab interior floor as well as a position indicator display in the cab operating panel capable of providing means of two-way, text-based communication when the emergency call button is engaged in the elevator car. These components, and associated cloud-based monitoring platform, will be non-proprietary in nature, allowing customization on where to direct emergency calls, while offering capability for any party to provide the emergency monitoring services.

Smart Device Elevator Calling with Occupant app API Integration: Contractor will provide an elevator calling application for smart devices (app) that can be accessed through Android and IOS smart device operating systems. This calling service shall be accomplished on both, Destination Dispatch and Traditional ETA elevator control system applications. Furthermore, a single, common and consistent app shall have the same user experience and user interface on both Destination Dispatch and Traditional ETA dispatching control systems. To enable mobile calling functionality without creating unnecessary wear on elevator components resulting from false calls, proximity detection beacons shall be installed in the elevator lobby at each floor. These beacons shall detect user smart devices and restrict calling of elevators when the user is not within a pre-configured range of elevator entrance. Beacon-based proximity detection distance must be configurable to accommodate various building and floor layouts. Once Bluetooth signal is detected, the user can place a floor call directly from their handheld or wearable device. The elevator calling app shall remove the need for interaction with hall fixtures, buttons or kiosks. This system shall be capable of placing an automatic call to a user-configured destination floor automatically based on both location in building (floor) and time of day. App users shall be able to configure their own source or starting floor, destination floor and schedule of automatic calling service, and be able to configure multiple automatic calling services and routines. System shall have reasonable ability to auto-provision users from access control system and not require duplicate entry of users for access control purposes. Finally, all services above shall be made available via an application programming interface (API) so that a 3rd party or tenant occupant app could be integrated with elevator smart device calling service so that users could receive multiple occupant experience-based services in a single, common, 3rd party mobile device application (app).

2.10 HALL STATIONS

- A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
 - 1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
 - a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
- C. Hall Position Indicator: Not Applicable
- D. Hall lanterns: Not Applicable

- E. Special Equipment:
Limited access operation: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.
- B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.
- C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 EXECUTION

3.1 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
- C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

- D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
- G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
- H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
- I. Lubricate operating parts of system, where recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
 - 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

- A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.
- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 ELEVATOR SCHEDULE

- A. Elevator Qty. 1
 - 1. Elevator Model: endura MRL Twinpost above-ground 1-stage
 - 2. Elevator Type: Hydraulic Machine Room-Less, Passenger
 - 3. Rated Capacity: 2100 lbs.
 - 4. Rated Speed: 110 ft./min.
 - 5. Operation System: TAC32H
 - 6. Travel: 12'-0"
 - 7. Landings: 2 total
 - 8. Openings:
 - a. Front: 2
 - b. Rear: 0
 - 9. Clear Car Inside: 5'-8" wide x 4'-3" deep
 - 10. Inside clear height: 7'-4" standard
 - 11. Door clear height: 7'-0" standard
 - 12. Hoistway Entrance Size: 3'-0" wide x 7'-0" high
 - 13. Door Type: One-speed | RH Side opening
 - 14. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
 - 15. Seismic Requirements: Zone
 - 16. Hoistway Dimensions: 7'-4" wide x 5'-9" deep
 - 17. Pit Depth: 4'-0"
 - 18. Button & Fixture Style: Traditional Signal Fixtures

19. Special Operations:

Limited Access with card readers by others

20. Digital Services:

Remote Monitoring with Application Programming Interface (API) Integration

ADA Phone - Code Compliant Cellular Connectivity

A17.1 2019 Code - Enhanced Communications

Smart Device Elevator Calling with occupant app API integration

END OF SECTION

SECTION 14 28 19
ELEVATOR EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide all labor, equipment and materials for the complete modernization of the elevator systems detailed herein.

1.2 RELATED REQUIREMENTS

- A. Section 09 68 13 - Tile Carpeting: Floor Finish in car
- B. Section 09 91 23 - Interior Painting: Field painting of hoistway entrance doors and frames.
- C. Section 26 05 00 - Common Work Results For Electrical: Electrical power for elevator installation and testing.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.
- C. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, Dumbwaiters, and Material Lifts; 2023.
- D. ASME QEI-1 - Standard for the Qualification of Elevator Inspectors; 2024.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- F. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.
- G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- N. NEMA MG 1 - Motors and Generators; 2018.

- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Prior to submission of cost proposal, 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 Owner, in writing, no less than seven (7) days prior to bid for resolution. Submission of discrepancies in writing will be accepted in writing via email, facsimile, or mail. All requests will be answered and copied to all interested vendors.

1.5 SUBMITTALS

- A. Prior to commencement of fabrication, submit details of proposed replacement items and finish samples for selection for approval. No fabrication will proceed without approval.
- B. Product Data: Submit data on following items:
 - 1. Signal and operating fixtures, operating panels, and indicators.
 - 2. Car layout, and components.
 - 3. Car and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
 - 1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 - 2. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
 - 3. Location and sizes of hoistway and car doors and frames.
 - 4. Electrical characteristics and connection requirements.
 - 5. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- B. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.
 - 1. The Contractors Management, Field Management and Field Leadership Staff must have been performing elevator maintenance, service repairs and modernization for a minimum of five years.
- C. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.7 MAINTENANCE

- 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.
- C. Manufacturer shall have a service office and full-time service personnel within 120-mile radius of the project site.
- D. 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. 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 during regular working hours

1.8 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 New York 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, current applicable Building Code, NFPA 70, and ADA Standards.
- C. Codes referenced shall be deemed a minimum. Fixtures and equipment specified that exceed these requirements shall be provided as specified.

1.9 OWNER'S MANUALS AND WIRING DIAGRAMS

- A. The following shall be provided upon completion and prior to Final Acceptance of the Installation:
 - 1. Drawings submitted.
 - 2. Two (2) complete sets of Wiring Diagrams for the elevator submitted to the Owner.
 - 3. One (1) complete set of Wiring Diagrams to be left in the elevator equipment room for use by maintenance personnel.
 - 4. Provide all instruments, specialty tools, and equipment necessary for proper maintenance and service of the elevator. These should also include ALL programming / installation tools and manuals.
- B. Ownership of all above noted instruments, manuals, tools, and/or equipment will convey to the Owner upon completion and Final acceptance of the elevator and will be retained on site in a location to be designated by the Owner.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials, components and equipment in manufacturer's protective packaging. Store materials in a dry protected area provided by building owner. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration.

1.11 WARRANTY

- A. The Elevator Contractor shall warrant that the material and workmanship of the equipment installed by them under these specifications will be first-class in every respect and will make good any defects except those due to improper use, which may develop within twelve months from the Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: ThyssenKrupp Elevator: www.thyssenkruppelevator.com/#sle.
- B. Other Acceptable Manufacturers:
 - 1. Otis Elevator: www.otis.com/#sle.
 - 2. Schindler Elevator Corporation: www.schindler.com/#sle.

NO PROPRIETARY SOFTWARE / HARDWARE EQUIPMENT SHALL BE INSTALLED

2.2 MATERIALS:

- A. Steel:
 - 1. Shapes and bars: ASTM A36/A36M.
 - 2. Sheet: ASTM A1008/A1008M, cold-rolled steel sheet, commercial quality, Class 1, matte finish, stretcher leveled.
 - 3. Finish: Factory-applied baked enamel.
- B. Stainless steel:
 - 1. Shapes and bars: ASTM A276/A276M, Type 300 (18-8).
 - 2. Tubing: ASTM A269/A269M, Type 300 (18-8).
- C. Aluminum:
 - 1. Sheet and plate: ASTM B209, alloy 6063-T52.
 - 2. Extrusions: ASTM B221, alloy 6063-T52.
- D. Plastic laminate:
 - 1. Decorative high-pressure type, complying with NEMA LD 3, Type GP-50 General Purpose Grade, nominal 0.050" thickness.

2.3 SYSTEM OPERATING FEATURES

- A. Duty
 - 1. The present capacity and speed will be retained: 2500 lbs. @ 200 ft./min.
- B. Travel
 - 1. The present travel and rise will be retained.
- C. Stops and Openings
 - 1. The present stops and openings will be retained: 2 Stops, 2 Openings.
- D. Automatic Self-Leveling
 - 1. The elevator shall be provided with automatic self-leveling that shall typically bring the elevator car level with the floor landings +/-1/4" regardless of load or direction of travel.
- E. Operation: One Car

1. Operation shall be automatic by means of the car and landing buttons. Stops registered by momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at that landing to enable the stop to be made. The direction of travel for an idle car shall be established by the first car or landing button actuated.
 2. Landing calls shall be answered while the car is traveling in the up direction and "DOWN" landing calls shall be answered while the car is traveling down. The car shall reverse after the uppermost or lowermost car or landing call has been answered, then proceed to answer car calls and landing calls registered in the opposite direction of travel.
 3. If the car without registered calls arrives at a floor where both up and down hall calls are registered, it shall initially respond to the hall call in the direction that the car was traveling. If no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite directions. Direction lanterns, if furnished, shall indicate the change of direction when the doors reopen.
 4. An independent service switch shall be provided in the car operating panel which, when actuated, shall cancel previously registered car calls, disconnect the elevator from the hall buttons and allow operation from the car buttons only.
- F. Firefighters' Emergency Operation (FEO)
1. Special Emergency Service operation shall be provided in compliance with the latest applicable revision of the ASME A17.1 Code.
 2. Firefighters' Emergency Operation Phase I to return the elevator non-stop to a designated floor shall be initiated by an elevator smoke detector system or a key switch provided in a lobby fixture.
 3. Provide contacts on the elevator controller to receive signals from the smoke detector system.
 4. A FEO cabinet shall be installed in the Car Operating Panel with a key switch for in-car control of the elevator when on Phase II of FEO.
 5. If the elevator is on independent service when the elevator is recalled on Phase I operation, a buzzer shall sound in the car and a jewel shall be illuminated, subject to applicable codes.

2.4 ELEVATOR MODERNIZATION EQUIPMENT

A. Controller

1. A microprocessor-based control system shall be provided to perform all the functions of safe elevator motion and elevator door control. This shall include all the hardware required to connect, transfer and interrupt power, and protect the motor against overloading.
 - a. 24 VDC signal voltage.
 - b. Auto light & fan feature.
 - c. Car Independent Service.
 - d. Car Traveling Lantern circuitry.
 - e. Door bypass operation.
 - f. Electronic door detector interface.
 - g. Hoistway access and enable.
2. The controller cabinet containing memory equipment shall be properly shielded from line pollution. The microcomputer system shall be designed to accept reprogramming with minimum system downtime.
3. Real-time, cloud-based predictive maintenance capabilities.
4. Battery Lowering in controller:
 - a. Provide an Emergency Return Unit (ERU) providing auxiliary power to the hydraulic elevator. In the event of a primary power failure or a single-phase condition, the ERU is designed to automatically return the elevator to its lowest landing at normal speed and allow all passengers to exit safely.
 - b. Four to six seconds after a power failure has been sensed, an electronic timer in the ERU is designed to turn on an inverter (converting DC battery power into elevator operating voltages). Six seconds later, the device is designed to send a signal to the microprocessor to disengage the hall and car floor buttons, close the door(s), and open the valve to return the car to the lowest landing at normal speed.

- c. When the car reaches the lowest landing, the ERU is designed to open the door(s) for a preset time. The device is also designed to allow the DOOR OPEN button to continue to operate normally to allow passengers to exit safely. After all passengers have exited, the car remains parked with the door(s) closed. To preserve battery life, the ERU is designed to turn off after four minutes.
 - d. If all elevator controls are in normal position, the elevator will be able to resume normal operation when building power is restored. Once main power has returned, it takes from six to 24 hours for the batteries to become fully charged, depending on the amount of power consumed in performing an ERU operation.
 - 5. Solid state starter: A new solid-state starter will be provided to control the motor starting and limit the in-rush current. The new starter will have built in protection for overload conditions, reverse phase, loss of phase, and shortened SCR. It will be of the same power requirement and starting configuration as presently exists.
 - 6. Viscosity control.
- B. Power Supply
 - 1. The present power supply will be retained.
- C. Power Unit:
 - 1. The existing power unit shall be replaced with a new submersible power unit. The new power unit consists of a positive displacement pump, motor, integral 4-coil control valve, oil tank and muffler. The pump and motor are submerged and are mounted to the tank with rubber isolators to reduce vibration and noise. The pump and motor are externally mounted and are belt driven. A muffler is provided to dissipate pulsations and noise from the flow of hydraulic fluid. The valve consists of up, up leveling, down and down leveling controls along with manual lowering and a pressure relief valve.
- D. Car & Cab Equipment:
 - 1. Car Equipment:
 - a. Toe Guard.
 - b. Fan: Two-speed.
 - c. Car top exit switch.
 - 2. Cab Equipment:
 - a. Car door.
 - b. Enclosure.
 - 3. Door Equipment:
 - a. Hoistway doors with Gibs & Escutcheons as needed - Front
 - b. Front hoistway door equipment, complete:
 - 1) Tracks & hangers - The existing tracks, hangers, rollers and interlocks shall be replaced. A thorough examination will be made of all mechanisms. All replacement components will be the original manufacture replacement parts or equal. Components will be cleaned, inspected and adjusted as necessary.
 - 2) Interlocks & pickups - interlock / pickup assemblies for existing Dover operators including closers - Front.
 - 3) Reel closers.
 - c. Door Operator with complete carside equipment (Front):

- 1) A new closed loop door operator shall be provided. Doors on the car and at the hoistway entrances shall be power operated by means of a closed loop door operator mounted on top of the car. The door operator is a closed-loop system designed to provide consistent door performance despite changes in temperature or wind and despite the presence of minor debris in the door track. The system continuously monitors door speed and position and adjusts them to match the predefined profile. Door operation shall be automatic at each landing, with door opening initiated as the car arrives at the landing. Closing will take place after an adjustable time interval expires. An electric car door contact shall prevent the elevator from operating unless the car door is in the closed position. Door close shall be arranged to start after a minimal time, consistent with disabled persons' requirements. Doors shall be arranged to remain open for an adjustable time period sufficient to meet ADA requirements. Elevator cars' door-open time intervals, when the car is at a landing, shall be adjustable independently for the cars' responses to car and hall calls.
 - d. Door Protection Device
 - 1) A solid state infrared passenger protection system shall be installed on the car door. The system shall continuously scan for interrupted beams. If any beam in the curtain is interrupted, the system will reopen the elevator door instantly. The systems infrared beams will also detect approaching objects within the elevator entrance which reduces potential for damage to elevator doors.
 - e. Door Restrictors
 - 1) Provide new code compliant restrictors.
 - f. Elevator Doors and frames on each floor shall be primed and painted, color to be determined.
- E. Hoistway Equipment:
1. HN Boxes (per each (2) cars, grouped).
 2. Steel tape with mounting hardware, selector and magnets (terminal limits included)
 3. Controller field friendly wiring package including:
 - a. Single travelling cable.
 - b. Hoistway wiring.
 - c. Interlock wiring.
 - d. Interlock connectors.
 - e. Serial wiring.
 4. Hoistway duct kit.
- F. Pit Equipment:
1. Pit Switch: An emergency pit stop switch shall be located in the pit accessible from the pit access door.
 2. Shutoff valve kit.
 3. Pit Ladder.

2.5 ELEVATOR FIXTURES AND AESTHETICS

- A. Car Operating Panel
1. Provide a new applied Car Operating Panel containing all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish. It shall contain a bank of round satin stainless steel, LED illuminated mechanical buttons. Flush mounted to the panel and marked to correspond to the landings served.
 2. The car operating panel shall be equipped with the following features:
 - a. Raised markings and Braille to the left-hand side of each push-button.
 - b. Digital Car Position Indicator at the top of and integral to the car operating panel.
 - c. Door open and door close buttons.
 - d. Inspection Station.
 - e. Hoistway Access switches or Lunar Key Access as required by code.
 - f. Emergency Communications:
 - 1) Comply with the requirements of ASME A17.1, and as supplemented herein.

- 2) Provide two-way hands free communications between the car and a location inside the building, switching over to another location if the call is unanswered, where authorized personnel are available who can take the appropriate action.
 - 3) Communications system shall support both verbal and non-verbal communication, activated by push button, and shall be located in accordance with current ADA requirements. Indication shall be given to acknowledge that communications with authorized personnel have been established.
 - 4) Operating instructions shall be incorporated or posted adjacent to the activation push button.
 - 5) Provide a means to display video to observe passengers at any location on the car floor to authorized personnel for entrapment assessment.
 - 6) Emergency communications systems shall automatically transfer to an auxiliary power supply if normal building power fails.
 - g. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
 - h. An emergency power unit employing a 12-volt sealed rechargeable battery and a totally static circuit shall be provided within the car operating panel. The light shall illuminate the elevator car and provide current to the alarm bell in the event of normal power failure. The equipment shall comply with the requirements of the latest revision of the ASME A17.1 Code.
- B. Hall Buttons
1. Provide new stainless-steel hall buttons and faceplates at each landing with a single button at each terminal landing. Faceplates shall be surface mounted to wall.
 2. A call shall be registered by momentary pressure of a landing button. The button shall become illuminated and remain illuminated until the call is answered. All buttons to be long life LED illumination.
- C. In Car Lantern and Chime
1. Install in the car entrance, a new car lantern with chime indicating directional lantern visible from the corridor. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
- D. Cab Interiors
1. Renovate the interior of the elevator which shall include the following:
 - a. New cab interior panels – The existing elevators shall have the existing panels removed to accommodate the Interiors Package. This shall include a modular horizontal panel system that spans the full width of the wall sections. Reveals shall be installed in the corners and against the return and strike jamb portions of the interior. Panels shall be finished in plastic laminate as selected from full laminate selections. The base shall be finished in plastic laminate. Furnish a one-eighth inch satin stainless steel inlay in the horizontal reveals between each panel.
 - b. Ceiling: New frame ceiling with LED lighting shall be furnished.
 - c. Handrail: New satin stainless-steel handrails shall be mounted to the new interior. panels on the rear wall and side walls in accordance with ADA requirements and local governing codes.
 - d. Contractor to remove existing floor covering and provide new carpet tile flooring. See Section 09 68 13 - Tile Carpet for requirements.
- E. Emergency Lighting
1. Provide as required by code.

2.6 REMOTE SERVICES

A. Remote Services

1. A microprocessor system that continuously monitors the Unit(s) on a 24-hour per day, year-round basis will be provided. The system will notify a dispatching center that the elevator is inoperative by sending a message via telephone line. This makes it possible to have a mechanic dispatched rapidly in response to such a message.
2. The monitoring system will collect data on the equipment condition whether the operation of a Unit has been interrupted.

2.7 GENERAL REQUIREMENTS

A. Wiring

1. All insulated conductors and conduits or tubing as well as fittings including metal boxes, troughs and ducts to comply with the requirements of NFPA 70.
2. Provide complete, new insulated wiring to connect all parts of new equipment and interface with retained components.
3. 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.
4. 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.
5. Provide dedicated ground where required by control equipment manufacturer. Ground all motors, controller cabinets, junction boxes and disconnects.

B. Engineering Design

1. All new material furnished shall be specifically designed to operate with the original equipment being retained, thus assuring maximum performance and eliminating any divided responsibility.

C. Permits and Inspections

1. The elevator contractor shall furnish all licenses and permits and shall arrange for and make all required inspections and tests.

D. Code

1. The elevator equipment shall be furnished and installed in accordance with the applicable version of the ASME A17.1 Safety Code for Elevators and Escalators, An American National Standard, including the latest Supplement, and the Americans with Disabilities Act.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, and machine room are ready for work of this section.
- C. Verify that electrical power is available and of correct characteristics.

3.2 INSTALLATION

- A. Install system components, and connect equipment to building utilities.
- B. Provide conduit, electrical boxes, wiring, and accessories. Refer to Sections 26 05 33.13.
- C. Install hydraulic piping between cylinder and pump unit.

- D. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- E. Adjust equipment for smooth and quiet operation.

3.3 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.
 - 1. Testing and inspection by regulatory agencies certified in accordance with ASME QEI-1.
 - 2. Perform tests as required by ASME A17.2.

3.4 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.

3.5 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Demonstrate proper operation of equipment to Owner's designated representative.
- C. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Manufacturer's training personnel.
 - 4. Location: At project site, unless noted otherwise.

END OF SECTION

SECTION 19 20 00
THEATRICAL LIGHTING, DIMMING & CONTROL SYSTEMS

PART 1 - GENERAL

1.1 PROJECT INFORMATION:

- A. Owner: Alfred Almond Central School District
6795 Route 21
Almond, New York 14804
- B. Architect: Hunt Engineers, Architects & Land Surveyors P.C.
Airport Corporate Park
100 Hunt Center
Horseheads, New York 14845
- C. Consultant: AVL Designs, Incorporated
1788 Penfield Rd, Suite 1
Penfield, New York 14526
Phone (585) 586-1100
- D. Contractor: The successful bidder for the work described herein. Also referred to as the Theatrical Contractor (TC), the lighting contractor, the lighting installer or the bidder.
- E. Others: Various companies doing construction work under the general contract.

1.2 PROFESSIONAL STANDARDS:

- A. The contractor is expected to install all work to the appropriate industry professional standards, manufacturer recommendations, and current applicable codes. If any work required exceeds the skills of the contractor, they will employ appropriate subcontractors for the scope required.
- B. The acceptability of materials and workmanship will be determined by the Architect, Consultant, and CM.
- C. Any new/removals related work or adjacent/mounting surfaces, etc. that might become damaged, have holes cut into them, receive anchorages, left with holes, etc. due to removals work, become inadvertently over sprayed/painted or become dirty during construction and the installation of the indicated devices will be protected/patched by the contractor (this includes patching to match existing & painting/repainting all affected walls, ceilings, misc. surfaces, boxes, devices, etc.). All responsibility for protection & patching work shall be by the contractor. The contractor shall provide final cleaning and/or repair of all equipment, patching/painting related surfaces, etc. related to or in their scope to like new (and to match adjacencies) condition.
- D. The contractor will attend and/or arrange meetings as required to make sure their scope is coordinated with all other trades. The contractor is responsible to make known to all other trades critically dimensioned items and locations to avoid conflicts. Where conflicts occur follow required procedures in the project manual to seek resolution.
- E. Where any substandard work is provided by related trades that impedes the work of the contractor, they will notify the CM, Consultant, Architect, or Engineer in writing as called for one the project manual to rectify the issue.

- F. Where work is provided by others the contractor is responsible to verify installation conditions that relate to their work. If installation of related work is substandard the contractor shall generate a written RFI through proper channels based upon the project manual. The contractor shall not install their work to any substandard devices, etc. provided by others until such work has been resolved or until the contractor has received written authorization from the construction manager to proceed. If the contractor ignores substandard installation work by others and proceeds to install his devices to these items, then he accepts and bears sole responsibility to repair, reinstall and correct any found deficiencies to the satisfaction of the owner upon final inspections.
- G. The contractor will comply with the AHJ (Authority Having Jurisdiction) as it relates to programming any and all emergency interfaces.
- H. The contractor is expected to possess knowledge of the equipment of their industry and to provide all small items required to install the specified equipment. Provide small items such as rack rails, DIN rails, rack panels, power cords, connectors, wall-wart power supplies, crimps, Nicopress and other items that may not be called out on drawings or in specs but are required to support primary equipment.
- I. When in doubt about any aspect of the work the contractor should not proceed until they obtain clarification from the appropriate entity following procedures detailed in the project manual.

1.3 DEFINITIONS:

Code Requirements	Minimum requirements as specified by all applicable and published codes.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Diagrammatic	A diagram, paragraph, note or drawing serving to explain general intents and requirements (not necessarily an exact representation).
Devices	Any piece of gear, equipment, indicated component and any misc. related items required to implement and install a fully functioning system.
Equal or Equivalent	Equally acceptable as determined by Owner's Representative.
ETR	Existing to remain.
Extend	To increase the length(s) of any indicated conduit/wiring, etc. so as to reach a particular specified or implied point – including the provision of any misc. additional equipment as required for proper extension and to maintain full system functionality.

Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location to the appropriate trade responsible for installation.
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 items and make ready for use.
Labeled	Refers to classification by a standards agency.
Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional, Construction Management or Clerk of the Works.
Patching	Repair/repainting of holes, marks and damage/damaged surfaces left from removals or new installations work. Consult project manual for additional requirements.
Provide	Procure all required materials, labor, coordination and equipment and locate, install, connect and test 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.
Remove	Safely Disconnect including any and all wiring, hardware, conduit (except concealed), anchors, suspension hardware etc. Legally dispose of items not called out to be offered to or returned to owner.
Review	A general contractual conformance check of specified products.

Satisfactory	As specified in contract documents.
Shall	Indicates that the contractor must perform work and provide devices as indicated. This is a mandatory, obligatory, contractual requirement and is not optional in any way.
VIF	Verify in field.

Refer to General Conditions of the Contract for additional definitions.

1.4 INTENT OF DRAWINGS:

- A. Throughout the contract documents there are various manufacturers and products referenced. It is understood that these products establish a basis of design that all other "or equal" substitutions must meet or exceed. All submitted devices must be the referenced product or approved equal.
- B. The drawings in this package are diagrammatic in nature, unless detailed dimensioned drawings are included. The drawings show the approximate locations of equipment and devices. The final and exact locations of all non-dimensioned devices are subject to the approval of the Owner or the Owner's Representative. Devices with detailed installation dimensions; however, are critically located and must be installed to those indicated dimensions unless alternate instructions have been given to the contractor in writing by the consultant.
- C. The contractor(s) shall inspect the entire building(s) with the Owner's representative prior to beginning any work and shall identify the exact locations and installation methods for all devices, conduit and wiring prior to beginning work.
- D. Typical details are shown for the installation of various devices. The details do not apply to all situations. Installation methods for all work shall be subject to the Owner's and construction manager's approval. Provide all work and equipment required for a professional, workman-like installation.

1.5 SECTION INCLUDES BUT IS NOT LIMITED TO:

- A. Removals – May include storage and reinstallation of some items.
- B. Provision of Theatrical lighting system and related work scope as indicated on drawings, including controls for lighting fixtures.
- C. Furnishing some equipment for install by others.
- D. Wiring, setup, focus and commissioning.
- E. Training and closeout documents.

1.6 RELATED SECTIONS & DOCUMENTS:

- A. The contractor(s) shall examine the full set of construction drawings and specifications and ascertain all aspects of the scope of work described within this specification. The contractor will be responsible for cooperation with and adherence to the overall scope and intent of the project relative to the work being done by the contractor.
- B. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 0, 1 and 26 specification sections apply to work of this section (related

specification sections may vary depending upon the particular CSI format being adhered to). All related drawings, contract conditions and general requirements found in the project manual that apply to the general contract will apply to the work described in this specification. Examine all referenced documents for general project requirements relating to the work in this specification. Contact the architects, engineers and/or construction manager for any clarification required to properly bid this project. It is the contractor's responsibility to obtain necessary clarification before bidding. No change orders will be allowed for existing project conditions and contractor requirements not properly investigated by the contractor.

1.7 RELATED WORK NOT INCLUDED:

- A. Electrical Removals Work: The electrical contractor shall be removing extensive portions of the existing dimming and architectural control systems, wiring, feeders, racks, etc. The TC will need to coordinate with the EC as it relates to these systems and any items that could potentially be reused.
- B. Electrical: The electrical service for the lighting system will be provided by the EC/electrical contractor. The specialties contractor (TC) will need to coordinate his work with the availability of electrical service. The electrical requirements are detailed and extensive and are as noted on the contract drawings.
- C. Electrical: The EC shall be providing fairly extensive removals work as part of the lighting systems removals. The electrical removal requirements are detailed on the contract drawings.

1.8 GENERAL REQUIREMENTS:

A. ITEMS TO BE PROVIDED BY OTHERS:

- 1. Electrical services by Division 26 Contractor. See drawings for more information.
- B. Removals - Offer all existing portable and removed equipment to the owner prior to legally disposing of these items. Obtain written permission from the owner for all existing removed items that they do not desire to retain prior to disposal.
- C. Provide all equipment outlined and described within this specification and assemble it into a complete, properly functioning system for use by the owner as described within this specification.
- D. It is the contractor's responsibility to clarify any misunderstandings or drawing-to-drawing/drawing-to-spec discrepancies prior to bid. In cases of a difference between stated quantities in drawings, specs or electrical drawings, the higher quantity will prevail.
- E. Check each component before installation as well as each portion of the project during installation to ensure that the intent of this specification is achieved.

1.9 BIDDER QUALIFICATIONS – SUBMITTALS:

- A. The bidder shall provide references of at least three (3) installations of comparable scope performed by the bidder, including location, system description, and name, address, and telephone number of the architects, consultants, and owners and the names of contract persons for each.
- B. The bidder must maintain service facilities and have service available on site within 24 hours. The bidder must be a factory authorized dealer for all products submitted and may be required to submit such proof of factory authorization in writing, or in the form of copies of authorized agreements with the various vendors.

- C. The bidder and all persons performing theatrical lighting system related work on this project must be certified (those performing low voltage terminations, system commissioning, programing, fixture focus/hang, DMX/RDM/Network addressing and other related areas). This will require the installer to either be a current ETCP (Entertainment Technician Certification Program) certified entertainment electrician or an equivalent factory trained and certified installer (from the equipment supplier) or a crew working under the direct supervision of a certified foreman (of either certification described above). This applies to all theatrical lighting equipment installation and any other assemblies indicated as being provided or installed by the contractor. Proof of current certification MUST be provided in the submittals package (this is typically in the form of a pdf copy of the current and active certification certificates from PLASA). Out of date or expired certifications shall not be recognized as meeting the requirements of ETCP certification.

1.10 INQUIRIES AND COMMUNICATIONS:

- A. All questions should be posed in writing as called for in the project manual.
- B. Direct communications to the consultant via phone are recommended for initial discussion about intent or site issues. (unless prohibited in the project manual). No action may be taken based on verbal communications, they must be followed up in writing as called for in the project manual.
- C. Where discrepancies occur, and pre-bid instructions have not been obtained by written request, the contractor will abide by the owner's decision at no additional cost to the owner.

1.11 COORDINATION:

- A. Cooperate with other trades to achieve well-coordinated progress at all times. Notify the owner and consultant as often as necessary with regards to job progress or changes in the installation schedule. No change orders for additional payment will be allowed based upon conflicts with other trades on the project site. All such conflicts will be reported to the architect, construction manager, owner, and consultant in writing. All reasonable attempts will be made to correct any difficulties.
- B. Staff the job site adequately at all times to maintain a progress in keeping with the total project progress. No allowances will be made for overtime required to maintain job progress.
- C. Provide all materials to be installed by others in a timely fashion based upon the related trades' schedules.
- D. The job site will be left in a clean safe condition at the end of any workday. All cleanup and debris removal to a site designated by the owner will be the responsibility of the bidder on a daily basis.
- E. All storage of tools and materials will be done by the contractor. No on-site storage security will be provided by the owner.
- F. The contractor will attend regular meetings with the architect, owner, general contractor, and the consultant when requested by any of the above, in order to achieve project coordination and progress.
- G. The contractor shall be required to share all approved lighting system shop drawings with the EC prior to rough-in. He shall work closely with the electrician in determining final control wiring types, quantities and requirements, related device locations, backbox sizes, conduit routings, etc. before the EC has purchased his supplies and in order to meet the construction schedule.

1.12 DELIVERIES:

- A. It is each contractor's responsibility to receive all device shipments, equipment, deliveries, etc. for their own equipment on/at the job site personally. Each contractor shall be responsible to arrange for storage of all received materials on site until the appropriate time when they shall either turn them over to installing contractor or install them.
- B. If the contractor chooses to allow a third party to receive shipments on his behalf the contractor bears sole responsibility for any missing and/or damaged parts.
- C. Any equipment that is furnished by the contractor for installation by others shall be turned over to the installing contractor at a time that fits into their production schedule and the project's overall construction schedule.

1.13 STANDARDS REFERENCES:

- A. The contractor is responsible for the provision of material and methods installation of equipment conforming to the currently applicable standards of:
 - 1. ADA - Americans with Disabilities Act
 - 2. AISC - American Institute of Steel Construction
 - 3. AISI - American Iron and Steel Institute
 - 4. ANSI - American National Standards Institute
 - 5. ASME - American Society of Mechanical Engineers
 - 6. ASTM - American Society for Testing Materials
 - 7. AWS - American Welding Society
 - 8. EIA - Electronic Industries Association
 - 9. ESTA - Entertainment Services and Technology Association
 - 10. FCC - Federal Communications Commission
 - 11. IEC - International Electronics Commission
 - 12. IEEE - Institute of Electrical and Electronics Engineers
 - 13. IFI - Industrial Fasteners Institute
 - 14. ISO - International Organization for Standardization
 - 15. NACM - National Association of Chain Manufacturers
 - 16. NEC - The National Electric Code
 - 17. NEMA - National Electrical Manufacturers Association
 - 18. NFPA - National Fire Protection Association
 - 19. OSHA - Occupational Safety and Health Association
 - 20. SAE - Society of Automotive Engineers
 - 21. SMPTE - Society of Motion Picture and Television Engineers
 - 22. TIA - Telecommunications Industry Association
 - 23. UL - Underwriters Laboratories (Electrical components, devices and accessories shall bear a UL label where applicable. UL listed and labeled as defined by NFPA70, article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.)
 - 24. USITT - United States Institute for Theater Technology "Recommended Guidelines for stage rigging and stage machinery-specifications and practices".
- B. Provide certification and labels where applicable. Comply with federal, state and local regulations and applicable union regulations where required. Provide all equipment with proper labels for sale and use within New York State.

- C. Provide only equipment that is standard, new equipment, the latest model of regular stock product and is supplied with all parts regularly used with the equipment offered for the purpose intended. The contractor guarantees that no modification of the equipment has been made contrary to the manufacturer's regular practice.
- D. Review all materials and equipment prior to installation and notify owner as to any changes or discrepancies between published specifications and the actual material and equipment to be installed, including discontinued product updates, etc.
- E. It is understood throughout this document that any referenced standards are intended to refer to the most current version of said standard (even if an older version of the standard is referenced).

1.14 EQUIVALENTS:

- A. The successful bidder shall submit any product equivalents prior to award of the contract detailing the kind, type, brand, manufacturer or equipment included in the base bid. Equivalent products must be highlighted on this list. When requested, the successful bidder shall also submit information, describing in specific detail, how the equivalent bid material differs from the appearance, quality and performance required by the base specification. Submittal of the manufacturer's advertising cut sheets alone is not acceptable for proof of equivalency.
- B. Proof of equivalency may require the bidder to provide physical samples, a full-sized mockup or specific manufacturer information detailing technical equivalency. Full-sized physical samples/mockups must contain all matching equivalent product equipment (fixture, driver, power supply, housing, connectorizations, cross-sectional area, connection types/locations, etc.). Physical samples/mockups that feature some alternate variant from what is being proposed as an equivalent will not be considered at all. Physical samples/mockups may be required for every different variant of said equipment. Full-sized equivalent physical samples/mockups must be delivered to the owner, architect and consultant (as directed in the submittal review process) for full evaluation and testing and cannot adversely affect the overall construction schedule (products that adversely affect the overall construction schedule shall not be considered at all). Proof of equivalency shall be the burden of the submitting contractor/bidder and not that of the consultant. Proof of equivalency relates to all pertinent functions of the specified equipment, regardless of if that information is reflected on any manufacturer's issued cut sheets. Final acceptance of equivalent or "or equal" products shall be as indicated below. Along with the above required submissions for equivalent or "or equal" products, the contractor shall submit paperwork detailing the shipment dates/timelines of those products, as this will weigh heavily into the acceptance or rejection of those products as well as their technical aspects.
- C. If proposing equivalents that affect the system design as is indicated on the contract drawings, the bidder must submit additional flow charts, detail drawings, manufacturer supporting data and any other drawings necessary to show the differences in the system operation from the primary referenced system.
- D. The bidder will pay for any and all changes to related work scope required by the equivalent products.
 - 1. This includes electrical, architectural, structural and other changes that might be needed to implement an equivalent product.
 - a. Some products with virtual identical functions may have varying power requirements, physical dimensions, differing minimum clearances, etc.

- E. The risk of whether or not bid equivalents or “or equal” submissions will be accepted is borne solely by the contractor. See section 2.1 “Performance Requirements” and further statements below for more information.
- F. No equivalents will be considered after award of the contract unless specifically provided for in the Contract Documents.
- G. The final judgment as to the equality or equivalency of any product submitted as an “or equal” will be solely that of the consultant, architect, construction manager and owner. The contractor shall abide by these decisions.
- H. Equivalents must meet or exceed the specified product’s performance characteristics. No product shall be considered equivalent to the specified product if it has lesser performance characteristics in any critical area.
- I. All costs for any changes required by other trades to implement the contractor provided “or equal” equivalents will be borne by the contractor.
- J. All costs for providing the specified products (or any required rush shipping, etc.) due to the rejection of contractor intended “or equal” products (that have been determined by the consultant, architect, construction manager and owner to not be equivalent) will be borne by the contractor.

1.15 SUBMITTALS:

- A. Equipment: The contractor must, after bid award but before ordering any equipment or starting any installation work, submit to the consultant, architect & owner for approval a list of all equipment to be furnished showing types, models, quantities and manufacturer. Attach manufacturer data sheets for all items submitted.
- B. The quantity and form (paper and/or electronic copies) of all submittal material required shall be provided by the contractor to the appropriate parties as is indicated in the contract front end documents (in addition to any requirements listed below). If there are no indications in the contract front-end documents, then the contractor shall submit (1) electronic copy of each area, category, etc. of items as listed below. All submissions are understood to be intended for approval by the construction manager, the architect, owner, general contractor and the consultant prior to any fabrication or installation of any devices.
- C. Submit a schedule for submission of drawings for fabrication and site work.
- D. Submit a complete submission package with all required paperwork.
- E. Submit each of the following as each pertains to this project. Provide a copy for each related person performing indicated work who holds these certifications:
 - 1. Current training certifications.
 - 2. Current ETCP certifications.
 - 3. Current manufacturer certifications.
- F. Submit material schedules and shop drawings for approval by the architect, consultant and owner prior to any fabrication or installation as follows:
 - 1. The full set of submitted drawings and data sheets must be presented in a professional manner.
 - 2. All drawings for submission must be CADD drawn (created with a computer aided drafting program). Hand drawings are not allowed. Illegible drawings shall not be acceptable.

3. All cut sheets for submission must be high-resolution electronic (pdf) copies of the manufacturer's actual data sheets. Mark up each sheet with highlights or boxes around submitted products, options, etc. No data sheets shall be acceptable that are illegible, poorly photocopied or hand marked up with scribbles, etc.
4. Drawings of proposed mounting methods for all equipment.
5. Samples of proposed marking systems for wire and equipment labeling.
6. Rack layouts, panel layouts and proposed labeling.
7. Schedule for submission of drawings for fabrication and site work.
8. PE stamped shop drawings for the intended rigging supports for all fixtures being suspended in non-standard ways (i.e. fixtures being suspended from Unistrut channels, angle iron, box steel, misc. metal, etc. and that are not mounted into drop/hard ceilings or from typical pendant style mounts).

G. Quality Assurance

1. The Basis of design for the dimming, relay and control systems equipment as well as most of the theatrical fixtures shall be manufactured by Electronic Theater Controls, Inc., 3030 Laura Lane, Middleton, Wisconsin. The equipment is described in complete technical data available from the manufacturer.
2. Fabrication shall begin only after approved drawings and a written notice to proceed have been delivered to the manufacturer at the manufacturer's place of business.
3. A qualified engineering representative employed by the manufacturer shall visit the job site after installation is complete and prior to the energization of the system to inspect, test and adjust the system.
4. This representative shall terminate & connect all control wiring, verify all load and line wiring, and energize the system. The factory representative will also program architectural control presets.

H. The intent of the submittal package is that it contain one copy of the appropriate cut sheet for each item that the contractor is proposing to use on this project as well as a complete set of shop drawings that shows plan, section and elevation views and details of the entire lighting system. Typical drawings to include are as follows:

1. Plan view drawings detailing conduit sizing, wiring types, device types/locations and all other related device locations.
2. Individual elevation/section views that show set any pertinent details.
3. Detail drawings that show all typical installation, labeling intents, attachment devices, etc. as well as all custom fabricated devices, suspension intentions, etc.

1.16 GENERAL SYSTEM DESCRIPTION:

A. Theatrical Lighting System:

1. Architectural Lighting Controls
2. Performance Lighting consoles
3. Integrally dimmed LED lighting
4. Hang and focus of luminaires
5. Integration of house/work/accent lighting into overall system architecture
6. Commissioning, Training and closeout documentation

PART 2 - PRODUCTS

THEATRICAL LIGHTING & CONTROL SYSTEMS

2.1 PERFORMANCE REQUIREMENTS:

- A. The requirements of the referenced equipment are not generic in nature. Specific performance, control and routing capabilities are necessary for any alternate or substituted equipment. The details set forth herein and within the functional descriptions of each system are the critical criteria for the selection of each piece of equipment.
- B. In bidding equipment from manufacturers other than those referenced be aware that all functional information included in this specification as well as the manufacturer's specifications, physical size, serviceability, acoustic output, warranty terms, product availability and other non-technical issues may be determining factors in product equivalency. Final judgment as to equality will be solely that of the owner, architect and consultant.
- C. If the contractor substitutes a piece of equipment that does not meet with all of the critical device functionality of the specified equipment (functionality and feature set as detailed below, inherent in the specified equipment, available as provided option and/or required based upon the intents of the contract documents), then he will have to replace all substandard equipment or substituted equipment that does not meet, match or exceed the specified equipment with either the specified equipment or an alternate piece(s) of equipment that meets/exceeds the specified equipment's feature set and shall provide all reprogramming, installation, conduit, wire, etc. as is required.
- D. All lighting must meet these minimum requirements:
 - 1. Minimum Foot Candle Requirements: See Section S804 of the New York State Education Department's Manual of Planning Standards – 2014 Draft. Reference Table S804-1.
 - 2. All luminaires must meet or exceed the minimum initial NEMA LE5 Target Efficacy Rating (TER). See Section S804 of the New York State Education Department's Manual of Planning Standards – 2014 Draft. Reference Tables S804-2 & S804-3.
 - 3. All LED fixtures shall feature power factor correction (PFC) in their circuitry and/or meet a minimum power factor (PF) of .9. Active PFC is preferred, although passive PFC is acceptable, if the fixtures meet the minimum PF.
- E. Equivalents Criteria:
 - 1. Lighting control system device substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Product warranty period
 - b. Physical device size
 - c. Device installation options (rack mount, DIN rail mount, etc.)
 - d. Physical quantity of inputs, outputs, sourcing & sinking
 - e. Output modes (0-10V, 0-15V, 0-2.5V, 0-5V, etc.)
 - f. Current rating per channel
 - g. RDM discoverability and remote manipulation capabilities
 - h. Selectable starting addresses
 - i. Signal isolation and fault protection limits
 - j. Voltage step selections (.05V, .1V, etc.)
 - k. Quantity of DMX universe control
 - l. Protocol conversion and compatibility with alternate control schemes (sACN, DMX, RDM, 0-10V, DALI, etc.)
 - m. Display, programming buttons & configuration limitations
 - n. Panic controls interface
 - 2. Dimmer rack & dimmer module substitutions require proof that the substituted product meets all performance requirements including but not limited to:

THEATRICAL LIGHTING & CONTROL SYSTEMS

- a. Product warranty period
 - b. Physical rack size
 - c. Dimmer density
 - d. dB noise output of rack
 - e. Rack noise frequency response curve
 - f. Form factor
 - g. Availability of sound suppression devices to quiet rack
 - h. Dimmer module rise time
 - i. Dimmer module types, configurations, etc.
 - j. Quiet fan kit.
 - k. Sound attenuating hood.
 - l. Dimmer rack's acoustic output and tonality
 - m. No field modifying the rack itself by the contractor in order to meet spec.
 - n. No operational capabilities limitations in order to meet spec.
3. Lighting control console substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period and advanced replacements policies
 - b. Physical console size
 - c. Console fader wing attachment locations and options as well as how these devices interconnect with the console and the monitor mounts, clearances in low-profile rolltop units, ability to configure as the specified system, etc.
 - d. Quantity of individual faders
 - e. Moving light knobs/wheels
 - f. Remote focus unit device interface without the need for remote or multiple wireless access points, etc.
 - g. Ability to output to an external monitor
 - h. Quantity and type of physical external monitor outputs
 - i. Ability to interface with touch screen monitors
 - j. Control channel count capacity
 - k. DMX universe count control capacity
 - l. Built in touch screen control
 - m. Drag and drop features on console touchscreen
4. Architectural control system substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period
 - b. Physical device size
 - c. Required device backbox sizes
 - d. Architectural control system topology
 - e. Preset recall by button stations and LCD displays.
 - f. LCD display size, color & programming options
 - g. LED indicator light on individual control station devices
 - h. Form factor
 - i. No required, additional or "buried" accessories or devices in order to obtain system performance requirements.
 - j. No spare wire requirements
 - k. Ability for each pushbutton station button to trigger the unique preset desired and not simply manufacturer determined or hardware/software restrictive preset order recalls.
 - l. Ability for architectural control system to read console snapshots and recall them via presets.

- m. No “room” restrictions in system topology or functionality.
 - n. Proximity detector on LCD stations
 - o. For all 0-10V, DMX, network or RDM devices the equipment provided must meet or exceed all programmatic, voltage options, etc. of the specified equipment.
5. LED fixture substitutions require proof that the substituted product meets all performance requirements including but not limited to:
- a. Product warranty period and advanced replacements policies
 - b. Physical LED strip size, flexibility & durability
 - c. PF (power factor)
 - d. Light output pattern
 - e. Efficacy (lumens per watt)
 - f. CRI
 - g. PWM frequency adjustability (to high rates)
 - h. Light output intensity in FC distribution
 - i. Form factor (physical size, weight, etc.)
 - j. Wattage of LED’s
 - k. Expected and average LED & related drive electronics lifespan
 - l. Total length of runs powered by a single, dimmable LED driver/power supply shall meet or exceed specified products.
 - m. LED driver/power supply(ies) and their ability to dim the LED’s smoothly and down to 1% is critical.
 - n. Ability of LED fixtures/strips to fit in intended locations and with all physical limitations of surrounding structure.
 - o. Binning tolerances & LED quality control must match or exceed specified product.
 - p. LED drivers, interfaces, mounting options, etc. shall meet or exceed specified product.
 - q. No rope lighting or similar products (not even LED rope lighting) shall be considered as an equal to the specified LED strip lighting products nor shall any rope lighting equivalents be approved.
 - r. Lumen outputs at deep colors
 - s. Visual representation of white light output of fixture - color temperature variants
 - t. Power draw requirements.
 - u. Beam spread characteristics
 - v. Fixture power supplies must have inherent brown-out protection built in, such as a switching power supply, that shall be self-resettable, not fuse driven and shall not require human interaction in order to operate.
 - w. Color mixing capabilities without excessive rainbowning effects at beam edges
 - x. Fixture lens options
 - y. Total numbering and visual quality of distinct renderable colors
 - z. Critical accessories and mounting options.
 - aa. Fixture cooling methodologies – convection cooled, fan cooled, overall fan noise in dB, tonality of fan noise and any frequency spectrum spikes in the overall response curve, etc.
 - bb. Programmatic usage of the space as well as the specific room acoustic character, overall HVAC noise and tonality, etc. will also have an effect on any particular fixture’s suitability for use in a space and are evaluated on a case-by-case basis.

6. Wire substitutions require proof that the substituted product meets all performance requirements including but not limited to:
 - a. Jacket Type
 - b. Number of Conductors
 - c. Jacket Shape – i.e. round, twisted, etc.
 - d. Number of strands and gauge
 - e. Flexibility
 - f. Overall physical size of wire
 - g. Capacitance and resistance conductor-to-conductor as well as single conductor.
- F. No contractor-manufactured products shall be acceptable in place of referenced items except for those items enumerated in this specification as "custom."
- G. The current manufacturer's data sheet, user's manual and actual technical specifications/capabilities/feature set for each referenced piece of equipment in force at the date of printing of this specification shall be the basis for the specifications of the referenced equipment.
- H. Any necessary product accessories such as additional duplex power outlets, power supplies, rack mount kits, connectors, adapters or other small items are the responsibility of the contractor to provide, whether or not they are called out in detail within these specifications. This may include additional electrical work, depending upon the differences between substituted and specified equipment and shall be the sole responsibility of the contractor to provide at no additional cost to the owner.
- I. Specification details are provided only for the features required for current and intended future uses of the products.
- J. Quantities:
 1. Where no quantity is indicated in the written specifications, the contractor shall supply quantities as indicated on drawings.
 2. Items not indicated on drawings but necessary for project completion shall be provided as required for project execution at no additional cost.

2.2 STANDARDS:

- A. Intentions of standards:
 1. This document establishes the minimum standards required for the specified lighting and related equipment installed in this facility as part of this specification and related drawings; however, the proper installation and operation of this equipment are equally important. Equipment shall be operated and maintained by (or under the supervision of) a competent person (trained and experienced personnel with the proper knowledge and training to understand theatrical lighting systems and to recognize all of the imposed hazards and functional requirements that these devices involve as it relates to this particular installation). Failure to adhere to these minimum standards could result in serious injury to operators or bystanders and/or death.
 2. These standards apply to theatrical lighting hardware only and not to the building or related structure from which these components are supported/suspended.
- B. All lighting system equipment shall conform (as a minimum) to the standards set forth in ANSI standards that deal with luminaires, control protocols for lighting, photometrics and electrical power (or the current version of the most recent standard revision).

- C. All lighting system equipment shall conform (as a minimum) to the standards set forth in ANSI E1.24 – 2012 (R2021) (Entertainment Technology – Dimensional Requirements for Stage Pin Connectors) or the current version of the most recent standard revision.

2.3 THEATRICAL LIGHTING CONSOLE: REFERENCED PRODUCT ETC ION XE 20

A. General

1. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems. The console shall be the Ion Xe 20 as manufactured by Electronic Theatre Controls, Inc., or equal.
2. The system shall provide control of either 2,048 or 12,288 outputs on a maximum of 32,768 control channels, which may be any number from 1 to 99,999. Systems that require external co-processing to control 12,288 outputs shall not be acceptable. Output shall be distributed over a 10/100 MB Ethernet network using Net3/ACN, ETCNet2, Avab and/or Artnet (multi-cast) protocols. The user shall be able to control the application of protocols at an individual address level.
3. The system shall support full bi-directional RDM communication with compatible devices via Net3 DMX/RDM Gateways. RDM communication shall adhere to ANSI standard E1.20-2006 Entertainment Technology – RDM – Remote Device Management Over DMX512 Networks. Supported RDM features shall include:
 - a. Discovery and Identification of RDM capable devices
 - b. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM
 - c. Viewing of Sensor data as provided by connected devices
 - d. Error reporting as provided by connected device
4. A maximum of 10,000 cues, 1000 groups, 1000 presets, 4 x 1000 palettes (Intensity, Focus, Color and Beam), 99,999 macros, 1000 effects, 1000 curves, 1000 Color Paths and 1000 snapshots may be contained in non-volatile electronic memory and stored to an onboard solid-state hard drive or to any USB storage device.
5. Recorded cue lists may be played back simultaneously on a maximum of 200 faders. Channels shall respond to cue information by last instruction with discrete rate control provided for all cues. The console may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required. HTP/LTP intensity flags, assert, proportional, intensity master or manual master fade control. Priority and Background Priority may be placed on each cue list. It shall also be possible for a cue list to contribute to playback background states or to withhold such contributions.
6. A Master Playback fader pair shall be provided. The 100mm motorized fader pair may execute crossfades or all-fades, with IFCB cue level timing,
7. 20 45mm faders shall be user configurable across 100 pages and provide additional playback faders (up to 200), additive or inhibitive submasters (up to 999), and grand master control. Associated displays provide content identification. Presets and IFCB palettes may be loaded to faders for playback control, either individually or in user-defined lists. Virtual fader control is also provided.
8. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling within selected displays. Four pageable encoders shall be provided for control of non-intensity parameters. Non-intensity encoders toggle between coarse and fine control. The expand function for frame table devices shall provide a graphic representation of all images and colors in the associated device for instant selection. A graphic shutter representation shall provide additional control of

- shutter parameters. The display shall also provide an indication of the current value for the associated parameter, based on channel selection. A high-resolution rate wheel, which may also be used for fader paging shall be provided.
9. Control surface buttons shall be backlit. This backlighting provides indication of functional states. Backlight intensity shall be user controllable, and shall automatically dim after a defined period of inactivity.
 10. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, color characterization allowing color mixing and storing in Hue and Saturation or native device values.
 11. System information, including playback status, live output and blind values for all record targets shall be displayed on a maximum of two external high resolution monitors, which may also be multi-touch touch-screens. All displays may also be routed to the integral touch screen. Every display shall support three user-definable workspaces. Each of these workspaces shall provide individually configured frames, with size/scaling controls. Any Windows 7 compatible display may be used.
 12. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system.
 13. A fully integrated Virtual Media Server feature shall allow user to map images and animations to a rig array. 40 such maps may be created, each with 12 layers. System that rely on external hardware or software for this functionality shall not be acceptable.
 14. User-definable, interactive displays may be created. These displays, which can be used in live and blind operating modes, allow graphical layout of channels, desk buttons and programming tools. Standard symbols are provided, and the user may import their own symbols or graphics. Each symbol may be individually defined with data feedback characteristics. Non-interactive status information, such as a mirror of other user's command lines, may also be included in the display. A graphical browser is provided for fast selection of these views. Multiple zoom factors and placements may be stored and recalled for each display.
 15. A detachable alphanumeric keyboard shall be provided. The keyboard shall allow labeling of all show content. The central touch screen shall also repaint to access an integrated virtual alphanumeric keyboard.
 16. Console software upgrades shall be made by the user via flash drive. It shall be possible to install software updates in all consoles, processor units and remotes from one device over the network.
 17. The console operating software shall be loaded into program execution memory from the internal hard drive when the console is powered. In the event of an uncontrolled shutdown, the console shall return to its last output state when power is restored. Devices requiring a UPS to provide such protections shall not be acceptable.
 18. Integrated dimmer monitoring features shall be provided to allow indication of dimming system status, error states and dimmer load monitoring. Adjustment of dimmer configuration from the console shall also be supported. Communications with the dimming system shall utilize ANSI E1.17 2006 - Entertainment Technology - Architecture for Control Networks.
 19. Integrated RDM device features shall be provided. The console shall discover and patch RDM devices. The console shall monitor RDM devices to allow indication of RDM device online/offline status error states. The console shall be capable of changing settings of RDM devices such as the DMX start address. Communications with the RDM devices shall utilize ANSI E1.20 2006 – Remote Device Management.

20. Network configuration tools shall be provided from within the desk.
21. Show data may be created and modified on a personal computer, using either Windows 7 or higher or a Macintosh platform running OS 10.11 or later via a free offline editing application. The program shall run natively on Apple operating systems. Applications requiring PC emulation programs shall not be acceptable.
22. A PC, using either Windows 7 (or higher), or a Macintosh running OS 10.11 (or later) using the offline software application shall be able to connect to a control system via the network and view or modify current show data in an independent display environment, using an ETCnomad key. When connected without the key, the computer shall operate in Mirror Mode, with the device to be mirrored selectable by the user.
23. Synchronized backup shall be provided via another full console on the network, an ETCnomad/Puck, or by use of a remote processor unit. The backup console/RPU shall maintain synchronized playback with the master and shall take over control of the lighting system upon loss of communication with the master. Use of two RPUs to service and backup system output is also supported.
24. A maximum of 99 users may access and interact with show data simultaneously. Each user shall have an individual workspace. User identification may be assigned to more than one control device, allowing users to work in tandem, or allowing a designer/ALD to mirror the current display format, mode and command line of the associated programmer. Partitioned control allows discrete control of channel/parameter groupings by user. Partitioned control may be easily enabled and disabled with no need to merge show data from multiple users.
25. The system shall support up to 32 individual simultaneous Time Code inputs or Event lists using Show Control Gateways.
26. Systems that do not provide the above capabilities shall not be acceptable.

B. Controls and Playback

1. Manual Control and Programming Section
 - a. The console keyboard shall be grouped by function. Major groupings shall be record target functions, numeric keys, level assignment functions, display navigation functions and controls, as well as non-intensity parameter controls.
 - b. The command keypad shall be fully interactive with direct selects and other virtual controls, which provide "one touch" selection of channels, groups, palettes, presets, effects, snapshots and macros.
 - c. Non-intensity parameters may be set numerically via an extensible keypad on the central LCD. This control shall be fully interactive with the moving light encoder controls and the virtual controls. The LCD touch screen associated with the encoders shall display the current encoder function. The touch screen shall also access available modes for each parameter type, min and max values for each parameter as applicable, as well as home position on a parameter basis. Each encoder shall support shift functions for fine control. The range of motion of coarse control may be set by the user. Tactile feedback shall indicate full and half frame positioning of certain controls.
 - d. Only those parameters available for control in the active lighting system shall be displayed for control. Displays shall condense or lowlight parameters not available to selected channels. Alternatively, the encoders may be placed in a state allowing parameters not applicable to the current selection to be suppressed.
 - e. Lamp controls provide direct access to luminaire functions such as striking and dousing arc lamps and calibrating entire fixtures or individual mechanisms of

- fixtures, as provided by the luminaire manufacturer. User access to these features is normalized across all manufacturers for ease of use. Use of a “control channel” for accessing these functions shall not be required and systems requiring use of control channels for these functions shall not be acceptable.
- f. Fan functions shall be provided both via command line operation and through encoder controls.
 - g. Highlight shall be supported, with user definable highlight values. Lowlight conditions may be defined for selected, but not specified channels. Rem Dim commands, at specific levels by channel, may be optionally and automatically called with the highlight command.
 - h. Advanced color control functions provide color mixing in any of six different color spaces. Gel matches are provided via gel picker or by command line control. Tinting tools allow adjusting the color mix irrespective of the native mixing system. Spectrum tools support adjusting the output of additive color systems with more than three emitter types, allowing the X/Y coordinate to be held while adjusting the recipe that achieves that mix. Color Path tools allow the user to control the live fade of fixtures through the color space.
 - i. The Virtual Media Server function shall allow the user to create layouts of devices, identified as pixel maps. Media content (images, movies, text and procedurally generated effects) may then be applied, manipulated and stored. Stock content is provided and the user may import his own imagery and animations.
 - j. Macros may be set to run as default. Default macros called manually shall post to the command line, but executed via cue lists shall run in the background. The user may override this behavior by defining the macro to always execute in the foreground or background, regardless of the recall method. Startup, Shutdown and Disconnect macros may also be defined.
2. Playback Section
- a. The playback faders shall consist of a motorized 100mm Master Fader pair and 20 45mm additional playbacks.
 - b. Up to 200 cue playback faders may be defined on the fader array. Each playback shall have an associated 60mm motorized potentiometer and definable buttons.
 - c. Faders may be grouped for playback, with sliders and button action defined by the user.
 - d. It shall be possible to instantaneously halt an active cue, back to the previous cue, manually override the intensity fade or manually override the entire fade.
 - e. It shall be possible for a cue list to contribute to the background state or for the contents of each cue list to be withheld from such.
 - f. Playback faders shall have the following associated controls:
 - 1) Freeze, which halts the output of the fader
 - 2) Stop Effect, which stops the action of an effect
 - 3) Filter, to assign filter states to a fader
 - 4) Go To Cue 0, to reset a cue list
 - 5) Off, to turn off the contents of a playback, releasing control to the background state or to set to null.
 - 6) Assert, to replay an active cue
 - 7) Release, to release control to the background and reset the cue list.
 - 8) Timing disable, channel filters, parameter filters, priority and background priority status may also be defined.

- 9) The potentiometer shall be configurable as a proportional master, an intensity master, or manual master. Support for rate, effect rate, effect size and Master Only controls is also provided. Filtered manual timing masters may be configured.
- 10) Rate override and fader paging are supported with a wheel encoder and associated controls.
 3. Submasters
 - a. Up to 999 proportional, fully overlapping additive or inhibitive submasters may be defined. Submasters shall have colored LEDs to indicate submaster status. Each submaster may have fade up, dwell and down fade times. Submasters may be set to priority and background priority status.
 - b. Submasters may be set to HTP or LTP intensity. Non-intensity parameters on submasters shall be LTP only.
 - c. Exclusive mode for a submaster shall prohibit the live contribution of that submaster from storing to cues or other submasters. Shield mode prohibits access of associated channels from any other playback or manual control operations.
 - d. A submaster potentiometer may be defined as proportional, master only or intensity master. When set as an intensity master, a mark and unmark feature is supplied.
 - e. Motorized faders shall set submasters to required positions as fader pages are changed.
 - f. The submaster blind buffer shall be linked directly to live playback.
 - g. It shall be possible to set submaster values directly from the command line.
 - h. Submasters may be set to fade to background or to minimum value when the fader is returned toward zero.
 - i. Submaster values may contribute to the background state or withheld from such.
 4. Grand Master Faders
 - a. The location of the Grand Master shall be user definable. The grand master shall have associated blackout and blackout enable buttons.
 - b. Blackout shall send all associated intensity outputs to zero. Non-intensity outputs shall not be affected.
 - c. Motorized faders shall set grand masters to required positions as fader pages are changed.
- C. Display Controls
 1. Format shall change the view of selected displays.
 2. It shall be possible for the user to choose which parameter categories or parameters (s)he wishes to display.
 3. Flexichannel shall change which channels are viewed in selected displays, as follows:
 - a. All channels
 - b. Patched channels
 - c. Show channels
 - d. Active/Moved channels
 - e. Selected channels
 - f. Manual Channels
 - g. View channels (user identified list)
 - h. Channels with discrete timing
 4. Expand shall extend the selected view sequentially across connected displays.
 5. [Time] depressed shall display discrete timing data. [Data] suppressed shall display absolute values of referenced data. These functions may be latched.

6. Displays may also be toggled to show stored data currently manually overridden, the source of the current parameter data, output level, patch assignment, part structure and referenced marking data.
7. Playback status displays are provided with a variety of different formats. Indications are provided per cue for live moves (lights fading from zero and also moving non-intensity parameters) and dark moves (inactive lights which have stored non-intensity parameter moves).
8. Display content including which of the workspaces is in focus on any of the three monitors and what views are docked in those workspaces may be instantly recalled using snapshots.

D. Operating Modes

1. Live Mode

- a. Channel lists may be constructed using the +, -, and Thru keys as well as the direct selects. Channel selection and deselection is fully interactive, regardless of the method used.
- b. Levels may also be set with the keypad, level wheel and non-intensity encoders. "Selected" channels shall be those last addressed and under keypad control. Controls are provided for single button access to the last selected channel list, all channels with manual levels and all active channels.
- c. Channels may be set at a user defined default level using the Level key. +% and -% keys adjust channels quickly by user definable values.
- d. Channels and/or channel parameters may be captured. Capture mode shall allow the user to selectively capture channel data at specific levels. Captured data shall be indicated on the Live display.
- e. Sneak shall be used to restore specified channels to background states, default values, or to send them to specified values, in user specified times.
- f. Selected channels may be set at a level or held to current values while all other channels are set to zero using Rem Dim. Toggling Rem Dim shall restore all unselected channels to original levels. The Rem Dim level shall be user definable via the command line or with a default setup value.
- g. Channels may be recorded into groups for fast recall of commonly used channels. 1000 groups shall be available. Groups shall store selection order. The Offset function supports rapid creation of ordered groups, including reverse and random order.
- h. Parameter settings may be stored to Intensity, Focus, Color and Beam Palettes and to Presets. All referenced data may be stored to whole numbers or to up to 99 decimal places between each whole number.
- i. The following conditions may be placed on a channel or channel parameter to be included with a cue record action.

1) Discrete fade time and/or delay

2) Block flag

3) Assert flag

4) IFCB Filters, which may be set at a parameter level.

5) Release and Restore

- j. 999 cue lists may be stored. Cues may be recorded in any order. Up to 99 decimal cues may be inserted between any two whole number cues. Each cue may contain a maximum of twenty parts.
- k. It shall be possible to record cues and cue parts with the following information:

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- 1) Any collection of channel data, as determined by the use of “Record”, “Record Only” or selective store commands, combined with parameter filters.
- 2) Cue Level timing and delays for Intensity Up, Intensity Down, Focus, Color and Beam.
- 3) Follow or hang time
- 4) Link instruction
- 5) Loop value
- 6) Block, Assert, Preheat, and/or Mark Flag
- 7) Curve
- 8) Allfade
- 9) Label and note
- 10) Execute list to trigger other activity
 - l. Non-intensity channel parameters may be marked (preset), in two ways. Automark presets any parameters transitions in the cue just prior to intensity becoming active. Automark may be disabled on a cue or cue part basis, enabling a “live” move. Alternatively, non-intensity parameters may be marked to a specific cue with a single command instruction. It shall not be necessary to store these parameters directly into the cue in which the movement is to occur.
 - m. Any channel parameter may be stored with an effect instruction. These effects may contain relative offsets from current value, or absolute instructions. Effects may be progressive action or on/off states. Entry and exit behaviors shall modify the channel parameters activity when beginning and ending the effect.
 - n. Update may be used to selectively add modified parameter data quickly to that parameter’s current source. Update may be specified to modify referenced data content or break the link to that content. A dialogue informs the user of the content that will be updated. A trace command may be used to modify the data to the original source of its move instruction. It shall be possible to update inactive record targets.
 - o. Recall From quickly pulls specified data from record targets or other channels into the current view.
 - p. Copy To quickly copies selected data to specified channels or other record targets.
 - q. Address and channel check functions shall be provided.
 - r. Channel parameters may be “parked” at levels. Those levels are not added to any live record operations, nor may they be changed until the parked element is “unparked”. Scaled park provides real time proportional adjustment of stored intensity values. Address Park shall also be provided.
 - s. About shall provide detailed status of selected channels or specified record targets. This shall include current source, current value, discrete timing, parked value, marked to and for indications. Background levels and current DMX output are also displayed. Channel usage indicates submaster and cue information and also provide a "dark moves" report on a per channel basis.
 - t. 1000 snapshots may be stored which instantly recall specified front panel and display configurations.
 - u. Live data may be displayed in a summary view or detailed table orientation.
 - v. Query shall allow selection of channels by their current or possible state. Keywords and fixture types shall allow quick access to fixtures.
 - w. User definable home positions, on a per channel basis, may be defined.

- x. Channel level offset commands provide channel ordering and sub-grouping functions.
 - y. Undo shall be used to sequentially step back through manual operations or to undo record and delete actions. It shall be possible to undo multiple commands in one action.
 - 2. Blind
 - a. The Blind display allows viewing and modification of all record targets without affecting stage levels.
 - b. Record target data may be displayed in a summary view, a detailed table orientation or a spreadsheet view, which allows quick data comparisons, move and replace functions.
 - c. Changes to blind data shall be automatically stored. Range selection of both record targets and channels shall be supported.
 - 3. Patch Display
 - a. Patch shall be used to display and modify the system control channels with their associated library data.
 - b. Each channel may be provided with a proportional patch level, curve, label, swap and invert functions, as well as keywords to service Query.
 - c. Accessing library data to patch multiple parameter fixtures may be accomplished entirely from the command line. Use of a pointing device to patch to moving lights shall not be required.
 - d. Offset functions in patch shall allow selection of channel ranges and shall allow the user to establish a “custom” footprint for any device output.
 - e. Custom color wheels, color scrolls and gobo wheels shall be defined in patch. These devices shall be created with a simple table and graphical user interface supported by images of major manufacturers.
 - f. RDM discovery and device monitoring shall be supported.
 - g. Copy to and Move functions shall be supported in patch.
 - 4. Setup/Browser
 - a. Setup shall access system, show and desk configurations.
 - b. It shall be possible to partially import Eos show files. Users shall be able to select as much or as little of the show file as required, with renumber tools.
 - c. It shall be possible to import ASCII and Lightwright data files. It shall be possible to export as ASCII or .csv.
 - d. Setup shall also access show data storage, import, export, print to .pdf and clear functions, as well as show data utilities.
 - e. The system shall support programming and playback of real time clock events, including cue, submaster and macro execution at specific times of specified days or at a time based on astronomical events.
 - f. A control screen shall be provided for network configuration, selecting date/time, software update controls, selecting functional language and/or keyboard for labeling option, as well as other system level tools.
 - g. Available languages for prompts, advisories and help messages shall include English, Bulgarian, German, Spanish, French, Italian, Japanese, Korean, Russian, Chinese, simplified and Chinese, traditional.
 - h. Supported keyboards shall include American, United Kingdom, French, German, Italian, Korean, Norwegian, Russian, Slovakian, Turkish, Swiss, Swedish, Finnish and Bulgarian.
- E. Dimmer Monitoring and Configuration

1. The lighting control system shall provide communication with an ETC Sensor+, Sensor3 or FDX dimming system for remote monitoring and configuration of show specific functions from within the software application.
2. Circuit level configuration and monitoring functions shall include but not be limited to:
 - a. Control mode (dimmable, switched, latch-lock, always on, off or fluorescent).
 - b. Curves
 - c. Control threshold
 - d. Min and Max Scale Voltage
 - e. Preheat
 - f. Scale load
3. Rack status messages shall include but not be limited to:
 - a. State of UL924 panic closure
 - b. DMX port error/failure
 - c. Network error/failure
 - d. A, B, C Phase below 90 or above 139 volts and headroom warning
 - e. Ambient temperatures out of range
4. Circuit status shall include but not be limited to:
 - a. Module type and location
 - b. Output level
 - c. Control Source
 - d. Overtemp
5. Advanced circuit feedback shall include but not be limited to:
 - a. Load higher or lower than recorded value
 - b. DC detected on output
 - c. SCR failed on/off
 - d. Breaker trip
 - e. Module has been removed
 - f. Load failure
 - g. Shutdown due to Overtemp

F. Interface Options

1. The console shall support a variety of local interfaces.
 - a. AC input
 - b. USB (five ports for items such as alpha-numeric keyboard, mouse, touch screens, USB Flash drive...)
 - c. Ethernet (two ports)
 - d. Two Display Port output connectors, supporting Windows 7 compliant monitors as 1280x1024 resolution minimum. Touchscreen/multi-touch support of any/all of these monitors is provided.
 - e. Contact Closure trigger via D-Sub connector
 - f. 4 DMX/RDM ports
 - g. Alternative Contact Closure trigger through Gateway
 - h. OSC Transmit/Receive
 - i. MIDI In/Out, MSC and MIDI Notes through Gateway
 - j. SMPTE Timecode through Gateway

G. Accessories

1. Touch Focus Remote
2. iRFR and iRFR Preview (applications for iPhone, iPod Touch and iPad units)
3. aRFR (application for Android devices)

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4. Net3 Remote Video Interface 3
5. 20 Fader or 40 Fader non-motorized fader wings
6. 10 Fader or 20 Fader motorized fader wings
7. Gateways
 - a. Net3/ETCNet 2 to DMX/RDM Gateways (one to four ports)
 - b. MIDI/SMPTE Gateway
 - c. I/O Gateway with 12 analog inputs, 12 SPDT contact outputs, RS-232 interface
- H. Synchronized Backup
 1. An optional Backup system shall consist of one of the following combinations of devices:
 - a. Two networked Consoles.
 - b. One (or more) Console with one Remote Processor Unit (RPU)
 - c. One (or more) Consoles with two Remote Processor Units (RPUs)
 - d. ETCnomad/Puck
- I. Physical
 1. All operator controls and console electronics for a standard system shall be housed in a single desktop console, not to exceed 30" wide, 15" deep, 4.5" high, weighing 16.6 pounds. Console power shall be 90 – 240V AC at 50 or 60Hz, supplied via a detachable locking power cord.
- J. Accessories: Provide the console with the following (see drawings for models and quantities, if required):
 1. Eos Client Software Kit
 2. Touchscreen monitors
 3. LCD Monitor
 4. Chief Manufacturing Monitor Mounts
 5. Portable Network Cables (Gepco CT Series Heavy-Duty Tactical Style Cables)
 6. Edison To Edison Extension Cord
 7. SL Waber-By-Tripp Lite Deluxe Style Multiple Outlet Strip
 8. DVI Cables
 9. USB Cables
 10. Back up UPS - To Power Lighting Console, Monitors & Related Equipment)
 11. Littlelight Work Lights
 12. USB Extended Keyboard - Black
 13. USB 2-Button Laser Mouse - Black
 14. Heavy-Duty Keyboard/Mouse Drawer
 15. Multi-Port USB Hub
 16. USB Memory Stick (Thumb Drive for saving backup, configs and show files)
 17. Any other miscellaneous cables needed to complete the system. See TL series drawings for more information. Note that all loose lighting or power cables & wiring must be dressed neatly with tie wraps & eyes or ring runs & tucked up against underside of countertop. Drill clean passthrough holes as necessary & provide black grommets as needed.
- 2.4 LIGHTING CONSOLE WIDESCREEEN TOUCHSCREEN DISPLAY: REFERENCED PRODUCT DELL S2240T 21.5" FULL HD 16:9 BLACK MULTITOUCH LED TOUCHSCREEN MONITOR
 - A. Display:
 1. **Viewable image size (diagonal):** 54.6 cm (21.5 inches)

2. Horizontal/Vertical: 476.64 mm (18.77 inches); 268.11 mm (10.56 inches)
 3. Maximum resolution: 1920 x 1080 at 60 Hz
 4. Aspect ratio: 16:9
 5. Pixel pitch: 0.248 x 0.248 mm
 6. Brightness (typical): 250 cd/m²
 7. Color gamut (typical): 84%
 8. Color depth: 16.7 million colors
 9. Contrast ratio (typical): 3,000:1
 10. Dynamic contrast ratio (max): 8 million:1
 11. Viewing angle (typical): (178° vertical / 178° horizontal)
 12. Response time (typical): 12 ms with overdrive
 13. Panel type: VA
 14. Panel Backlight: LED
 15. Tilt: Up to 60°
 16. Flat Panel Mount Interface: VESA Mount 100mm x 100mm (Wall Mount sold separately)
- B. Touch specifications:
1. **Touch technology:** Projected capacitive system
 2. **Sensor stack thickness:** 1.1 mm
 3. **Cover glass thickness:** 1.1 +/- 0.2 mm
 4. **Touch method:** Fingers and thin gloves
 5. **Touch point:** 10 touch-points
 6. **Response time:** 25 ms
 7. **Supporting OS:** Windows 8 Certified
- C. Connectivity:
1. **Connectors (S2240T):**
 - a. DVI-D (HDCP)
 - b. HDMI
 - c. VGA
 - d. USB 2.0 upstream port (for touch enablement)
 - e. Audio line-out
- D. Security: Security lock slot
- E. Physical:
1. Dimensions:
 - a. **Height (extended):** 370.8 mm (14.60 inches); **Width:** 522.5 mm (20.57 inches); **Depth:** 205.7 mm (8.10 inches)
 2. Weight:
 - a. **Weight with packaging:** 6.9 kg (15.20 lbs)
 - b. **Weight without packaging:** 5.80 kg (12.78 lb)
 - c. **Weight of monitor only (without stand):** 3.4 kg (7.49 lb)
- F. Service and warranty: 1 year limited hardware warranty and advanced exchange service.
- G. Power:
1. **AC input voltage/frequency/Current (typical):** 100 VAC to 240 VAC / 50 Hz or 60 Hz + 3 Hz / 1.2 A (typical)
 2. **Power consumption (normal operation, typical):** 20 W
 3. **Power consumption (active off mode):** <0.5W

2.5 ETR DIMMER RACK: REFERENCED PRODUCT ETC SENSOR 3 DIMMER RACK
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A. General

1. Provide all cleaning and upgrades to the rack, including all required reprogramming, etc., as indicated.
2. The installation rack shall be the Sensor3 120V as manufactured by Electronic Theatre Controls, Inc., or equal. The Power Control System enclosure shall consist of up to 48 module spaces.

B. Electrical

1. Sensor3 racks shall operate at 120V, three phase, four wire + ground, 47-53 or to 57-63 Hz at 800 amps max. Other voltage and phase options are available upon request. Sensor racks shall automatically compensate for frequency variations during operation. Provisions shall be made for optional amp trap devices for fault current protection. Standard SCCR fault current protection shall be 100,000A.
2. All load and neutral terminals shall accept up to #4 AWG (25mm²) wire. Systems providing smaller terminals do not allow contractor wire sizing flexibility and shall be deemed unacceptable.
3. Load terminals shall be located at the front of the wiring cavity. Front access racks having terminals located at the back of the rack or on the side near the back of the rack such that adjacent load cabling may block terminal access shall not be acceptable.

C. Electronics

1. Power control electronics (CEM3) shall be contained in a single module that can be plug-in capable without use of tools. Power control and dimming systems that require tools for removal of control electronics shall not be acceptable.
2. All data and power input for CEM3 control electronics shall be located on a separately removable/pluggable termination connector on the backplane such that backplane can be replaced without removal and discrete secondary conductor terminations. Systems that require discrete termination of DMX, Ethernet, power input, and dimmer control output directly on terminals on the control module or pluggable backplane shall not be permitted.
3. The power controller shall directly support the following network protocols:
 - a. Net3 protocol suite including ANSI E1.31 Streaming ACN (sACN)
 - b. ANSI E1.17 Architecture for Control Networks (ACN)
 - c. Systems that do not support the above listed industry standard ACN protocols for Ethernet setup, control and feedback integrated directly between the power system and control system shall not be deemed acceptable.
4. The power controller shall directly support 2 ports of control input using ANSI E1.11 USITT DMX512-A

5. Control signals shall be sent between control module and dimmer/power modules using flat ribbon cables. Systems using cat5 cable and rj45 connections or discrete hand wired conductors as sole physical communication media between control module and dimmer/power modules shall be considered long term unreliable and shall be not be acceptable.
6. System shall provide an optional low voltage connection to maintain power of control electronics through brown out, instantaneous, and sustained power outages. Systems that do not provide optional low voltage backup power connection to the power controller shall not be acceptable.
7. Control electronics shall be housed in a formed steel body with cast-aluminum face panel.

D. Physical

1. The Sensor3 rack shall be a free-standing, dead-front switchboard, substantially framed and enclosed with 16 gauge, formed steel panels. All rack components shall be properly treated, primed and finished. Exterior surfaces shall be finished in fine-texture, scratch-resistant, epoxy paint. Removable top and bottom panels shall facilitate conduit termination on the 48 module rack. Knockouts shall serve the same purpose on 12 and 24 module racks.
2. Sensor3 racks shall be available in three sizes, with the following dimensions.

a.	SR3-12 (12 module)	25.8"H x 14.8"W x 13.3"D
b.	SR3-24 (24 module)	45.8"H x 14.8"W x 16.8"D
c.	SR3-48 (48 module)	83.1"H x 14.8"W x 22.8"D
3. Racks shall be designed for front access to allow back-to-back or side-by-side installation.
4. Racks shall be designed to allow easy insertion and removal of all modules without the use of tools. Supports shall be provided for precise alignment of modules into power and signal connector blocks. With modules removed, racks shall provide clear front access to all load, neutral and control terminations. Racks that require removable panels to access load, neutral or control terminations shall not be acceptable.
5. An optional bus bar kit shall be available from the factory to allow adjacent racks to be powered by a single line feed. No soft buss rack-to-rack wiring shall be required. Racks that require discrete cabling to connect adjacent racks shall not be acceptable.
6. Module spaces shall be mechanically keyed to accept only the 20A or below, 50A, or 100A module specified for that space. Racks that allow modules of varying wattages to plug into the same space shall not be acceptable. The rack shall be configurable to accept mixed dimmer types and sizes throughout the rack.

7. Each rack shall provide a lockable full-height door containing an integral electrostatic air filter that shall be removable for easy cleaning. A single low-noise fan shall be located at the top of each rack. Design of the rack and modules shall draw all cool air intake air through the integral electrostatic air filter at the front of the rack, discretely through each module housing and directly out the top of the rack such that exhausted hot air from adjacent modules does not heat the module(s) above, below, or to the side of each other. System designs that draw the same heated air through multiple modules shall not be acceptable.
8. The fan shall maintain the temperature of all components at proper operating levels with dimmers under full load, provided the ambient temperature of the dimmer room does not exceed 40°C/104°F. Racks that do not employ both locking doors and electrostatic air filters shall not be acceptable.
9. The fan shall turn on whenever any circuit in the system is activated. In the event of an over-temperature condition, only the affected dimmer module(s) shall shut down and a message shall appear on the control module LCD. The fan shall remain on during thermal shutdown of individual dimmer modules. Systems that do not include over-temperature sensing and preventative thermal shutdown shall not be acceptable.
10. A fan sensor shall be provided. In the event of momentary fan failure, error message will be displayed and sent remotely over Ethernet to optional logging systems. Systems that do not provide optional system event logging shall not be deemed acceptable.
11. If the ambient room temperature drops below 0°C/32°F or rises above 40°C/104°F, a warning shall appear on the dimmer rack LCD. If the temperature rises above 46°C/115°F, the rack shall shut down until the condition is corrected.
12. A 3 x .5-inch LED status indicator (beacon) shall be mounted in the rack door. The beacon shall be visible throughout a wide viewing angle. In normal operating conditions, this LED is illuminated. If the rack's control module senses an error condition, the beacon shall flash until the error is corrected. An optional indicator shall be available for remote locations. Racks have no external means of visually showing that an error is present shall not be acceptable.

2.6 DIMMER RACK CONTROLS BATTERY BACKUP: REFERENCED PRODUCT ETC SENSOR BATTERY PACK OPTION

A. General

1. The BatteryPack Option installs in a separate enclosure from the Sensor3 rack and keeps the processor energized in the event of power loss or interruption to the system. One of two Sensor3 PowerSupport options, the BatteryPack option is designed for applications where CEM3 Power Control Processor must remain online during power loss providing power for several minute or more. Each CEM3 requires its own battery pack. The enclosure can hold up to two battery packs.
2. Provides power for a single CEM3 Control processor for a minimum of 30 minutes.
3. UL and cUL LISTED.
4. CE Marked.

B. FEATURES

1. Designed for use with Sensor3 Power Control System.

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2. Long term power back-up of control electronics for at least 30 minutes.
3. Automatically engages when power is lost.
4. Automatically recharges from power feed during normal power conditions
5. Two-hour recharge time from full discharge

C. FUNCTIONAL

1. Designed for use with Sensor3 Power Control Systems.
2. Compatible with CEM3 Power Control.
3. Seamless transfer from charge to power output without user intervention.
4. Prevents CEM3 from rebooting when power returns.
5. Allows for immediate control of the full system as soon as normal power is present

D. MECHANICAL

1. 18-gauge formed steel construction.
2. Fine-texture, scratch resistant, epoxy paint.
3. Field installed without tools.
4. Visible indicator lights clearly identify when the battery is providing power and if maintenance is required.
5. Installs using factory provided wire harness.

E. ELECTRICAL

1. Seamless transfer to battery power upon loss of normal power.
2. Provides 24vDC power for control processor during power loss.

F. THERMAL

1. Ambient room temperature: 0-40°C / 32-104°F Ambient humidity: 10-90% non-condensing.

G. PHYSICAL

BatteryPack Option Dimensions*

MODEL	HEIGHT		WIDTH		DEPTH	
	inches	mm	inches	mm	inches	mm
SR3-BPO	13.9	353.1	10	254	4.1	104.1
SR3-BPO2	13.9	353.1	10	254	4.1	104.1

BatteryPack Option Weights*

MODEL	WEIGHT		SHIPPING WEIGHT	
	lbs	kgs	lbs	kgs
SR3-BPO	10	4.5	13	5.9
SR3-BPO2	12.2	5.5	15.2	7.4

*Weights and dimensions typical

2.7 DIMMER RACK CONTROL ELECTRONICS MODULE: REFERENCED PRODUCT ETC CEM3

A. Replacement/Upgrade

1. If this control module is an upgrade from an older version of this module to the newest version, then the contractor shall provide this module as well as all required reconfigurations of the rack, reprogramming, imported programming, cleaning, setup and all required manufacturer procedures, warranty, etc. and in order to give the owner a new, system-wide 5-year warranty.
- B. General
1. The Power Control electronics shall be contained in one plug-in Power Controller. Each power controller shall plug into a dimming cabinet with no need for tools or discrete wire connections. A simple user interface shall be provided for group configuration, testing and diagnostics. The Power Control System shall be Sensor 3 as manufactured by Electronic Theatre Controls, Inc.
 2. Power control shall be UL/cUL Listed and CE Marked. Power and dimming control that require tools for removal of control electronics shall not be acceptable.
- C. Physical (Control Interface)
1. The control electronics shall be contained in one plug-in module, housed in a formed steel body with cast-aluminum face panel, and self-retaining ejection handles to ease removal from the rack.
 2. A backlit eight-line by 20-character graphical LCD shall be provided for system configuration, live control and status display.
 3. The following features shall be available in power control to reduce setup and tech times:
 - a. Full number pad shall be provided for quick access to dimmers. Power Control that does not provide 0-9 number pad and logic keys for AND, THRU, and AT for fast access, selection, and control of circuit/dimmer numbers shall not be acceptable.
 - b. Power control shall provide NEXT and LAST buttons to progress through individual circuits/dimmers during pre-show lighting checks for lamp burnouts.
 - c. Shortcut buttons for Setup, About and live control shall be provided. These functions shall be separated in such a way that user intending to check status or settings does not accidentally render their system unusable. These buttons shall also serve to reduce maximum time to access any feature or setting on a single dimmer, range of dimmers or an entire rack.
 - d. Power control that does not include the above features shall not be acceptable.
 4. The front panel shall have five status LED indicators: power, network activity, DMX A, DMX B, and panic state.
- D. Control Signals and Physical Communications Media ports
1. The power control shall be provided with an Ethernet control signal input. This input shall be fully configurable with a range of patching and priority programming capabilities. The Ethernet signal shall supply seamless integration between the dimmer racks and both the entertainment and architectural lighting control systems. The Ethernet signal shall also enable remote configuration, playback, file storage and monitoring features on a personal computer on the network. Dimming systems that require Ethernet to DMX translation devices for control of critical show lighting introduce a potential failure point and shall not be acceptable.

2. All data and power input for control electronics shall be located on a separately removable/pluggable termination connector on the backplane such that backplane can be replaced without removal and discrete secondary conductor terminations. Systems that do not support tool-less replacement or that require removal of wires connected directly to the control electronics shall not be acceptable.
 3. Dimming systems that require discrete termination of DMX, Ethernet, power input, and dimmer control output directly on terminals on the power control or pluggable backplane shall not be acceptable.
 4. DMX connections shall be available with option for pluggable screw or punch-down type terminal. Systems that do not allow this option do not support both DMX over CAT5 and mule-strand conductors shall not be acceptable.
 5. Ethernet connection shall be available via standard Cat5 RJ45 connection. System requiring punch down direct to rack or controller cannot be Cat5 system certified and shall not be acceptable.
 6. Power Control shall provide a convenience Ethernet uplink to the lighting network at the front face of the control module. Network capable 3rd party control and monitoring devices shall be provided full access to control, editing and real time feedback.
 7. The following options shall be available to backup all controller setup UL924 Panic configuration, and recorded presets:
 - a. Automatic backup in non-volatile backplane memory
 - b. Automatic backup in non-volatile Controller memory
 - c. 3rd party FTP server
 - d. USB storage device pluggable on the controller face panel
 - e. Data shall also be transferable to and from library storage on a personal computer on a per-rack basis
1. Power Controller shall support Class 2 EchoConnect control communications
 - f. The control network shall utilize unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit). Use of Category 5, or better, control network wiring shall also be supported.
 - g. The control network wiring may be bus, loop, home run, star or any combination of these
 1. The control network wiring may be bus, loop, home run, star or any combination of these
 2. The power controller shall directly support the following network protocols:
 - h. Net3 protocol suite including ANSI E1.31 Streaming ACN (sACN)
 - i. ANSI E1.17 Architecture for Control Networks (ACN)
 - j. Systems that do not support the above listed industry standard ACN protocols for Ethernet setup, control, and feedback integrated directly between the power system and control system shall not be deemed acceptable.
 3. The power control shall directly support 2 optically isolated ports of ANSI E1.11 USITT DMX512-A for control input. Minimum 2,500V of optical isolation shall be provided between the DMX512 inputs and the electronics. Systems that do not have optical isolation on a prewired factory plug-in device shall not be acceptable.
- E. Power Control Features

1. The power control shall automatically compensate for frequency variations during operation.
2. Dimmer outputs shall exhibit no oscillating or hunting for levels. Dimmers with the same choke type set to the same level shall output within $\pm 1V$ of each other, regardless of phase or input voltage.
3. Power control shall maintain proper dimming performance for all line feed frequencies from 47-53Hz and 57-63Hz without flicker or misfire. Shifts in frequencies up to 3 Hz shall not result in flicker or loss of dimming timing. Systems that cannot perform to these frequency tolerances and shifts shall not be acceptable.
4. Dimmer output levels shall be regulated for incoming line voltages. The regulation shall adjust for both RMS voltage changes and deformations in the incoming AC waveform. The power control shall monitor and adjust each dimmer's output to maintain a constant power to the load. Regulation shall maintain the desired output voltage $\pm 1V$ for the entire operating range (91-139V and 181-259 VAC) with the exception that the maximum output will be no greater than the line voltage minus dimmer insulation loss. The regulation shall compensate for dips and anomalies in the AC waveform on a dimmer-by-dimmer basis. There shall be no interaction between dimmers in the system or any other equipment. The output shall be nominally regulated to 115V/230V appropriate for the market, but shall be field adjustable on a dimmer-by-dimmer basis to allow for varying cable length. Systems that cannot maintain perform to the above stated voltage regulation shall not be acceptable.
5. Power control shall support a rack filled with different types and sizes of dimmer modules. The properties of each dimmer shall be configurable, including dimmer name, output curve, dimmer firing mode, and scale voltage values.
 - a. The output curve selections shall include IES Modified Square, Square, Linear, Modified Linear and a Sensor v2.0 output curve. The power control shall also have the capability of storing up to three custom curves as well as an adjustable preheat level, assignable on a per-dimmer basis.
 - b. Circuit control modes shall include: Always on, Dimmable, Dimmer Doubled, Switched (unregulated on/off with adjustable on-at level), Fluorescent with adjustable threshold and Off.
 - c. Power Control shall support forward or reverse phase firing of appropriate modules.
 - d. Dimmers set as Dimmer Doubled shall allow a single dimmer to set two different levels on one dimmer circuit by splitting the AC power into positive and negative half cycles with no resultant DC line current.
 - e. Power Control that does not support all above listed adjustments to dimmers on a per circuit basis shall not be acceptable.
6. User programmable parameters shall support onsite setup via the local interface in the rack. These parameters shall include, but not be limited to, defining module type, scale voltage for each dimmer, firing mode, curve, dimmer numbering, and DMX512/sACN network port assignments. Systems requiring factory programming shall not be acceptable.
7. Hardware settings for rack type, available module types, availability of AF features, and operating voltage shall be configurable at the factory or in the field, and shall not require secondary setup after system commissioning even in the event of power controller replacement.
8. Controller shall support two methods of automatic configuration during controller replacement in a rack.

- a. Use backplane configuration: The backplane shall retain full setup and preset data in. In this recovery mode, when a new power control is inserted, the controller shall automatically come on-line fully functional without any manual intervention.
 - b. Use controller configuration: Override backplane configuration such that replacement modules automatically use the configuration resident in nonvolatile memory of the power control.
9. Controller shall be capable of changing rack setup for multiple shows for an entire system with a single update command from a remote PC.
10. In the event of data loss each rack shall maintain the last level for a user-programmable time (zero to five minutes or indefinitely) or may be programmed to fade out or to play a specific preset. Systems that do not offer this feature shall not be acceptable.
11. The power control shall contain diagnostic routines to allow the user to test and troubleshoot the system. The power control shall also contain a Test/Bypass switch to turn all dimmers on to full for testing. This switch shall bypass all electronics and shall force the fan on. Systems that do not include local control, "all on" control bypass, and diagnostic routines shall not be deemed acceptable.
12. The power control shall be able to record up to 64 presets in a rack. Presets shall be user programmable by recording a snapshot of current dimmer levels (as set by the all control sources), by entering dimmer levels on the power control directly or by a combination of both methods. The system shall have the ability to program and activate group-wide presets from the power control, remote station, console, networked computer or handheld device. Presets shall be activated in the default fade time of 2 seconds, but shall be have a user-programmable fade time between 0 and 60 minutes.
13. A system-wide panic (emergency UL924) activation circuit shall be provided. Any dimmer in any rack may be assigned to the panic circuit. The panic closure shall be maintained. Upon activation the system shall:
 - a. Force all circuits selected to be included in panic to a master level between 80-100%
 - b. Optionally force all non-panic dimmers to zero
 - c. Provide configurable fade time to and from "emergency" state
 - d. Provide configurable delay to and from "emergency" state
14. DMX A and B as well as the Ethernet DMX (EDMX) data may be patched using a rack start address - assigned sequentially from a starting control channel or patched individually on a per-dimmer basis. Priority may be set per universe for the DMX inputs, and set per universe by the control source for Ethernet input. Each dimmer may have up to six network control inputs with either a highest takes precedence or priority patch. Each dimmer may also then be assigned to one of 16 spaces for additional specific preset control. Each preset shall have a separate priority for maximum flexibility of prioritization. Systems that do not support prioritization of multiple Ethernet sources beyond HTP shall not be acceptable. Systems that do not support the above listed flexibility in control source prioritization shall not be acceptable.
15. Power control shall provide the ability to set a single circuit, all circuits or a range of circuits to a level at the control interface in the rack. Systems that cannot locally control dimmers through local control override shall not be acceptable.
16. The power control shall be capable of monitoring and displaying incoming line voltage for all three phases on the LCD. With installed current sensors, the same display shall show amperage on each phase.

17. The power control shall support security protected access. The user shall to able to program passwords that restrict access, preventing unauthorized use of higher-level functions by unauthorized personnel. Systems that do not provide security protected access to features that can render the system unusable shall not be acceptable.
18. Advanced Features (AF) option shall add an additional sensor in the individual dimmer modules. This option shall allow monitoring of current and output voltage on a dimmer-by-dimmer basis and provide information on lamp burnouts, dimmer status and input voltages.
19. Power control shall allow the user to record the loads of all AF dimmers in the system. The power control shall, during operation, test each AF dimmer, determine its load and compare it to the recorded load. Any change from recorded loads of configured tolerance shall display an error on the power control and any monitoring device on the network. If a dimmer is driven on with no load, an optional message shall be available to notify the console operator and electrician that there is no load.

F. Connect to Console Communications

1. The Ethernet network shall provide an integral link to connect all racks in the system for remote rack-to-console and rack-to-network device communication of the below listed features of real-time control, configuration, and status/feedback using industry standard ANSI E1.17 ACN lighting protocol. Power control and dimming systems that do not use this protocol shall not be permitted. Reported system errors shall be given ACN access to be cleared remotely at the console with exception of system critical errors that require a person to go directly to the rack to manually clear the exiting fault.
2. Control
 - a. E1.31 sACN control
 - b. Activate/Deactivate rack presets
 - c. Set/Unset circuit levels as overrides to Preset, DMX, and sACN control
 - d. Lock relays into On/Off/Remote switching states without patching to a console.
 - e. Lock dimmers into non-dim mode with On/Off/Remote switching states without patching to a console.
3. Remote console configuration shall include, but not be limited to, real time reporting and editing the following:
 - a. Circuit's control mode
 1. Dimmable
 2. Switched
 3. Latch-lock
 4. Always on
 5. Off
 6. Fluorescent
 - b. Curves
 - c. Control threshold
 - d. Min Scale Voltage
 - e. Max Scale Voltage
 - f. Preheat
 - g. Scale load
4. Standard rack feedback - Rack status messages shall include, but not be limited to, real time reporting of the following:
 - a. Identification
 7. Rack type

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8. Rack name
 9. Rack number
 - b. State of UL924 panic closure
 - c. DMX port A or B has an error or has failed
 - d. Network has an error or has failed
 - e. Phase A, B or C is below 90 volts
 - f. Phase A, B or C is above 139 volts
 - g. Phase A, B or C did not start because it was outside of allowable voltage ranges at power up
 - h. Phase A, B or C voltage headroom warning
 - i. Frequency is not 50 or 60 Hz
 - j. Ambient temperature is below 0°C/32°F
 - k. Ambient temperature is above 40°C/104°F
 - l. System Critical-Ambient temperature exceeds 46°C/115°F
 - m. Configuration memory error
 - n. Run hours remaining before rack filter needs to be cleaned
 - o. IP address of the controller in the rack
 - p. Software version of the controller in the rack
 5. Standard branch circuit feedback - Ethernet console access of the following circuit status shall be provided:
 - a. Module type
 - b. Circuit location
 - c. Patched circuit addresses
 - d. Output level
 - e. Control Source
 - f. Overtemp
 6. Advanced branch circuit feedback - Dimmer Specific status messages shall include, but not be limited to, the following:
 - a. Load has dropped below recorded value
 - b. Load has raised above recorded value
 - c. DC detected on dimmer output
 - d. One SCR has failed on/off
 - e. Dimmer has failed off or circuit breaker has tripped
 - f. Dimmer has been removed
 - g. Dimmer load has failed
 - h. Dimmer has shut down due to over temperature
- 2.8 ARCHITECTURAL CONTROL SYSTEM RACK ENCLOSURE: REFERENCED PRODUCT ETC
UNISON ERN SERIES CONTROL ENCLOSURES
 - A. Control Enclosures
 1. The control Enclosure shall be the Unison ERn Series Control Enclosure as manufactured by Electronic Theatre Controls, Inc., or equal.
 - B. Mechanical
 1. The ERn Control Enclosure shall be a surface mounted panel constructed of 18 gauge formed steel panels with a hinged, lockable full-height door containing an integral electrostatic air filter.
 - a. The Enclosure door shall have an opening to allow limited access to the control module face panel.
 - b. Enclosures shall be convection cooled without the use of fans.

2. Control Enclosures shall be sized to accept one or two Control Processors and one or two Station Power Modules, including various options and accessories.
 - a. The two-space Control Enclosure (ERn2) shall support a single Station Power Supply module
 - b. The four-space Control Enclosure (ERn4) shall support two Control Processors, and two Station Power Supply modules, or, one Control Processor, one Station Power Supply Module and one Station Bus Repeaters module, or one control processor and one dual Station Bus Dual Repeater module.
3. All Enclosure components shall be properly treated and finished.
 - a. Exterior surfaces shall be finished in fine textured, scratch resistant, powder-based epoxy paint.
4. Enclosure(s) shall also be available in a 19" rack mounted (RM) version.
 - a. Rack-mounted version shall have an independent Enclosure suspension kit, with a full height, locking door/cover attached to the kit.
 - b. Rack-mounted version shall have an opening to access the control module face panel, and openings to view indicators on option modules.
5. Enclosure dimensions and weights (without modules) shall not exceed:
 - a. ERn2 - 15" W x 9" H, 10" D, 15 lb.
 - b. ERn2-RM - 19" W 11"H 10" D, 20 lb.
 - c. ERn4 - 15" W x 14" H x 10" D, 20 lb.
 - d. ERn4-RM - 19" W x 16" H x 10" D, 25 lb.
6. Top, bottom, and side knockouts shall facilitate conduit entry.
7. Enclosures shall be designed to allow easy insertion and removal of all control and option modules without the use of tools.
 - a. Supports shall be provided for precise alignment of modules into power and signal connector blocks.
 - b. With modules removed, Enclosures shall provide clear front access to all power and control wire terminations.
8. Option Modules
 - a. Ethernet Switch (ENET - Surface Mount ERn only)
 - i) The Control Enclosure shall support an optional 5-port Ethernet Switch, with at least 4 ports supplying Power over Ethernet (PoE).
 - ii) The Ethernet Switch module shall be 10/100BaseTX, auto MDI/MDIX, 802.3af PSE compliant.
 - iii) The Ethernet Switch module shall contain power, status, and activity indicators. All indicators shall be visible when the Enclosure door is open for wall mounted ERn.
 - b. Redundant Power Supply (RRPS)
 - i) The Control Enclosure shall support an optional redundant power supply which shall automatically provide power to the control electronics upon failure or removal of the primary power supply.
 - ii) The redundant power supply shall assert itself seamlessly without a loss of power to the control electronics.
 - iii) The redundant power supply shall seamlessly remove itself when the primary power supply is reengaged.
 - iv) The redundant power supply shall provide visible indication that it is active.
 - c. Station Bus Repeaters (ERn4 only)

- i) The Control Enclosure shall support an optional module to expand the station bus length an additional 400 meters, and the station count an additional 30 stations (62 maximum per processor/Enclosure)
 - ii) Wall-mount and 19" Rack-Mount versions of the Station Bus Repeaters shall also be available to support mid-span insertion away from the Control Enclosure.
 - d. Station Bus Dual Repeaters (ERn4 only)
 - i) The Control Enclosure shall support an optional module to expand the station bus length to two additional 400-meter segments (a total of 1200 meters from a single Enclosure, and the station count to 62 stations (62 maximum per processor/Enclosure).
 - ii) Wall-mount and 19" Rack-Mount versions of the Station Bus Dual Repeaters shall also be available to support mid-span insertion away from the Control Enclosure.
- 9. Provide the following accessories
 - a. RideThru Option (RTO)
 - i) The Control Enclosure shall support an optional, short-term back-up power source for the control electronics installed inside the Enclosure.
 - ii) RideThru Option (RTO) provides power for control electronics during brief power outages or drop outs.
 - iii) The short-term back-up power source shall automatically engage upon the loss of normal power, seamlessly transitioning the supply power for the control electronics power to itself.
 - iv) The short-term back-up power supply shall detect the return of normal power, and seamlessly return the control electronics to normal power.
 - v) The short-term back-up power source shall support the control electronics for at least 10 seconds.
 - b. BatteryPack Option (BPO – Surface Mount ERn Only)
 - i) The Control Enclosure shall support an optional, long-term back-up power source for the control electronics installed outside the Enclosure.
 - ii) The long-term back-up power source shall automatically engage upon the loss of normal power, seamlessly transitioning the supply power for the control electronics power to itself.
 - iii) The long-term back-up power source shall supply power to the control electronics for at least 90 minutes.
 - iv) The long-term back-up power supply shall detect the return of normal power, and seamlessly return the control electronics to normal power.
 - v) A test switch/indicator shall be available without opening the rack door or removal of any modules/components.

C. Electrical

- 1. Control Enclosures shall be available in 100, 120, 230 and 240 volt, single-phase configurations.
- 2. Control Enclosures shall be completely pre-wired by the manufacturer. The contractor shall provide input and control wiring.
- 3. Control Enclosures shall be designed to support the following wire terminations:
 - a. AC (single phase)
 - b. Echelon link power (Belden 8471 or equivalent)
 - c. 24Vdc (2- 16AWG Wire)
 - d. DMX512A Port A (In or Out) (Belden 9729 or equivalent)
 - e. DMX512A Port B (In or Out) (Belden 9729 or equivalent)

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- f. RS232 Serial In/Out (Belden 9729 or equivalent)
 - g. Unshielded Twisted Pair (UTP) Category 5 Ethernet
 - h. Contact Closure In (14AWG to 26AWG Wire)
 - i. Contact Closure Out (14AWG to 26AWG Wire)
 - i) Contact Closure Out shall provide 1A @ 30vDC
 - 4. Station Power Modules
 - a. Station power supply modules shall provide LinkPower for at 32 stations and 1.5A@24VDC of Auxiliary (AUX) power.
 - b. Station power repeater modules shall provide LinkPower for 30 stations and 1.5A@24VDC of Auxiliary (AUX) power.
 - c. Station power module shall support over-current/short protection for LinkPower and Aux. LinkPower shall support fault detection on each leg of the balanced data bus.
 - 5. All control wire connections shall be terminated via factory provided connectors.
 - D. Thermal
 - 1. Ambient room temperature: 0-40°C / 32-104°F
 - 2. Ambient humidity: 30-90% non-condensing.
- 2.9 ARCHITECTURAL CONTROL PROCESSOR: REFERENCED PRODUCT ETC UNISON PARADIGM CONTROL PROCESSOR MODULES
 - A. The Architectural Control Processor shall be the Unison Paradigm P-ACP Series Control Processor as manufactured by Electronic Theatre Controls, Inc.
 - B. Mechanical
 - 1. The Architectural Control Processor (ACP) assembly shall be designed for use in DRd Series Dimming Enclosures and ERn Series Control Enclosures.
 - 2. The processor shall utilize microprocessor based, solid state technology to provide multi-scene lighting and building control.
 - 3. ACP module electronics shall be contained in a plug-in assembly.
 - a. The module shall be housed in a formed steel body and contain no discrete wire connections.
 - i) No tools shall be required for module removal or insertion.
 - 4. The ACP shall be convection cooled.
 - 5. User Interface
 - a. The ACP shall utilize a backlit liquid crystal display capable of graphics and eight lines of text.
 - b. The ACP shall provide an alpha-numeric keypad for data entry and navigation.
 - c. The ACP shall provide a touch-sensitive control wheel for navigation.
 - d. The ACP shall provide shortcut buttons to assist in navigation, selection, and data entry.
 - e. The ACP keypad, buttons, and wheel shall be backlit for use in low-light conditions.
 - i) The backlight shall have a user selectable time out, including no time out.
 - 6. The ACP shall provide a front-panel RJ45 jack for Ethernet connection to the processor for configuration, live control, and web-browser-based system access.
 - a. The Ethernet port shall be secured behind the locking door.
 - 7. The ACP shall provide a Secure Digital (SD) Removable Media slot on the front panel for transfer of configuration data.
 - a. The SD slot shall be secured behind the locking door.

8. The ACP shall provide a Universal Serial Bus (USB) port on the front panel for transfer of configuration data.
 - a. The USB port shall be secured behind the locking door.
 9. Architectural Lighting System configuration and program information shall be stored in flash memory, which does not require battery backup.
 - a. The ACP shall provide a Compact Flash (CF) Card as backup flash memory and storage.
 - b. The CF Card is stored in the back of the ACP, and can be accessed only by removing the ACP.
 - c. The ACP data can be exchanged by inserting the CF card into another ACP.
- C. Electrical
1. The ACP shall require no discrete wiring connections; all wiring shall be terminated into Dimming or Control Enclosure.
 2. The ACP shall require low-voltage power supplied by the Dimming or Control enclosure.
 3. The ACP shall be hot-swap capable.
 4. The ACP shall support Echelon LinkPower communications with remote devices, including button stations, button/fader stations, Touchscreen stations, sensors, and third party LonMARK compliant products.
 - a. The LinkPower network shall utilize polarity-independent, low-voltage Class II twisted pair wiring, type Belden 8471 (unshielded) or Belden 8719 (shielded) or equivalent. One # 14 AWG drain wire will be required for system not using grounded metal conduit. Touchscreen stations, interface stations and portable stations connectors will also require (2) #16 AWG wires.
 - b. The LinkPower network shall be topology free. Network wiring may be bus, loop, home run, star or any combination of these.
 - c. Link power wiring shall permit a total wire run of 1640 ft. (500m) without a repeater. Repeater option modules shall be available to increase wiring maximums in increments of 1640 ft. (500m).
 - d. Link power wiring between stations shall not exceed 1313 ft. (400m).
 5. The ACP shall support 10/100BaseTX, auto MDI/MDIX, 802.3af compliant Ethernet networking using TCP/IP, ESTA BSR E1.17 Advanced Control Networks (ACN) and ESTA BSR E1.31 (sACN) Protocols for internal communication and integration with third-party equipment.
 6. The ACP shall support EIA-RS232 serial protocol for bi-directional command and communication with third-party equipment.
 7. The ACP shall support two discrete ESTA DMX512A ports, configurable as input or output ports.
 - a. °When used in a Dimming Enclosure, the second port is always an output port.
 8. The ACP shall provide four onboard dry contact closure inputs for integration with third-party products.
 9. The ACP shall provide four onboard contact closure outputs, rated at 1A@30VDC, for integration with third-party equipment.
- D. Functional
1. Capacity
 - a. Shall support 1024 channels of control
 - b. Shall support 2 physical DMX ports, each of which may be configured as an input or output
 2. System

- a. Runtime application shall utilize support Net3 system interoperability
 - b. System shall support the use of Network Time Protocol for real time clock synchronization
 - c. System shall support remote firmware upload an over Ethernet connection from a connected PC running the Light Designer software or another connected processor.
 - d. System shall support local firmware upload from removable media (SD Card, USB Flash Drive)
3. Diagnostics
 - a. Shall output an Event log
 - b. Standard log shall store a fixed-length history of recent activity
 - c. Separate critical log shall only store important messages (such as boot-up settings)
4. Configuration Data
 - a. Configuration Data can be uploaded over an Ethernet connection from a PC running Light Designer application
 - b. Configuration Data can be retrieved from another Paradigm Processor
 - c. A Paradigm Processor shall make its configuration data available for retrieval by another Processor as a backup/recovery mechanism
 - d. Configuration Data shall be stored on solid-state media that can be removed to facilitate transfer between Processor units
 - e. Configuration Data may be loaded to and from removable media access provided on front panel
 - f. Configuration Data for the entire System shall be available for download from any single Processor
 - g. Shall store configuration data for Dimming enclosure processors and shall make available for download
5. Scalability
 - a. Adding additional Processors to a System shall proportionately increase its overall capabilities up to a maximum System size
 - b. The maximum number of Processors configured as a System shall be at least 12.
 - c. Multiple Processors shall utilize the Ethernet network to remain time synchronized and share control information
 - d. Multiple Processors shall utilize the Ethernet network to maintain configuration data synchronization as modifications are made
 - e. Failure of a single Processor shall not prohibit continuing operation of the remaining Processors
 - f. It shall be possible for multiple Systems to coexist on the same physical network with logical isolation between Systems
6. Local User Interface
 - a. Shall provide access to Processor setup (IP address)
 - b. Shall provide access to Processor status and diagnostics
 - c. Where the Processor is installed within a Dimming enclosure, shall provide access to Dimming enclosure setup, status and diagnostics
 - d. Shall provide control functionality for Control Channels, Zones, Fixtures, Groups, Presets, Macros, Walls and Sequences within the current configuration.
 - e. Shall provide functionality to schedule astronomical and real time events (add/edit/delete)

- f. Shall allow for display of local DMX information
 - g. Shall allow for transfer of log files to local removable media
 - h. Shall allow to perform firmware upgrades for connected Dimming enclosures
 - i. Shall allow for transfer of configuration to and from Dimming enclosures using removable media
 - j. Shall allow for transfer of configuration to and from LCD Stations using removable media
 - k. Shall allow for binding of Stations
- 7. Access Controls
 - a. There shall be 2 user accounts - Administrator, and User with separate password protection
 - b. Account and password settings shall be local to each Processor
 - c. Access Controls shall be applied to certain areas of the Paradigm Local User Interface and Web Interface
- 8. Web User Interface
 - a. Shall be an internal web server accessible via Ethernet port
 - b. Shall support common web browsers on Windows and Mac platforms
 - c. Shall provide functionality to Activate and Deactivate Presets
 - d. Shall provide functionality to schedule timed events (add/delete)
 - e. Shall display status information
 - f. Shall display log files
 - g. Shall allow for configuration of Processor settings (date, time)
 - h. Shall allow for upload and download of configuration data
 - i. There shall be links to other web-enabled devices in the System, including other Paradigm Processors
- 9. Stations
 - a. Stations shall be connected to a Paradigm Processor via a LinkPower network or Ethernet
 - b. Station discovery and binding shall be accomplished from the Local User Interface or Light Designer
- 10. Net3 and ACN Devices
 - a. Net3 Devices shall be connected to and controlled from Paradigm Processors via Ethernet
 - b. Paradigm Processors shall provide DMX-Net3 gateway functionality
 - c. It shall be possible to send and receive Macro triggers defined within the System configuration via Net3
 - d. There shall be support for Streaming ACN on up to 24 universes per Processor
- 11. Operation
 - a. When contained in an dimming enclosure, a snapshot of the dimming enclosure output data shall be stored in persistent memory so that hardware can access it for immediate output on boot
 - b. DMX output refresh rate shall be configurable
 - c. There shall be support for 16-bit DMX Attributes
 - d. DMX inputs may be patched to DMX and Streaming ACN outputs as external sources
 - e. Streaming ACN inputs shall be patched to DMX outputs (gateway) as external sources
 - f. Where there are multiple external sources then priority and HTP shall be used to perform arbitration

- g. External and internal sources shall be arbitrated based on user-selection of standard or custom rules
 - h. On Preset Record, the values of Attributes within the Preset shall be updated to reflect the current output
 - i. The total output may be the combination of many different Presets running concurrently
 - j. There shall be no hard limit on number of concurrent cross fades
 - k. Multiple Presets controlling the same Attribute shall first interact based on priority and second based on Latest Takes Precedence(LTP) or Highest Takes Precedence (HTP)
 - l. LTP and HTP operation shall be supported simultaneously and interact (at the same priority) using HTP
 - m. Settings due to LTP Presets may be automatically discarded from operation when overridden
 - n. It shall be possible to specify that a Preset or Attribute Control will persist when overridden
 - o. A Preset may be designated as an HTP Override and shall cause HTP values to be discarded
 - p. It shall be possible to modify the rate of a Preset (Cross fades, Effects) from a Control within the System
 - q. Each Preset shall have a status that can be Activated, Deactivated or Altered
 - r. Preset status may be set based on matching levels in the current output as an option
 - s. On startup the System shall be capable of automatically executing timed events within the previous 24 hours to synchronize its initial output state with the current time of day
12. Serial Input/Output
- a. RS232 shall support 8-bit word length, parity selection and 1 or 2 stop bits
 - b. RS232 shall support baud rates from 4800 to 115,200 bps
 - c. Serial input and output messages are fully customizable
 - d. Serial output messages can be generated by any Control or Event

2.10 ARCHITECTURAL CONTROL PROCESSOR: REFERENCED PRODUCT ETC UNISON
STATION POWER MODULE

A. Station processor Modules

- 1. The Station Power Module shall be the Unison Paradigm P-SPM Series Station Power Module as manufactured by Electronic Theatre Controls, Inc., or equal.

B. Mechanical

- 1. The Station Power Module (SPM) assembly shall be designed for use in DRd Series or ERn Rack Enclosures.
- 2. The SPM shall convert input power into low-voltage (Class II) power with data line and a secondary auxiliary low-voltage line to energize button, button/fader, touchscreen, and interface devices for multi-scene lighting and building control.
- 3. SPM module shall be contained in a plug-in assembly.
 - a. The module shall be housed in a formed steel body and contain no discrete wire connections.
 - i) No tools shall be required for module removal or insertion.
- 4. The SPM shall be convection cooled.
- 5. User Interface

- a. The SPM shall utilize light emitting diodes (LED's) to indication function, status and fault.
 6. The SPM shall be secured behind the locking door.
 7. Wall-mounted, direct wire and 19" rack-mount, connectorized repeater and dual-repeater variants shall be available from the same manufacturer where required on the project.
- C. Electrical
 1. The SPM shall require no discrete wiring connections; all wiring shall be terminated into the dimming enclosure, unless required by a variant.
 2. The SPM shall require line-voltage power supplied by the contractor, terminated inside the dimming or control enclosure.
 3. The SPM shall be hot-swap capable.
 4. The SPM, in conjunction with a matching Architectural Control Processor (ACP), shall support Echelon LinkPower communications with remote devices, including button, button/fader, touchscreen and interface stations, and shall interoperate with LonMARK-approved third-party devices.
 - a. The LinkPower network shall utilize polarity-independent, low-voltage Class II twisted pair wiring, type Belden 8471 (unshielded) or Belden 8719 (shielded) or equivalent. One # 14 AWG drain wire will be required for system not using grounded metal conduit.
 - b. The LinkPower network shall be topology free. Network wiring may be bus, loop, home run, star or any combination of these.
 - i) Link power wiring shall permit a total wire run of 1640 ft. (500m)
 - ii) Repeaters allow an additional wire run of 1640 ft. (500m)
 - c. Dual-repeaters allow two additional wire runs of 1640 ft. (500m)
 5. Link power wiring between stations shall not exceed 1313 ft. (400m).
 6. The SPM shall support auxiliary power for certain remote devices, including touchscreen and interface stations, as required by the device.
 - a. The auxiliary power network shall utilize polarity-dependent, low-voltage Class II wiring, consisting of two # 16 AWG wires.
 - b. Auxiliary wiring shall permit a total wire run of 1640 ft. (500m)
 - i) Repeaters allow an additional wire run of 1640 ft. (500m)
 - ii) Dual-repeaters allow two additional wire runs of 1640 ft. (500m)
 - c. The SPM shall supply 1.25 amps at 24v DC continuously.
- D. Functional
 1. Capacity
 - a. Each SPM shall:
 - i) Supply power for up to 32 button and button/fader stations.
 - a) Repeaters and dual-repeaters allow 30 additional stations, 62 total
 - b. Supply auxiliary power for a similar number of interface stations.
 - c. Shall supply auxiliary power for up to four Touchscreen stations, when a like number of other stations are deducted from the total.
 - i) Repeaters and dual-repeaters allow two additional Touchscreens (six total) when a like number of other stations are deducted from the total.
 2. Operation
 - a. The SPM shall not require configuration or programming.
 - b. The SPM shall automatically detect faults in the wiring, indicate the fault, including the fault polarity, and shut down the output power.

- i) The SPM shall automatically reset when the fault is clear, and can be manually reset by removing and re-inserting the module.

2.11 GENERAL NETWORK:

A. General

1. The Electronic Theatre Controls Net3 network shall provide data distribution over a TCP/IP network. Data shall be layer 3 routable over the Ethernet network. Systems using proprietary formats or formats other than TCP/IP or non-layer 3 routable networks shall not be accepted.
2. Connections shall be made between consoles, facepanels, architectural processors, computers and Net3 Gateways over standard Ethernet distribution systems using 10/100BaseT wiring and/or 10/100BaseFL. All installations shall conform to established Ethernet wiring practice and installation shall be performed by contractors qualified to do this type of work. All wiring shall be tested at Category 5 or higher for full bandwidth operation to the appropriate IEEE standard.
3. The Lighting Control system must be supplied by a single manufacturer and must have seamless integration over Ethernet between the Entertainment and Architectural lighting control.

B. Capacities

1. The network shall provide DMX routing, patching, and prioritization for choice of up to 32,910,848 DMX addresses. Each address may be input or output from any port on any DMX Gateway in the system. DMX input, routing and output shall be specifically supported on the system from multiple sources and locations up to the maximum number of Gateways supported by the Ethernet topology.
2. The network shall support multiple consoles, computers, file servers, printers, and architectural processors with discrete command lines and control. The Net3 network shall support multiple venues/systems on the same network.
3. Network configuration shall be via ETC Gateway Configuration Editor (GCE) software. The software shall permit complete user flexibility allowing the system operator to patch DMX data over Ethernet DMX (EDMX), assign Gateway labels for easy identification, assign DMX offsets and provide choice of DMX port prioritization. Each Gateway shall have a specific IP address provided automatically by the software. The user may edit this IP address. Systems that do not support simple Windows configuration, or systems that do not allow complete reconfiguration of the above mentioned features over Ethernet shall not be acceptable.
4. All configuration data for each network device shall be held at the device and system operation shall not require continuous on-line operation of the network configuration software.
5. Architectural and Entertainment systems connected to the same Net3 network shall be capable of arbitrating control over EDMX data. The system shall be capable of alternating control of individual dimmer data between architectural and entertainment systems without intervention by the user. The user shall dictate the conditions under which system shall automatically take control and the network shall allow user override of the user selected defaults. Systems which require direct user intervention to allocate control of dimmers between architectural and entertainment lighting systems shall not be allowed.

6. The Net3 network shall allow multiple DMX inputs assigned to the same EDMX range to be set at different priorities. This shall allow the user to assign high or low priority to each DMX input port in the network on a port by port basis. The network shall require a valid DMX signal present at the input to initiate prioritization. Systems that do not allow for prioritization shall not be allowed.

C. Operational Features

1. The video monitor outputs at any Net3 Remote Video Interface (RVI) shall be able to monitor the video output of any Net3 console connected to the network.
2. Each DMX Gateway shall control up to 512 DMX addresses per port, within the confines of up to 64,279 DMX (32,910,848 address) "universes". The specific DMX data input or output by the Gateway shall be freely configurable by the user. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
3. Any number of DMX universes may be configured with any length up to 512 addresses as long as the total does not exceed 32,910,848. Any range of DMX addresses may be selected for each. Multiple sources may be combined and a priority may be assigned to each source. Each DMX input may have its own universe and offset address for ease of use.
4. DMX ports shall be configurable for either input or output. Multiple DMX signal routing patches and multiple facilities shall be specifically supported and limited only by the file storage capacity of the computer with ETC Network Configuration Editor software installed.
5. File transmission, synchronization and access to software shall be supported.

2.12 ARCHITECTURAL BUTTON, FADER & INTERFACE STATIONS: REFERENCED PRODUCT ETC UNISON HERITAGE STATIONS

A. Button Stations

1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
2. Mechanical
 - a. Unison Heritage Button stations shall operate using up to ten programmable buttons.
 - b. All button stations shall be available with white, cream, ivory, gray or black faceplates and buttons.
 - i) Manufacturer's standard colors shall conform to the RAL CLASSIC Standard.
 - c. Stations shall have indicators lights at each button or fader.
 - i) Indicators shall be comprised of red, green and blue LED's.
 - ii) Indicator color and state (steady On, Blink, Off) shall be configured in software, and shall operate relative to the button or fader it is associated with.
 - d. All faceplates shall be designed for flush or surface mounting.
 - e. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - f. Station faceplates shall be indelibly marked for each button or fader function.
 - g. The manufacturer shall supply back boxes for flush mounted half gang stations and for all surface mounted stations.
 - h. All Button and Button/Fader stations shall be shall be designed to accept the infrared signal from a remote hand held IR transmitter.

- i) The stations shall have a 60° reception angle and shall operate reliably within a 45' distance.
 - i. IR Transmitters shall be available in seven or twelve button configurations. Custom transmitters may have up to 10 programmable buttons.
 - i) IR transmitters shall be mounted in a hand-held black plastic controller. Transmitter dimensions shall be 1.875" wide, 6.625" long and 0.60" deep.
- 3. Electrical
 - a. Unison control station wiring shall be an Echelon® Link power network.
 - i) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - ii) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - iii) Network wiring may be bus, loop, home run, star or any combination of these.
 - iv) Network insulation displacement connectors shall be provided with all stations.
- 4. Functional
 - a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Button, Button/Fader, and Interface or Astronomical time clock controls. System shall allow the programming of presets, sequences, macros and time clock events.
 - i) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond.
 - b) Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - ii) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - iii) System time clock events shall be programmable via LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.

- b. Station Button, Button/Fader, and Interface control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - i) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.
 - ii) Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.
 - c. Stations (Button and Button/Fader) shall allow programming of station and component electronic lockout levels via LightDesigner.
- B. Button/Fader Stations
- 1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
 - 2. Mechanical
 - a. Unison Heritage Button/Fader Stations shall operate using up to sixteen programmable faders and twelve programmable buttons.
 - b. All button/fader stations shall be available with white, cream, ivory, gray or black faceplates, fader knobs, and buttons.
 - i) Manufacturer's standard colors shall conform to the RAL CLASSIC Standard.
 - c. Fader stations shall utilize standard 45-millimeter slide potentiometers.
 - d. Stations shall have indicators lights at each button or fader.
 - i) Indicators shall be comprised of red, green and blue LED's
 - ii) Indicator color and state (steady On, Blink, Off) shall be configured in software, and shall operate relative to the button or fader it is associated with.
 - e. All faceplates shall be designed for flush or surface mounting.
 - f. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - g. Station faceplates shall be indelibly marked for each button or fader function.
 - h. The manufacturer shall supply back boxes for flush mounted half gang stations and for all surface mounted stations.
 - i. All Button and Button/Fader stations shall be shall be designed to accept the infrared signal from a remote hand held IR transmitter.
 - i) The stations shall have a 60° reception angle and shall operate reliably within a 45' distance.
 - j. IR Transmitters shall be available in seven or twelve button configurations. Custom transmitters may have up to 10 programmable buttons.
 - i) IR transmitters shall be mounted in a hand-held black plastic controller. Transmitter dimensions shall be 1.875" wide, 6.625" long and 0.60" deep.
 - 3. Electrical
 - a. Unison control station wiring shall be an Echelon® Link power network.
 - i) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - ii) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.

- iii) Network wiring may be bus, loop, home run, star or any combination of these.
- iv) Network insulation displacement connectors shall be provided with all stations.

4. Functional

- a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Button, Button/Fader, and Interface, or Astronomical time clock controls. System shall allow the programming of presets, sequences, macros and time clock events.
 - i) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond.
 - b) Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - ii) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - iii) System time clock events shall be programmable via LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.
- b. Station Button, Button/Fader, and Interface) control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - i) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.
 - ii) Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.
- c. Stations (Button and Button/Fader) shall allow programming of station and component electronic lockout levels via LightDesigner.

C. Connector Stations

- 1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
- 2. Mechanical
 - a. Unison connector stations shall provide an interface to portable Unison stations.

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- b. All connector stations shall be available with white, cream, ivory, gray or black faceplates, fader knobs, and buttons.
 - i) Manufacturer's standard colors shall conform to the RAL CLASSIC Standard.
 - c. All faceplates shall be designed for flush or surface mounting.
 - d. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - e. Station faceplates shall be indelibly marked for each function.
 - f. The manufacturer shall supply back boxes for flush mounted half gang stations and for all surface mounted stations.
3. Electrical
- a. Unison control station wiring shall be an Echelon® Link power network.
 - i) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - ii) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - iii) Network wiring may be bus, loop, home run, star or any combination of these.
 - iv) Network insulation displacement connectors shall be provided with all stations.
4. Functional
- a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Button, Button/Fader, and Interface or Astronomical time clock controls. System shall allow the programming of presets, sequences, macros and time clock events.
 - i) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond.
 - b) Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - ii) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - iii) System time clock events shall be programmable via LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically

compensate for regions using a fully configurable daylight saving time.

- b. Station Button, Button/Fader, and Interface control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - i) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.
 - ii) Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.
- c. Stations (Button and Button/Fader) shall allow programming of station and component electronic lockout levels via LightDesigner.

D. Contact Interface Station

- 1. The Lighting Control Stations shall be the Unison Heritage UH Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
- 2. General
 - a. Unison Contact Interface shall provide direct interface (in and out) to external devices via contact closure. Interface enclosure shall consist of 16 input connections and 16 output connections.
- 3. Mechanical
 - a. The surface mount enclosure and cover shall be constructed of 16- gauge (.08) steel and are finished in black smooth matte powder coat paint. The enclosure shall be 14" W x 10.5" H x 3" D.
 - b. Conduit access points shall be provided on the top and bottom of the unit.
 - c. The assembly shall consist of up to 16 connections; 8 inputs functionally coupled with 8 normally open relay contact outputs. Inputs and outputs may be configured as either maintained or momentary.
- 4. Electrical
 - a. Unison control station wiring shall be an Echelon® Link power network.
 - i) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - ii) Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - iii) Network wiring may be bus, loop, home run, star or any combination of these.
 - iv) Network insulation displacement connectors shall be provided with all stations.
 - b. Ratings:
 - i) The Input Rating shall be 5V@10mA (unit requires dry contact closure)
 - ii) Dry contact outputs shall consist of:
 - a) Normally-Open 2-pole contact closure outputs: 1A@30Vdc & .5A@120V.

2.13 TOUCHSCREEN CONTROL STATIONS: REFERENCED PRODUCT ETC UNISON PARADIGM TOUCHSCREEN

- A. The Touchscreen Control Stations shall be the Unison Paradigm Touchscreen P-LCD Series Control Stations as manufactured by Electronic Theatre Controls, Inc.
- B. General
 - 1. Touchscreen stations shall support default and fully graphical control pages.
 - 2. The Touchscreen station shall operate using graphic buttons, faders and other images on at least 30 separate programmable control pages.
 - 3. Touchscreen stations shall also allow programming of page pass-code, lock out and visibility levels.
- C. Mechanical
 - 1. Touchscreen stations shall consist of a seven inch, backlit liquid crystal display (LCD) with a minimum resolution of 800 by 400 pixels and 12-bit color depth with a touch interface.
 - 2. Touchscreen bezels shall be constructed of aluminum and shall have no visible means of attachment.
 - a. The bezel shall install and remove without the use of tools.
 - b. The bezel shall provide two working positions for the Touchscreen: service and operating.
 - 3. The Touchscreen shall have a protective overlay over the display.
 - a. The overlay shall reduce wear
 - b. The overlay shall reduce glare
 - 4. The manufacturer shall provide backboxes for all LCD stations.
 - a. Flush back box dimensions shall be 7.94" wide x 5.33" high x 3.25" deep
 - b. Surface back box dimensions shall be 8.3" wide x 5.6" high x 2.55" deep
- D. Electrical
 - 1. Touchscreens shall be powered entirely by the System network.
 - 2. Touchscreens shall connect to the System using an Ethernet network with Power over Ethernet (PoE) or the Unison control station Echelon® Link power network.
 - a. Ethernet Network
 - i) Ethernet network shall be 10/100BaseTX, auto MDI/MDIX, 802.3af compliant.
 - ii) Network shall utilize Unshielded Twisted Pair (UTP) Category 5 wiring.
 - b. Echelon® Link power network.
 - i) Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - ii) Touchscreen stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.
 - iii) Network wiring may be bus, loop, home run, star or any combination of these.
 - iv) Network insulation displacement connectors shall be provided with all stations.
- E. Functional
 - 1. System
 - a. The Touchscreen shall support configuration firmware upload from a Paradigm Processor as proxy
 - b. The Touchscreen shall support configuration or firmware upload from local removable media

2. Setup Mode
 - a. There shall be a setup display that is separate from any user-defined configuration
 - b. It shall be possible to view and modify connectivity settings
 - c. It shall be possible to view status information
 - d. It shall be possible to view and modify LCD screen settings
 - e. It shall be possible to perform Touchscreen calibration
 - f. It shall be possible to view and modify audio settings
 - g. The appearance of the setup display shall be standard and not editable
 - h. The setup display may be invoked from within the user-defined configuration and/or physical button on the Touchscreen
 - i. There shall be a default protected method to invoke the setup display
3. Configurations
 - a. It shall be possible to have multiple configurations stored within an LCD Station
 - b. Only one configuration may be active on the LCD Station
 - c. It shall be possible for Touchscreen Stations connected via the Echelon® Link power network to select a configuration automatically based on the configuration of the physical connection.
 - d. Where multiple configurations are stored there shall be a boot menu to allow selection of a configuration
 - e. Each configuration shall be identified as a different Station within the System
4. Operation
 - a. The Unison Paradigm Control System shall be designed to allow control of lighting and associated systems via Touchscreen controls. System shall allow the control of presets, sequences, macros and time clock events.
 - i) System presets shall be programmable via Button, Button/Fader, Touchscreen, or LightDesigner software.
 - a) Presets shall have a discrete fade time, programmable from zero to 84,600 seconds with a resolution of one hundred milliseconds.
 - b) Presets shall be selectable via Touchscreen stations.
 - ii) System macros and sequences shall be programmable via LightDesigner system software.
 - a) Macro and sequence steps shall provide user selectable steps, and allow the application of conditional logic.
 - b) Macro and sequences shall be activated by button, time clock event or LightDesigner software.
 - iii) System time clock events shall be programmable via the Touchscreen, LightDesigner system software, the processor user interface, or the internal web server.
 - a) Time clock events shall be assigned to system day types. Standard day types include: anyway, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.
 - b) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using a fully configurable daylight saving time.

- b. Touchscreen stations shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via LightDesigner, the Windows-based configuration program.
 - i) Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, and cue light, or room join/separate.
 - ii) Optional fader functions include master control, individual channel control, fade rate control or preset master control.
 - c. Touchscreen stations shall allow programming of station and component electronic lockout levels via LightDesigner.
 - d. It shall be possible to adjust LCD contrast and brightness.
 - e. It shall be possible to program the station to dim during periods of inactivity.
 - F. Contractor shall provide quantity and style of touchscreens as indicated on the bid documents (permanently installed wall mount, portable or wireless).
- 2.14 ARCHITECTURAL LIGHTING CONTROL SYSTEM CONFIGURATION & CONTROL SOFTWARE: REFERENCED PRODUCT ETC LIGHTDESIGNER
 - A. The contractor shall program the architectural lighting control system via LightDesigner per the contract document intents and with owner input for initial system setup and basic operation.
 - B. The contractor shall provide additional Paradigm programming services for the owner of (2) standard eight-hour work days (sixteen hours total in a maximum of two site trips) in adjusting the initial settings to system presets, misc. advanced programming, LCD touchscreen layout/operational changes, etc. (these are typically remote reprogramming services and are limited to the first 12-month period after the substantial completion date). If this additional programming is required on site, then the stated hours listed above would also include travel time. All additional programming time shall be tracked by the contractor with owner requests, sign-off sheets, cumulative hours, etc. up to the stated hours listed above. Any additional programming/reprogramming required either after the additional hours listed above or beyond the initial 12-month period shall be only at additional expense to the owner.
 - C. Unison Paradigm LightDesigner software has been included in the written specifications in order to reference a base standard for operational and programming capabilities of the system. Its inclusion neither intends to insinuate nor allows the owner to possess a loadable version of this software to be installed onto other computers or systems nor does it grant the owner any related training in using or manipulating this software or in personally making changes to the system configuration file. This software is intended only as part of the field service tech's toolkit in programming and configuring the architectural lighting control system (unless specific instructions are noted elsewhere on the contract documents to the contrary).
 - D. System Configuration
 - 1. The Architectural Control System Configuration software shall be the Unison Paradigm LightDesigner as manufactured by Electronic Theatre Controls, Inc., or equal.
 - 2. Definitions
 - a. A System is the configuration of one or more Paradigm Processors
 - b. A Fixture is a controllable entity with one or more Attributes
 - c. An Attribute is a parameter of control such as Intensity, Pan or Gobo select
 - d. A Group is a selection of Fixtures that can be stored and recalled
 - e. A Space is defined area where other System objects reside. A Space defines the scope of Control for other objects.

- f. Room Combine is functionality enabling the scope of control to vary in a pre-defined way based on the current status of a moveable Wall or Walls
 - g. A Control is a single point of input to the System (e.g. Button, Fader, Serial Port)
 - h. An Indicator is a single point of feedback from the System (e.g. LED, Label on LCD)
 - i. A Station has an arrangement of Controls and Indicators
 - j. A Page stores the assignment of function to Controls and Indicators of a particular Station and their properties (e.g. lockout threshold)
 - k. Actions are items of functionality that can occur within a running Paradigm system in response to events (e.g. button presses, timed events)
 - l. Preset is a container of Attribute settings (levels) and timings that can be stored and recalled
 - m. A Sequence is a series of connected steps referencing Presets along with additional timing information
 - n. Effects are Attribute settings that result in continually varying levels following a specified curve and using additional timing parameters (e.g. period, offset)
 - o. Palette is a container of Attribute settings (levels) that can be referenced from Presets, allowing a change in the Palette to globally modify referenced Presets.
 - p. Macros are user-defined operations built up as a sequence of Actions that can be recalled
 - q. Binding is the process of associating a logical instance of a device within the configuration with a physical device discovered at runtime
3. Environment
- a. Shall be possible to work with multiple System configurations simultaneously
 - b. There shall be clipboard functionality (cut, copy, paste) for entire objects (e.g. Presets, Stations), settings (e.g. Attribute levels) and text
 - c. There shall be undo and redo functionality where persistent changes are made to the System configuration (but not application settings or playback state)
 - d. There shall be a auto-backup feature
 - e. The application interface shall be based around (i) a tree-view; (ii) a workspace area; (iii) a properties inspector; (iv) item selector.
 - f. It shall be possible to represent data about the workspace area graphically (plan) or in tabular form
 - g. Plan views shall support zoom
 - h. Plan views shall support a layout grid with user-defined spacing and color with associated snap-to-grid functionality
 - i. The properties inspector shall be used to view and modify the properties of one or multiple objects
 - j. There shall be 2 modes of operation that expose progressively more in-depth functionality (Normal, Advanced)
 - k. It shall be possible to enter User-configurable names in any language supported by their operating system (e.g. encoded as UTF8)
 - l. User-configurable names shall be limited to 64 display characters each
 - m. There shall be provision for help functionality to be accessed from within the application
4. System Configuration
- a. It shall be possible to create Spaces
 - b. It shall be possible to add Fixtures by selecting a Fixture Template from the provided library and create custom Fixtures

- c. It shall be possible to add Stations by selecting a Station Definition from the provided library and create custom Stations
 - d. It shall be possible to create a System based on data imported from a defined documentation format (e.g. CSV, XML)
 - e. It shall be possible to export System configuration data to a defined documentation format (e.g. CSV, XML)
 - f. There shall be a wizard to assist with the initial setup of a System including Project data entry, Space creation, network configuration, and zone creation.
 - g. There shall be a straightforward process for the assignment of Fixtures and Stations to particular Processors
 - h. There shall be a 2-dimensional plan view that displays the layout of Spaces
 - i. A Space shall be displayed as a user-configurable polygon with straight edges
 - j. The plan shall display Fixtures and Stations located within Spaces
 - k. The plan shall display Walls between Spaces and their current state (open, closed)
 - l. Items displayed on the plan may be arranged using standard graphical interaction methods (e.g. drag-and-drop)
 - m. It shall be possible to import images JPEG, BMP and GIF formats as a background image to the plan view
 - n. It shall be possible to create Walls that accomplish Room Combine between Spaces
5. Fixture Configuration
- a. There shall be functionality to patch Fixtures to DMX and Streaming ACN
 - b. There shall be support for Fixtures with split patches (e.g. VL5)
 - c. There shall be support for multiply-patching a Fixture
 - d. It shall be possible to swap pan and tilt axes for a moving-light Fixture
 - e. It shall be possible to specify a minimum and maximum value for an Attribute
 - f. It shall be possible to specify a minimum fade time for an Attribute
 - g. It shall be possible to invert the range of values for an Attribute
 - h. It shall be possible to specify a default value for an Attribute
 - i. It shall be possible to specify a dimmer curve for an intensity Attribute
6. Design and Simulation
- a. There shall be a tabular view of Fixture Attributes within Spaces
 - b. There shall be control of Zones (as a type of Fixture)
 - c. There shall be control of LED arrays (as a type of Fixture)
 - d. There shall be control of moving lights (as a type of Fixture)
 - e. There shall be independent control of every Attribute of a Fixture
 - f. Appropriate graphical controls shall be provided for non-intensity Attributes (e.g. color picker)
 - g. It shall be possible to create Groups as a selection shortcut
 - h. The plan shall show the current status of Room Combine
 - i. The plan shall show simulation feedback for Fixtures in a graphical form
 - j. Feedback values for Attributes shall be displayed in terms of real-world units where an appropriate real-world unit and mapping is available (e.g. pan in degrees)
 - k. Control events may be simulated by clicking on a representation of the Station in at least the plan view
 - l. The simulation may be linked to the actual online System to synchronize playback and inject control events (live control)
7. Presets

- a. There shall be provision to record a Preset based on current Attribute settings
 - b. There shall be a display of Presets that affect Fixtures in the Space being worked with and their activation status
 - c. A Preset may store a reference to a Palette as an Attribute setting
 - d. Presets may be displayed and modified in tabular form (spreadsheet)
 - e. Timing in Presets may be set on an individual Attribute basis
 - f. Timing settings shall include a fade time, a delay time and a fade profile
 - g. All Presets may include split timing
 - h. Presets may be applied in an Latest Takes Precedence (LTP) or Highest Takes Precedence (HTP) manner
 - i. It shall be possible for all Presets to include Effects
 - j. Each Effect shall have a Curve and parameters (to include size, period, offset and repeat count)
 - k. There shall be support for a flicker effect
 - l. There shall be a provision to create Sequences from Presets
 - m. It shall be possible for a Sequence to be displayed and modified as a timeline display
 - n. It shall be possible for any step of a Sequence to trigger a defined Action
 - o. The end state of a Sequence shall be user configurable (e.g. release, loop, hold at end)
8. Stations and Events
- a. Can assign functionality (Actions) to Controls and Indicators on a Page for a particular Station
 - b. Stations may have multiple Pages that can be switched between at runtime
 - c. Controls shall have a configurable event handler (Script) that determines the nature of the control (e.g. momentary vs. maintained button)
 - d. Actions initiated from a Station shall, by default, be restricted to affecting the Space containing the Station
 - e. A Control may be configured so that the Actions it triggers behave as if initiated from a specified Space anywhere in the System
 - f. Controls shall have a priority that is used when performing operations (e.g. preset activation, fader attribute control)
 - g. It shall be possible to specify timed events (including repeat intervals hourly, daily, weekly, etc.)
 - h. It shall be possible to specify astronomical timed events
 - i. Serial (e.g. RS232, Ethernet) input data shall be treated as a Control event and shall be handled through use of Script (standard or custom)
 - j. There shall be support for Occupancy functions using proximity sensors connected via Echelon LonTalk or a Contact Interface
 - k. There shall be support for Daylight Harvesting functions using photo sensors connected via Echelon LonTalk or a Fader Interface.
 - l. There shall be Override functionality that can be applied to any Control or Event
 - m. There shall be Lock Out functionality for Controls using 3 distinct lockout variables
 - n. Direct control of Attributes can be assigned to Controls (e.g. buttons, faders)
 - o. Mastering of Intensity for Fixtures, Groups or Presets can be assigned to Controls
 - p. There shall be extensible support for third-party LonMark devices

- q. A physical Lon native Station that is portable may automatically bind to different logical Stations within the configuration based on an established physical LON connection
 - r. There shall be an option to assign default functionality to Controls and Indicators of a Station automatically when it is added to the configuration and update it as the configuration changes
 - s. There shall be an option to generate a graphical configuration for an Touchscreen automatically based on the current configuration and update it as the configuration changes
 - t. It shall be possible to import .ics files for display of holidays or other notable dates
9. Actions
- a. There shall be a standard Action for toggling the Intensity Attribute of a Fixture or Group (Fixture Toggle)
 - b. There shall be standard Actions for recalling Presets (Preset Recall)
 - c. There shall be a standard Action for recording a Preset (Preset Record)
 - d. There shall be standard Actions for controlling Sequences (Timeline Control)
 - e. There shall be standard Actions for changing Wall state (Wall Toggle)
 - f. There shall be a standard Action for raising or lowering the intensity setting of a Fixture or Group
 - g. There shall be a standard Action for raising or lowering the intensity setting of a Preset
 - h. There shall be a standard Action that activates Faders within its scope (Manual)
 - i. There shall be a standard Action that activates Faders on a target station and locks out other Stations within its scope (Take Control)
 - j. There shall be a standard Action for setting lock out variables for a Station, within a Space or System-wide (Lock Out)
 - k. There shall be a standard Action for enabling and disabling Overrides
 - l. There shall be a standard Action for recalling a Macro (Call Macro, Macro Toggle)
 - m. There shall be a standard Action for turning Off a particular Fixture, Group or Fixtures within a Space (Off)
 - n. There shall be a standard Action for controlling Fixture or Group Intensity levels from a Fader
 - o. There shall be a standard Action for controlling Preset Intensity levels from a Fader
 - p. There shall be a standard Action for mastering Fixture or Group Intensity levels from a Fader
 - q. There shall be a standard Action for modifying Preset fade times from a Fader
 - r. There shall be a standard Action for modifying Preset rate from a Fader
 - s. There shall be an equivalent standard Indicator behavior for every standard Action
 - t. Qualified users may create custom Actions
10. Macros
- a. Users can create, store and recall Macros that are sequences of Actions (standard or custom)
 - b. Macros may define separate sequences to occur when turned on and off (toggle)
 - c. Macros may incorporate conditional statements based on current status of the System (e.g. comparisons such as $x > y$)

- d. Conditional statements may be combinations of several simpler statements using logical operators (AND, OR)
- 11. Script
 - a. There shall be a mechanism for defining custom functionality using a scripting language
 - b. The behaviors of Controls and Indicators may be customized through the use of Script
 - c. Script may be used to define custom functionality (Actions) within the System
 - d. Script shall allow new functionality to be defined in a manner that is reusable in different Systems
 - e. Script shall support logical and arithmetic operations
 - f. Script shall support direct access to System data using names
 - g. Script shall support creating, reading and writing to persistent System-wide variables (registered variables)
 - h. Script shall support timer functionality including the capability to cancel a running timer
 - i. Script shall support logging functionality
 - j. Standard functionality may be implemented as Scripts that will not be user modifiable
 - k. A Custom Script may be copied from a suitable Standard Script to provide a starting point
 - l. Script shall support reading data directly from connected interfaces (e.g. LON NVs, ACN properties, DMX inputs)
 - m. Script shall support writing data directly to connected interfaces (e.g. LON NVs, ACN properties, DMX outputs, Serial ports)
 - n. Script shall allow parsing of data (e.g. reading 8 contact inputs as individual bits from a byte of data)
- 12. Network
 - a. Shall display a topological view of Paradigm Processors and connected Stations
 - b. Can associate a particular Station with a Paradigm Processor
 - c. Shall report online status of Paradigm Processors and Stations
 - d. Shall allow for configuration of network properties (IP) of Paradigm Processors
 - e. Shall allow for upload of configuration data to all or individual Paradigm Processors
 - f. Shall allow for download of configuration data from Paradigm Processors
 - g. Shall allow for download of logging data from Paradigm Processors
 - h. Shall provide for performing firmware upgrades to Paradigm Processors
 - i. Shall allow to perform firmware upgrades for Dimming enclosures using Paradigm Processors as proxies
 - j. Shall allow for transfer of configuration to and from LCD Stations using Paradigm Processors as proxies
 - k. Shall allow for discovery and binding of Stations
 - l. There shall be a mode in which configuration changes are propagated to Processors as they occur without interrupting operation (live edit)
- 13. Reports
 - a. It shall be possible to generate tabular reports and customize their layout and appearance
 - b. It shall be possible to print reports
 - c. It shall be possible to export reports to file (e.g. CSV)
 - d. There shall be reports for Presets

- e. There shall be reports for Fixtures
- f. There shall be reports for Stations
- g. There shall be reports for Processors
- h. There shall be reports for Macros
- 14. Resources
 - a. The installed package shall include a set of LCD Design Themes
 - b. Effect Curves, Fade Profiles and Dimmer Curves shall use a common format and allow custom variants to be generated by the user
 - c. Additional Fixture Templates may be defined by the user (custom Fixtures)
 - d. Additional Station Definitions may be defined by the user (custom Stations)
- 15. Pharos
 - a. It shall be possible to add Pharos systems to the configuration for triggering and status monitoring
 - b. There shall be standard Actions and Indicator behaviors for Pharos integration via Ethernet
- E. Touchscreen Station Configuration
 - 1. The Architectural Control System Touchscreen Configuration software shall be the Unison Paradigm ControlDesigner as manufactured by Electronic Theatre Controls, Inc., or equal.
 - 2. The Unison Paradigm ControlDesigner software program shall be an application software package that facilitates off-line Unison Paradigm Touchscreen station configuration.
 - 3. Software setup shall include Configuration and Design Wizards, to create a graphical representation of a control environment.
 - 4. The software program shall be downloadable from the manufacturer's website free of charge.
 - 5. Functions
 - a. Provides functionality to create and modify Pages for display on a specific type of LCD Station
 - b. There shall be a wizard to assist with the creation of Pages
 - c. A single configuration for an LCD Station shall be defined as a set of one or more Pages
 - d. Each Page shall have a background that may incorporate multiple images or animations
 - e. Pop-ups can be shown/hidden over any Page in a Configuration and more than one Popup can be shown at once
 - f. Pages may have multiple design elements that may be Controls, Indicators or both
 - g. Design elements shall have a user-defined size, position and z-order that cannot be changed from within the System
 - h. Each design element shall have between 1 and 256 states, each of which can have a distinct appearance
 - i. The appearance of a state can be taken from a Theme or imported image file
 - j. There shall be support for import of at least JPG, PNG and GIF image formats
 - k. Transparency shall be supported
 - l. Animated images shall be supported
 - m. Transitions between states of design elements can be animated
 - n. Page transitions can be animated
 - o. Design elements shall have a visibility group and threshold

- p. Design elements that are Controls shall have a lockout group and threshold
- q. All text shall have a user-definable font family, size, color and alignment
- r. There shall be at least the following types of design elements
 - i) Label
 - ii) Level Indicator
 - iii) Button
 - iv) Fader (straight and curved)
 - v) Clock (analogue and digital)
 - vi) Numeric Keypad
 - vii) Tab widget
- s. Themes shall define a collection of consistent appearances and sounds for design elements
- t. It shall be possible to change the Theme used for a particular Station without modifying the underlying design elements
- u. There shall be tools to assist with the creation of new Themes
- v. Shall allow sounds to be associated with a particular Page
- w. Shall allow sounds to be associated with state transitions of particular design elements
- x. Sounds may be used to provide Touchscreen interaction feedback
- y. A Page can be designated as the Stations inactivity Page
- z. A Page can have a lockout group and threshold
- aa. A Tab can have a visibility group and threshold
- bb. There shall be a visualization interface for Page creation and editing
- cc. Standard graphical interaction methods (drag-and-drop) shall be used to arrange design elements on Pages
- dd. There shall be a layout grid with user-defined spacing and color with associated snap-to-grid functionality
- ee. It shall be possible to reuse the graphical layout of a configuration independent of any assigned functionality
- ff. The LCD Design functionality shall be part of a separate application that can be used alongside Light Designer
- gg. Pop-ups can be any fixed size up to the Page size
- hh. Pop-ups will have a fixed position on screen (but may move when being shown/hidden)

2.15 PURE SINE WAVE UNINTERRUPTIBLE POWER SUPPLY WITH SURGE SUPPRESSION AND POWER FILTRATION: REFERENCED PRODUCT MIDDLE ATLANTIC NEXSYS SERIES UPX-2000R-2 RACKMOUNT UNINTERRUPTABLE POWER SUPPLY

A. GENERAL

- 1. Provide the specific model of backup UPS as listed on the contract documents (or most recent iteration or replacement model) and as is needed based upon the plugged equipment power requirements.
- 2. Provide expanded run time battery pack as indicated.

B. Specifications

1. Rackmount Uninterruptible Power Supply (UPS) shall be Middle Atlantic Products model # UPX-__ R-2 or UPX- RLNK-__-__ (refer to chart). UPS shall be line interactive with AVR. Unit shall measure 19.00" W x 3.50" H x __.00" D (refer to chart for depth) and occupy 2 rack spaces. UPS shall have a rear mounting range of 20" to 36". UPS shall have slim rail mounting allowing mounting with a pair of middle rack rail. Unit shall operate on 120 VAC/60Hz current with a Power Factor of 0.9. Unit shall have a nominal output of 120V with optional selection for 110V or 127V. Unit shall have a capacity of __ VA and __ W (refer to chart). Unit shall have (8) NEMA 5-__ receptacles on the rear of the unit (refer to chart). Unit shall have all outlets controlled via 2 banks for selection of non-critical load shedding, or individual outlet control, depending on model. Unit shall be IP enabled, depending on model (RLNK models), or when used with optional RackLink™ Network card, model# UPX-RLNK-CARD. Rackmount UPS shall include an IEC-C13 detachable 6' (1.83m) SignalSAFETM power cord with NEMA __ (refer to chart) plug. UPS shall have all mode surge suppression and overload protection. Rackmount UPS shall have a hot swappable battery that allows for a __ minute run time at half load and a __ (refer to chart) minute run time at full load. Rear of unit shall have inputs that allow for the installation of up to 4 additional hot swappable batteries. Rackmount UPS shall utilize Middle Atlantic NEXSYS Power Management software. Rackmount UPS shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years; battery shall be warrantied for a period of 2 years. Rackmount UPS shall be tested to UL 1778 and CAN CSA-C22.2 standards in US and Canada. Rackmount UPS shall be FCC Class A certified and complies with Canadian ICES-003. Rackmount UPS shall be EnergyStar 2.0 certified.
- C. Expanded Battery Pack:
1. Rackmount expandable run time battery pack shall be Middle Atlantic Products model# UPX-EXPANRUN-__-__ (refer to chart). UPX-EXPANRUN-10-15 shall be suitable for use with UPX-1__00R-2 and UPX-RLNK-1__00R-__ (refer to chart). UPX-EXPANRUN-20 shall be suitable for use with UPX-2000R-2 and UPX-RLNK-2000R-__ UPS-2200R. UPS-EBPR shall measure 19.00" W x 3.50" H x __" D (refer to chart for depth) and occupy 2 rack spaces. UPS-EBPR shall require __" useable depth (refer to chart). With __ hot swappable batteries connected to the unit, there is a __ minute run time at half load and a __ minute run time at full load (refer to chart). Rackmount expandable run time battery pack shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years; battery shall be warrantied for a period of 2 years. Rackmount expandable run time battery pack shall be tested to UL 1778 and CAN CSA-C22.2 standards for US and Canada. Rackmount UPS shall be FCC Class A certified and complies with Canadian ICES-003.
- D. Features:
1. Pure Sine Wave technology with Automatic Voltage Regulation to improve the quality of power provided to the A/V system
 2. 8 outlets
 3. Bank Controlled option with (2) 4 outlet banks
 4. Individually Controlled options for all 8 outlets via RackLink™
 5. All NEXSYS UPSs have a Pure Sine Wave output and AVR (automatic voltage regulation) providing the cleanest power to your connected equipment, especially the most sensitive equipment

6. Everything is assembled and connected right from the factory saving you time during your installations
 - a. Rack ears are pre-installed with the “4-Post” mounting brackets ready to be rack mounted even if you have a 3rd pair of rackrail
 - b. The battery is already connected so just plug it in
 7. The NEXSYS Power Management Software on your PC allows you to customize and configure various settings and notifications
 8. The NEXSYS UPSs are RackLink compatible for remote monitoring and management and some are compatible right out of the box! Look for RLNK in the part number. Use the RackLink Discovery Tool on your on PC, Apple or Android devices and connect directly to the UPS
 9. Set reminders or notifications for things like battery replacement, etc. via email or on the UPS
 10. Front panel LCD screen shows UPS Device Name, Model Number, Serial Number
 11. Hot swappable battery from the front access panel for easy service without disrupting the system
 12. The IEC Input allows for better cable management of the power cord if shorter or longer cords are required
 - a. All UPSs include a 6’ (1.8m) IEC power cord
 13. Energy Star Certified
 14. U.S. Department of Energy Compliant for energy efficiency
- E. Accessories (Provide with all accessories listed on the contract drawings):
1. UPS-IPCARD - Web based control shall be enabled on non-internet enabled Middle Atlantic Products UPS by UPS-IPCARD, which shall be installed into the Expansion Port on the rear of the UPS. This shall be compatible with UPS firmware v1.65 or greater, and provide full functionality when used on models with firmware v1.75 or greater.
 2. UPS-RLCARD - Remote shutdown of the UPS shall be enabled on non-internet enabled Middle Atlantic Products UPS by UPS-RLCARD, which shall be installed into the Expansion Port on the rear panel of the UPS. This shall be compatible with UPS firmware v1.65 or greater. A user supplied remote push button and external +12VDC source shall be connected to the DB-9 connector on the UPS-RLCARD to activate the remote shutdown feature.
 3. Expansion Battery - Rackmount expansion battery pack shall be Middle Atlantic Products model# (see above description). Rackmount expansion battery pack shall be warrantied for a period of 2 years.
 4. Replacement Battery - Replacement Battery Pack for the UPS shall be Middle Atlantic Products model # UPS-RBP. Replacement battery pack shall be suitable for use with both UPS-1000R__ and UPS-2200R__. Replacement battery shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 2 years.
- F. Technical Specifications:

ELECTRICAL SPECIFICATIONS

NEXSYS Line Interactive UPS				
Model		UPX-1000R-2 UPX-RLNK-1000R-2 UPX-RLNK-1000R-8	UPX-1500R-2 UPX-RLNK-1500R-2 UPX-RLNK-1500R-8	UPX-2000R-2 UPX-RLNK-2000R-2 UPX-RLNK-2000R-8
	UPS Topology	Line Interactive		
	VA	1000VA	1500VA	1350VA
	Watts	900W	1350W	1800W
	Power Factor	0.9		
Input	Nominal Voltage	120Vac		
	Voltage Range	80-158 Vac		
	Frequency	50/60Hz Autosensing		
	Sensitivity	Adjustable for generator application		
	Input Power Cord Type	SignalSAFE IEC to 5-15P 6' (1.83M)	SignalSAFE IEC to 5-20P 6' (1.83M)	
Output	Waveform on Battery	Pure Sine Wave		
	Voltage Regulation	90Vac min-146Vac max		
	Double Boost	105Vac and 90Vac		
	Double Buck	130Vac and 146Vac		
	Nominal Voltage (Battery Mode)	120Vac ±5%		
	Selectable Battery Voltage	110/120/127 Vac ±5% (Note: 110Vac selection derates UPS to 90%)		
	On Battery Frequency	50Hz or 60Hz ±0.5Hz		
	Number of Outlets	8		
	Outlet Type	NEMA 5-15R	NEMA 5-20R	
	Surge Protection	1000 joules		
	Overload Protection	Circuit Breaker		
	Transfer Time	Typical: 4ms Max: 0-10ms		
	Fan / Audible Noise	45db @ 1m variable speed fan		
	Crest Ratio	3:1		
	Harmonic Distortion	5% max @ 100% linear load, 12% max @ 100% non-linear load		
	BTUs (Line Mode)	70	105	140
	BTUs (Battery Mode)	495	750	990
	Full Load Run Time	4 minutes	3 minutes	3 minutes
	Half Load Run Time	13 minutes	10 minutes	10 minutes

NEXSYS Line Interactive UPS				
Model		UPX-1000R-2 UPX-RLNK-1000R-2 UPX-RLNK-1000R-8	UPX-1500R-2 UPX-RLNK-1500R-2 UPX-RLNK-1500R-8	UPX-2000R-2 UPX-RLNK-2000R-2 UPX-RLNK-2000R-8
Battery	Recharge Time	6-8hrs		
	Battery Maintenance	Hot Swappable Front Access		
	Battery Pack Voltage	36VDC	36VDC	48VDC
	Battery Pack Details	(3) 12V 7Ah Sealed Maintenance Free Lead Acid Batteries	(3) 12V 9Ah Sealed Maintenance Free Lead Acid Batteries	(4) 12V 9Ah Sealed Maintenance Free Lead Acid Batteries
	Replacement Battery Part Number	UPX-RPLBA TT-A	UPX-RPLBATT-B	UPX-RPLBATT-C
Environment	Operating Temperature & Relative Humidity	32 DEG F (0 c) - 104 DEG F (40 c) 0% - 95% non-condensing		
Communication	Storage Temperature	5 DEG F (-15 c) - 113 DEG F (45 c)		
	NEXSYS Management Software	Supports Windows® 7/8/10/11 and Windows Server 2008, 2012, 2016, 2019 Windows 2008/2012 Server Core, Hyper-V 2008/2012		
	Ports	USB, RS232, EPO, Dry Contacts, EXB Auto Detect and RackLink Network Card Option		
Control	Load Shed	Programmable Bank 1 and 2 (standard), Programmable Individual Outlet (optional)		
	Active On / Off	Manually turn power receptacles on or off using the front panel LCD or the UPS Manager Software		
	Scheduling	Fully programmable scheduling available for bank or outlet switching (based on the model purchased)		
RackLink Network Card Option	Features	SNMP V3, HTTP, HTTPS, TLS 1.2, SSH, Imbedded Web GUI w/Dashboard, RADIUS, TCP/IP, Telnet, FTP		
Front LCD Interface	Notification	LED = Normal Mode, AVR Mode, Battery Mode, Internal Fault, Battery Fault		
	Audible Alarms	On Battery, Low Battery, Battery Disconnected, Fault or Overload		
Dimensions	Width x Height x Depth	17.3" (440mm) x 3.4" (86.5mm) x 17.3" (440mm) 17.3" (440mm) x 3.4" (86.5mm) x 23.6" (600mm)		
Weight	Product Weight	44.1 lbs. (20kg)		63.05 lbs. (28.6kg)
	Shipping Weight	54.1 lbs. (24.5kg)		71 lbs. (32.2kg)
Certifications	Safety Standards	cTUVus - Tested to UL 1778 & CAN CSA-C22.2 standards		
	EMI Standards	FCC Class A		
	Environmental	RoHS 3 / REACH Compliant		
	Energy Efficiency	Energy Star 2.0		
Features	Load Shedding	Yes		
	Site Fault Detection	Yes		
	Cold Start	Yes		
	Standard Warranty	3 Years Limited (2 Years Battery). For warranty information, refer to legrandav.com/policies/warranty_information		

NEXSYS Line Interactive UPS				
Model		UPX-1000R-2	UPX-1500R-2	UPX-2000R-2
		UPX-RLNK-1000R-2	UPX-RLNK-1500R-2	UPX-RLNK-2000R-2
		UPX-RLNK-1000R-8	UPX-RLNK-1500R-8	UPX-RLNK-2000R-8
Weight	Product Weight	44.1 lbs. (20kg)		63.05 lbs. (28.6kg)
	Shipping Weight	54.1 lbs. (24.5kg)		71 lbs. (32.2kg)
Certifications	Safety Standards	cTUVus - Tested to UL 1778 & CAN CSA-C22.2 standards		
	EMI Standards	FCC Class A		
	Environmental	RoHS 3 / REACH Compliant		
	Energy Efficiency	Energy Star 2.0		
Features	Load Shedding	Yes		
	Site Fault Detection	Yes		
	Cold Start	Yes		
	Standard Warranty	3 Years Limited (2 Years Battery). For warranty information, refer to legrandav.com/policies/warranty_information		

2.16 PURE SINE WAVE UNINTERRUPTIBLE POWER SUPPLY WITH SURGE SUPPRESSION AND POWER FILTRATION: REFERENCED PRODUCT APC SMART UPS SMT FLOOR MOUNT UNINTERRUPTABLE POWER SUPPLY

A. GENERAL

1. Provide the specific model of backup UPS as listed on the contract documents and as is needed based upon the plugged equipment power requirements (provide per intended load, regardless of what is shown on contract documents).
2. APC Smart-UPS traditional Tower form factor.
3. PowerChute management software for servers and workstations and advanced UPS management (All major operating systems supported). Connectivity is through serial or USB port (USB not standard on all models). Additional manageability is available through the SmartSlot, an internal accessory slot that allows you to install optional accessories to enhance the performance of your UPS. Network connection with Web browser management and/or environmental monitoring, serial port expansion, and out-of-band management options are available.
4. With pure sine-wave output ensuring compatibility with all connected devices, Intelligent Battery Management ensuring a highly available UPS and an advanced 16 segment bar graph display.

B. TECHNICAL SPECIFICATIONS:

Cable Details	
Form Factor :	External
Dimensions & Weight (Shipping)	
Shipping Depth :	23 in
Shipping Height :	15 in
Shipping Weight :	58.2 lbs
Shipping Width :	13 in
Run Time Details	
Load Type :	Full load
Run Time (Up To) :	7
UPS	
Battery Technology :	Lead acid
Battery	
Enclosure Type :	Internal
Load Type :	At full load
Recharge Time :	3 hours
Run Time (Up To) :	7 min
Cable	
Connectivity Details Length :	6 ft
Connectivity Details Type :	Power cable
Connectivity Details Type :	USB cable
Environmental Parameters	
Humidity Range Operating :	0 – 95%
Max Operating Temperature :	104 °F
Min Operating Temperature :	32 °F
Sound Emission :	45 dBA
Header	
Brand :	APC
Compatibility :	PC
Manufacturer :	APC
Model :	1500VA USB
Packaged Quantity :	1
Product Line :	APC Smart-UPS

Interface Provided			
Connector Type :	25 pin D-Sub (DB-25)		
Qty :	1		
Type :	Management (RS-232)		
Type :	Management (USB)		
Miscellaneous		Power Output Connectors Details	
Color :	Black	Connector Qty :	8
Color Category :	Black	Connector Type :	Power NEMA 5-15
Networking		Power Supply	
Remote Management Interface :	RS-232, USB	Device Energy Rating :	459 Joules
Power Device		Service	
Form Factor :	External	Support Details Full Contract Period :	2 years
Frequency Provided :	50/60 Hz	Support Details Type :	Limited warranty
Frequency Required :	50/60 Hz	Service & Support	
Input Connector Qty :	1	Type :	2-year warranty
Input Connector Type :	Power NEMA 5-15	Slot Provided	
Input Voltage Range :	AC 82 - 144 V	Free Qty :	1
Input Voltage Range (Adjustable) :	AC 75 - 154 V	Total Qty :	1
Output Connector Qty :	8	Type :	SmartSlot
Power Capacity (VA) :	1440 VA	Dimensions & Weight	
Power Provided :	1kW	Depth :	17.3 in
Surge Suppression :	Yes	Height :	8.5 in
UPS Output Waveform :	Sinewave	Weight :	53.13 lbs
UPS Technology :	Line interactive	Width :	6.7 in
Voltage Provided :	AC 120 V	General	
Voltage Provided Margin :	± 5%	Product Type :	UPS
Voltage Required :	AC 120 V	Subcategory :	UPS

C. GENERAL

1. Provide with the APC 3-year warranty.

2.17 4-COLOR MIXING OR WHITE LIGHT EMITTING DIODE ELLIPSOIDAL FIXTURE: REFERENCED PRODUCT ETC COLORSOURCE SPOT V LED

- A.** Basis of Design: ColorSource Spot V as manufactured by ETC Inc. Brings together a five-color light engine with the build-quality and support of an ETC product. Uses a mix of red, green, blue, indigo and lime LED emitters. ETC optics, adapters, and accessories.

1. Standards Compliance:
 - a. Listed: cETLus, UL 1598, UL 924, CSA C22.2 No. 250.0.
 - b. Compliance: CE.
2. Model ColorSource Spot V with shutter barrel, black.
3. Model ColorSource Spot V, body only, black.
4. Source:
 - a. LED Details: 60 Lumileds LUXEON Rebel and LUXEON C LEDs.

- b. Max Lumens: 9300.
- c. Lumens per Watt: 47.2.
- d. L70 Rating: Greater than 54000 hours.
- 5. Colors:
 - a. Colors Used Spot: Red, green, blue, indigo, lime.
 - b. Color temperature Range: Color mixing.
 - c. Calibrated Array: Yes.
 - d. Red Shift: No.
- 6. Optical:
 - a. Beam Angle Range: 5 to 90 degrees. Swappable lens tubes.
 - b. Gate Size: 80 mm.
 - c. Aperture Size: 6.25 to 14 inches depending on lens tube.
 - d. Pattern Projection: Yes.
 - e. Pattern Size: A or B.
 - f. Camera Flicker Control/Hz Range: 5 kHz and 25 kHz.
- 7. Control:
 - a. Input Method:
 - i) DMX-512 via 5-pin XLR connector. Protocols: DMX512, RDM.
 - ii) City Theatrical Multiverse. Protocols: DMX512, RDM
 - b. NFC Configuration: Yes, via Set Light app.
 - c. RDM Configuration: Yes.
 - d. User Interface Type:
 - i) ColorSource Spot V: 7-segment 3 button interface.
 - e. Local Control: Yes. (ColorSource Spot V only)
 - f. Onboard Presets: Yes, 12. Onboard Sequences: Yes, 5. Onboard Effects: No.
 - g. Fixture-to-Fixture Control: Yes.
 - h. 15-bit virtual dimming engine.
- 8. Electrical:
 - a. Voltage: 100 to 240 VAC, 50 to 60 Hz.
 - b. Input Method: powerCON True1 TOP in and thru.
 - c. Inrush First Half Cycle: 55 A at 120 V. 59 A at 240 V.
 - d. Fixtures per Circuit:
 - i) Eight. (R20 module or similar).
- 9. Thermal: Operating Temperature: 32 to 104 degrees F.
 - a. Fan: Yes. Controllable.
 - b. Droop Compensation: Yes.
 - c. BTUs/hour: 671.77.
- 10. Physical: IP Rating: ColorSource Spot V: IP-20.
 - a. Materials: Die-cast aluminum. Colors: Black, white, silver, or custom.
 - b. Mounting Options: Yoke.
 - c. Included Accessories: Hanging yoke, 39 inch power cable, soft-focus diffuser in an A-size gobo holder.

2.18 5-COLOR MIXING LIGHT EMITTING DIODE FRESNEL WASH FIXTURE: REFERENCED PRODUCT ETC COLORSOURCE FRESNEL V MAX LED

A. Basis of Design: ColorSource Fresnel V MAX as manufactured by ETC Inc. An affordable high quality Fresnel wash fixture with motorized zoom. Uses RGBIL color system.

- 1. Standards Compliance:
 - a. Listed: cETLus, UL 1598 & 924, CSA C22.2 No. 250.
 - b. Compliance: CE and UKCA.

THEATRICAL LIGHTING & CONTROL SYSTEMS

2. Model ColorSource Fresnel V MAX: Black, White, Silver Gray (custom colors upon request)
3. Arrays:
 - a. RGBIL (Red/Green/Blue/Indigo/Lime).
4. Source:
 - a. LED Details: 60 Lumileds LUXEON C ES LEDs
 - b. Max Lumens: 10,023
 - c. Lumens per Watt: 48.
 - d. L70 rating: Greater than 54,000 hours.
5. Color:
 - a. Color temperature Range: Color mixing.
 - b. Calibrated Array: Yes.
 - c. Red Shift: No.
6. Optical:
 - a. Beam Angle Range: 13-44 degrees
 - i) Motorized zoom
 - b. Gate Size: N/A.
 - c. Aperture Size: 7.48" (190 mm)
 - d. Pattern Projection: No.
 - e. Pattern Size: N/A.
 - f. Camera Flicker Control/Hz Range: Default: 5kHz. RDM: 25,000 Hz (via RDM).
7. Control:
 - a. Input Method: DMX-512 via 5-pin XLR connector. Protocols: DMX512, RDM, City Theatrical Multiverse, NFC.
 - b. RDM Configuration: Yes.
 - c. NFC Configuration: Yes
 - d. User Interface Type: 7-segment 3 button, single encoder interface.
 - i) Encoder controls local motorized zoom
 - e. Modes (footprint): 6 modes (standard, RGB, 1 channel, direct, 6 channel & CCT – studio)
 - f. Local Control: Yes.
 - g. Onboard Presets: Yes, 12.
 - h. Onboard Sequences: Yes, 5.
 - i. Onboard Effects: No.
 - j. Fixture-to-Fixture Control: Yes.
 - k. 15-bit virtual dimming engine.
 - l. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors
 - m. The fixture shall be City Theatrical Multiverse (SHoW Baby)-compatible via wireless DMX (900 MHz/2.4 GHz). Wireless shall be banded on the 2.400 – 2.480 GHz band with a range of 100 m indoors, 500 m line of sight (subject to site conditions). Maximum receivers shall be: DMX (no limit); RDM (varies by transmitter used); Multiverse SHoW Baby (585); Multiverse Transmitter (5,000). Broadcast power shall be 100 mW.
 - n. The fixture shall be NFC (near field communication)-compatible via ETC's Set Light app (and shall be configurable without power). This enables wireless addressing & configuration of fixtures (either to set new or to pull existing configurations).
8. Electrical:

- a. Voltage: 100 to 240 VAC, 50 to 60 Hz. Input Method: PowerCON True1 in and thru.
- b. Inrush First Half-Cycle: 120 V, 36A; 240 V, 57A.
- c. Fixtures per Circuit (on standard R20 breaker):
 - i) 3 (link up to 4 via Power Thru connector)
 - ii) Note TRUE1 connector rated for 20A (120V/60Hz) and 16A (230V/50Hz).
 - iii) Wattage: 208 W at 120 V. 205 W at 230 V.
 - iv) Current Draw: 1.75 A at 120 V. 0.95 A at 230 V.
- 9. Thermal: Operating Temperature: 32 to 104 degrees F.
 - a. Fan: Yes. Controllable: Yes.
 - b. Droop Compensation: Yes.
 - c. BTUs/hour (120V): 709.
- 10. Physical:
 - a. Materials: Die-cast & extruded aluminum.
 - b. Color Options: Black, white, silver, or custom
 - c. Mounting Options: Yoke.
 - d. IP Rating: IP-20.
 - e. Included Accessories: Power cable and hanging yoke.
 - f. Weight: 6.24 kg (13.75 lb).
- 11. Accessories:
 - a. Aperture and accessory slots shall accommodate standard 7.5” accessories such as used in other similar-sized fixtures
 - b. Accessories available as options shall include but not be limited to:
 - i) Gel/diffusion frames
 - ii) Top hats (half, cross baffle, 3” or 6”)
 - iii) Egg crate louvers
 - iv) Standard and studio barn doors
 - v) Weighted base
- 12. WARRANTY
 - a. Fixture: 5 years
 - b. LED array: 10 years

2.19 POWER DISTRIBUTION EQUIPMENT:

A. General

- 1. Connectors available are 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A “U” ground (dual rated “T-slot”); other connectors available as specified. Pigtails shall be three-wire type “SOW” rubber jacketed cable sized for the circuit ampacity. Internal wiring shall be sized to circuit ampacity and shall be rated at 125°C.
 - a. 20 amp cable mount stage pin connectors shall be 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket.
- 2. Terminations shall be at one end using feed through terminals individually labeled with corresponding circuit numbers. 20 amp circuits shall use screwless tension clamp or standard screw-type/barrier strip U-style terminals listed for 20 – 8 gauge wire. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire and 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire. Terminals that place a screw directly on the wire are not acceptable.

3. Equipment, except for wall-mounted boxes, shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings. Connector strips shall have brackets on 5' centers. Brackets shall be 1½" x .188" ASTM A 36 steel and hardware shall be ASTM A307 grade 5.
 4. A low voltage distribution system for DMX or Network (or other protocols as specified) shall be available, incorporated in the connector strip, locations and methods to be per print. Connector strips shall have a voltage barrier installed to accommodate these systems. Distributed DMX or Network systems shall use pass through assemblies consisting of a 6" panel with the following: one DMX or Network Output Connector, one DMX or Network Input (Pass Through) connector, one DMX or Network Pass Through (Bypass) Switch, and a label detailing the use of the pass through assembly. The bypass switch shall be used when no DMX or Network devices are present at that location. When activated, the pass through switch shall pass DMX or Network directly through to the next DMX or Network panel on the strip. The pass through switch shall have a mechanical indicator to show the operator that it has or has not been engaged. Low Voltage signals shall enter the connector strip via a strain relief or connector mounted in a separate DMX or Network terminal box at the specified end of the connector strip.
 5. Power distribution equipment shall be Underwriter Laboratories (UL) Listed.
- B. Connector Strips
1. Connector Strips shall be fabricated from 18 gauge galvanized steel 6.25"H x 3.3"D with length specified in increments of 6" and shipped fully wired in a minimum of 6'0" sections with all splicing hardware included. They shall be finished with fine-textured, scratch-resistant, black powder coat. Circuits shall be labeled on one side of the connector strip with 2" white lettering on black background labels. Pigtailed and outlets shall be spaced on 18" centers, or as otherwise specified. Outlets shall be mounted on individual 3" panels and there shall be no external terminal boxes for units with 28 or fewer circuits unless otherwise specified.
 - a. Connector strip circuit number labeling:
 - i) Circuits shall be labeled on one side of the connector strip with 2" white lettering on black background labels.
- C. Junction Boxes
1. Gridiron Junction Boxes shall be fabricated from 16-gauge cold rolled steel with 14 gauge end panels. They shall be finished with fine-textured, scratch-resistant, black powder coat. For 30 circuits and less they shall be 14"H x 14"W x 4"D and for 31 to 60 circuits they shall be 14"H x 28"W x 4"D. Cover(s) shall be attached with machine screws and Tinnerman retainer nuts. Cover(s) shall be 16-gauge cold rolled steel. Cover(s) shall be hinged and mounting should allow installer to orient the hinged door to open in any direction.
- D. Outlet and Pigtail Boxes
1. Outlet and Pigtail Boxes shall be fabricated from 18-gauge cold rolled steel with 16 gauge covers. They shall be finished with fine-textured, scratch-resistant, black powder coat. Circuit numbers shall be 2" or ¾" labels with white letters on black background (sized to match product). Pigtailed and outlets shall be spaced on 3" centers, or as otherwise specified.
- E. NEMA Wall Plates

1. An alternative to surface and recessed outlet boxes, ETC's NEMA style wall plates shall be available for 20A Stage Pin, Edison and Twist-Lock connectors. For use with industry-standard back boxes, the wall plates shall be fabricated of .125 AL and shall be finished with fine-textured, scratch-resistant, black powder coat. Circuit numbers shall be 2" or 3/4" labels with white letters on black background (sized to match product).
- F. Floor Pockets
 1. The floor pocket shall be a wiring device designed for flush mount installation in the stage floor. The floor pocket cover plate shall be constructed of 3/8" cast iron with a non-skid tread pattern and four (4) recessed mounting holes. The cover shall be constructed with integral hinges and four (4) cable notches. Secured to the cover plate shall be an angled sheet-steel mounting panel for receptacles. The floor pocket back box shall have provisions for an integral voltage barrier for low voltage circuits. Circuit designations shall be white on black background labels. The floor pocket cover plate, back box and connector-mounting panel shall be finished in a low gloss black finish. The back box shall be constructed of 16-gauge cold rolled steel and UL listed for use in the United States and Canada.
- 2.20 WIRING DEVICES (DISTRIBUTION EQUIPMENT): SEE DRAWINGS FOR DETAILS
 - A. Wiring devices shall be fabricated from 16 gauge cold rolled steel, in 6' 0" sections as required. Devices shall be properly cleaned, primed and painted with fine-textured, scratch resistant, black powder coat. Circuit numbers shall be 3/4" Lexan tags with white letters on black background.
 - B. Individual pigtails and outlets shall be evenly spaced, on 12" centers in connector strips, or as otherwise specified. Where a circuit would fall on a joint it shall be moved 3" towards the junction box end of the strip.
 - C. All connectors shall be flush mount 20 Amp 2P&G unless otherwise noted.
 - D. Devices except for wall-mounted boxes shall be supplied with appropriate hardware for mounting as shown on the drawings. Connector strips shall have brackets on 5' centers. Connector strips shall have a terminal block on one end as shown on the drawings.
 - E. Wiring devices shall be UL Laboratories Listed.
- 2.21 WIRE STANDARDS: ALL WIRE IN OR OUT OF CONDUIT WILL BE TYPE CL2-CL3 UNLESS OTHERWISE REQUIRED BY NEC AND JOB SITE CONDITIONS. PORTABLE CABLE EXCLUDED.
 - A. WIRE – PORTABLE CONTROL CABLES (those cables for use with DMX512-A and USITT DMX512/1990 Systems):
 1. The data transmission rate (250 kbits/s) used by DMX512 requires the selection of a portable DMX512 cable that does not significantly distort the signal or give rise to spurious signal reflections. Cables intended for use with audio systems (such as microphone cables), while having the convenience of flexibility, availability and relative low cost, may not be suitable for use with DMX512 because of their high capacitance and incorrect characteristic impedance; at DMX512 data rates this will give rise to bit time distortion and signal reflections/overshoot.
 2. Maximum and minimum cable lengths

- a. Maximum and minimum run lengths are specifically omitted due to a number of factors, including signal quality, device operating characteristics including capacitive values, and installation environment. Maximum distance runs without repeaters, therefore, shall be determined by standard industry practices of approx. 330 feet. Regardless of the overall run lengths, the system shall run properly, reliably and without errors, glitches, etc. due to improper use of installed/portable cabling or connectors, terminations, etc.
3. Construction
 - a. Portable DMX512 cables shall use twisted pair conductors. Conductors shall be of stranded construction. The raw cable used for a DMX512 cable assembly shall be declared by its manufacturer as suitable for use with EIA-422/EIA-485/EIA-485-A systems. Shielding shall be on individual pairs or overall shielding of pairs or both. The portable cable itself shall be flexible and rugged enough for the repeated coiling and uncoiling to which it will be subjected.
 - i) Cables implementing only the Primary Data Link shall consist of at least one twisted pair and be marked according to ANSI E1.27-1, Clause 7.1.
 - ii) Cables implementing both Data Links shall consist of at least two twisted pairs and be marked according to ANSI E1.27-1, Clause 7.1.
 - iii) Cables implementing only the Secondary Data Link shall not be allowed.
4. Impedance
 - a. Portable DMX512 cables shall have a characteristic impedance in the range 100 to 120 ohms. Due to the characteristic impedance of 120 ohms in EIA-485 systems, 120 ohms is preferred.
5. Capacitance
 - a. Capacitance between conductors within a shield shall not exceed 19.8 pF/ft (65 pF/m). Capacitance between any conductor and the shield shall not exceed 35 pF/ft (115 pF/m).
6. Dielectric Withstanding Protection
 - a. Dielectric rating for portable DMX512 cables shall conform to prevailing electrical codes.
7. Connection Methods - Required Connector
 - a. Portable cables shall use 5-pin XLR connectors. The physical pin designations of the 5-pin XLR shall be in accordance with Table 1 (see below).
 - b. Any use of alternate connectors shall comply with ANSI E1.11.
8. Electrical Specifications and Physical Layer
 - a. General
 - i) The physical layer of a DMX512 data link is constrained by earth grounding practices, termination methods, signal levels, EMI, and accidental damage by connection to other devices. Where a conflict exists, DMX512-A shall govern.
 - b. DMX512 Portable Cables
 - i) General
 - a) A DMX512 Portable Cable is a digital data transmission cable designed for the provisional interconnection of two DMX512 devices. Portable cables shall each have two prescribed connectors, a male 5-pin XLR at the end nearest the transmitting device and a female 5-pin XLR at the end

nearest the receiving device. Pins shall be designated 1 through 5. There shall be no connection to the shell.

9. Data link common and grounding topologies
 - a. In all cases Pin 1 of DMX512 portable cable connectors shall act as Data Link Common. The wire connected to Pin 1 shall be no smaller than the wire used for the twisted pairs in the cable.
10. Each data link shall consist of a separate twisted pair.
11. Terminations
 - a. All DMX cabling shall be terminated per applicable standards and so that all devices in any given data run work properly. Use DMX terminators where and as needed and recommended by equipment manufacturers.
 - b. 5-Pin XLR Cabling:

Table 1 – Signal Designations Summary		
Use	5-Pin XLR Pin	DMX512 Function
Common Reference	1	Data Link Common
Primary Data Link	2	Data 1-
	3	Data 1+
Secondary Data Link	4	Data 2-
	5	Data 2+

- c. CAT5 Pinout DMX Cabling: *

Wire Color & #	Function	Equivalent XLR Pin #
1 (White/Orange)	Data + (pair 1 true)	3
2 (Orange)	Data – (pair 1 complement)	2
3 (White/Green)	Optional Data + (pair 2)	5
6 (Green)	Optional Data – (pair 2)	4
4 (Blue)	Unassigned	--
5 (White/Blue)	Unassigned	--
7 (White/Brown)	Common for pair 1	1
8 (Brown)	Common for pair 2	1

* The above table is shows the ANSI E1.27-2 standard DMX pinout when using Category 5 (or higher) wire and an RJ45 connector.

The above table is intended for DMX512 cabling only - **NOT** DMX-over-Ethernet cabling. Great care must be taken to prevent the accidental connection of DMX equipment to non-DMX equipment. The connection of DMX equipment to non-DMX equipment such as Ethernet switches or telephone equipment may result in serious equipment damage and/or personal injury, as pins 4 and 5 may carry voltages of up to 48VDC or greater. Category wire is not recommended for loose or temporary cabling. The use of RJ45 connectors for DMX equipment should be restricted to patch bays in access controlled rooms and should not be used for the direct connection of portable equipment.

Please be aware that some non-standard pin-outs are also in use (i.e. Color Kinetics, etc.) and that custom cabling, connectorizations, etc. may be required in order to interface non-standard pin-outs with the specified system.

2.22 RACKS AND HARDWARE

A. SWING OUT WALL RACK:

1. EIA compliant 19" wall mount rack shall be Middle Atlantic Products model # SR-__ - __ (refer to chart). Overall dimensions shall be 23.4" W x __" H x __" D (refer to chart). Weight capacity

shall be ___ lbs. Tool-Free Quick-Mount™ system enables one-person installation. Useable depth shall be ___" (refer to chart) and shall extend into the back pan 3.5". Center section and back pan shall be 16-gauge steel, phosphate pre-treated and finished in a black textured powder coat. Rackrail shall be constructed of 11-gauge steel with tapped 10-32 mounting holes in universal EIA spacing with black e-coat finish and marked rack spaces. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening. Rack shall have a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts installed in base, and a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts, four Decora® cutouts, and BNC knockouts for UHF/VHF antennas installed in top. Large laser knockout on back pan shall have a 12-1/2" x 12-1/2" cutout for electrical pull-box. Fan knockouts on top and bottom shall allow for installation of up to four 4-1/2" fans. Rack shall have 2" knockouts, 4" knockouts for Wiremold 4000® Series raceways, and knockouts for UCP Series universal connector panels on the side. Top, bottom and sides shall feature vertical vent pattern. SR Series enclosures shall satisfy the 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) "D" with lateral force requirements for protecting 140 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5 when used with DWRSR-ZL Latch. Rack shall be UL Listed in the US and Canada to the UL-2416 (NWIN) Category when used with optional bonding kit, model # PET-K-___. SR Series shall meet all enclosure requirements towards PCI DSS (Payment Card Industry Data Security Standard) Compliance. Rack shall be GREENGUARD Gold Certified. Rack shall comply with the requirements RoHS EU Directive 2002 / 95 / EC. Rack shall be manufactured by an ISO 9001 and ISO 14001 registered company. Rack shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack.

2. EIA compliant 19" wall mount rack shall be Middle Atlantic Products model # DWR-__-__ (refer to chart). Overall dimensions shall be 23.4" W x ___" H x ___" D (refer to chart). Weight capacity shall be ___ lbs. Tool-Free Quick-Mount™ system enables one-person installation. Useable depth shall be ___" (refer to chart) and shall extend into the back pan 3.5". Center section and back pan shall be 16-gauge steel, phosphate pre-treated and finished in a black textured powder coat. Rackrail shall be constructed of 11-gauge steel with tapped 10-32 mounting holes in universal EIA spacing with black e-coat finish and marked rack spaces. Rack shall be constructed to swing open for component cabling access, center section shall pivot for either left or right opening. Rack shall have a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts installed in base, and a rear knockout panel with 1/2", 3/4", 1", 1-1/2", 2" and 3" electrical knockouts, four Decora® cutouts, and BNC knockouts for UHF/VHF antennas installed in top. Large laser knockout on back pan shall have a 12-1/2" x 12-1/2" cutout for electrical pull-box. Fan knockouts on top and bottom shall allow for installation of up to four 4-1/2" fans. Rack shall have 2" knockouts, 4" knockouts for Wiremold 4000® Series raceways, and knockouts for UCP Series universal connector panels on the side. Top, bottom and sides shall feature vertical vent pattern. DWR Series enclosures shall satisfy the 2007 & 2010 CBC; 2006, 2009 & 2012 IBC; ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and the 2006 & 2009 editions of NFPA 5000 for use in areas of high seismicity, Seismic Use Group III, Zone 4 or Seismic Design Category (SDC) "D" with lateral force requirements for protecting 140 lbs. of essential equipment in locations with the highest level of seismicity and top floor or rooftop installations with an Importance factor (Ip) of 1.5 when used with DWRSR-ZL Latch. Rack shall be UL Listed in the US and Canada to the UL-2416 (NWIN) Category when used with optional bonding kit, model # PET-K-___. DWR Series shall meet all enclosure requirements towards PCI DSS (Payment Card Industry Data Security Standard) Compliance. Rack shall be

GREENGUARD Gold Certified. Rack shall comply with the requirements RoHS EU Directive 2002 / 95 / EC. Rack shall be manufactured by an ISO 9001 and ISO 14001 registered company. Rack shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack.

3. Options

- a. Front doors shall be reinforced 16-gauge steel, model # FD-XX (solid), VFD-XX (vented, 25% open area), LVFD-XX (vented, 64% open area), PFD-XX (plexi), (XX= # of rackspaces of DWR rack)
- b. Keyless Latch replaces keylock, fits front & rear doors, shall be models # LATCH
- c. Rear rail kit 11-gauge, 10-32 threaded, sold in pairs, hardware included, shall be model # DWR-RRXX
- d. Fan kits with two 4-1/2" exhaust fans, fan guards and vent blockers, shall be model # DWR-FK17 (fits DWR-xx-17), DWR-FK22 (fits DWR-xx-22), DWR-FK26 (fits DWR-xx-26), DWR-FK32 (fits DWR-xx-32)
- e. Vent Blockers used to promote active thermal management, shall be model # VBK-D17 (fits DWR-XX-17), VBK-SD22 (fits DWR-XX-22), VBK-E20 (fits DWR-XX-26)
- f. Optional cover plate / shelf kit shall be model # DWR-CVR • Minimum-clearance latch shall allow side-by-side or corner mounting, shall be model # DWRSR-ZL
- g. Optional bonding kit for UL-2416 (NWIN) compliance shall be Middle Atlantic Products PET-K-D/EWR (for backpan to center section), PET-K-D/EWRD (for backpan to center section to front door), PET-K-FD (for front door to center section)

B. RACK DRAWERS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO D SERIES.

1. Provide ONE rack drawer for each CR rack. Locate system as-built drawings and manuals inside this drawer.
2. EIA compliant 19" rackmount drawer shall be Middle Atlantic Products model # DX or TDX (X = # of rackspaces required, refer to chart). Drawer shall have an overall height of __" (refer to chart), and useable depth of 14-1/2". Drawer base shall be 20-gauge steel, top and sides shall be 16-gauge steel. Drawer faceplate shall be .090" thick aluminum with a __ (black brushed & anodized or black textured powder coat) finish (refer to chart). Drawer shall use full extension, ball bearing slides. Grommet shall be provided for safely passing cables through the cable entry point at the rear of the drawer on 2, 3 and 4 space models. 2, 3 and 4 space drawers shall include a no-slip drawer mat. Drawer shall have a 50 lb. weight capacity.
3. Drawer shall be warrantied to be free from defects in materials or workmanship under normal use and conditions for a period of three years. Drawer shall be UL Listed in the US and Canada.
4. Drawer shall be GREENGUARD Indoor Air Quality Certified for Children and Schools. Drawer shall be RoHS EU Directive 2002/95/EC compliant. Drawer shall be manufactured by an ISO 9001 and ISO 14001 registered company.

C. POWERCOOL

1. EIA compliant 19" PowerCool™ Rackmount power distribution and cooling unit shall be Middle Atlantic Products model # PD-COOL-__ (refer to chart), with a __ (15, 20 refer to chart) amp capacity, 2 stage, normal mode (Line to Neutral) spike and surge suppression with dry contact and LED status indicators and EMI filtering. PowerCool shall activate at 87°F (30.5°C), reach full speed at 95°F (35°C) and switch off at 85°F (29.4°C). PowerCool shall displace 50 CFM with a maximum decibel level of 29 dB (measurements made 1 meter from source, centered horizontally and vertically). PowerCool shall operate at a static pressure of .031 in. H2O. PowerCool shall have a removable 10" temperature probe. PowerCool shall have a normally open contact closure for remote surge suppression status notification to customer supplied monitoring device shall operate on 120 volt AC/60Hz nominal power. PowerCool shall have a removable 6' __ A (14-3) IEC SignalSAFE™ power cord with IEC C-(14 or 20) receptacle (refer to chart). PowerCool shall have __ (0,1) front and 10 NEMA 5-__ R outlets, and (circuit breaker switch with switch guard, keyswitch, always on, refer to chart) located on the front of the unit. "Clean ground" surge suppressor design shall not pass noise contamination to the ground. PowerCool shall occupy one rackspace with a (flat black, black brushed and anodized finish, refer to chart). PowerCool shall comply with the requirements of RoHS EU Directive 2002/95/EC. PowerCool shall be manufactured by an ISO 9001 registered company. PowerCool shall be warranted to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years. PowerCool shall be ETL listed to UL standard 1419 in the US and CAN/CSA C22.2 #60065 in Canada.
- D. MODULAR POWER RACEWAYS: REFERENCED PRODUCT MIDDLE ATLANTIC MPR RACEWAYS. SEE DRAWINGS FOR CIRCUIT QUANTITIES AND CONFIGURATION.
 1. MPR modular raceways shall be Middle Atlantic Products model # MPR-6. Power modules shall be M-20. Isolated ground outlets shall be available, suffix part with IG (ex. RLM-20IG). Stand-alone power modules shall be RLM-xx-1C and shall include a 9' power cord with NEMA 5-15P plug or 5-20P plug. MPR components shall be warranted to be free from defects in material and workmanship under normal use and conditions for a period of 3 years. MPR components shall be UL Listed separately and as a system in the US and Canada.
 - a. Modules on the same circuit shall interconnect using J series jumpers, which feature #12 (20 amp) wire with genderless 30 amp connectors at both ends and require no hard wiring.
 - b. All modules on separate circuits shall connect using T series tails, which feature #12 (20 amp) wire with genderless appliance-grade 30 amp connector on one end and wire tails for J-box connection on the other.
 - c. Two separate circuits can feed two duplexes on M-2X modules. Remove the factory-installed jumpers (line & neutral) and feed each duplex using two T series tails.
 - d. Isolated ground outlets shall not be mixed with non-isolated ground modules on the same circuit.
 - e. Module chassis shall be constructed of 18-gauge steel finish in a durable black powdercoat.
 - f. The modules shall be attached to MPR raceways using two conveniently located screws.
- E. BLANK PANELS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO BL SERIES.
 1. EIA compliant 19" blank panels shall have a black powdercoat finish. Blank panels shall be constructed of 16-gauge aluminum.

- F. VENT PANELS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO VT SERIES.
1. EIA compliant 19" vent panels. Vent panel shall be constructed of 16-gauge aluminum and shall have a black powder coat finish.
 - a. VT perforation pattern shall be: 5/32" dia. hole, with 3/16" staggered centers. Open Area 63%

- G. RACK DRAWERS: REFERENCED PRODUCT MIDDLE ATLANTIC AUDIO D SERIES.
1. EIA compliant 19" rackmount drawer shall have an overall height of X", and useable depth of 14-1/2". Drawer base shall be 20-gauge steel, top and sides shall be 16-gauge steel. Drawer faceplate shall be .090" thick aluminum with a black brushed & anodized finish. Drawer shall use full extension, ball bearing slides. Laser knockout shall be provided for passing cables through the rear of the drawer. Drawer shall be UL Listed in the US and Canada. Provide all drawers with keylock option.

2.23 LED RACK WORK LIGHT: REFERENCED PRODUCT MIDDLE ATLANTIC LT SERIES

A. Features:

1. LT series shall have an adjustable width of 17.73" to 21", a height of 1.75" and a depth of 1.72".
2. LT series shall have a light temperature of 2,700-6,500K, and provide __lm (refer to chart).

	Light Qty	Interconnect Cable / Length	Light Temperature	Lumens
LT-CABUTL-SINGLE	1	no	2700-6500K	480-540lm
LT-CABUTL-DUAL	2	yes / 118 [3000]	2700-6500K	960-1080lm

3. LT series light bar shall have an adjustment range of 100°. LT series shall have a cord length of 59", and the interconnect cable (LT-CABUTL-DUAL only) shall be 118".
4. LT Series shall include power adaptors for US, BS, SAA and EU. LT Series shall have a UL Listed power supply that meets US DOE Level VI requirements with an output of 12VDC, 2 Amps.
5. LT Series shall have an input voltage range of 90VAC to 260VAC, an input frequency range of 50/60Hz, and a max AC current draw of 800mA AC.
6. LT Series shall meet the EU RoHS Directive 2011/65/EU. LT Series shall be warrantied to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years.
7. LT Series shall be CE Marked (single light only) and FCC Part 15, Class
8. Mount on the upper rear rack rail and orient to spill lighting down inside the entire interior rear portion of the rack.

B. Technical Specifications:

TECHNICAL SPECIFICATIONS	LT-CABUTL-SINGLE	LT-CABUTL-DUAL
INPUT (AC/DC ADAPTER)		
Input Voltage Range	90VAC - 260VAC	
Input Frequency Range	50/60Hz	
Max AC Current Draw @ Full Load	800mA AC	
OUTPUT (AC/DC adapter)		
Nominal DC Output Voltage	12VDC	
DC Output Voltage Range	11.4VDC - 12.6VDC	
Typical DC Current Draw	Single Light 0.6ADC, Dual Light 1.2ADC	
Max DC Load Current	2.0ADC	
Short Circuit Protection	Yes	
DC Output Connector	3.5mm x 1.35mm x 12mm, Center Positive	
PHYSICAL (AC/DC adapter)		
Dimensions	1.8 x 3.5 x 1.5 in (45.5mm x 88mm x 38mm)	
AC Receptacles	Four (4) Interchangeable: US, BS, SAA, EU	
Weight Lb. (G)	0.39lb (175g)	
REGULATORY(AC/DC adapter)		
Safety	UL, cUL, CE	UL, cUL
EMI (Adapter and Lights)	FCC Class B, CE	FCC Class B
Efficiency	Meets US DOE Level VI requirements	
ENVIRONMENTAL (lights and AC/DC adapter)		
Operating Temperature	32F TO 104F (0C TO 40C)	
OPERATING RELATIVE		
Humidity	0 TO 90% NON-CONDENSING	

2.24 BILL OF MATERIALS

- A. Dimming system equipment, console and all accessories and controls - see drawings for equipment, quantities and required coordination with the EC and other related trades.
- B. Lighting fixtures: See drawings for quantities, types, lamps, locations, installation requirements, etc.
- C. Provide all theatrical fixtures with C-clamp, safety cable, lamp, gel frame and connector as called for on the contract drawings and/or to match existing devices (provide adapters as necessary for all fixtures that require them in order to interface with any existing and reused system equipment). Swap out connectors as required when reusing existing system equipment.
- D. Every portable cable shown or referenced on the TL series drawings shall have one 24" piece of black tie-line (Samson black braided tie cord/sash cord or equal - breaking strength 100 lbs./WLL 15 lbs., rip-tie hook & loop black Velcro or equal) choked onto one end (near connector). Provide two full 500'/600' rolls for this project and leave the remainder on site for the owner's future use upon project completion (or at least 1/2 roll, whichever is more). This does not include two-fer cables under 5' long in overall length. Provide 16" tie line for portable cables under 8' in overall length.
- E. Theatrical Fixtures: Swap out, at no additional cost to the owner, any different lenses or fixture barrels for the specified fixtures that may be needed due to field conditions, focus plot intents, etc. per the owner's directive. If there are no specific lenses called out on the drawings, then provide lenses dictated by the field conditions, focus plot, owner and/or the consultant. If the specific fixture barrels called out on the drawings do not provide the intended patterns, etc. that are needed and desired by the focus plot intents of the owner, then provide barrel swaps for all

affected fixtures so that the focus plot functions as intended –this will be only one barrel per fixture.

- F. Provide all DMX terminators as necessary for all DMX controlled equipment.

PART 3 - EXECUTION

3.1 GENERAL:

- A. All liability for rigging, fastening, wiring and other installation methods shall be borne by the contractor alone. If the contractor has a reason to believe that safety will be compromised in the installation of any specified equipment in the locations specified, they must note this at the time of bid and offer alternatives in writing.
- B. Assess life safety implications of all installation methods and verify there is no compromise of life safety issues.
- C. Any dangerous work areas must be marked or roped off in a manner that will inform all persons as to potential danger, regardless of that person's sensory handicaps.
- D. Maintain M.S.D.S. for all materials used where applicable and submit same if requested upon completion.
- E. Maintain the integrity of all fire-walls and doors during construction and upon completion.
- F. Take all precautions necessary to guard against electromagnetic interference, electrostatic hum and RF interference, especially into the audio and video systems.
- G. The contractor shall supply adequate ventilation and will install all equipment for the maximum safety of the operator.
- H. The contractor shall verify all on site dimensions prior to the ordering or installation of critically dimensioned equipment and wiring. In a case of discrepancy between these documents and attached drawings, construction documents and actual on-site dimensions, the contractor will notify the owner and consultant in writing before making any changes in intended work. The owner and consultant will determine the correct modification to the work that needs to be done.
- I. All methods must be cosmetically acceptable to the owner. All equipment shall be installed neatly, with respect to level & plumb, sight lines and finish. All wiring must be neatly run and concealed in an orderly fashion and attached to appropriate support structures.
- J. Identify any equipment requiring licensing and initiate licensing procedures for all such equipment.
- K. Coordinate all work with other on-site trades in order to achieve a coordinated progress at all times.
- L. All RDM fixtures (remote device management) shall incorporate the latest RDM standard in fixture addressing, remote management, reporting, etc. (must be ANSI E1.37.2 or later compliant).

3.2 WIRING AND RACKS:

- A. All CR (communications rack) wiring shall be neatly tie wrap bundled (or as indicated otherwise on contract drawings) with wires parallel and perpendicular to rack sides and backs All wiring

shall be properly strain relieved as it exits the rear connection points on the related equipment, shall be routed out to lacing bars, shall be routed out along lacing bars to rack side areas and shall be tie wrapped to the lacing bars. All rack wiring shall be performed as noted. Loose, haphazard or otherwise poorly managed wiring without proper strain relief shall not be allowed.

- B. Provide all internal network/DMX style wiring, etc. Needed inside the relay panel & all required interconnections & feeds to external equipment.
- C. Control hookup is provided by the factory technician.
- D. Within the dimmer/relay rack all wiring splices must utilize butt style line insulated splices crimped with a controlled cycle termination tool. Referenced style Panduit BSV10X-D or equal. Size splices per gauges of wiring to be spliced. See written specifications for more info.
- E. All wiring that is not in conduit shall be black jacketed. No other jacket colors on exposed/loose wiring shall be allowed.
- F. All wiring that is not in conduit shall be plenum rated wiring (Belden 1585A or equal).
- G. All control booth wiring shall be neatly tie wrap bundled and dressed neatly.
- H. All lighting or power cables & wiring must be dressed neatly with tie wraps & eyes or ring runs & tucked up against underside of lighting countertop
- I. No undue stress shall be placed on any connection by a lack of support of the wiring within the rack.
- J. Any wiring splices necessary must utilize butt style inline insulated splices crimped with a properly adjusted controlled cycle termination tool. Referenced style Panduit BSV10X-D or equal. Size splices per gauges of wiring to be spliced & provide as required. No incorrectly sized splices shall be allowed.
- K. Any equipment having accessible controls that are not normally used during system operation will have its controls capped or otherwise locked such that they are not adjustable. If no other means is feasible the use of security covers is mandated. Rack doors are not acceptable as means of tamper resistance for controls.
- L. Provide all (rack panels, bottom/top pans, spreader bars, access panels, etc.) blank and/or vent panels as needed to complete each rack with no unfilled spaces, as per rack elevations or as required by alternates to equipment specified. No racks with unfilled panel spaces shall be allowed. Seal all air gaps around conduit entry holes as needed in order to keep air gaps to a minimum.
- M. Wiring Standards - Plenum Rated Cable: Unless specifically noted on the drawings, all low voltage wiring is to be CL2/CL3 wiring.
- N. No rack rails will be allowed for equipment mounting in the rear of the rack unless otherwise noted in this specification.
- O. All conduits indicated on the drawings shall terminate directly into racks as shown – top, bottom or at any of the provided knockout locations (unless otherwise and specifically indicated on the drawings as otherwise) and so as not to obstruct access to the racks or adjacent walkways or approaches.

- P. Route conduits into racks with as few bends as possible – use sweep elbows where necessary. All wiring shall be protected in conduit until it has reached the internal space of the indicated rack(s).
- Q. All dimming/lighting system related racks shall be mounted vertically and as intended by the manufacturers. No racks shall be allowed to be mounted horizontally.
- R. The contractor shall program the main dimmer rack(s) control module(s) to “hold last look” upon loss of DMX signal. Duration of this hold shall be for 15 minutes (unless the system has been shut down or turned off by the architectural control system). This shall prevent the room from going dark in the case of lighting console failure or inadvertent disconnection of DMX/NET input from lighting control console to the system.
- S. ELECTRICAL & GROUNDING:
 - 1. Grounding of shields and chassis will adhere to industry standard practice and as required by the dimming & control systems manufacturer.
 - 2. Verify that all hot, neutral and ground conductors are tightened at least 5 days after initial installation and landing of line & load conductors.
 - 3. Any AC service shall be installed to standard Edison U-Ground style outlets at the locations noted on the electrical drawings. Where racks are located the service is to be run to the interior of the rack. Two U-ground outlets will be available for each 20-amp, single-phase circuit unless otherwise indicated or terminated into MPR style devices.
 - 4. Internal rack AC distribution is the responsibility of the contractor. Acceptable methods: Rack mount power strips, rack mounted power distribution devices, Wiremold style outlet strip.
 - 5. Install all internal AC rack power with all switches and controls carrying hazardous voltage housed in steel enclosures within the rack. Provide positive electrical grounding for all steel enclosures. All AC service will incorporate separate hot, neutral and ground for each device. All grounds and neutrals will be appropriately bonded and connected to earth as required by codes and normal practice.
- T. CONDUITS:
 - 1. Use separate conduits for data and other control cabling. Control power and ground may be run with data for the same devices.
 - 2. All conduits shall be concealed unless the owner has been notified in writing and accepts by written approval the location of all exposed conduits.
 - 3. A pull string shall be left in place by the installing contractor after pulling all wiring through each conduit. This pull string shall be tied off at both ends and left for future use.
 - 4. All lines, cabling or wiring in any conduit run must be free from any splices or junction points.

5. All lines, cabling or wiring must be free from damage. Any that exhibits stress, damage, intermittent signal problems, data errors or other anomalies due to excessive pull torque shall be replaced.

U. JUNCTION/GANG BOXES:

1. Unless otherwise specified all controls, receptacles, user interface stations, plugs and outlets shall be located in an appropriately sized gang box. No multi-gang backboxes with raised, tile ring, extension ring or mud ring style reducers to obtain the specified faceplate gang size shall be acceptable in lieu of the indicated device backbox.
2. Any junction (i.e. terminal blocks, punch down blocks etc.) shall be housed in metal enclosures with an attached ground. No such connections may be made in ceiling spaces or other areas without the use of a steel enclosure.
3. Any field added junction boxes shall be sized and located for ease of troubleshooting access and all connections within shall be connected on terminal strips, which are clearly identified, in a logical, consistent & permanent manner.

3.3 ASSEMBLY AND PRE-TEST:

A. LIGHTING FIXTURES:

1. Install connectors as required on fixtures prior to bench test and focus.
2. Attach all safety cables to fixtures by removing one yoke bolt and sliding the fixed end loop of the safety cable over the yoke. Reinstall the yoke bolt.
3. All incandescent lamps shall be burned in for at least 8 hours to check for defective lamps. Replace any lamps that fail and burn those lamps in for at least 8 hours.
4. Adjust incandescent lamp center for highest output flat field (bench focus). This is required for any new and/or existing to remain and be reused fixtures.
5. All LED fixtures shall be DMX addressed, set up in the proper color mode, have fan speeds set to quietest mode of operation, etc. and tested with addressing in place.
6. Each LED fixture shall be turned on and "burned in" at full for (2) weeks in the contractor's shop in order to check for defective power supplies, drive electronics packages or other fixture anomalies.
7. See TL series drawings for a more complete description of the procedures recommended for bench focusing of fixtures.

B. LIGHTING EQUIPMENT (OTHER THAN FIXTURES):

1. All new equipment shall be turned on/burned in and tested prior to delivery to the site. No equipment may be delivered to the site without being fully tested off-site. The equipment does not need to be under load during this period. This includes, but is not limited to, the lighting control console, fader wing panels, video displays/monitors, remote focusing units, Blues System power supplies, portable network gateways/nodes, architectural control processors, followspot fixtures and related power supplies, network switches, portable dimmer devices and any other lighting related portable equipment. Burn in requirements do not apply to installed dimmer racks, grid iron junction boxes, individual dimmer modules or DMX distribution racks.

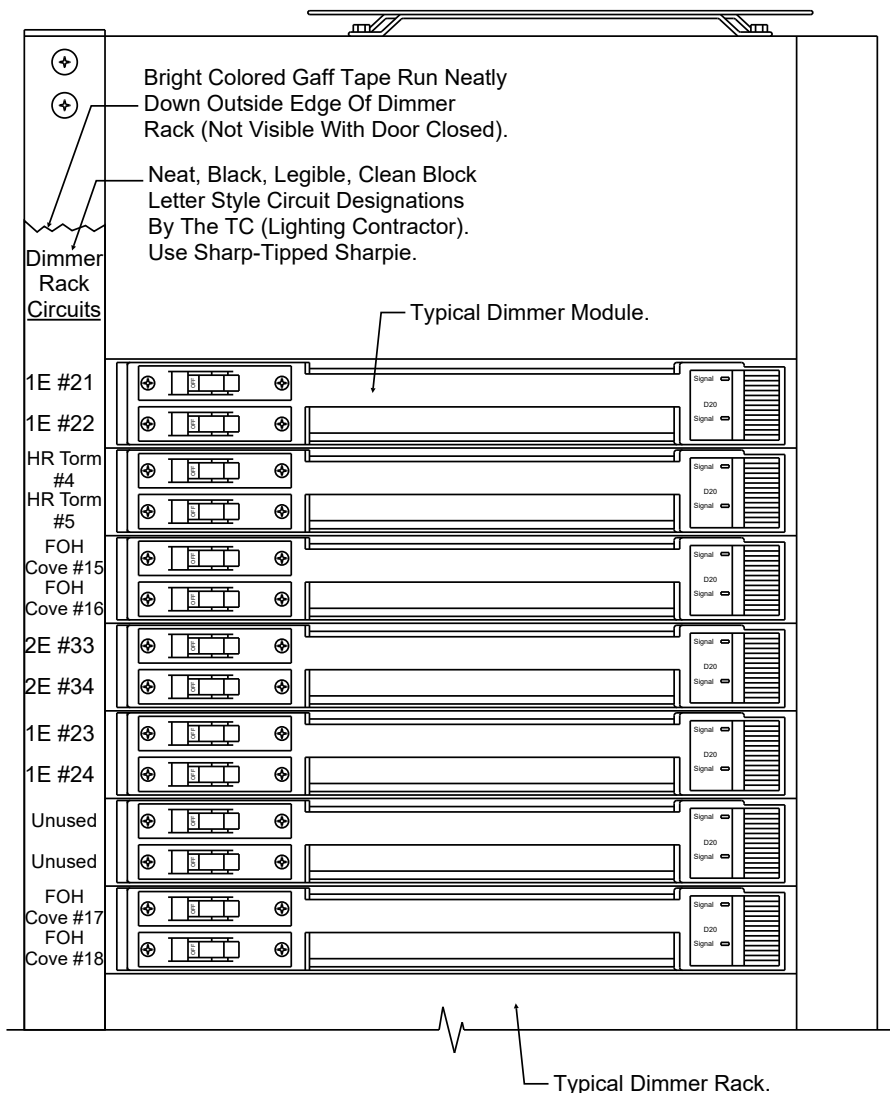
3.4 FINISHES & CLEANING:

- A. All finishes shall be returned to their original finish and condition after any temporary machining or other work.
- B. Cover any walls, furniture, finished floors and carpeted areas to catch all metal particles, grit, etc. that may occur during installation.
- C. Cover and protect all equipment left or installed on site during construction.
- D. Provide thorough cleaning of all work areas including vacuuming, spray cleansers and dust removal as required. Clean all equipment fan filters before final acceptance tests.
- E. Provide a thorough cleaning of all lighting system and related devices, including but not limited to, fixtures, housings, racks, cables/cordsets, data lines, reflectors, lenses, modules, mounting pipes, controls, consoles, etc. regardless of status (new or existing to remain/reuse). Cleaning shall be after all dust/dirt creating work has been completed and just prior to walk-through/punch list and turnover to the owner.
- F. Maintain clean work areas, removing all debris daily.

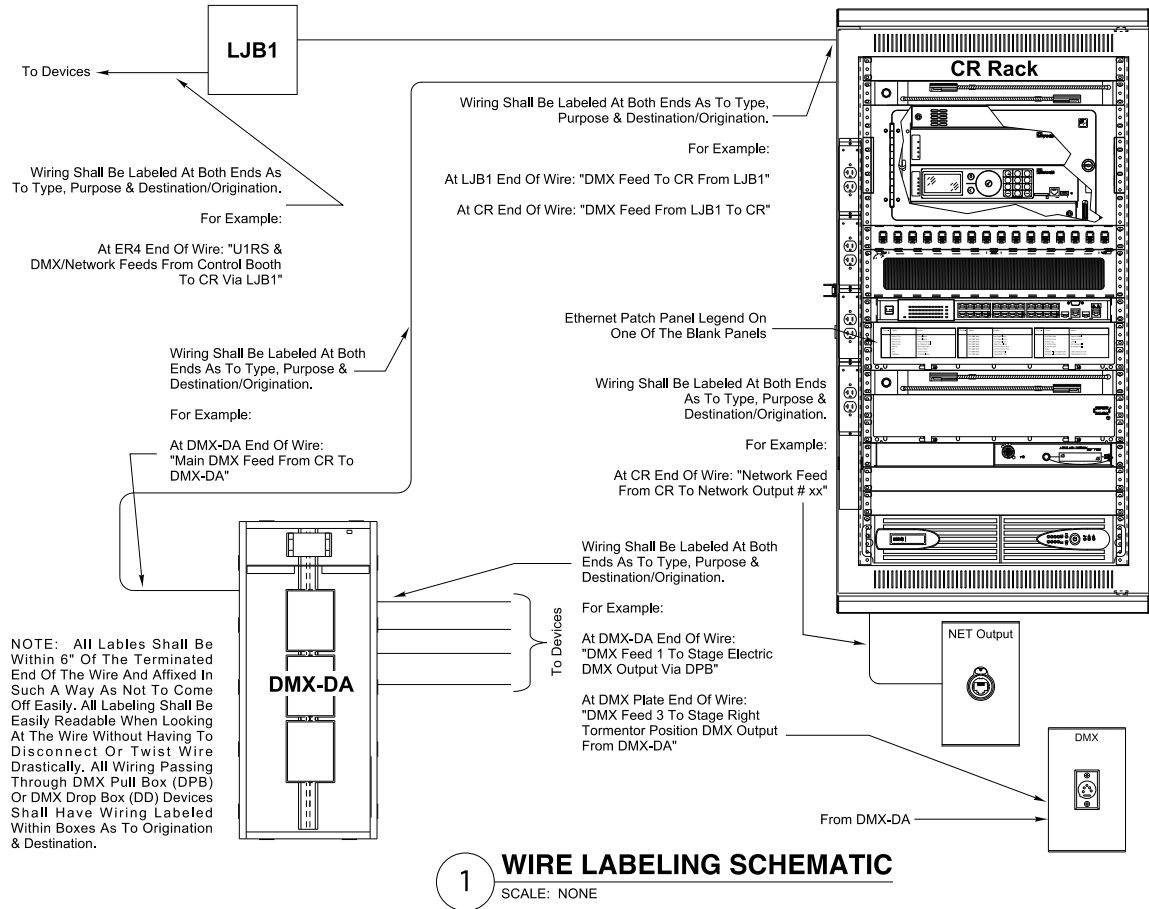
3.5 LABELING:

- A. All switches, cables, wire, controls and outlets will be permanently and logically marked during installation. Submit to the consultant for approval a listing of intended nomenclature. Where possible engrave directly upon plates and assemblies. Where disassembly would be required the use of adhesive or screw on engraved labels will suffice. Engravings will be paint filled for best contrast with black or white paint.
- B. Do not use Dymo style labels or hand lettering. No cables shall be labeled with masking tape, gaffer tape or other material subject to degradation. Such labeling may be done on a temporary basis during installation so long as all such labels are removed and their adhesive cleaned off when final labeling is applied. Self-laminating labels are preferable for the final labeling system.
- C. Permanently mark cables with an identifying label at each end in a consistent, logical manner.
- D. Color-coding of the entire system shall be logical and adhere to accepted industry standards.
- E. The contractor shall provide the owner with a laminated hard copy chart (Microsoft Excel style) of the dimmer channel assignments and locations along with any soft patched devices, DMX assignments, Network assignments, house, accent and worklighting channel assignments, submaster assignments, etc. to be left at the control console location.
- F. The contractor shall label each circuit in each dimmer rack as to its destination (permanent black marker on bright colored gaff tape is acceptable – printed legibly). Contractor may also use any style of durable, stick-on, printed style labeling that will remain adhered, is approved by the manufacturer, does not violate NEC and is large enough to easily read. Example for circuit #32 would be – “1E #32” (First Electric, Circuit #32) OR example for circuit #2 would be – “Cove, Circuit #2” OR example for circuit #102 would be – “Houselights R1” (row 1 of houselights). Contractor shall also provide multiple copies of a typed “spreadsheet-style” sheet showing all circuit assignments along with their destinations, designations, descriptions and locations to the owner for future reference. Place one laminated copy of this sheet on the wall beside the dimmer rack. See diagram below for more info. This includes any existing and to be reused dimmer racks - layout may deviate from what is shown due to physical differences and constraints of existing racks vs diagram that follows. In that case, provide labeling for each such rack that is as similar to what is shown as is possible, while placing labels as needed and in locations that

make sense, do not impede airflow, module removal or rack functionality or violate existing rack manufacturer's specifications.



- G. The following schematic diagrams have been provided as examples of acceptable and intended wiring (patch panel legend labels to be included for all racks as shown on contract drawings), wiring destinations & origins: (these schematic drawings are diagrammatic only and do not reflect all of the actual parts and/or components, etc. designed into this project.) Contractors (Both EC and theatrical/lighting contractors) shall use these schematic diagrams as guides and references and label or wire all related and additional devices in a similar manner to those shown here. These diagrams are typical of all lighting related devices, communications racks, etc. designed into this project. The intent is for all portions of this project to be labeled in a concise, intelligent and consistent manner. Provide patch panel legends for all network, 0-10V and DMX distribution (separate for each and located near related distribution equipment). Patch naming shall be concise, can be intelligently abbreviated and specific to locations. Matching names shall be located on all wiring (both ends) as well as on output plates.



3.6 RIGGING:

- A. The following minimum standards apply in addition to the standards referenced elsewhere in this specification. These guidelines do not negate the standards referenced elsewhere in this specification.
- B. All equipment not described as portable in this specification will be rigidly held in place as per the manufacturer's recommendations or as indicated.
- C. All equipment (except luminaires) will be supported at a minimum of three points plus a backup. Each point shall be able to carry the entire rated load with a safety margin of at least five (5) times the rated load. All methods shall incorporate an independent safety backup with a safety margin of at least five (5) times the rated maximum load as installed in case of failure of any rigging component. All safety cables shall be installed so that they have little to no slack in order to reduce shock loading in the event of a catastrophic failure of the primary rigging attachments.
- D. Theatrical lighting fixtures will be supported by their primary attachment point, either C clamp or factory supplied or other specified clamp (such as a Megaclaw style clamp for motorized lighting fixtures). A safety cable rated for at least 10 times the rated static weight of the fixture will be utilized as a safety backup in case of a failure of the primary attachment point.
- E. All rigging and related fastening methods must be treated as permanent. All threads shall be treated with vibration compounds such as Vibratite or Loctite as per manufacturer's recommendations and shall be visible upon inspection.

- F. All rigging hardware shall be load rated with the load rating or approval stamped on each piece of hardware.
- G. No chain of any type will be acceptable for the hanging or backup support of any equipment except in the case of trim chains.
- H. All trim chain shall be Peerless black theatrical chain type or equal.
- I. No fabric or plastic devices of any type will be considered as acceptable methods of hanging of any equipment.
- J. No stainless steel or galvanized wire rope shall be secured with Crosby clamps or other threaded type fittings alone. Compression type closures such as Nicopress with thimbles and copper sleeves ONLY must be utilized for all wire rope terminations. Each closure must have a backup closure. All wire rope is to have strain relief thimbles installed where it attaches to other rigging components. The contractor shall never violate the minimum bend radius when using or installing wire rope.
- K. All loose ends of the wire rope will be neatly taped down after Nicopress is installed and crimped. No frayed rope ends will be allowed under this specification. This includes safety cables.
- L. All Nicopress or equal compression connections and wire rope swaging products utilized on this project shall be required to pass field gauge tests as to their proper terminations and compression (typically referred to as go-no-go gauge tests). Due to the sheer quantity of manufacturer's and the varying types/styles of compression tools in use, this will require the contractor to provide the proper go-no-go gauge during acceptance testing (punch list) for each different compression tool utilized on the project (typically a specific gauge is provided with each tool purchased). This gauge will be turned over to the consultant for use in verifying that the correct compression has been performed on the oval sleeves. It is understood that the consultant cannot test every single oval sleeve but will, instead, check a random percentage of sleeves that will be assumed to be typical of all similar compression fittings on this project. It is the contractor's responsibility to verify, during installation, that every oval sleeve has been compressed properly and that it passes the go-no-go gauge test.
- M. All Nicopress of equal compression connection thimbles shall be loaded (mounted) only on a round shaft. Thimbles through a punched hole or other where the thimble encounters an edge shall not be allowed.
- N. Nothing shall be allowed into the interior of any Nicopress or equal compression connection oval sleeves except the wire rope itself. Any taping of wire rope ends shall be performed only after all compression connections are properly swaged.

3.7 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.

- C. 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.
- D. 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.
- E. For equipment and connections provided in this contract, prepare roughing drawings as follows:
- F. Where more than one trade is involved in an area, space or chase, the contractor shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements.
- G. Provide code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation.
- H. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location. Submit as part of submittal package prior to installation. Do not install prior to written approvals.
- I. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings. Submit as part of submittal package prior to installation. Do not install prior to written approvals.

3.8 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. Patch all cut or abandoned holes left by removals of equipment or devices. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering or other finished surfaces. Patch openings and damaged areas equal to existing surface finish (i.e., "patch to match existing"). This includes, but is not limited to, complete removal of irrelevant, abandoned or protruding hardware, anchorages, misc. holes, mismatched paint on walls/surfaces after removals, excessive dirt/debris left after removals work, etc. as well as touch up painting and/or cleaning of related areas of removal, wall surfaces, etc.). If no instructions exist in the contract documents addressing these issues, then the contractor shall contact the architect and construction manager in writing prior to proceeding with any work in order to obtain written instructions regarding this type of work.

3.9 CONCEALMENT:

- A. Conceal all contract work above ceilings and in walls, below slabs and elsewhere throughout building (this does not include lighting fixtures, control consoles, user interface stations, etc.). If concealment is impossible or impractical, notify Owner's Representative before starting that

part of the work and install only after his review and written authorization and instructions on how to proceed.

3.10 PERFORMANCE:

- A. The systems will be utilized for lighting various types of performances from solo artists to large groups. The intent is for the preset lighting controls to accommodate most of the general lighting needs. The owner will compile a list of presets to be loaded into the control system. These presets will consist of a prefocused aiming of all lighting instruments.
- B. All LED fixtures shall exhibit quiet operation (the preference is for all fixtures to be convection cooled). Audible requirements for ALL LED fixtures is as follows:
 - 1. No LED fixture shall be allowed that exceeds an NC10 noise curve as measured 4' – 0" from any point of the fixture.
 - 2. NC measurements shall be dBA and measured in 1/3rd octave resolution.
 - 3. For fan cooled devices, the fans are normally to be set up and operated in auto mode.
 - 4. Any fixtures and fixture fans that exhibit or develop a tonality within the first 12 months of use shall be replaced by the contractor at no additional cost to the owner and within a reasonable amount of time (typically less than 2 weeks).
** Tonicity shall be defined as any frequency or frequency bands that are narrower than 1/3rd of an octave that exceed the average adjacent background level by more than 3 dB as measured on an FFT style trace. This is typical of both fundamental frequencies as well as any related harmonics.
- C. For relay circuits powering LED fixtures, set dimmer profile to be on in all cues, etc. so that LED fixtures are always powered on during performances. Relays shall be set to be turned off when system is not in use in order to preserve drive electronics estimated max life cycle. Perform this function in the architectural control system programming software.
- D. Program all touch screens, including magic sheets (with graphic overlays of the space as well as with fixtures by group) for the owner's use.
- E. Program all theater lighting presets to maintain the minimum required egress levels of lighting at all times and in all cues based upon life safety code NFPA 101 & local building codes. The minimum egress lighting level is .2 fc.
- F. Provide custom signage for the dimmer/relay rack location as indicated. Provide all nomenclature indicated plus additional as applicable. Mount signage on an adjacent wall near the dimmer/relay rack as space allows.
- G. Provide the consultant, owner and architect with the following files as it regards the lighting system, control console, paradigm system, misc. Devices and controllers. All project related final lighting system files shall be provided in both compiled and uncompiled (editable) formats and in the current software/firmware format. All files must be named so that identification as to project, file type/intent, etc. Is readily identifiable from the name alone. Provide all files saved to a thumb drive:
 - 1. ETC Paradigm Lightdesigner config file
 - 2. ETC concert config file
 - 3. ETC console template/show files
 - 4. All console template files

5. Network system config files
- H. LED fixtures: all fan-cooled LED fixtures must have the ability to be run at full light output (typically full white) for a 4-hour minimum without light output reduction and without the fan speed ramping up to a level noticeable to a listener from a distance of 6' - 0" away (see noise requirements above). Fan speeds must be assigned to a DMX channel, configured by the setup technician and locked so that they are at the lowest fan speed setting possible while still maintaining full light output out of the fixtures. The cumulative fan acoustic output must be inaudible in the seating area, no matter how many LED fixtures are on. This configuration must be field verified on site for an 8-hour minimum - (2) 4 hour cycles. The total light output shall, at no point in time, be allowed to automatically dip below 90% overall output (unless specifically being dimmed for a theatrical reason) in order to enter a "self-protection" mode or other automated cycle designed to prevent the fixture from overheating. See written specifications for more information and noise curve requirements for all LED fixtures.
- I. Post a complete copy set of the lighting system one-line diagram, system as-built drawings, laminated excel spreadsheets of all circuit & DMX/network assignments, etc. as listed on TL flow diagrams) in the CR rack drawer. Provide an additional laminated circuit assignments sheet for the lighting console position.
- J. Training & Instruction:
 1. Provide all on-site owner training, software training, architectural system preset programming (including pushbutton & LCD stations), edited DVD training video, bench & field focus of fixtures, etc. As detailed on the bid drawings and in written specifications. (training, DVD, focus and programming time is extensive and detailed). See specs for total quantity of hours of training, focus and software programming requirements that the owner is entitled to as part of this bid package. All items shall be provided as a part of his bid at no additional cost to the owner after bid. Owner is not obligated to receive all training time; however, all training time, etc. As listed above, in written specifications and on the bid drawings is the sole responsibility and obligation of the contractor to provide. All training shall be at times and in duration as directed by the owner and shall be held on-site at the owner's facilities.
 2. Give the owner detailed and specific instructions on powering/depowering and the insertion/removal of PowerCon power connectors for any LED fixtures included in this project. Since the PowerCon connector is a connector without breaking capacity, these connectors should not be inserted or removed under load or when live. Per the manufacturer's instructions, the user is to disconnect the end of the power cable that is plugged into the wall outlet/distribution first and prior to insertion/removal of any PowerCon connectors. Failure to do so may damage, pit or char the contacts inside of the PowerCon connector, rendering them unable to make proper contact and unusable without replacement of the PowerCon connectors. Any such damage to the PowerCon connectors due to failure to disconnect the fixtures from power first will result in factory repairs that will not be covered under warranty.
 3. Give the owner detailed and specific instructions on (as well as turning over a copy of the manufacturer's safety notice data sheet) on the hazards that may be associated with the improper use of Neutrik PowerCon True1 connectors.
- K. LIGHTING SYSTEM NETWORK:
 1. Design and provide all LCD touchscreen layouts as indicated in the written specifications.

2. Provide all ethernet style switches to be power over ethernet switches with all ports/outputs powered. Provide quantity of switches and outputs in order to output signal to all lighting system network devices.
 3. After final system setup and configuration, provide the owner with a USB flash memory drive (memory stick or thumb drive) device with a complete copy of the "as built" system configuration stored on it - including electronic as built drawing set (4 GB drive - in addition to other drives noted).
 4. Instruct the owner on how to make basic system and preset setup changes with a standard web browser (via LightDesigner access).
 5. The lighting system network shall not be hardwired to or capable of being interconnected with the building-wide network or direct access to a gateway providing internet (world wide web) access. The lighting system network is comprised of simple network devices that do not have the capability or protection to remain immune to viruses, etc. The lighting system network must remain a stand-alone network. Failure to segregate the lighting system network from the building-wide network and internet access could result in a catastrophic failure of the entire lighting network and loss of vital data (including show files, system patch, fixture profiles, default system setup, etc.) If infected with a computer virus, and which would result in the need for a total system reboot back to factory defaults (all "as built" system configuration files would then need to be recreated from scratch).
- L. Verify the load requirements for all PoE switch outputs and the related devices being powered via the network switch. Provide a switch that is capable of powering all network devices & outputs indicated per the manufacturer's recommendations.
- M. Perform all DMX and network programming, dimmer assignments, device addressing and related software/firmware setup, LED setup, modes and addressing, etc. All LED fixtures, network gateways, houselighting fixtures and RDM setups and any other DMX/network/RDM addressable devices shall be addressed in an intelligent, consecutively numbered, individually addressed manner prior to completion of the project and final acceptance tests.
- N. Work closely with related trades in setting up, testing, verifying and tweaking the houselighting system, lamps, etc. In order to get consistent and acceptable results. This includes DMX/RDM setup of houselighting fixtures, populating those fixtures into the architectural control system, dimming rack control module and lighting control console, dimmer module curve settings, providing/swapping out indicated modules for modules that will control the associated fixtures better (i.e. ELV's for D20e's, etc. As needed), assisting in visual confirmation of performance acceptability, recording lighting performance visuals for record and any other items as noted in ec houselighting notes or other required coordination. Obtain a written sign-off acceptance by the owner of visual performance of the houselighting system prior to finalizations & programming.
- O. All connector strip, outlet box, gateway, etc. Devices must have the proper grommets and strain relief devices in place from the point where the loose or multicable wiring enters the device and at all connection/transition points into the related device. Devices without grommets and strain relief shall not be allowed.
- P. Verify the actual electrical loading demands of all devices plugged into indicated UPS devices and provide appropriately sized backup UPS devices as needed, even if that means providing upsized devices beyond what is indicated in order to meet the actual electrical demands of the serviced devices. No UPS device shall be allowed to be loaded past 90% of its rated capacity.

3.11 INITIAL POST COMPLETION TESTS & SET UP:

A. GENERAL OVERVIEW OF FOCUS GOALS:

1. The contractor is responsible to implement the owner's intended focus plot for each space included in the contract documents. Each category below relates to each included space individually and separately. Any lighting focus must have the owner's input, in writing, as to the intents of each luminaire's intended physical installation location, DMX address, target, control intents and all related fixture settings. Each space has been populated with an assortment of fixtures and placed in a generic layout on the contract drawings. It is up to the contractor and owner to fully lay out and detail which fixtures get dedicated to which use.
2. The focus intents should be governed by several pertinent topics and should be posed/requested by the contractor as a series of questions to the owner. These questions should include things such as the following (as presented to the owner and as is pertinent to each related space): Where do your choral groups perform? How tall are your participants? Where do your bands, ensembles, orchestras perform? What are the extents of these instrumental setups? Where is your conductor located? Where do you typically place a podium? Is this space used for school board or other similar types of tabled events? Where would those tables, chairs, etc. typically be set up? Is this space used for general assemblies, study halls, as an overflow space or for other non-specific uses? What are the parameters surrounding lighting usage for each type of event? How much of the stage do you need to light for each category of event listed above? How much of the pit or seating areas do you need to light for each category of event listed above?
3. Typical Fixture Usage:
 - a. Fresnel Style Fixtures: these are fixtures that generate wide, very soft edged pools of light that can be aimed at the stage or pit area from either overhead rigging or front of house positions. Fresnel fixtures have an adjustable zoom range. These fixtures can also utilize barn doors in order to shape/contain the light beam and are intended to wash various sized areas with an even distribution of light.
 - b. Ellipsoidal Style Fixtures: these are spotlight fixtures that generate sharp-edged, round pools of light that vary in width depending on the barrel used and that can be aimed at the stage or pit area from either overhead rigging or front of house positions. These fixtures can utilize a variety of gel frame/holder accessories as well as drop in gobos and are intended to highlight scenic elements, actors, etc.
4. Typical Fixture Deployment:
 - a. Meeting Use: in this application, the fixtures would typically be deployed in order to highlight a podium, a desk or an arrangement of tables set up for various speakers/participants, etc. Typically, the featured object(s) of this light would be lit from at least a couple of angles (front, top, back, sides) in order to give dimensionality to the object and to properly display facial features. This would typically be accomplished with the use of ellipsoidal style fixtures (or a

combination of ellipsoidal and tight wash fixtures), saved as a preset focus and those fixtures left in place for that dedicated use.

- b. Choral Use: in this application, the fixtures would typically be deployed in order to evenly light an entire grouping of participants located in a pre-arranged area and typically on some staging/risers. Typically, the feature objects of this light would be lit from the front/sides in a wash of white light. This would typically be accomplished with the use of par or fresnel style fixtures (or possibly wide-patterned ellipsoidal fixtures), saved as a preset focus and those fixtures left in place for that dedicated use.
- c. Theatrical Use: in this application, the fixtures are typically deployed for the specific performance piece, scenes, actors, locations, moods, etc. and is almost always arranged by the owner, as needed, for each use. This would typically be accomplished with the use of the owner's entire arsenal of available fixtures, beam patterns and styles. The owner, however, has the option to utilize all indicated focus time for this type of specific deployment, if desired.
- d. Zone Focus Use: in this application where the owner has no specific focus goals, the fixtures would typically be deployed in order to provide a zonal wash over the stage and pit areas. Typically, since there are no specific intended objects for the lights, the stage and pit areas are broken up into a series of adjacent 10' x 10' (or other regularly sized) squares of light, each with front, top and back lighting. This would typically be accomplished with the use of strip, par, fresnel and/or ellipsoidal style fixtures, saved as a series of preset area focuses and those fixtures left in place for those zonal uses.

B. FIXTURE FOCUS & GEL:

- 1. The lighting plot shown on the drawings is generic/diagrammatic and is not necessarily the plot the contractor will hang. Its inclusion on the contract documents is intended to inform the contractor that he has the responsibility to not only provide the fixtures but to also hang, interconnect, address, program, assign/group and focus each fixture and incorporate it into the overall lighting system (both the lighting control console and the architectural control system) per the owner's instructions. Verify with the owner prior to fixture hang the plot they want hung (multi-purpose, specific, zonal, etc.). Failure to do so will result in the contractor having to provide a second, owner-directed focus at no additional cost.
- 2. Fixtures included on the contract documents shall be unboxed, fully assembled, set up, tested, burned in, all included accessories installed (barn doors, shaping filters, gobos, etc.) and verified fully functional prior to the commencement of any hang/focus. This shall be performed by the contractor.
- 3. Theatrical Focus: The contractor shall be responsible to hang and focus all fixtures indicated on the bid documents. Theatrical focus shall be directed by the owner or by a designated owner's representative.
- 4. In the event that there were previously removed theatrical style fixtures that are intended to be reinstalled, the contractor shall be responsible to rehang and focus all previously removed fixtures as directed by the owner (this may be in a similar fashion as they were

prior to the start of this project or in a new configuration). The contractor must record all details of the previous fixture hang/focus prior to any removals in order to recreate it if needed, including physical fixture locations, interconnections, addressing, etc.).

C. Focus Hours Required (per space).

1. Focus Day Requirements For <100 Theatrical Fixtures: The contractor shall be responsible for (1) one full day of focus (8 hours) and (2) two full days (16 hours) of programming maximum (in addition to any other programming requirements listed elsewhere in this specification). The contractor shall focus all fixtures with the owner or a designated owner's representative present.
2. Man-Power Requirements (Dead-Hung System): The contractor shall supply (2) two qualified lighting technicians for the day of focus and (3) three walkie-talkies or intercom belt packs, power supplies and all related required cabling. The contractor shall supply a manlift and either extension or stepladders for the day for focus.
3. Intent of Theatrical Focus: The intent of the theatrical focus is for the contractor to hang the fixtures indicated on the drawings to their related and indicated pipe battens, tormentor, Shakespeare or truss locations and then to focus or aim those fixtures in a logical fashion toward the stage or pit areas (depending on fixture location intents) in order to establish a base-line lighting plot for typical events. If a focus plot has been included, then this is what the contractor shall use as a basis for his rough focus. If the owner has a specific focus plot; however, that they wish executed, then the contractor shall focus all fixtures as directed by the owner (the owner's wishes shall supercede all directives here or on the drawings). This includes, but is not limited to, general area washes for the pit and stage areas, even borderlight style colored washes, lectern focus lighting, seamless cyclorama illumination, basic backlighting setups and general area lighting for choral events, orchestral events, lectures, worklight setups and basic stage usage events. The intent for this initial focus and hang is not for the contractor to generate and/or execute a detailed lighting plot for specific theatrical shows and performances. The intent is also not for the contractor to act as a lighting designer or technical lighting advisor. The focus day(s) may also require the contractor to swap barrels, relocate fixtures, swap color changing devices, etc. as directed by the owner.
4. Specific ladder style to provide depends upon accessibility and physical restrictions present in the auditorium. Typically, if a man-lift cannot access FOH rigid cove or motorized FOH truss areas, then a stepladder is used in order to obtain a good "ground-focus" height from which fixtures are then hung and focused (motorized truss fixtures are hung with truss at low trim and then rough focused from an intermediate height. Final focus tweaks are then accomplished by minor adjustments at low trim height until fixtures focus properly at the truss operating height.). Stage fixtures are typically focused from a man-lift, scaffolding or stepladder. Tormentor or Shakespeare position fixtures are typically focused with a stepladder on flat floor areas or with an extension ladder for sloped floor areas. All accessible areas reachable with a man-lift shall utilize a man-lift for both hang and focus as this presents the safest method of installation. Neither the contractor nor any related personnel shall be allowed to "ride" counterweight sets or motorized truss/stage electric sets or climb tormentor or Shakespeare assemblies in order to hang and focus lights in lieu of utilizing ladders or a man-lift to access lighting support positions.

D. ARCHITECTURAL CONTROL STATIONS:

1. All architectural control stations (pushbutton, key stations, LCD stations, etc.) shall be named in the Light Designer and Control Designer software so that they reflect the

actual room and geographic locations within the room (i.e., Auditorium South Entrance, etc.).

2. Room, entry or other names and designations TBD by owner. The contractor shall obtain these descriptions from the owner in writing prior to ordering these faceplates or programming the architectural control system. All stations shall be labeled with the owner indicated names and with specific nomenclature as indicated on the bid drawings. No device model number names shall be allowed. Names shall be engraved on device plates with a high contrasting color in a legible, large enough font size so that they are easily seen and read. No black on black or self-adhesive tape labels shall be allowed.

E. ARCHITECTURAL SYSTEM PRESETS:

1. Architectural lighting will be included in the preset configurations.
 - a. The presets to be programmed by the lighting contractor will consist of no more than 10 presets for architectural lighting. The presets will be determined by the owner and consultant.
 - b. The contractor shall program the houselighting presets to minimize hotspotting, dark rows and large footcandle variations from row to row. Contractor shall coordinate preset setup with the owner and consultant. Preset looks shall be finalized only after most room treatments, etc. have been completed and with the consultant present.
 - c. All pushbutton stations shall be programmed so that, when no presets are selected and no lights are on, there is an LED or button on each station that is lit at all times so that the stations are readily visible in the dark.
 - d. All faders shall be programmed per owner's instructions (typically faders control groups of similar fixtures and/or fixtures in similar locations as a group).
 - e. All pushbutton stations shall be programmed so that engaging any particular pushbutton toggles the associated preset on and off with subsequent pushes of that button. All preset pushbuttons shall trigger mutually exclusive presets (turning the previous preset off as it engages the selected preset) and shall not operate in a pile-on style hierarchy. In other words, if a user engages preset #1 by pressing the associated button, this should trigger all previous light levels or presets to "off" and turn "on" or trigger the lights and light levels associated only with that particular button and preset.
 - f. The architectural control system shall be programmed so that, whenever any preset or LCD station pushbutton is pressed, all relay modules powering any LED fixtures in the room are immediately powered on. These relay modules shall remain on and shall be turned off by astrological clock for overnight hours as indicated.
 - g. The dimming system shall be programmed so that, when the lighting control console is powered on, all relay modules are immediately energized (turned on).
 - h. Architectural Station Presets:
 - i) All preset stations MUST be set up and loaded with the "looks" as directed by the owner. The contractor shall not decide for himself nor preload any temporary preset looks into the architectural control system that the owner hasn't desired. The contractor should obtain all of these programming directives in writing prior to system turn-on so that they can be easily programmed during commissioning, etc.

- ii) All preset buttons located on pushbutton stations shall have the capability to respond to whichever preset the owner wishes, including conventional theatrical, houselighting and LED color mixing fixtures. In other words, the pushbutton stations shall not be restricted as to which system preset each button or class of stations can trigger.
- iii) UH10001 (1 Button Stations): If station(s) on stage, it should be programmed to turn on/off the stage worklights ONLY. If station(s) located in catwalk or at catwalk entrances, they should be programmed to turn on/off the catwalk worklights ONLY. If station(s) in the auditorium area, then they should be programmed to trigger one preset as directed by the owner.
- iv) UH10005 (5 Button Stations): These stations are typically programmed to recall the first four system presets from the architectural controller and off. Contractor shall program each station to control presets as directed by the owner.
- v) UH10010 (10 Button Stations): These stations are typically programmed to recall the first nine system presets from the architectural controller and off. Contractor shall program each station to control presets as directed by the owner.
- vi) Interactive Technologies (8 Button Stations): These stations are typically programmed to recall the first seven system presets from the architectural controller and off. Contractor shall program each station to control presets as directed by the owner.
- i. ETR Ipad & Iphone Programming:
 - i) The contractor shall fully program and set up the iPad tablet to control both the lighting system console as well as the architectural control system. This includes fader pages, preset button programming, etc. This also includes purchasing the apps, setting up an Apple/Android ID/user account for the owner (if one does not already exist - or interfacing with owner personnel in order to obtain existing account login info), downloading the various control software apps (both architectural system and lighting control console interface apps) and setting up/training the owner on the apps and their use in the aud as a portable lighting system controller (both for the lighting console and the architectural control system).
 - ii) The contractor shall be responsible to setup and program up to (10) additional wireless devices by owner designated personnel that can control various aspects of the architectural control system or lighting control console. App purchases shall be the responsibility of the device owner for personal devices. The contractor shall simply assist in setting up presets, fader pages, etc.
 - iii) LCD Touchscreen: The LCD devices shall be programmed with preset and/or fader pages for the owner's use as described below and on drawings. LCD screens shall "mirror" each other as to the current "state of affairs" so that both screens look identical and that user selected moves are shown on both screens (just as if the user were controlling both) and so that there is a visual confirmation on both screens of the last user selected move, selection or parameter change.
 - a) Contractor shall provide the owner with a saved version of the final system configuration as a backup copy in case of

system failure and/or system reset needs may arise. Provide two copies (one copy on each of two USB thumb drives. One copy to be placed in a Ziploc bag at or near the architectural control processor or lighting system control area and one copy to be located as per the owner's instructions – preferably in a separate, secure and remote part of the facility).

- b) Contractor shall provide the owner with a complete hard-copy listing of all lockout values, unlock codes, visibility values & preset priority values used within the system configuration and with training on how to alter or change those codes. Contractor should also enter all passwords and lockout codes into the "Job Information" section of the Unison configuration file so that they will be saved along with the as-built system configuration.
- c) Any disabling of the pushbutton stations by a password entry shall be reset at midnight of each day via the astrological clock function so that preset stations operate normally and are not locked out continually.

F. TOUCHPANEL SETUP:

1. Intent: Touchpanel screen layouts shall be similar to what is shown. Not all control screens have been shown, but a representative sample has been provided so that the contractor gets a real sense of the intent of the look and layout and feel of each touchpanel. Buttons shall be gel style as noted. Touchpanel background shall be a slate/silver grey color with a brushed aluminum look. Buttons shall be a royal blue color. All gel button text shall be black, unless otherwise noted. Dialing and QWERTY keypads, drop down dialog boxes, etc. shall be black background with white text and shall float over other control screens (feather backpanel edges as needed). All buttons shall be high-resolution, crisp edged buttons that do not appear with jagged edges, pixelization, etc. The control screen layout file shall be sized so that it fits onto the allotted memory inside the specified touchpanel. There may be additional screens and controls that the contractor will need to program into the touchpanel system that do not appear in the following descriptions or on the detailed screen layout drawings. The contractor shall provide all screens & programming necessary for a complete system and may need to field tweak or add/delete functionality to the touchscreen system based upon immediate user and consultant feedback. Color selections for screen background, font colors, etc. shown on the contract documents shall be followed unless the owner has a specific preference as to the color scheme, layout, etc.
2. The contractor shall be required to coordinate with other contractors providing touchscreens for this project so that the theme and layout of all touchscreens within this space match.
3. The info button on each screen, if touched, shall bring up a floating, pop-up window on top of and centered on the current screen that gives a brief, but detailed, explanation of the intents of the screen and the parameters the user must select.
4. Each touchpanel screen shall incorporate a standard "Home Screen" that uses the owner's logo as the background behind all button/preset display overlays. Actual logo

to be used is TBD by the owner. Contractor is to obtain appropriate file from owner. Size logo on screen as directed by owner.

5. Each touchpanel screen shall incorporate a “Home” button or object on every screen (or physical button on unit – if screen is so equipped) that will take the user to the home screen (Main Menu) whenever this button is activated.
6. Each touchpanel screen shall incorporate a “Back” button or object on every screen, except the Home screen, (or physical button on unit – if screen is so equipped) that will take the user back to the previous page/screen whenever this button is activated.
7. All touchpanel buttons shall be programmed so that, when a button or preset is selected, the active icon highlights or changes color and becomes visually distinguished from all other buttons/presets on the page in order to easily identify and indicate which button or preset has been activated and is currently active.
8. Contractor is to submit all screen layouts (jpeg screen shots are acceptable) to the consultant for final approval prior to loading all software.
9. Contractor is responsible for all touchpanel and control system programming and final touchpanel screen looks, layouts and icons and for interfacing each piece of controlled equipment with the lighting control system and other related systems (such as Crestron interfaces, iPad, iPod, iPhone apps, etc.).
10. The contractor shall provide a minimum of two levels of password/passcode access to the touchscreens and their functionality. There shall be a user level password access, which limits those users to only certain functions. There shall be an administrator level password access, which provides those users with unlimited access to all system functions present and programmed.
11. The contractor shall provide all touchscreens to mirror each other and so that system selections, etc. performed on one screen automatically show up on all other architectural control screens.
12. The contractor shall provide, as part of his bid price, all touchscreen layout buttons, menus, background, layout, programming, etc.
13. All access to the LCD programming functions, preset changes, clock functions, recording capabilities, etc. shall be password protected.
14. Program the architectural control system LCD displays with a submasters page, rehearsal light preset, choral group preset, several houselighting presets, stage worklight preset, stage wash preset, colored stage wash preset(s) and other presets as determined by the owner or owner's representative and as required in the written specifications. LCD displays shall be programmed so that users without a passcode are unable to access any incandescent houselighting fixtures except turning any included day-to-day fluorescent/LED houselight, catwalk worklight and/or stage & wing worklight fixtures on or off.

15. Create & setup at least 20 preset buttons on pages (10 per page and in addition to other presets as called for in the specifications) and there must be a record button on each page. The intent of this is so that the owner can easily, with password access, save/record "looks" to presets quickly & easily into the architectural control system.
 16. A secondary level of password protection shall be setup so that all other LCD and pushbutton stations can be locked out from functioning or altering the lights during an event. The intent of this feature is so that accidental activation of unwanted lighting fixtures during a performance is avoided. Program the astrological clock to reset all LCD and pushbutton station functionality (and deactivate lockout) at midnight of every day - 365 days per year.
 17. LCD touchscreens shall be located within the system topology in such a way as to allow snapshotting functions from the lighting control console into the architectural control system LCD and pushbutton units. All LCD touchscreens shall be mirror images of each other (both containing the same screens, information, etc.).
 18. LCD touchscreens shall recall all presets and shall incorporate fader and button pages, etc. See above and specifications for more information on LCD programming requirements.
 19. Program the LCD screens with basic "color chooser" pages for the LED fixtures (arranged by zone) so that the owner may quickly and easily pick one of 20 colors for any bank of LED's. Color chooser pages shall visually show thumbnails of colors (similar to the output color of the LED fixtures) and allow the user to touch a colored button in order to switch all of the LED's in that bank to that color.
 20. LCD screens shall have no limitations as to which fixtures or DMX universes they can access and/or control. I.E. they must be able to recall whatever preset looks the owner wishes them to recall.
- G. Sample Screen Shots: (See contract drawings for actual screen shot examples of the intents of the LCD screens that must be included and the general layout of each screen).
- H. DMX & UNIVERSE SETUP GUIDE:
1. The goal in setting up the DMX addresses for this project is to make things simple for the end user both in operation of the system and in finding fixtures, dimmers, relays, etc. This type of approach will embrace a compact setup/layout. It is our intention to outline a conceptual path forward without actually assigning universes and/or actual addresses. That will still be left up to the contractor to figure out and perform based upon the final fixture count, selections, owner input, etc.
 2. The initial objective is as follows:
 3. DMX Assignment Order (addressing given/shown on an ascending order priority basis)
 -
 - i) Dimmer rack and dimmed modules (incandescent fixture control)
 - ii) Beginning with DMX address #1 and continuing in ascending order without gaps in assignments until all dimmer rack/dimmed modules have been addressed.
 - iii) Relay rack and non-dimmed and/or constant/relay modules (LED & moving head fixture control)

- iv) Beginning with the next free address after the last dimmer rack/dimmed module address and continuing in ascending order without gaps in assignments until all non-dimmed, constant and relay modules have been addressed.
 - v) Addressing for theatrical fixture lighting devices
 - vi) Beginning with the next free address after the last non-dimmed, constant and relay module address and continuing in ascending order without gaps in assignments until all theatrical fixtures have been addressed.
 - vii) Fixtures should be addressed in the following ascending order: front of house (first cove, second cove, etc.), stage (1st electric, 2nd electric, 3rd electric, etc.), side house lighting (side galleries, Shakespeares, tormentors, balcony pipes, etc.) *.
 - viii) Fixtures should be grouped by type and assigned DMX addresses as such at each location for ease of use (i.e. wash fixtures then ellipsoidal fixtures, then zoomable fixtures, etc.). The exception to this is stage LED strip borderlight style fixtures, which would typically be grouped into a range of DMX addresses so that they can be quickly and easily selected as an entire stage wash.
 - ix) *As an alternative, the owner might select to have the side house lighting (galleries, torms, etc.) occur before the stage assignments.
 - x) House and work lighting fixtures (incandescent, LED or 0-10V fixture control)
 - xi) All houselighting fixtures (at the top of the address order beyond all other utilized DMX addresses – and within the control system’s capabilities).
 - xii) All worklighting fixtures (at the top of the address order beyond all other utilized DMX addresses, including houselighting assignments – and within the control system’s capabilities).
4. The intent is that all DMX addressing should occupy as few universes of DMX control as is possible and without the facility’s DMX addressing being spread over multiplied universes of control. What should be avoided is assigning each physical location to a different DMX universe (i.e. first electric DMX universe #1, second electric DMX universe #2, ... houselighting to DMX universe #7, etc.).
5. A typical layout would look like the following:

DMX Assignment Schedule				
<i>Description</i>	<i>Fixture/Dimmer #</i>	<i>DMX Channel Assignments</i>		
Dimmer Rack (DR1)	Dimmer Channels #1 - 35	1	-	35
	Relay/Non-Dimmed Channel #1 - 61	36	-	96
Cove/Catwalk - ETC ColorSource Spot LED	RGBL Front of House Cove Spot Fixtures #1 - 10	97	-	146
Cove/Catwalk - ETC ColorSource Par	RGBL Front of House Cove Wash Fixtures #1 - 6	147	-	176
Rear Torm - House Left - ETC ColorSource Spot LED	RGBL Rear Torm Spot Fixtures #1 - 3	177	-	191

Rear Torm - House Left - Philips Showline SL Punchlite 220	RGBL Rear Torm Remote Zoom Fixtures #1 - 3	192	-	245
Rear Torm - House Right - ETC ColorSource Spot LED	RGBL Rear Torm Spot Fixtures #1 - 3	246	-	260
Rear Torm - House Right - Philips Showline SL Punchlite 220	RGBL Rear Torm Remote Zoom Fixtures #1 - 3	261	-	314
Front Torm - House Left - ETC ColorSource Spot LED	RGBL Front Torm Spot Fixtures #1 - 3	315	-	329
Front Torm - House Right - ETC ColorSource Spot LED	RGBL Front Torm Spot Fixtures #1 - 3	330	-	344
Stage - First Electric - Philips Showline SL BAR640 Wash Borderlight Fixtures	RGBW Wash Fixtures #1 - 4	345	-	404
Stage - Second Electric - Philips Showline SL BAR640 Wash Borderlight Fixtures	RGBW Wash Fixtures #5 - 8	405	-	464
Stage - Third Electric - Philips Showline SL BAR640 Wash Borderlight Fixtures	RGBW Wash Fixtures #9 - 12	465	-	524
Stage - First Electric - ETC ColorSource Par	RGBL Stage Wash Fixtures #1 - 4 (Stage Electric #1)	525	-	544
Stage - Second Electric - ETC ColorSource Par	RGBL Stage Wash Fixtures #1 - 4 (Stage Electric #2)	545	-	564
Stage - Third Electric - ETC ColorSource Par	RGBL Stage Wash Fixtures #1 - 4 (Stage Electric #3)	565	-	584
Houselighting Fixtures	Rows #1 – 6	585	-	590
Worklighting Fixtures	Stage Hi-Bays	591	-	592
Worklighting Fixtures	Catwalk	593	-	593
N/A	Any required DMX addresses necessary in order to address and control the DMX or 0-10V misc. fixtures, outlets, etc.	As required		
This DMX Assignments Chart Is Intended To Be A Starting Point Or Failsafe In Case The Owner Has No Particular Addressing Preferences; However, The TC Shall Consult The Owner Prior To Addressing Any Fixtures With A Printed Copy Of This List And Work Out All Specific Assignments With The Owner Prior To Addressing Any Fixtures As The Owner's Wishes May Differ From What Is Shown Here. Get Owner Approved DMX Assignments In Writing Prior To Assigning Any Fixtures, Dimmers, Misc. Portable Devices, Houselighting Fixtures, Etc.				
DMX Assignments Approval:	Duly Authorized Owner Or Owner's Representative Signature:			

Approved As Indicated:	_____
Approved With Indicated Changes:	_____
Written Name:	_____
Date:	_____/_____/_____

† Always obtain final owner sign-offs for all DMX assignments. Failure to do so could result in the contractor having to reprogram all or large portions of the lighting system in order to accommodate the owner's wishes.

3.12 OWNER INSTRUCTION:

- A. The contractor shall provide a training program for the owner at the project location and with the project equipment (owner's equipment), consisting of the following hours/periods of instruction specifically and exclusively regarding the theatrical lighting systems and related equipment. This training time shall not exceed (36) hours. No training block shall be less than four hours in duration. This time is in addition to training times noted below.
- B. The contractor shall provide additional programming time for the owner of (12) hours in adjusting basic settings to system presets, misc. reprogramming, etc.
- C. The contractor shall provide additional network gateway system software training for the owner of (4) hours in operating, configuring and programming (latest non-beta version) software and in operating, configuring, resetting, managing and changing all network and gateway parameters/assignments.
- D. See LightDesigner spec paragraphs in Section 2 above for additional required programming services specific to that software package.
- E. All owner instruction and programming services shall be provided by the contractor as part of this contract & shall be scheduled and performed within twelve months of the final system turnover date to the owner. Any unused training hours that do not get utilized during that twelve month period shall be considered forfeit.
 1. The turnover date is defined as the date of completion of all open punch list items and final acceptance by the owner.
 2. Attendees/trainees shall be as designated by the owner and may consist of multiple groups requiring separate training sessions on the same topics (all sessions must fit into the training times as allotted above).
- F. All owner instruction training hours are exclusive of travel time. Training time hours will begin to elapse at the prearranged hour agreed upon by both the owner and the contractor.

- G. Training time may be utilized in any number of ways that may not relate directly to the hands-on training. These required hours can be utilized in order for the contractor to perform additional system programming, set manipulation, customizing layouts, control screen optimizations/changes or any other related work requested and approved by the owner – up to the “not to exceed” hour totals listed in these specifications. Additional training or programming work beyond that indicated in these specifications shall be at additional cost to the owner.
- H. Each training session shall be no more than four hours in duration, unless specifically requested by and/or approved by the owner in advance of each session.
- I. It is understood that, if there are multiple spaces/locations (e.g., high school auditorium, middle school gym, elementary school cafetorium, etc.), the training sessions noted shall be required independently at each facility.

3.13 TRAINING:

- A. Training must provide useful information that covers all major topics of how a system would typically be used by an end user/owner. This also applies to documentation and video training.
- B. Provide training only at the request of the owner’s authorized representative(s). Make clear (in writing) to the owner’s authorized representative(s) that any training hours not formally requested, scheduled and performed within twelve months of the final system turnover date to the owner shall be forfeited.
- C. Track all training hours in writing and provide copies of attendance sheet sign-offs to the owner of who attended, how long each session lasted and what topics were covered.
- D. On a job-by-job basis the training sessions may vary significantly. The training hours allotted may be used by the owner as required for any purpose related to the system and in any number of ways that may not relate directly to the hands-on training. These required hours can be utilized in order for the contractor to perform additional system programming, fixture manipulation, customizing layouts, control screen optimizations/changes or any other related work requested by the owner – up to the “not to exceed” hour totals listed in these specifications.
- E. Additional training or programming work beyond that indicated in these specifications or after the initial twelve-month period shall be at additional cost to the owner.
- F. Turn over copies of all video-taped training recordings to the owner as described below.
- G. It is recommended that most training be hands on with the owner’s personnel operating the equipment.

3.14 QUALIFICATIONS OF TRAINERS:

- A. All persons performing system training must be experienced operators of the specific equipment they are training others to use. If no one on the contractor’s staff has experience on a specific device or piece of equipment, then the contractor must provide qualified third-party personnel in order to perform those training sessions.

3.15 SCHEDULING FOR TRAINING:

- A. All training sessions must be scheduled with the owner and by the contractor with at least three weeks advanced notice.

- B. If the contractor arrives for a scheduled training session and the owner personnel are not present, then the contractor must notify the owner that a four-hour training segment has been forfeited.
- C. If a scheduled session lasts less than four hours, it will still expend four hours of allotted training time due the owner.
- D. Training session must be scheduled and performed at a time when the space is available and otherwise unoccupied.
- E. Coordinate all training sessions with the owner, all uses of the room, any related contractors, attendees, etc. Training sessions, especially those being videotaped, shall not be allowed while other uses of the room are in session, especially those involving the use of construction equipment, drills, saws, rehearsals, etc.

3.16 EXAMPLE TRAINING SCHEDULE:

Typical Training Hour Breakdown		Typical Content
	Hours	
<i>System overview and basic Training</i>	4	Full Walk around, system layout, power sources etc. And an overview of operation. Set up and loading, saving, etc. show files, cue stacks, etc. How to approach a new show.
<i>iPad remote access set up, operation, integration, etc.</i>	4	This session can be the same day as system overview if schedule allows. Understanding the file and Library system, how to update libraries, saving show template files, use of remote devices during show focus, etc.
<i>DMX/RDM Overview</i>	4	Training users on the overall concept of DMX addressing, DMX topology, RDM implementation & assignments, moving fixtures and relocating addresses, etc.
<i>Special Effects</i>	4	Using fixture and/or console special effects, color pickers, cue timing, etc.
<i>Assistance with setting up first Event</i>	4	Show files, presets, global techniques, etc.
<i>On site for first show as tech support</i>	4	
<i>On site for Second show as tech support</i>	4	
<i>Follow Up/Higher Level Training</i>	4	
	32	Total Allotted hours vary on each project, this is just an example.

3.17 INITIAL TRAINING:

- A. Walk through the facility and familiarize the owner with where all primary system equipment is and what it does. See below for additional instructions and requirements for training sessions,

video recording/documentation, etc.

- B. Training on Lighting Control Console Operations (list is not exhaustive):
 - 1. Power up/power down sequences.
 - 2. Touchscreen setup and use.
 - 3. Magic sheet creation and use.
 - 4. Template and show file use.
 - 5. Setting up and using submasters.
 - 6. Setting up cues, scenes, presets, base show files, saving files, importance of backups, working from templates and other primary and commonly used functions.
 - 7. RDM access fixtures & programming.
 - 8. Patching the dimmer/relay racks to the console.
 - 9. Restore techniques for console (back to factory defaults).
- C. Training on Lighting Fixtures (list is not exhaustive):
 - 1. RDM access fixtures, on-fixture controls & programming.
 - 2. Fixture cleaning and maintenance.
 - 3. Specialty fixture specifics – moving heads, remote zoom, motor noises, fan speeds, move-in-black requirements, etc.
 - 4. DMX addressing conventions, how to implement changes when physically moving/relocating fixtures, etc.
 - 5. Boot up sequence timing, etc.
- D. Training on Lighting System Architectural Controls (list is not exhaustive):
 - 1. Touch screen controls & programming.
 - 2. Pushbutton/fader controls & programming.
 - 3. General station cleaning and maintenance procedures.
 - 4. Lockout functions and release.
 - 5. Use of astrological clock, timed events & sequences, etc.

3.18 VIDEO RECORDING OF TRAINING WITH OWNER – INITIAL TRAINING:

- A. Record all aspects of the initial owner training with the group of trainees present. A live training session by default may be interrupted with questions or unrelated discussions, which is acceptable. The camera should record through the entire session, unedited.
- B. Provide simple explanations of what each piece of lighting equipment does/what it is intended for, how to properly interface with that equipment (controls, consoles, stations, gateways, etc.), present an overview of general programming parameters as well as what an end user should do if a piece of lighting equipment fails, if the motorized fixtures (if present) were to be shut down or become non-functional, etc.

3.19 VIDEO RECORDING OF DEVICE TRAINING – SECONDARY TRAINING:

- A. Device specific training shall be recorded by the contractor independent of the initial training session. This recording should be performed in the contractor's shop, at the owner's site without trainees present or at another location as appropriate. The intent of this training is to give specific, guided instruction on each piece of equipment. Where manufacturer's professionally produced video trainings are available (via YouTube or manufacturer's website), these will suffice. The contractor should then supplement these with all other video training requirements presented in these specifications. The preference is for the contractor to offload manufacturer

training videos onto a thumb drive to present to the owner; however, active links to these videos embedded in the final O&M documentation is an acceptable alternative.

B. The secondary video training must provide:

1. A video tour (walk-through) of the lighting system equipment present at the owner's site that clearly shows where all primary lighting system equipment is located, gives a brief overview description of what that equipment's primary functions are and what any related devices, screens or indicator lights look like when everything is working properly. This video should not exceed 30 minutes in length.
2. A video tour (walk-through) of the lighting system related power panels, breakers and disconnects feeding the system equipment (dimmer/relay rack, ELTS2, EM devices, etc.), which breaker operates each power feed and what the normal state looks like. Room names, numbers and locations that conform to site nomenclature should be used throughout. This video should not exceed 10 minutes in length.
3. For all lighting system elements note all control boxes, their use and how to check for trouble status in controls, how to initiate and complete any required reset procedures, etc. This video should not exceed 10 minutes in length.
4. A separate video should include a discussion of emergency procedures, manufacturer 24-hour service hotline phone number, system reset procedures, meanings & intents of safety signage, safe "work-at-height" procedures, overall safety precautions and behaviors, etc. This video should not exceed 15 minutes in length.
5. A separate video should include a series of quick start videos for someone who must use the lighting system equipment who has no idea how to operate any portion of it (A Beginner's Guide). Each related video clip should not exceed 5 minutes in length.
 - a. Example:
 - i) How to boot up the console.
 - ii) How to access a show file.
 - iii) How to run a cue.
 - iv) How to navigate screen pages, how to find magic sheets and how to operate them.
 - v) How to navigate screen pages on individual fixtures (rear fixture control screen), determining and/or changing fixture DMX address, etc.
 - vi) Basics on lighting priority – why lights might still be on from the architectural control system and how to manage these conflicts, etc.
 - vii) How to shut down the console and the lighting system.
 - b. Additional information examples for anyone who needs to do the following:
 - i) RDM protocol and implementation, how to alter fixture DMX parameters via RDM, etc.
 - ii) Patch lights and dimmers, including RDM functions. This should include what to do when a fixture won't RDM properly.
 - iii) How to create a lighting cue and edit timing, etc.
 - iv) How to load faders and sub masters.
 - v) How to save a show to USB.
 - vi) How to load a show from USB.
 - vii) Patching and grouping – how and why to use groups.
 - viii) Color and focus functions – how and why to use.
 - ix) Differences in color gamut between manufacturers of LED's.

C. Video recording general requirements (applies to all training & for record videos):

1. Static shots: The video recording device (camera, tablet and/or phone) must be placed on a tripod or other fixed stand, situated on a stable base and remain in a location that offers a good view of the rigging system, locking rail, arbors and any related equipment or controls being discussed. Handheld video recording of static scenes shall be avoided.
2. Roaming shots: The video recording device must employ motion stabilization (smart device app, post-production stabilization software or physical gimbal, etc.). Shaky, blurry videos shall not be acceptable.
3. Lighting: The lighting must be consistent (training space must be well lit without interruption-supplementary video lighting may be required). Lighting must be adequate for the video recording device and so that final video presentation appears professionally lit and dim/dark views of equipment are avoided. Provide portable lighting as needed to accomplish this.
4. Audio: The audio must be clear throughout (supplementary/advanced mic'ing techniques may need to be utilized), there must be no other noises on the video that mask the verbal communications (HVAC noises, whines, hums, equipment crashing, the use of any construction equipment or power tools, off camera voices, etc. Audio must be recorded so that the trainer's words are clear, are not muffled, so that vocals do not trail off and so all spoken portions of the training videos are easily understandable.
5. Shot Composition: The video recording device must be pointed at the elements/objects being discussed (showing devices, screen shots, etc.). Utilize good framing techniques, close-ups as required and overall generalized shots where appropriate.
6. Topics & Viewability: The topics explored and trained on in the video trainings must be clear, consistent and of value. Text on screens must be readable, so close-up shots will be required when discussing certain elements (especially when discussing user interface screens, touch controls, etc.).
7. Typically, the video recording should be performed by a person other than the one doing the actual training. In this way, the operator can zoom to specific areas being discussed, etc. while the trainer continues presenting.
8. Editing/Final Presentation: All video recordings must be professional throughout from trainer presentation to video editing and final packaging. Video footage must be obtained and then "cut" together into a well-structured, chaptered format from which an owner can access whichever topic of interest or concern they may have without having to view or fast-forward through other discussions. Video edits should not end or cut off mid-sentence. Edit and title the final video training sessions into logical chapter format. The basis for titles, sections, chapters, etc. shall be the general content of the included equipment.
9. The intent of training videos is for an end user to be able to watch these and to follow along with button pushes, menu choices, etc.; therefore, the videos cannot be shot in a manner where the trainer's body blocks major parts of the screen or where the trainer's back is turned towards the camera and hearing/understanding the trainer is difficult and distant or where screens/buttons cannot be read. In order to allow an end user a clear understanding of system training, additional video may need to be shot by the contractor and edited into the final product with picture-in-picture style or split screen style editing where close up shots are easily readable.
10. The trainer/presenter for each session (especially for the secondary training section videos) must be articulate, speak clearly, properly enunciate his words and professionally present the information in a clear, concise and easily understood manner.
11. Convert each recording to standard formats for playback on Mac/PC based platforms and write to the devices as described below.
12. Provide all training videos on USB stick formats.

13. On the USB stick, include a PDF document that contains all relevant links to the manufacturer's video training series for basic, intermediate and advanced topics/functions. Where manufacturer videos are available, provide these and/or the active links to these videos on the manufacturer's website and/or other relevant sites (YouTube) for the owner's future use and reference.
 14. In subsequent advanced training sessions with the owner's personnel, higher level functions may be covered. Some owners will not require this, but others will. The contractor is not required to video record subsequent sessions. The owner can record any session they want for future reference using their own equipment.
 15. Pre-recorded videos for some training sessions that are "canned" but appropriate for the equipment located in this facility are completely acceptable and need not be custom done for/at each and every facility; however, they must be custom compiled into a framework that fits all equipment in the owner's facility and must also include the initial training session(s) video footage.
- D. Provide (1) one copy (brand new and not previously used) of Stage Lighting: The Technicians' Guide: An On-the-job Reference Tool with Online Video Resources (provide the latest edition) by Skip Mort. This book shall remain with the owner as a reference manual.

3.20 FOLLOW-UP TRAINING SESSIONS:

- A. Follow-up sessions should be recorded on video for record only, except as noted elsewhere, and copies provided for the owner's records. These sessions are not to be confused with either initial or secondary system training intents.
- B. Follow-up sessions may include a re-presentation of any previous session's subject matter for a different group of end users or as a refresher to previously trained individuals.
- C. Often these sessions will be used for in-rehearsal or show sessions where the contractor is an advisor to the end users/operators during actual show setup and/or system use for the first performance with the new equipment. These sessions do not need to be videoed and/or recorded.

3.21 SIGNAGE:

- A. A sign shall be posted in an accessible location (typically on the rack(s) or in the control booth) providing the name, address and phone number of the primary system contractor, manufacturer and supplier (if not already listed) of the system equipment.

3.22 WARRANTY AND SERVICE:

- A. The contractor guarantees all equipment, materials (excepting incandescent lamps) and workmanship to be free from defects for a period of one year from owner acceptance. This warranty supersedes all manufacturers warranties for the one-year period. Any manufacturer's warranty that exceeds the one-year will continue to be applicable. The contractor will replace any defective materials at no charge to owner. Any equipment replaced during the one-year warranty will have a new one-year warranty to the owner.
- B. The contractor guarantees all labeling to be free from defects for a period of two years from the date of owner acceptance. In cases where the label's adhesive fails or the label suffers from degradation causing it to become unreadable, the label will be considered defective and will be replaced at no cost to the owner.

- C. LED Fixtures and lamps that fail in the first 90 days will be replaced at no cost unless an electrical fault can be shown to have caused a major lamp outage or fixture failures.
- D. The contractor will respond by phone to requests for service within 2 business hours and respond with a technician being sent (if needed) within 1 business day.
- E. Any equipment that tends to "drift" or whose performance deteriorates during the warranty period will be considered defective, even if such drifting is normal during break in. This equipment will be readjusted by the contractor at no additional charge to the owner.
- F. Provide all service at the owner's location regardless of any manufacturer warranty terms regarding carry in service.
- G. During the warranty period if any equipment failed will take more than 24 hours to repair, the contractor will make available and interconnect at no cost to the owner suitable temporary equipment to maintain a fully operational system until repairs are complete.

3.23 DEMONSTRATION AND ACCEPTANCE:

A. CONDITIONS FOR SCHEDULING FINAL ACCEPTANCE:

- 1. The system is required to be complete and fully tested. Any failure that may have occurred between the contractor's final tests and the date of acceptance will be noted and can be corrected after that date
 - a. Final setup for the houselighting system must be scheduled so that the owner or owner's representative, consultant, contractor and factory technician are all present. This will also constitute the final acceptance meeting for the houselighting system and all related preset setups. A factory technician must be present at this time or no final setup or final acceptance will be performed. If the factory technician has to return for this meeting, it will be at no additional charge to the owner.

B. PROCEDURE FOR SCHEDULING FINAL ACCEPTANCE:

- 1. The contractor shall notify the owner and consultant of a proposed date and time for the final acceptance tests. The contractor shall include two alternate dates and times. The dates proposed will be a minimum of fourteen (14) calendar days from the date of the proposal.
- 2. If none of the dates and times are acceptable, the owner and/or consultant will submit two alternate dates and/or times to the contractor.

C. DATE OF TESTS:

- 1. Sufficient personnel will be on hand so that final focus/adjustments can be made to the lighting fixtures.
- 2. The contractor will have the appropriate equipment available to focus/adjust the lights (for example, ladder, manlift, etc.).
- 3. Tools must be on hand to remove connector plates and provide for other possible inspections.

4. All racks must be able to be opened for inspection.
5. Documentation for all wiring must be completed in at least a neat draft form and on site. This must include as built nomenclature and wiring schedules.
6. The contractor will demonstrate operation of all major components of the systems including, but not limited to, the following:
 - a. Demonstrate all system functions and presets.
 - b. Demonstrate programming input.
 - c. Demonstrate operations of all devices with the lighting console.
 - d. Demonstrate that all new fixtures and ETR circuits are fully functional.
7. Any time required resolving any of the above conditions will be billed by the consultant at the rate of \$100.00 per hour to be deducted from the contractor's remaining balances with the owner. Any time waiting for the contractor to set up test equipment or locate microphones or other required equipment will be billed at the same rate and in the same manner.
8. Any return trips to correct any of the above conditions will be wholly billed to the contractor and deducted from the contractor's remaining balances with the owner at the same rate.

3.24 CONDITIONS OF ACCEPTANCE:

- A. It is understood that the consultant cannot inspect every aspect of the installation. The contractor is responsible for installation quality and methods, fabrication quality and methods, and performance of their work. Acceptance of the project will constitute an acceptance of the following:
- B. All specified equipment is installed, and the system is operating in an acceptable manner from a functional standpoint (See checklist below for specific functional requirements).
- C. Upon completion and acceptance of the project the contractor will provide to the owner a letter stating that all of the equipment and installation methods meet or exceed the specification requirements in all respects, and that the system as installed meets all of the applicable standards and codes required under the specification and meets applicable federal, state and local codes and laws.
- D. ACCEPTANCE TESTS CHECKLIST:
 1. Prior to acceptance testing there are a number of conditions that need to be verified. There are also site conditions required for the consultant to perform tests as indicated. The contractor shall ensure that every item on this checklist has been performed and verified prior to the consultant's acceptance tests can begin. Scheduling of the consultant to perform final acceptance tests must be coordinated with the owner, the project's construction manager (or clerk of the works), the contractor and the consultant (See paragraphs above for detailed requirements).
 2. GENERAL
 - a. No other contractors may be working within the rooms to be tested during tests.
 - b. No rehearsals or other activities may take place during tests.
 - c. The contractor must verify these conditions can be maintained during testing.
 3. THEATRICAL LIGHTING – TYPICALLY TAKES 3 – 4 HOURS:

- a. Required attendance – A technician fully capable of programming and operation on all software including the console, architectural controls and any other software must be on site. Personnel and equipment needed for focus also need to be on site.
- b. Any remote programming software that requires an external computer to address the lighting system must be on site, on line and loaded into a laptop provided by the contractor and ready for use if system programming changes are required.
- c. All lighting circuits tested and verified. Have factory test report available on site.
- d. Lighting control console set up, monitors in place and on mounts and all cabling and interconnections complete and neatly dressed.
- e. All lighting console patching including color and any moving lights must be complete.
- f. Remote Zoom Fixtures: All parameters and categories set, intensity, focus, color and beam palettes set, etc.
- g. Architectural presets and control patching complete.
- h. LCD screens completely programmed, mirror images of each other and fully functional, including password protection, astrological clocking functions, etc.
- i. All lighting system labeling complete, including wire management, yoke and fixture labeling, portable cabling, etc.
- j. Fixture focus as required within specifications will be done at this time unless the owner chooses to take charge of and responsibility for this at another date.
- k. Verification, in the form of signed documents, that all portable equipment has been delivered to the owner per specs and drawings and stored as per the owner's instructions. Portable equipment must be available for visual inspection as well.
- l. Network configuration software set up and fully programmed.

3.25 CLOSEOUT DOCUMENTATION:

- A. All closeout documentation, including training videos, must provide the owner with usable content. The determination of acceptability will be determined by the Consultant. Poor quality training videos and documents will be rejected.
- B. Closeout Documentation is to be submitted within XX weeks of system completion (see front end documentation for exact filing period).
- C. Contractor must submit the following items. All items should be part of the O&M Manual. Provide the quantity and form (paper and/or electronic) of these closeout documents as is indicated in the contract front-end documentation. Physical copies shall only be required if front-end documentation requires them.
- D. System testing documentation as required by final testing and acceptance procedures outlined in this document.
 1. ALL paper copy O&M Manual submissions shall be in heavy-duty, D-Ring style, 3-Ring binders All electronic copies shall be "bound" in an Adobe Acrobat style portfolio (see below for more complete information).
 2. Complete technical manuals for all equipment installed.

3. A full set of as built drawings (see requirements below).
4. List of serial numbers of all equipment installed
5. Warranty cards for all equipment.
6. Manufacturer MSDS sheets for all applicable equipment.
7. Operations & Maintenance Manuals shall include English and Spanish only.
8. Operations & Maintenance Manual: An operations and maintenance manual (or “Systems Manual”) written in English on the safe use of a that particular site’s lighting, dimming and controls system(s) shall be provided by the contractor to the owner. (provide separate manual sections for different spaces included in this project – each to be a separate, complete and distinct section in the manual for each differing or multiple system and location). This manual should include the following:
 - a. Table of contents.
 - b. A contractor written simplified guide to operating the system Include at minimum:
 - i) A contractor written simplified troubleshooting guide or what to check and where to check if no lights will come on. Provide this in a 2-column style format.
 - ii) How to power up and power down the console, lighting system, etc.
 - iii) Console touch screen set up and general info on how to access various screens.
 - iv) A key stroke guide on how to quickly get to menus to patch dimmers, RDM fixtures, address/patch LED’s or other moving/specialty lights and accessories to the console.
 - v) Constructing and editing cues.
 - vi) Programming sub masters.
 - vii) Loading Faders.
 - viii) How to perform file saves, file loads, etc.
 - ix) A short list of the required software reset procedures for all lighting system related subsystems.
 - c. A simplified guide to operating the architectural control system, an understanding of pile on system architecture and where the button stations get their content. If editing has been made available on LCD screens, provide a guide on how to save over presets that affect button stations.
 - d. Microsoft Excel spreadsheets of all initial lighting system patch data, DMX assignments and fixture types at final set up.
 - e. Emergency contact number(s) and procedures to follow in the event of a catastrophic system failure.
 - f. One copy of the “Workbook” version of each of the following training guides used (only provide for levels trained on):
 - i) ETC Level 1 console training – Essentials.
 - ii) ETC Level 2 console training – Enhanced Skills.
 - iii) ETC Level 3 – Advanced Programming.
 - g. Maintenance procedures and recommended schedules required for equipment installed that requires regular scheduled maintenance.
 - h. A DVD (or set of DVDS, depending on requirements listed Under Training Sections above) and a USB thumb drive with all content included on it.

THEATRICAL LIGHTING & CONTROL SYSTEMS

- E. As-Built Drawing Set requirements (required of all prime and sub-contractors):
1. As-Built Drawings (AKA as fitted or as installed): This drawing package is a revised set of “red-lined” construction drawings submitted by each installing contractor upon completion of the project. These drawings must accurately record and reflect the equipment installed, all changes made during the construction process and must also show the exact dimensions, geometry and location of all elements of the work completed under the contract. As built drawings should be added to throughout the construction process as the project gets built.
 2. The as-built drawing package must include the following:
 - a. Clean, consistent look, layout and markup methodology across entire set
 - b. Conduit sizes
 - c. Wire types pulled (manufacturer, model, AWG, etc.)
 - d. All junction box locations, names, internal components, etc.
 - e. Conduit routing (actual installation paths with notes as to elevation, access, etc.)
 - f. Panel and circuit numbers for all power related devices
 - g. Shop drawing changes
 - h. Extra work not originally included in the contract
 - i. Field changes
 - j. Design changes
 - k. Modifications
 - l. Labels and dates (attesting to when changes were made and why)
 - m. Locations and dimensions (if as designed, state such; if not, indicated all deviations). This should include heights AFF, etc.
 - n. Legend or Key explaining all markups, color codes, numbering sequences, etc.
 - o. Port assignments and related nomenclature (for all DMX, Data, 0-10V, IP, switches, etc.)
 - p. Embedment depth, type & size for rigging related anchors
 - q. Accurate details for all installed devices
 - r. Equipment relocations (due to required or requested field directives, owner requests, obstructions, etc.)
 3. As built drawings must be written in legible, plain English without the use of shorthand, abbreviations, codes, etc. Descriptions shall be clear and concise.
 4. As built drawings can also be provided with electronic and technology driven interactions such as embedded photos, GPS data and active links to relevant material.
 5. Typical markups that would be expected in all as-built drawing sets:
 - a. RED markups indicate where something has been REMOVED, RELOCATED or CHANGED from the original design.
 - b. GREEN markups indicate where something has been ADDED to the original design.
 - c. YELLOW markups indicate actual routings, locations, etc.
 - d. BLUE markups indicate special information that has been included regarding the installation of equipment, conduit & wiring.
 6. An accurate and useful set of As-Built drawings includes preparation before the commencement of the project, during the installation process by all involved parties and after the final punch list items have been addressed and corrected.
 7. Only include drawings in the as-built set that are relevant to the installed systems. For example, the EC would not include detail drawing as-builts for systems or equipment that he had nothing to do with providing and/or installing (such as Brickhouse arbors or AV system touchscreen layouts).

8. Do not include duplicate pages or pages without any markups. Every sheet included in the as-built set must include all relevant markups as listed above.
- F. O&M Manual pdf requirements: The contractor shall provide a pdf copy (with appropriate titles) for each piece of documentation listed above and bound together in a pdf portfolio/binder, labeled with the owner's name and with the submitting contractor's information. All electronic manuals shall contain only equipment and information that pertains to the project. Where custom procedural guides and troubleshooting manuals are required, these shall be produced by the contractor in a professional piece of software (Microsoft Office, Adobe Acrobat or cadd software or equal) and shall contain all required information in a neat and logical presentation. Where there are portions of the stock manuals that contain sections that do not pertain, the contractor shall use a program such as Adobe Acrobat Pro, BlueBeam or other similar pdf markup software applications and use the strikethrough function with a heavy red line to strike out any text or sections that do not apply. Where factory manuals are available the contractor shall provide these. Where factory manuals are not available, the contractor shall provide high resolution (150 dpi minimum and fully optimized in Acrobat or equal), full page, properly and consistently oriented pages in a consecutive ascending order. All pdf portfolio and binders produced and submitted shall be professionally put together and presented well. No pdf scan pages that are skewed, illegible, mis-ordered, angled, copied at a low dpi setting or that do not pertain to this project shall be allowed. All manuals shall be saved as standard Adobe Portable Document Format (PDF) files that are capable of being opened & viewed on any modern computer system with a standard pdf reader and shall be without password access protection or other security preventative measures engaged.

END OF SECTION