ADDENDUM NO. 1

TO THE CONTRACT DOCUMENTS
FOR THE CONSTRUCTION OF

NEW ARFF/SRE BUILDING – PHASE 2
AT
ITHACA TOMPKINS INTERNATIONAL AIRPORT
ITHACA, NY

FAA AIP NO.: 3-36-0047-xx-2026

TO ALL HOLDER OF CONTRACT DOCUMENTS:

Your attention is directed to the following interpretations of changes in and additions to the Contract Documents for the construction of the New ARFF/SRE- PHASE 2 Contract at the Ithaca Tompkins International Airport, NY. This Addendum is part of the Contract Documents in accordance with the provisions of **Article SP 20-16 ADDENDA AND INTERPRETATION**.

IN THE CONTRACT SPECIFICATIONS:

1. **DELETE** Section 236423.16 – Water-Cooled, Scroll Water Chillers in its entirety and **SUBSTITUTE THEREFOR** the attached Section 236423.16 – Water-Cooled, Scroll Water Chillers.
2. **ADD** Section 04200 – Unit Masonry.

ON THE CONTRACT DRAWINGS:

1. **DELETE** Sheet M-001 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-001 Revision 1.
2. **DELETE** Sheet M-103 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-103 Revision 1.
3. **DELETE** Sheet M-104 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-104 Revision 1.
4. **DELETE** Sheet M-105 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-105 Revision 1.
5. **DELETE** Sheet M-301 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-301 Revision 1.
6. **DELETE** Sheet M-302 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-302 Revision 1.
7. **DELETE** Sheet M-401 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-401 Revision 1.
8. **DELETE** Sheet M-402 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-402 Revision 1.
9. **DELETE** Sheet M-501 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-501 Revision 1.
10. **DELETE** Sheet M-503 in its entirety and **SUBSTITUTE THEREFOR** the attached SheetM-503 Revision 1.

11. **DELETE** Sheet M-601 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-601 Revision 1.
12. **DELETE** Sheet M-701 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-701 Revision 1.
13. **DELETE** Sheet M-702 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet M-702 Revision 1.
14. **DELETE** Sheet E-103 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet E-103 Revision 1.
15. **DELETE** Sheet E-602 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet E-602 Revision 1.
16. **DELETE** Sheet E-604 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet E-604 Revision 1.
17. **DELETE** Sheet ET-103 in its entirety and **SUBSTITUTE THEREFOR** the attached Sheet ET-103 Revision 1.

RESPONSES TO RFIs RECEIVED:

1. Q: Can you send an RFI for a few clarifications? The industry standard is 2 -coat fluoropolymer and they have specified a 3 -coat fluoropolymer on the roof panel. This adds a lot of cost to the job. What is the basis of design for the wall panels & soffit panels? They have specified Nucor as a bldg. basis of design but Nucor does not manufacture a16" wide, 3" deep concealed fastener, 22 ga. wall panels. They are also asking for a 22 ga. soffit panel is there a basis of design?
    A. A 2-coat fluoropolymer finish is acceptable.
    B. Provide MBCI Masterline 16 Smooth 24ga wall panels or approved equal.
    C. Provide MBCI Artisan L12 Smooth soffit panels or approved equal.

2. Can you confirm bid date specs say 4/16/26 but legal notice says 4/23/26?
    A. The bid date is 4/23/2026.

3. Specification Section 011200- Multiple Contract Summary, Part 1.5A states that Building Permit is by GC. Please provide AHJ/ Permitting Agency and confirm that this project will indeed have Permit Costs.
    A. The AHJ/Permitting Agency is County of Tompkins. AHJ is Arel LeMaro, Director of Facilities:
    alemaro@tompkins-co.org
    607-274-0350 (office)
    607-327-1309 (cell)

    For bidding purposes, assume permit fee is 0.4% of the total construction amount. Building Permit shall be procured by the GC.

4. In reference to the Door Schedule on Dwg A-601, please provide a specification for the hollow metal and steel doors and frames.
    A. Provide hollow metal doors and frames as specified in Division 133419 Metal Building Systems.

5. While reviewing the Drawings and Supplemental Information Volumes, the drawings indicate there are CMU walls. The Supplemental Volumes do not have a Division 4- Masonry. Will a

Division 4 for masonry be provided?

A. See attached specification 042000 – Unit Masonry for CMU wall requirements.

GENERAL:

1. Minutes from the 3.26.26 Pre-Bid meeting are attached. Included are responses and clarifications to questions received during the meeting.

2. Bids are due on **Thursday, April 23, 2026 at 2:00pm**. Upload one full copy of the completed Proposal Section only (plus bond) at the following location: https://www.tompkinscountyny.gov/All-Departments/Finance-Department/Purchasing-Division

   Respondents who do not have or cannot obtain internet access must contact the Purchasing Division, (607) 274-5500 for further submission instructions.

   i. Scanned copies of bid security/bid bond are acceptable when uploading proposal to BidNet. The official closing date for this bid is 4/23/2026. All scanned submissions are due in Bidnet by the 2pm ET deadline on that day.

   ii. Mail or hand deliver One (1) Original and One (1) Copy of completed Proposal Forms enclosed, including Federal certifications, Certification for Receipt of Addenda (if issued), and original 10% Bid Bond in a sealed envelope to the following address for receipt within 2 business days of bid opening:

   Ithaca Tompkins International Airport
   Attn: Ms. Roxan Noble, Airport Director
   72 Brown Road
   Ithaca, NY 14850

   Label the envelope:
   "*Proposal for New ARFF/SRE Building – Phase 2 (ARFF/SRE Building)*"

END OF ADDENDUM

C&S ENGINEERS, INC.

Francesca K. Neiley, P.E.
Principal Engineer

SECTION 236423.16 - WATER-COOLED, SCROLL WATER CHILLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water-cooled, scroll water chillers.

1.2 DEFINITIONS

A. COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.

B. DDC: Direct digital control.

C. EER: Energy efficiency ratio. The ratio of the cooling capacity given in terms of Btu/h to the total power input given in terms of watts at any given set of rating conditions.

D. IPLV: Integrated Part-Load Value. A single number part-load efficiency figure of merit for a single chiller calculated in accordance with the method defined by AHRI 550/590 and referenced to AHRI standard rating conditions.

E. kW/Ton: The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons at any given set of rating conditions.

F. NPLV: Nonstandard Part-Load Value. A single number part-load efficiency figure of merit for a single chiller calculated in accordance with the method defined by AHRI 550/590 and intended for operating conditions other than the AHRI standard rating conditions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

a. Performance at AHRI standard conditions and at conditions indicated.
b. Performance at AHRI standard unloading conditions.
c. Minimum evaporator and condenser flow rate.
d. Refrigerant capacity of water chiller.
e. Oil capacity of water chiller.
f. Fluid capacity of evaporator.
g. Fluid capacity of condenser.
h. Characteristics of safety relief valves.

i. Minimum entering condenser-water temperature.
j. Performance at varying capacity with constant design condenser-water temperature. Repeat performance at varying capacity for different condenser-water temperatures from design to minimum in 5 deg F increments.
k. Force and moment capacity of each piping connection.

B. Shop Drawings: Complete set of manufacturer's prints of water chiller assemblies, control panels, sections and elevations, and unit isolation. Include the following:

1. Assembled unit dimensions.
2. Weight and load distribution.
3. Required clearances for maintenance and operation.
4. Size and location of piping and wiring connections.
5. Wiring Diagrams: For power, signal, and control wiring.

C. Sustainable Design Submittals:

1. Refrigerant: Product Data for refrigerants, indicating compliance with refrigerant management practices.
2. Product Data: For refrigerants, indicating compliance with refrigerant management practices.
3. Product Data: For energy performance.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Certificates: For certification required in "Quality Assurance" Article.

C. Source quality-control test reports.

D. Startup service reports.

E. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each water chiller to include in emergency, operation, and maintenance manuals.

B. Instructional Videos: Including those that are prerecorded and those that are recorded during training.

1.6 QUALITY ASSURANCE

A. AHRI Certification: Certify chiller in accordance with AHRI 590 certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Ship water chillers from the factory fully charged with refrigerant and filled with oil.

B. Package water chiller for export shipping.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship within specified warranty period.

1. Extended warranties include, but are not limited to, the following:

a. Complete chiller including refrigerant and oil charge.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Condenser-Fluid Temperature Performance:

1. Startup Condenser-Fluid Temperature: Chiller is to be capable of starting with an entering condenser-fluid temperature of 60 deg F and providing stable operation until the system temperature is elevated to the minimum operating entering condenser-fluid temperature.
2. Minimum Operating Condenser-Fluid Temperature: Chiller is to be capable of continuous operation over the entire capacity range indicated with an entering condenser-fluid temperature of 110 deg F
3. Make factory modifications to standard chiller design if necessary to comply with performance indicated.

B. Site Altitude: Chiller is to be suitable for altitude at which installed without affecting performance indicated. Make adjustments to affected chiller components to account for site altitude.

C. Performance Tolerance: Comply with the following in lieu of AHRI 550/590:

1. Allowable Capacity Tolerance: Zero percent.
2. Allowable Full-Load Energy Efficiency Tolerance: Zero percent.
3. Allowable Part-Load Energy Efficiency Tolerance: Zero percent.

D. AHRI Rating: Rate water chiller performance in accordance with requirements in AHRI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

E. ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.

F. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Comply with requirements of UL 1995 "Heating and Cooling Equipment," and include label by a qualified testing agency showing compliance.

I. ASME Compliance: Fabricate and label water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.

J. Operation Following Loss of Normal Power:

1. Equipment, associated factory- and field-installed controls, and associated electrical equipment and power supply connected to backup power system is to automatically return equipment and associated controls to the operating state occurring immediately before loss of normal power without need for manual intervention by an operator when power is restored, either through a backup power source or through normal power if restored before backup power is brought on-line.
2. See Drawings for equipment served by backup power systems.
3. Provide means and methods required to satisfy requirement even if not explicitly indicated.

2.2 WATER-COOLED, SCROLL WATER CHILLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Jetson
2. Carrier Global Corporation
3. Daikin Applied
4. WaterFurnace International, Inc.
5. YORK; brand of Johnson Controls International plc, Building Solutions North America

B. Description: Chiller / heater module shall be 4-pipe system with a dual refrigerant circuit, one dual-circuited brazed plate evaporator and one dual-circuited brazed plate condenser. Each refrigerant circuit shall consist of a single on/off scroll compressor, along with expansion valves, liquid line filter driers, and interconnecting refrigerant copper pipes, and interconnecting refrigerant copper pipes.

C. Each circuit shall be equipped with an active freeze protection solenoid valve. This active freeze protection solenoid shall be located on a bypass line that extends from a compressor discharge line to a port that is between the expansion valve and the brazed plate heat exchanger. The active freeze protection solenoid valve will open the active freeze protection solenoid if the suction pressure falls to approximately 101 psig (32°F). The solenoid closes when the pressure climbs to approximately 105 psig

(34°F) and the freezing potential no longer exists.

D. Chiller arrays consisting of multiple chiller modules shall form a fully functional single high-capacity multistage water-cooled package chiller.

E. Chiller modules shall be capable of being combined in modular arrays. Each array shall have two 20-mesh wye strainers (evaporator and condenser), one flow switch (evaporator), and a set of 6-inch water headers. Modules shall be placed alongside other modules along the long dimension

F. Each chiller module must have a removable header pipe section with chilled and condenser water pipe, suitable for connecting the chiller modules together with parallel flow to form the chiller array. The header pipes shall be 6-inch pipes with grooved end connections. Flexible groove type couplings are required to connect adjacent chiller modules. An array controller package must be provided from the factory

G. The chiller array shall be controlled by a controller capable of maintaining the chiller array leaving hot water temperature set-point within a control zone by staging individual Chiller Module compressors

H. Chiller array must continue to heat entering hot water if a single chiller module in the array fails.

I. Each chiller module must have manual chilled water balancing and isolation valve capable of isolating a chiller module from the header pipe section so that a chiller module can be valved in and removed from the header pipe section without disturbing the chilled water flow, or operation, of the other chiller modules.

J. Compressor-Drive Assemblies:

1. Compressors:

a. Description: Positive-displacement direct drive with hermetically sealed casing.
b. Each compressor is to have suction and discharge service valves, crankcase oil heater, and suction strainer.

1) For multiple compressor assemblies, it is acceptable to isolate each compressor assembly in lieu of each compressor.

c. Operating Speed: Nominal 3600 rpm for 60 Hz applications.
d. Capacity Control: On-off compressor cycling

1) Digital compressor unloading is an acceptable alternative to achieve capacity control.
2) Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug or removable magnet in sump, and initial oil charge.
3) Manufacturer's other standard methods of providing positive lubrication are acceptable in lieu of an automatic pump.

e. Vibration Isolation: Mount individual compressors on vibration isolators.

1) For multiple compressor assemblies, it is acceptable to isolate each compressor assembly in lieu of each compressor.
2) Sound-reduction package is to consist of acoustic enclosures around the compressors that are designed to reduce sound level without affecting performance.

f. Compressor Motors:

1) Hermetically sealed and cooled by refrigerant suction gas.
2) High-torque, two-pole induction type with inherent thermal-overload protection on each phase.
3) Compressor Motor Controllers:

g. Across the Line: NEMA ICS 2, Class A, full voltage, nonreversing.

K. Refrigeration System:

1. Refrigerant Type: R-454b
2. Refrigerant Compatibility: Parts exposed to refrigerants are to be fully compatible with refrigerants, and pressure components are to be rated for refrigerant pressures.
3. Refrigerant Circuit: Each circuit is to include an electronic or a thermal-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
4. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid line to allow the isolation and storage of the refrigerant charge in the chiller condenser.

a. For multiple compressor assemblies, it is acceptable to isolate each compressor assembly in each circuit in lieu of each compressor.

5. Pressure Relief Device:

a. Comply with requirements in ASHRAE 15, ASHRAE 147, and applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
b. Select and configure pressure relief devices to protect against corrosion and inadvertent release of refrigerant.
c. Device is to be ASME-rated, spring-loaded, pressure relief valve; single- or multiple-reseating type. Each heat exchanger is to be equipped with pressure relief valve(s).

L. Evaporator:

1. Brazed-plate
2. Brazed Plate:

a. Direct-expansion, single-pass, brazed-plate design.
b. Type 304 or Type 316 stainless steel construction.
c. Code Compliance: Tested in accordance with ASME Boiler and Pressure Vessel Code.
d. Fluid Nozzles: Terminate with mechanical-coupling end connections for connection to field piping.
e. Inlet Strainer: Factory-furnished 20 mesh strainer for field installation in supply piping to evaporator. Manufacturer has option to factory install strainer.

M. Cabinet

1. Each chiller module shall have a single heavy gauge cabinet containing electrical power distribution components, control components and the chiller module unit controller.

a. The base of the chiller shall consist of galvanized-steel material, extending along the perimeter of the unit. This base shall securely accommodate the frame, compressors, and evaporator, ensuring a unified structure.
b. The frame of the chiller shall be constructed of rigid galvanized-steel material, firmly fastened to the base. This frame shall be engineered to provide support for the cabinet, condenser, control panel, and any other chiller components not directly upheld by the base.
c. Sound-reduction package designed to reduce sound level without affecting performance and consisting of the following:
d. Unit shall be painted in accordance with the manufacturer's standard procedures and practices suitable for the operating environment and as a minimum have a top coat of two-part epoxy

N. Refrigeration System

1. Compressor

a. Each circuit of the chiller shall feature a single hermetic ON/OFF scroll-type compressor mounted on vibration isolators for quiet operation.
b. Each compressor shall utilize R-454B refrigerant and be equipped with a crankcase heater for safeguarding against liquid flood-back conditions and preventing oil foaming during startup. No other refrigerant is accepted.
c. Total steps of capacity for one module shall be two (50%-100%).

1) Compressor Options:

a) Each compressor shall be equipped with sound blankets constructed from materials resistant to UV degradation, moisture, and extreme temperatures, designed specifically for noise reduction, ensuring durability and longevity.
b) Each compressor shall be equipped with compressor liquid and discharge service isolation valves.
c) Replaceable core filter driers
d) Each compressor shall be equipped with compressor liquid and discharge service isolation valves and replaceable core filter

driers.

d. Chiller shall include manual reset high refrigerant discharge pressure and low refrigerant suction pressure safety controls. Reset through Unit Controller is acceptable.

1) A liquid line sight glass and moisture indicator are required on each refrigerant circuit.
2) Refrigerant circuit must provide refrigerant charging ports including one port between expansion device and evaporator inlet.

2. Evaporator

a. Evaporator shall be brazed plate heat exchanger type constructed of 316 stainless steel, and shall be designed and tested in accordance with the UL 1995 Safety Standard bearing the UL Listing mark for US and Canada. Maximum refrigerant side design / abnormal pressure rating shall be no less than 650 psig, and water side design / abnormal pressure rating shall be no less than 330 psig.

1) Total heat exchanger plates shall be 214.

b. Evaporator shall be mounted below the compressor to minimize the potential for liquid slugging to the compressor on start-up caused by off cycle refrigerant migration to the evaporator. Evaporators mounted above the compressor are not acceptable.
c. Brazed plate evaporator shall have a waterside flush connection to permit back-flushing or cleaning of the evaporator without removal.
d. The brazed plate evaporator must be protected from freezing from an internal core temperature sensor. Evaporators without an internal core temperature sensor and protection are not acceptable. This temperature must be read by the unit controller.
e. The brazed plate evaporator shall have a factory installed air vent to aid in filling the system with water and prevent freezing in evaporator.
f. Chilled water wye strainer with 20-mesh straining element or finer is required and must be field installed in the evaporator inlet piping of the Chiller array.
g. Evaporator shall have flexible groove type couplings on water inlet and outlet for easy, unobstructed removal.
h. Evaporator shall be insulated with a minimum of 0.5 inch (12.7 mm) thick closed-cell flexible insulation with a K value of 0.26 BTU / (hr.-ft.- degF).

1) Evaporator Options:

a) Chiller shall include a high-capacity brazed plate evaporator to allow leaving hot water temperatures as low as 40°F without the need for glycol.
b) Motorized isolation valves, factory installed array headers, isolate modules not needed to meet current cooling or heating capacity. Water flow control is field provided and shall be modulated with VFD controlled variable flow primary pumps

based on the differential pressure across the water system. The rate of change in flow rate must not exceed 10% of design flow gpm per minute. Minimum flow allowed shall be as low as minimum flow of a single module.

3. Condenser

    a. Condenser shall be brazed plate heat exchanger type constructed of 316 stainless steel, and shall be designed and tested in accordance with the UL 1995 Safety Standard bearing the UL Listing mark for US and Canada.
    b. Condenser refrigerant side working pressure is 650 psig. The condenser water side working pressure is 360 psig.
    c. Condenser shall have factory installed manual balancing valves and gauge access ports for balancing the water flow to the condenser.
    d. Condenser shall have a waterside flush connection with ball valve to permit back-flushing or cleaning of the condenser without removal.
    e. Condenser shall have flexible groove type couplings on water inlet and outlet for easy, unobstructed removal.
    f. Condenser water wye strainer with 20-mesh straining element or finer. (Required for brazed plate condensers and must be field installed in the condenser inlet piping of the array)

4. Expansion Valves

    a. The refrigeration circuits will be outfitted with a mechanical expansion valve.

O. WATER SYSTEM

1. All water side components must be pressure rated for 300 psi
2. One evaporator flow-proving device must be provided per Chiller Array. A paddle style liquid flow switch is available with a NEMA Type 4X enclosure for field-installation.
3. Modular chillers are set alongside other Chillers along the long dimension. A common 6-inch header is connected between chillers on the short dimension. An array controller package must be provided from the factory.
4. A 20-mesh or finer strainer shall be installed for each brazed plate heat exchanger.
5. Water strainer options :

    a. Include two 20-mesh wye strainer kit that includes pipe adaptors, differential pressure ports and a blowdown valve. One kit for hot water and the other for condenser water.

6. Evaporators shall have factory installed manual balancing valves for balancing the water flow to the evaporator and isolating the evaporator for service.
7. Condensers shall have factory installed manual balancing valves for balancing the water flow to the condenser and isolating the condenser for service.

2.3 ELECTRICAL

A. Factory installed and wired, and functionally tested at factory before shipment.

B. Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary are to provide a single-point field power connection to water chiller.

C. House in a unit-mounted, NEMA 250, Type 1 enclosure with hinged access door with lock and key or padlock and key.

D. Wiring is to be numbered and color-coded to match wiring diagram.

E. Field power interface is to be to NEMA KS 1, heavy-duty, nonfused disconnect switch. Minimum short circuit current rating (SCCR) in accordance with UL 508 is to be as required by electrical power distribution system, but not less than 42,000 A.

F. Each motor is to have branch power circuit and controls with one of the following disconnecting means having SCCR to match main disconnecting means:

1. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses for Type 2 protection in accordance with IEC 60947-4-1.
2. NEMA KS 1, heavy-duty, nonfusible switch.

G. Each motor is to have overcurrent protection.

H. Overload relay sized in accordance with UL 1995, or an integral component of water chiller control microprocessor.

I. Phase Failure and Undervoltage: Solid-state sensing with adjustable settings.

J. Controls Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

K. Control Relays: Auxiliary and adjustable time-delay relays, or an integral component to water chiller microprocessor.

L. Indicate the following for water chiller electrical power supply:

1. Current, phase to phase, for all three phases.
2. Voltage, phase to phase and phase to neutral for all three phases.
3. Three-phase real power (kilowatts).
4. Three-phase reactive power (kilovolt amperes reactive).
5. Power factor.
6. Running log of total power versus time (kilowatt hours).
7. Fault log, with time and date of each.

2.4 CONTROLS

A. Manufactures controls shall be provided to meet desired sequence of operation.

2.5 ACCESSORIES

A. Factory-furnished, chilled- and condenser-water pressures differential type flow switches for field installation.

1. Manufacturer has option to factory install switches.

B. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.

1. Pressure measurement and display through chiller integral controls is an acceptable alternative.

C. Header assembly to accommodate an array of modular chiller.

2.6 CAPACITIES AND CHARACTERISTICS (As scheduled)

2.7 SOURCE QUALITY CONTROL

A. Perform functional test of water chillers before shipping.

B. Factory performance test water chillers, before shipping, in accordance with AHRI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

1. Test the following conditions:

a. Design conditions indicated.
b. AHRI 550/590 part-load points.

C. Factory test and inspect evaporator and water-cooled condenser in accordance with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.

D. For water chillers located indoors, rate sound power level in accordance with AHRI 575 procedure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before water chiller installation, examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, controls, and electrical connections to verify actual locations, sizes, and other conditions affecting water chiller performance, maintenance, and operations.

1. Water chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping, controls, and electrical connections.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF WATER-COOLED, SCROLL WATER CHILLERS

A. Coordinate sizes and locations of bases with actual equipment to be installed. Cast anchor-bolt inserts into concrete bases.

B. Equipment Mounting:

1. Install water chillers on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Maintain clearances required by governing code.

E. Chiller manufacturer's factory-trained service personnel are to charge water chiller with refrigerant if not factory charged and fill with oil if not factory installed.

F. Install separate devices furnished by manufacturer and not factory installed.

1. Chillers shipped in multiple major assemblies are to be field assembled by chiller manufacturer's factory-trained service personnel.

3.3 PIPING CONNECTIONS

A. Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to chillers, allow space for service and maintenance.

C. Refrigerant Pressure Relief Valve Connections: For water chillers installed indoors, extend vent piping to the outside without valves or restrictions. Comply with ASHRAE 15.

D. Connect each drain connection with a drain valve, full size of drain connection. Connect drain pipe to drain valve with union and extend drain pipe to terminate over floor drain.

E. Connect each chiller vent connection with an automatic or a manual vent, full size of vent connection.

3.4 ELECTRICAL POWER CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for

Electrical Systems."

C. Install nameplate for each electrical connection indicating electrical equipment designation and circuit number feeding connection. Nameplate is to be laminated phenolic layers of black with engraved white letters at least 0.5 inch high. Locate nameplate where easily visible.

3.5 CONTROLS

A. General

1. The chiller array shall be controlled by a microprocessor-based controller capable of operating the chiller array as a single high-capacity multistage water-cooled package chiller, while maintaining array leaving hot water temperature set-point within the control zone.
2. The controller shall also have the capability of being accessed from a remote computer such as a laptop using RS232 or Ethernet port having all functions that are available through the local interface with the additional ability to download and view fault history graphically.
3. The controller shall be capable of capacity modulation and equalizing the run time on all chiller modules. Capacity modulation shall be accomplished by staging individual compressors in each Chiller Module using lag/lead logic while performing all operational, annunciation, data retention, and communication functions.
4. The controller shall monitor entering and leaving hot water temperatures and stage individual compressors, within the Chiller Modules, to maintain leaving hot water set-point temperature within the control zone using proportional, integral, derivative (PID) logic.
5. The local operator must be capable of displaying all unit set points, faults, alarm and fault history, and operating conditions in a clear language format for easy interpretation by user/operator.
6. The Controller shall have multiple, progressive levels of security.
7. Controller inputs must include Remote Off/Auto (dry contact closure from a remote device); Flow Proving Device (dry contact closure from a remote device - input); Remote Start/Stop (input from BMS); customer demand limit reset signal (input from BMS); and customer chilled water reset signal.
8. Controller outputs must include the following items that can be only reviewed from the building management system (BMS); array run indication signal; customer alarm relay; array entering hot water temperature; array leaving hot water temperature; remote hot water flow switch input; array condenser pump relay; array chilled water pump relay;
9. The controller must provide the following dry contact closures for a remote device: remote alarm; remote hot water enable for a maximum of two (2) hot water pumps; evaporator water pump enable for one (1) evaporator water pump; array on/off status.
10. At a minimum, the controller should maintain a fault history with date and time of day of each fault up to the last 99 occurrences. The faults should include low hot water flow, low leaving hot water temperature, and hot module fault code.
11. The controller shall store a minimum of 1,008 packets of information for graphical presentation on a remote computer. The controller shall be capable of having

data taken for graphical display based on a set time interval. The time interval shall be factory set at 15 seconds, but shall be adjustable from 1 second to 12 hours. The Controller shall also allow up to 99 fault conditions to be stored.

12. The Controller shall also have RS485 and Ethernet communications ports for a Building Management System (BMS). Display and Keypad

3.6 STARTUP SERVICE

A. Perform startup service.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

C. Complete installation and startup checks in accordance with manufacturer's written instructions and perform the following:

1. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
2. Verify that pumps are installed and functional.
3. Verify that thermometers and gages are installed.
4. Operate water chiller for run-in period.
5. Check bearing lubrication and oil levels.
6. Verify that refrigerant pressure relief device for chillers installed indoors is vented outside.
7. Verify proper motor rotation.
8. Verify static deflection of vibration isolators, including deflection during water chiller startup and shutdown.
9. Verify and record performance of chilled- and condenser-water flow and low-temperature interlocks.
10. Verify and record performance of water chiller protection devices.
11. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

D. Inspect field-assembled components; equipment installation; and piping, controls, and electrical connections for proper assembly, installation, and connection.

E. Visually inspect chiller for damage before starting. Repair or replace damaged components, including insulation. Do not start chiller until damage that is detrimental to operation has been corrected.

F. Prepare a written startup report that records results of tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water chillers.

1. Instructor is to be factory trained and certified.
2. Provide not less than eight hours of training.
3. Train personnel in operation and maintenance and to obtain maximum efficiency

in plant operation.

4. Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
5. Obtain Owner sign-off that training is complete.
6. Owner training is to be held at Project site.

END OF SECTION 236423.16

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include data on material properties.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Normal weight.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.4 REINFORCEMENT

A. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.148-inch diameter (9ga).
3. Wire Size for Cross Rods: 0.148-inch diameter (9ga).
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.5 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, air-entraining agents, accelerators, retarders, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For interior non-load-bearing partitions and reinforced masonry, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws;

provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inchmaximum.
2. For conspicuous horizontal lines, such as lintels and sills do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners and door jambs do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill cores in hollow CMUs with grout 24 inches under bearing plates, lintels and similar items unless otherwise indicated.

E. Fill cores in hollow CMUs with grout full height at door jambs.

3.4 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course.
4. Fully bed entire units, including areas under cells, at starting course where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Provide masonry joint reinforcing at all masonry walls. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Provide continuity at wall intersections by using prefabricated T-shaped units.

C. Provide continuity at corners by using prefabricated L-shaped units.

3.6 REINFORCED UNIT MASONRY INSTALLATION

A. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Limit height of vertical grout pours to not more than 48 inches.

3.7 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. See Division 01 for Statement of Special Inspections.

3.8 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
3. Protect adjacent surfaces from contact with cleaner.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

3.9 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

ABBREVIATIONS

AMP	AMPERES	DTR	DUAL TEMPERATURE WATER RETURN	HPC	HIGH PRESSURE CONDENSATE	PTAC	PACKAGED TERMINAL AIR CONDITIONER
AAD	AUTOMATIC AIR DAMPER	DTS	DUAL TEMPERATURE WATER SUPPLY	HPS	HIGH PRESSURE STEAM	RA	RETURN AIR
ACCU	AIR COOLED CONDENSING UNIT	DWH	DOMESTIC WATER HEATER	HR	HUMIDITY RATIO, HOUR	RAD	RADIATOR, RADIANT PANEL
ACU	AIR CONDITIONING UNIT	DX	DIRECT EXPANSION	HRU	HEAT RECOVERY UNIT	RCP	RADIANT CEILING PANEL
ACV	AIR CONTROL VALVE	EAT	ENTERING AIR TEMPERATURE	HUM	HUMIDIFIER	RH	RELATIVE HUMIDITY
AFF	ABOVE FINISHED FLOOR	EBB	ELECTRIC BASE BOARD	HWC	HOT WATER COIL	RHC	REHEAT COIL
AHU	AIR HANDLING UNIT	EC	EXPANSION COMPENSATOR	HWS	HOT WATER SUPPLY	RPM	REVOLUTION PER MINUTE
APD	AIR PRESSURE DROP	EDB	ENTERING DRY BULB TEMPERATURE	HWR	HOT WATER RETURN	RTH	RADIANT TUBE HEATER
AS	AIR SEPARATOR	EFF	EFFICIENCY	HX	HEAT EXCHANGER	RTU	ROOF TOP UNIT
B	BOILER	ENC	ENCLOSURE	HZ	HERTZ	SA	SUPPLY AIR
BD	BYPASS DAMPER	ERU	ENERGY RECOVERY UNIT	IN	INCH	SS	SOLIDS SEPARATOR
BDD	BACK DRAFT DAMPER	ESP	EXTERNAL STATIC PRESSURE	IND	INDUCTION UNIT	SD	SMOKE DAMPER
BHP	BRAKE HORSE POWER	ET	EXPANSION TANK	KH	KILN HOOD	SHC	SENSIBLE HEAT CAPACITY
BOD	BOTTOM OF DUCT	EWB	ENTERING WET BULB TEMPERATURE	KW	KILOWATT	SOO	SEQUENCE OF OPERATIONS
BTU	BRITISH THERMAL UNIT	EWT	ENTERING WATER TEMPERATURE	LAT	LEAVING AIR TEMPERATURE	SP	STATIC PRESSURE
BTUH	BRITISH THERMAL UNIT PER HOUR	EXH	EXHAUST AIR	LB	POUND	SQ	SQUARE
C	COMMON	EXIST	EXISTING	LDB	LEAVING DRY BULB TEMPERATURE	SRV	STATIONARY ROOF VENT
CCU	CEILING CASSETTE UNIT	F	FAN	LPC	LOW PRESSURE CONDENSATE	TD	TRIPLE DUTY VALVE
CD	COLD CONDENSATE DRAIN	°F	FAHRENHEIT	LPS	LOW PRESSURE STEAM	TDH	TOTAL DYNAMIC HEAD
CDWS	CONDENSER WATER SUPPLY	F&T	FLOAT AND THERMOSTATIC TRAP	LV	LOUVER	TG	TRANSFER GRILLE
CDWR	CONDENSER WATER RETURN	FC	FLEXIBLE CONNECTION	LWB	LEAVING WET BULB	THC	TOTAL HEAT CAPACITY
CFM	CUBIC FEET PER MINUTE	FCU	FAN COIL UNIT	LWT	LEAVING WATER TEMPERATURE	TSP	TOTAL STATIC PRESSURE
CH	CHILLER	FD	FIRE DAMPER	MAX	MAXIMUM	TYP	TYPICAL
CGR	CHILLED GLYCOL RETURN	FIL	FILTER	MAU	MAKEUP AIR UNIT	UV	UNIT VENTILATOR
CGS	CHILLED GLYCOL SUPPLY	FSD	COMBINATION FIRE/SMOKE DAMPER	MBH	1000 BTUH	V	VOLT
CWS	CHILLED WATER SUPPLY	FMS	FLOW MEASURING STATION	MCA	MINIMUM CIRCUIT AMPACITY	VAL	VALANCE UNIT
CWR	CHILLED WATER RETURN	FPM	FEET PER MINUTE	MIN	MINIMUM	VAV	VARIABLE AIR VOLUME
CO	CLEANOUT	FR	FURNACE	MOP	MAXIMUM OVERCURRENT PROTECTION	VD	VOLUME DAMPER
CONV	CONVECTOR	FT	FEET	MV	MANUAL VENT	VIF	VERIFY IN FIELD
CP	CONDENSATE PUMP	FTR	FIN TUBE RADIATION	NC	NORMALLY CLOSED	VP	VACUUM PUMP
CT	COOLING TOWER	GAL	GALLONS	NIC	NOT IN CONTRACT	VSD	VARIABLE SPEED DRIVE
CUH	CABINET UNIT HEATER	GC	GENERAL CONTRACTOR	NO	NORMALLY OPEN, NUMBER	VUV	VERTICAL UNIT VENTILATOR
dB	DECIBELS	GPM	GALLONS PER MINUTE	OA	OUTSIDE AIR	WH	UNIT HEATER
DB	DRY BULB TEMPERATURE	GR	GRAINS	P	PUMP	WB	WET BULB TEMPERATURE
DC	DUST COLLECTOR	HD	HEAD	PD	PRESSURE DROP	WCU	WALL CASSETTE UNIT
DIA	DIAMETER	HGR	HOT GLYCOL RETURN	PG	PROPYLENE GLYCOL	WFS	WATER FLOW SWITCH
DN	DOWN	HGS	HOT GLYCOL SUPPLY	PH	PHASE	WG	WATER GAUGE
DP	DEWPOINT TEMPERATURE	HP	HORSEPOWER	PSI	POUNDS PER SQUARE INCH	WH	WALL HEATER
DSD	DUCT SMOKE DETECTOR					WPD	WATER PRESSURE DROP
						WWM	WELDED WIRE MESH

A1 ABBREVIATIONS
SCALE: NOT TO SCALE

1. ALL WORK SHALL CONFORM TO ALL APPLICABLE RULES, REGULATIONS AND CODES, INCLUDING, BUT NOT LIMITED TO THE APPLICABLE ENERGY CONSERVATION CODE OF NEW YORK STATE, AND BUILDING CODES OF NEW YORK STATE.
2. ALL EQUIPMENT SHALL COMPLY WITH THE PROVISIONS OF THE APPLICABLE ENERGY CONSERVATION CODE OF NEW YORK STATE. ALL SUBMITTALS FOR EQUIPMENT COVERED BY THE CODE SHALL INCLUDE THE MANUFACTURER'S STATEMENT OF CONFORMANCE TO THE CODE.
3. FIELD VERIFY ALL DIMENSIONS PRIOR TO DUCTWORK FABRICATION OR ANY OTHER MECHANICAL WORK. MECHANICAL CONTRACTOR SHALL COORDINATE INSTALLATION OF EQUIPMENT, PIPING, DUCTWORK, AND PADS WITH OTHER CONTRACTORS. PROVIDE FITTINGS, ELEVATION CHANGES, TRANSITIONS, AND OFFSETS REQUIRED, WHETHER SHOWN OR NOT, TO AVOID CONFLICTS WITH WORK OF OTHER CONTRACTS.
4. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING ALL HVAC PENETRATIONS (PIPING, DUCTWORK, ETC) IN ACCORDANCE WITH THE BUILDING CODE OF NEW YORK STATE, AND WHERE SHOWN OR SPECIFIED.
5. ITEMS OF SPECIFIC MANUFACTURER'S SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE PRINTED INSTRUCTIONS AND/OR MANUFACTURER'S REPRESENTATIVES DIRECTIONS.
6. MECHANICAL CONTRACTOR TO INSTALL ALL NECESSARY STIFFENERS, BRACES, STRUTS, ETC, WHETHER SHOWN OR NOT, TO PROVIDE A COMPLETE, SAFE, AND DURABLE SYSTEM.
7. DIMENSIONS SHOWN "AFF" INDICATE THE ACTUAL CLEAR DIMENSIONS FROM THE BOTTOM OF THE ITEM TO THE FINISHED FLOOR ELEVATION; UNLESS INDICATED OTHERWISE.
8. SUPPORT AND EQUIPMENT DETAILS MAY VARY TO SUIT EQUIPMENT AND PARTS SUPPLIED.
9. WELD ALL STEEL ANGLE JOINTS UNLESS OTHERWISE SHOWN.
10. PROVIDE NECESSARY BY-PASSES AND BALANCING MEANS AS REQUIRED TO ASSURE PROPER SYSTEM OPERATION.
11. ALL DUCT DIMENSIONS SHOWN ARE "SIDE SEEN" BY "SIDE NOT SEEN" AND ARE THE CLEAR INSIDE DIMENSIONS UNLESS OTHERWISE NOTED.
12. PROVIDE ACCESS DOORS AND CLEARANCES FOR EASY ACCESS TO ALL FIRE DAMPERS, CONTROL DAMPERS, LOUVERS, FILTERS, COILS, AND FANS.
13. BRANCH DUCTS TO GRILLES, DIFFUSERS OR REGISTERS SHALL BE THE SAME SIZE AS GRILLE, DIFFUSER OR REGISTER NECK SIZE UNLESS INDICATED OTHERWISE.
14. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR PRECISE LOCATION OF DIFFUSERS AND REGISTERS.
15. PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH TAKE-OFFS AND WHERE SHOWN.
16. PROVIDE ALL CONTROL AND INTERLOCK WIRING REQUIRED OR SPECIFIED THAT IS NOT PROVIDED BY THE ELECTRICAL CONTRACTOR.
17. COORDINATE WITH ELECTRICAL CONTRACTOR AND FIRE PROTECTION CONTRACTOR REGARDING THE RESPONSIBILITIES FOR SUPPLYING, INSTALLING AND WIRING OF HVAC-RELATED DISCONNECT SWITCHES, STARTERS, SAFETY INTERLOCKS, EMERGENCY SHUTDOWN AND WIRING.
18. WORK ON M-SERIES DRAWINGS IS BY THE MECHANICAL CONTRACTOR UNLESS OTHERWISE NOTED.
19. VERIFY ALL LOCATIONS, DIMENSIONS, EQUIPMENT ARRANGEMENTS, CLEARANCES AND ELECTRICAL CHARACTERISTICS IN THE FIELD PRIOR TO BID. PROMPTLY NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES.
20. PRIOR TO CUTTING THROUGH FLOORS AND WALLS, THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL STRUCTURAL MEMBERS, JOISTS, AND OR COLUMNS. PROMPTLY NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES. DO NOT CUT ANY STRUCTURAL MEMBERS UNLESS SPECIFICALLY DIRECTED TO DO SO.
21. THE MECHANICAL CONTRACTOR SHALL REMOVE DUCTWORK BACK TO A POINT WHICH WILL ALLOW THE INSTALLATION OF SUPPORT STEEL THAT IS REQUIRED / RELATED TO THE HVAC EQUIPMENT. THE MECHANICAL CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR IN THE LOCATIONS WHICH WILL REQUIRE MECHANICAL SUPPORT STEEL.
22. INSTALL ALL NEW DUCT AND PIPE WITHIN EXISTING OPENINGS SUCH THAT IT ALLOWS AS MUCH SPACE AS POSSIBLE TO ONE SIDE WHICH MAY ALLOW PASSAGE.
23. ALL EXISTING-TO-REMAIN DIFFUSERS AND DUCT SYSTEMS TO BE REBALANCED TO CFM INDICATED.
24. PATCH AND SEAL DUCT WHERE BRANCHES / TAKEOFFS HAVE BEEN REMOVED AND NO NEW CONNECTION IS NEEDED.
25. CAP AND SEAL PIPING WHERE BRANCHES / TAKEOFFS HAVE BEEN REMOVED AND NO NEW CONNECTION IS NEEDED.
26. DASHED PIPING AND EQUIPMENT SHOWN ON FLOOR PLANS AND ENLARGED VIEWS IS WORK THAT IS TO BE DONE "BY OTHERS" SIMULTANEOUSLY. REFER TO C3/M-401 AS AN EXAMPLE. COORDINATION WITH NOT IN CONTRACT SCOPE WILL BE NECESSARY WHEN LAYING OUT EACH CONTRACTOR'S RESPECTIVE WORK.

A3 GENERAL NOTES
SCALE: NOT TO SCALE

PIPING

- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- NEEDLE VALVE
- PRESSURE RELIEF VALVE
- MANUAL AIR VENT
- AUTOMATIC AIR VENT
- PRESSURE GAUGE
- THERMOMETER
- FLEXIBLE PIPE CONNECTOR
- UNION
- REDUCER
- STRAINER
- TRIPLE DUTY VALVE
- TWO-WAY CONTROL VALVE
- THREE-WAY CONTROL VALVE
- PIPE DROP
- PIPE RISER
- PIPE ANCHOR
- PIPE GUIDE
- OR PIPE CAP
- OR CALIBRATED FLOW BALANCING VALVE
- OR INLINE PUMP
- AIR SEPARATOR
- BASE MOUNTED PUMP
- PIPE CONNECTION OFF BOTTOM
- PIPE CONNECTION OFF TOP

DUCTWORK

- RETURN GRILLE
- SUPPLY DIFFUSER
- EXHAUST GRILLE
- LINEAR SLOT DIFFUSER
- SQUARE TO ROUND DUCT TRANSITION
- SQUARE MAIN TO ROUND BRANCH TAKE-OFF
- FC FLEXIBLE DUCT CONNECTOR
- POSITIVELY PRESSURIZED SUPPLY DUCT OUT OF THE PLANE
- POSITIVELY PRESSURIZED SUPPLY DUCT INTO THE PLANE
- NEGATIVELY PRESSURIZED RETURN DUCT OUT OF THE PLANE
- NEGATIVELY PRESSURIZED RETURN DUCT INTO THE PLANE
- NEGATIVELY PRESSURIZED EXHAUST DUCT OUT OF THE PLANE
- NEGATIVELY PRESSURIZED EXHAUST DUCT INTO THE PLANE
- SQUARE ELBOW WITH TURNING VANES
- MANUAL VOLUME DAMPER
- AAD OR AAD AUTOMATIC AIR DAMPER
- TYPE CFM NECK SIZE (TYPICAL OF) DIFFUSER/GRILLE/REGISTER DESIGNATION
- UNIT GENERAL EQUIPMENT DESIGNATION
- UNIT GPM GPM HEATING COOLING UNIT WITH HEATING AND COOLING
- UNIT MAX. CFM UNIT WITH AIR FLOW
- UNIT GPM UNIT WITH HEATING OR COOLING
- TYPE NO. FTR-X FIN-TUBE RADIATION DESIGNATION
- ACTIVE LENGTH X'-X"
- BALANCED FLOW X.X GPM

GENERAL

- NEW PIPING
- EXISTING PIPING
- FUTURE
- REMOVALS
- DISCONNECT FROM EXISTING
- CONNECT TO EXISTING
- TS TEMPERATURE SENSOR
- T THERMOSTAT
- T G THERMOSTAT W/ GUARD
- T D THERMOSTAT W/ DIGITAL DISPLAY
- P PRESSURE SENSOR
- S SENSOR (CO & NO2)
- CO_2 CARBON DIOXIDE SENSOR (DEMAND CONTROL VENTILATION)
- CO CARBON MONOXIDE SENSOR
- DP DIFFERENTIAL PRESSURE SENSOR
- M DAMPER ACTUATOR
- S SOLENOID ACTUATOR
- DIRECTION OF AIRFLOW
- X KEYNOTE
- VIEW SHEET ENLARGED PLAN & DETAIL CALL OUT
- FD FIRE DAMPER
- VOLUME DAMPER

NOTE: NOT ALL SYMBOLS ARE USED.

A4 SYMBOLS
SCALE: NOT TO SCALE

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3/27/2026

REGISTRATION EXPIRES: 10/31/2026

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ITHACA TOMPKINS INTERNATIONAL AIRPORT
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ITHACA, NY 14850

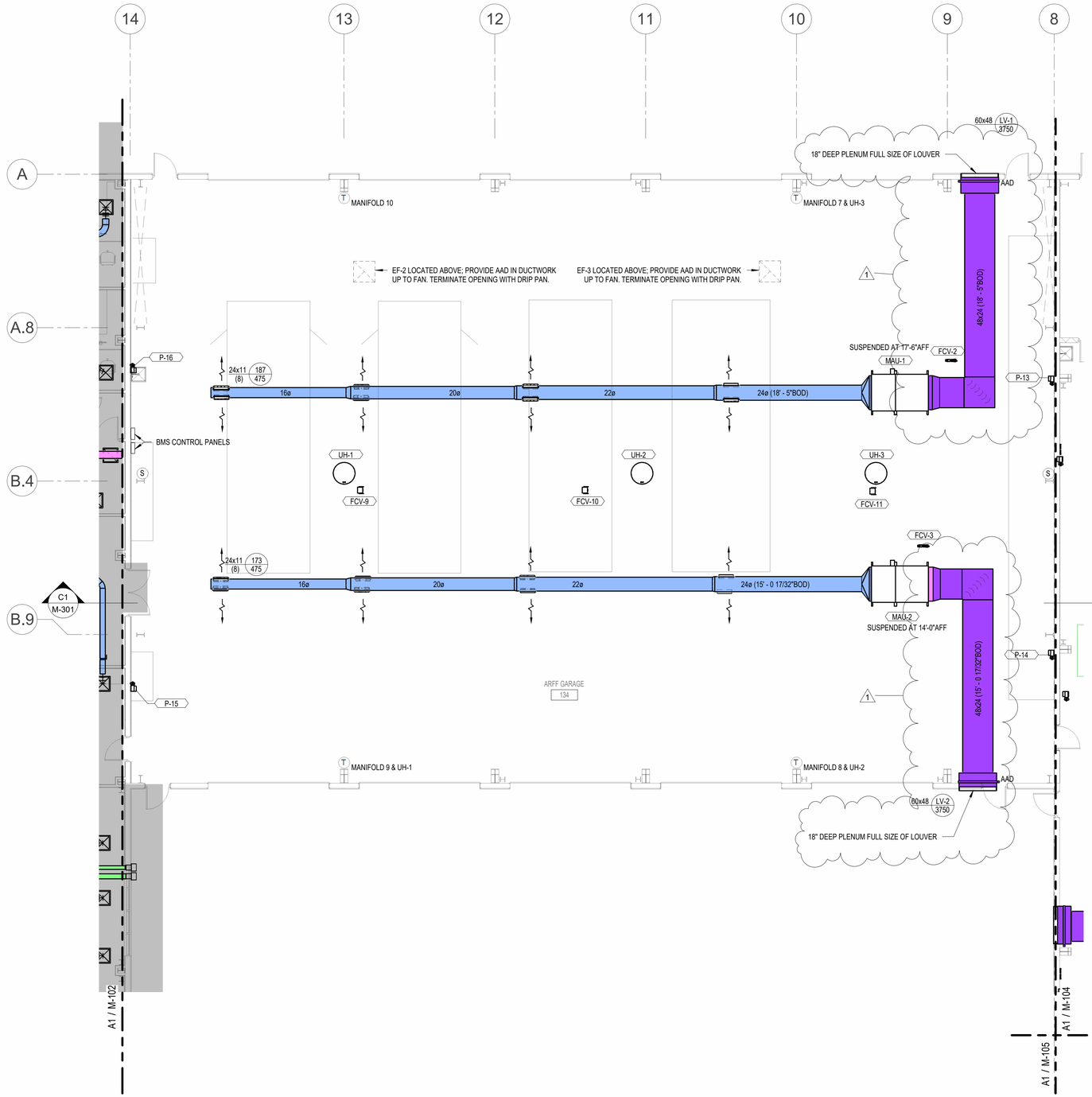
MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1
REVISIONS		

PROJECT NO:	158.095.001
DATE:	MARCH 2026
DRAWN BY:	A.M. CALABRESE
DESIGNED BY:	A.M. CALABRESE
CHECKED BY:	A.J. MILNE, P.E.

NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK EDUCATION LAW

SYMBOLS, NOTES AND ABBREVIATIONS

M-001



A1 HVAC FLOOR PLAN - AREA B (ADD ALT. NO. 1)
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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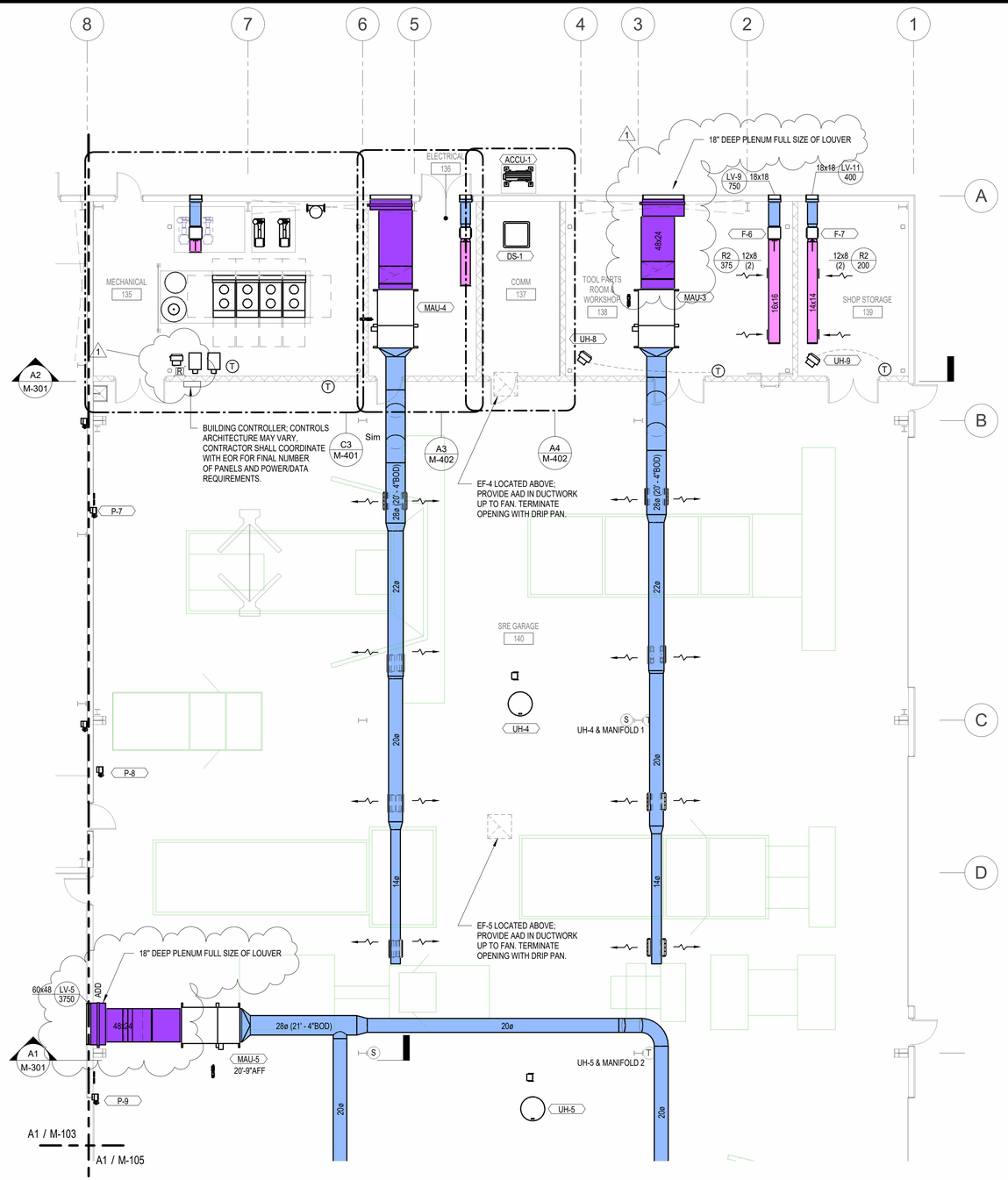
MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1

REVISIONS

PROJECT NO:	158.095.001
DATE:	MARCH 2026
DRAWN BY:	A.M. CALABRESE
DESIGNED BY:	A.M. CALABRESE
CHECKED BY:	A.J. MILNE, P.E.

FIRST FLOOR HVAC PLAN - AREA B (ADD ALT. NO. 1)

M-103



PLAN NORTH

A1 HVAC FLOOR PLAN - AREA C
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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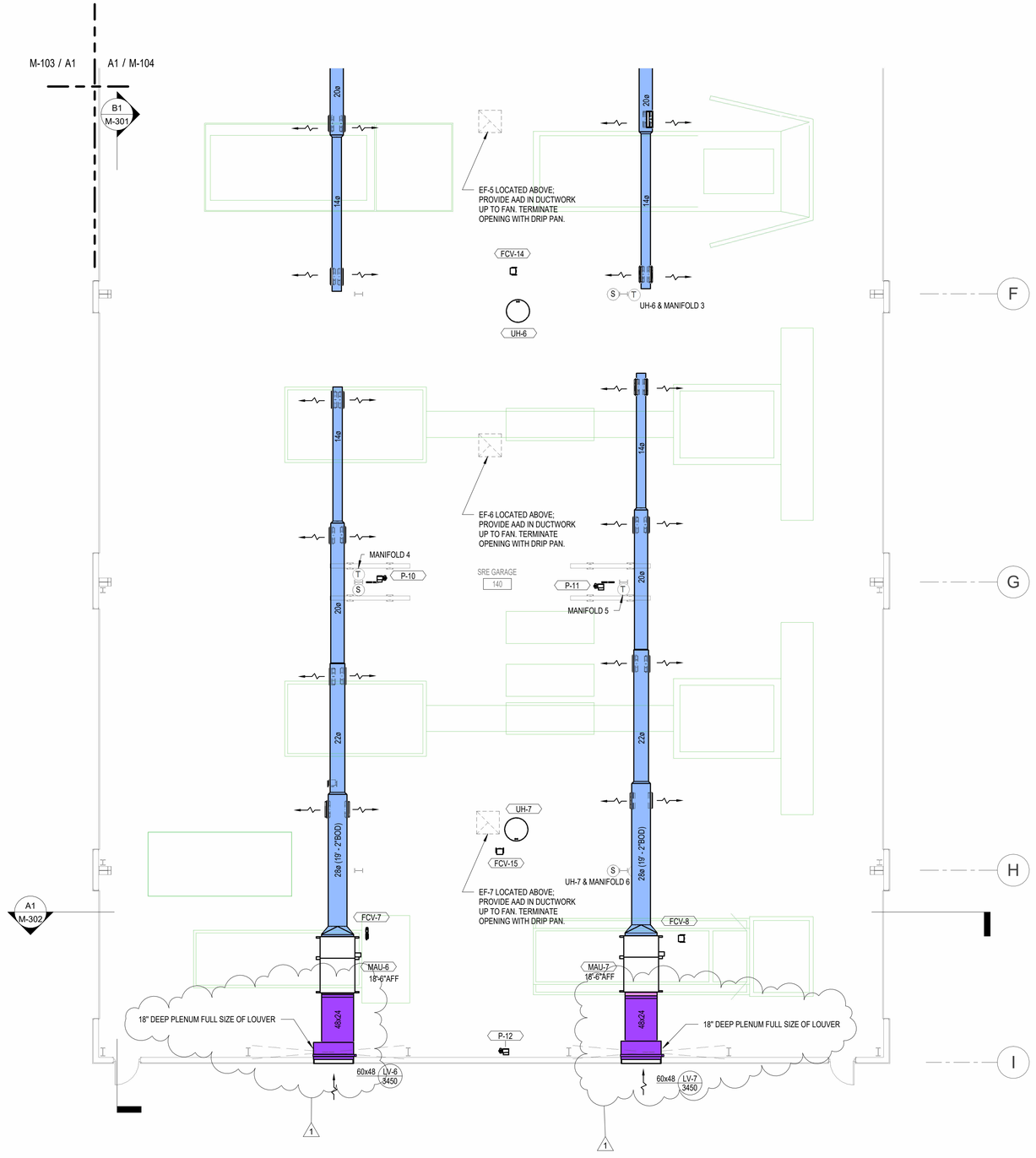
FIRST FLOOR HVAC PLAN - AREA C

M-104



PLAN NORTH

A1 HVAC FLOOR PLAN - AREA D
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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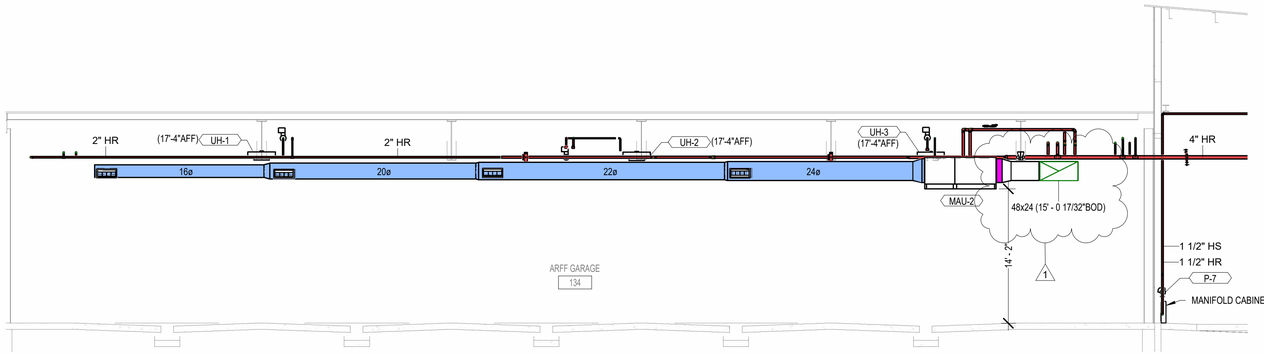
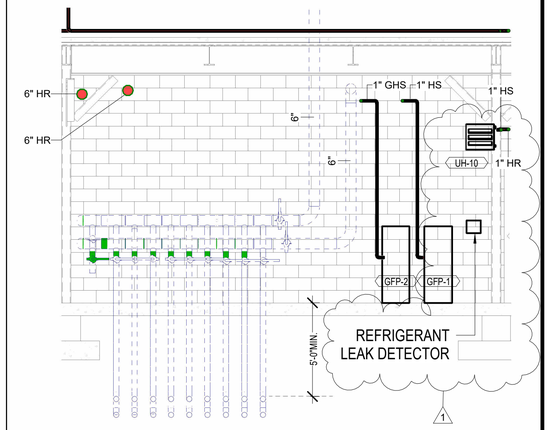
FIRST FLOOR HVAC PLAN - AREA D

M-105



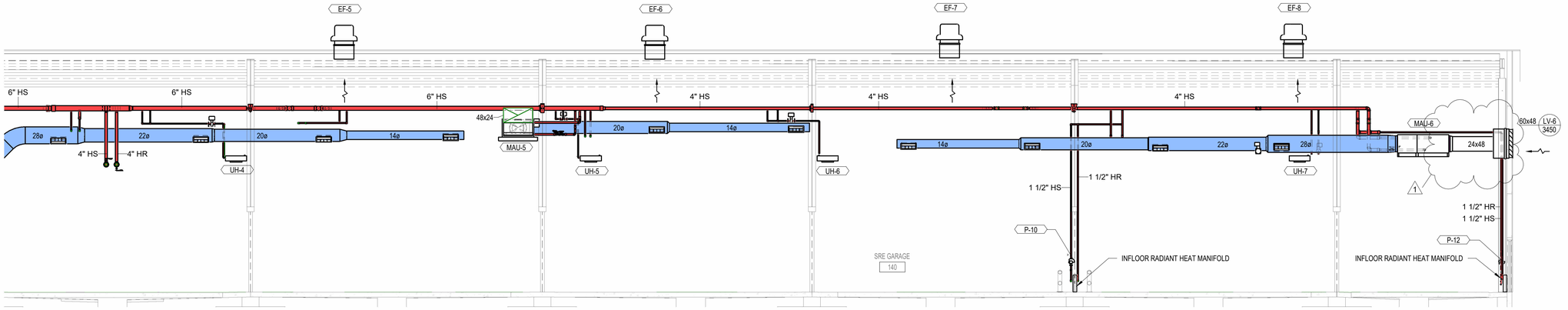
C1 ARFF GARAGE - SECTION 1
SCALE: 1/8" = 1'-0"

0 4' 8' 16'



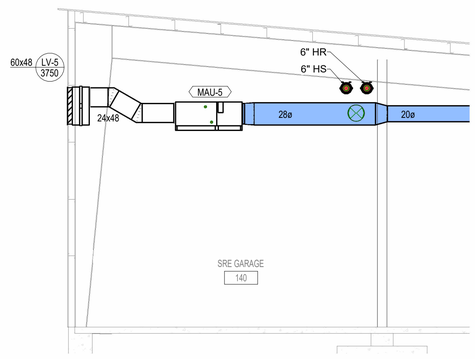
A4 MANIFOLD PIPING DETAIL
SCALE: 1/4" = 1'-0"

0 2' 4' 8'



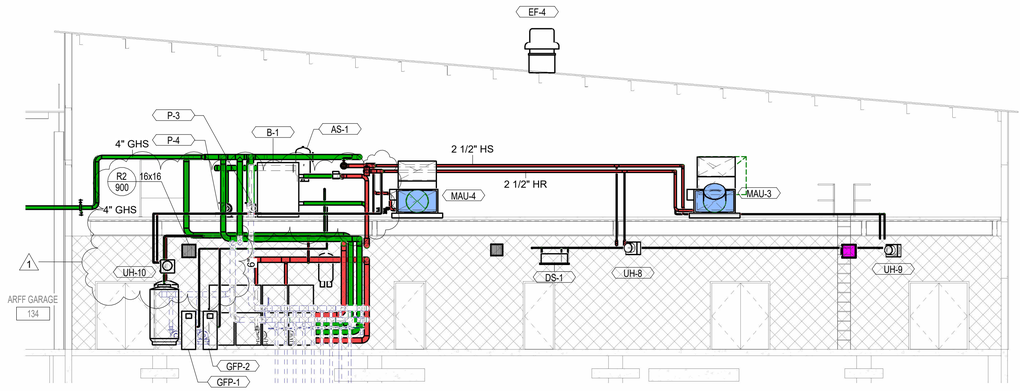
B1 SRE GARAGE - SECTION 1
SCALE: 1/8" = 1'-0"

0 4' 8' 16'



A1 MAU-5 ELEVATION
SCALE: 1/8" = 1'-0"

0 4' 8' 16'



A2 MECHANICAL ELEVATION
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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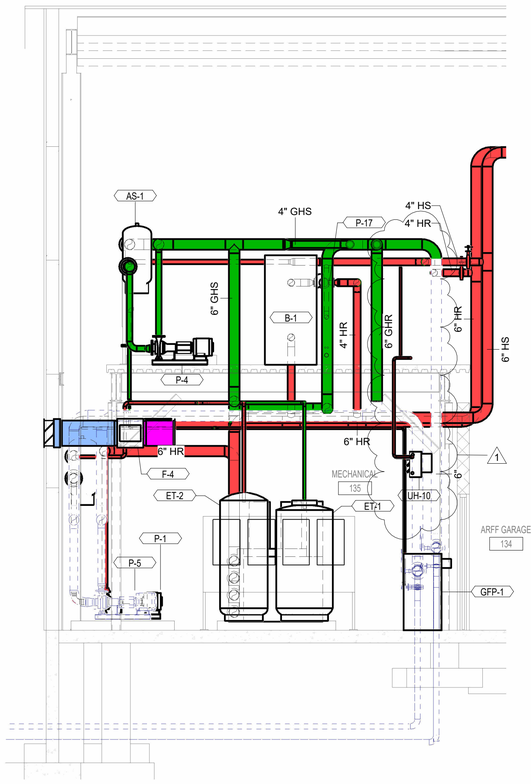
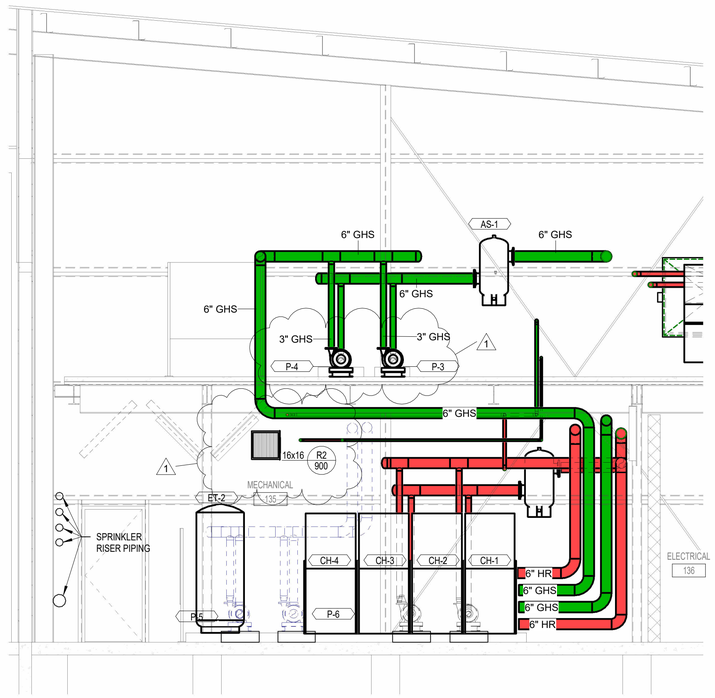
ELEVATIONS

M-301



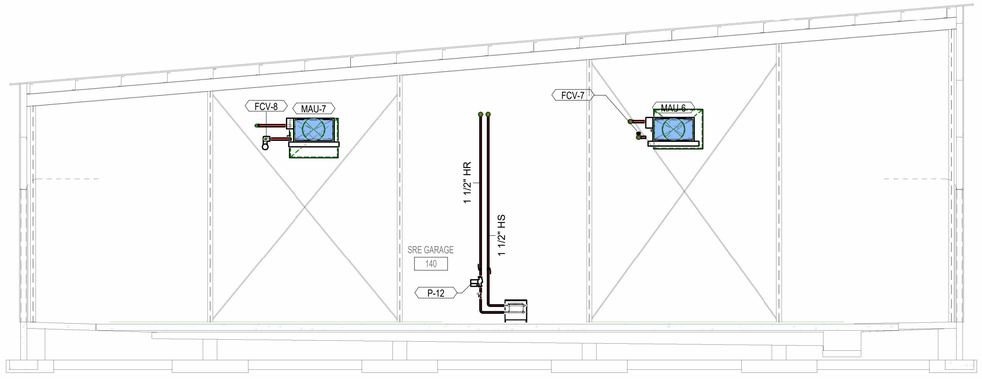
B1 MECHANICAL ROOM - SECTION 1
SCALE: 1/4" = 1'-0"

0 2' 4' 8'



B3 MECHANICAL ROOM - SECTION 2
SCALE: 1/4" = 1'-0"

0 2' 4' 8'



A1 SRE GARAGE - SECTION 2
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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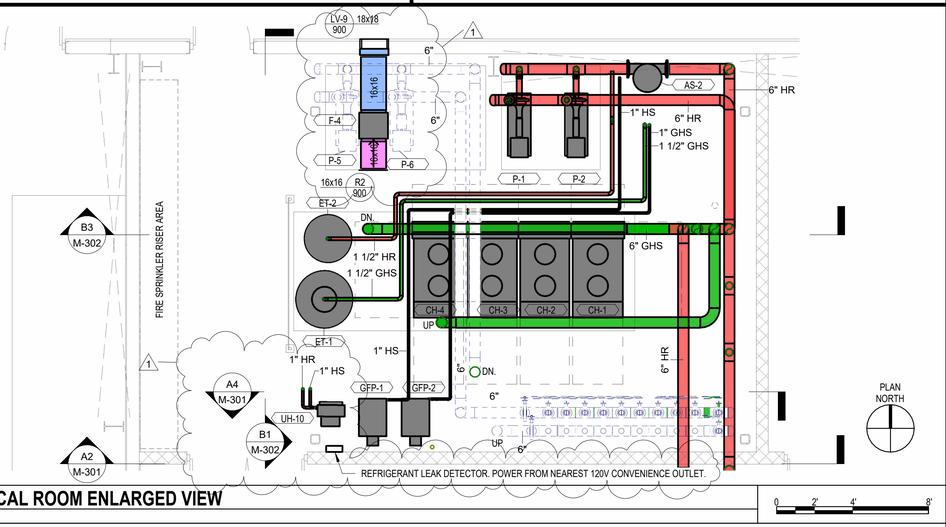
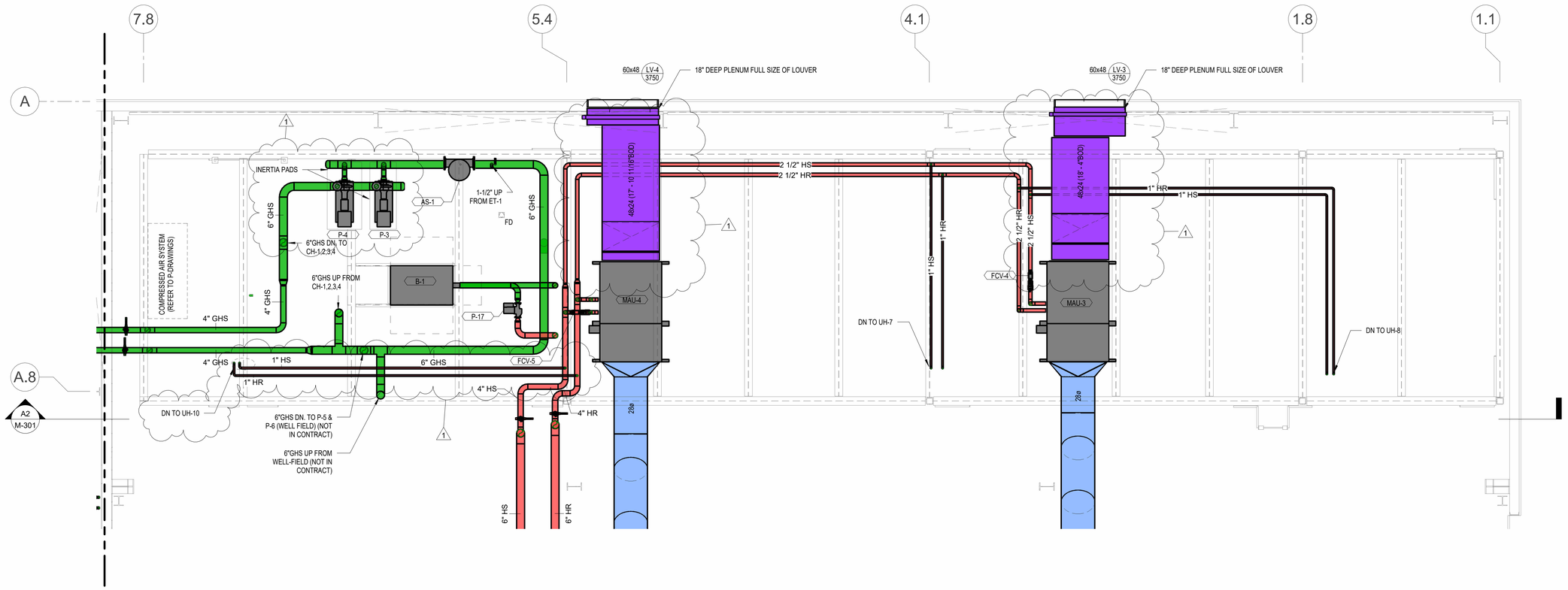
ELEVATIONS

M-302



C3 MECHANICAL ROOM ENLARGED VIEW
SCALE: 1/4" = 1'-0"

0 2' 4' 8'



A1 MEZZIANE ENLARGED PLAN
SCALE: 1/4" = 1'-0"

0 2' 4' 8'

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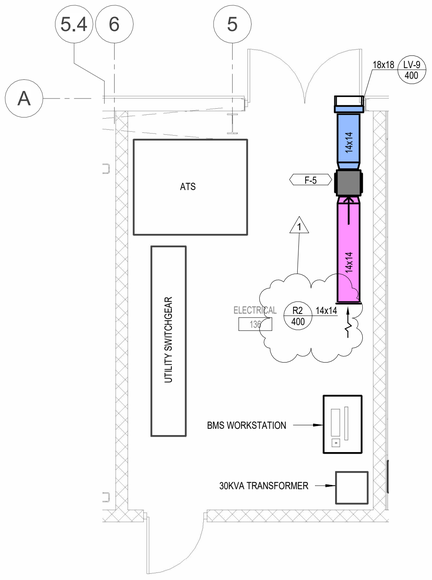
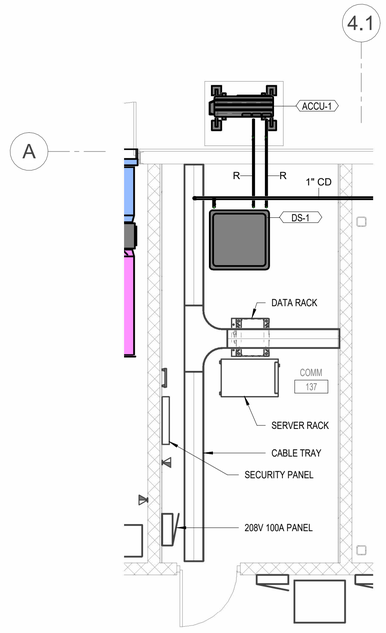
ENLARGED PLANS

M-401



A3 **ELECTRICAL 136 ENLARGED VIEW**
SCALE: 1/4" = 1'-0"

0 2' 4' 8'



A4 **COMM 137 HVAC ENLARGED VIEW**
SCALE: 1/4" = 1'-0"

0 2' 4' 8'

COMM 137 HEAT LOAD SUMMARY

EQUIPMENT/HEAT SOURCE	QTY.	BTU/HR	TOTAL BTU/HR	
208V - 100A PANEL	1	1,774.76	1,774.76	
SECURITY CARE KEY ACCESS PANEL	1	500.00	500.00	
DATA RACK	1	13,652.00	13,652.00	
SERVER RACK	1	13652	13,652.00	
ENVELOPE HEAT GAIN	1	2,955.00	2,955.00	
		TOTAL	**32,533.76**	**BTU/HR**

PLAN NORTH

PLAN NORTH

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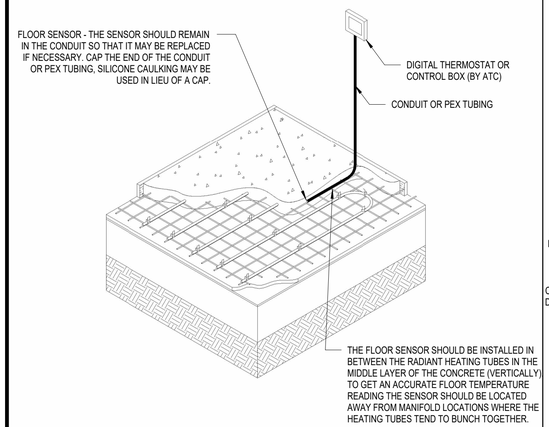
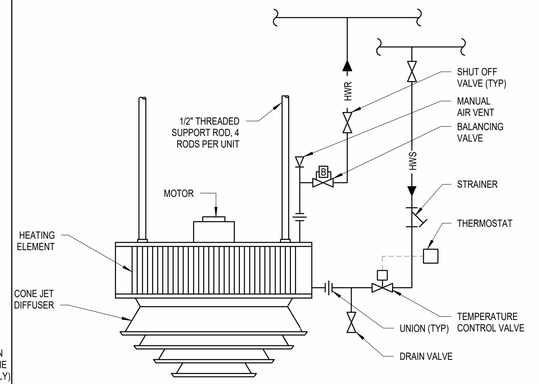
ENLARGED PLANS

M-402



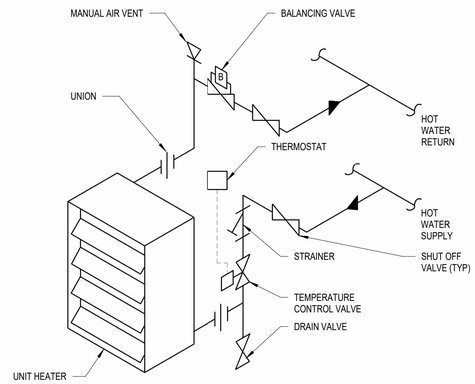
C1 RADIANT FLOOR SENSOR INSTALLATION

SCALE: NOT TO SCALE



C2 UNIT HEATER PIPING DETAIL (VERTICAL)

SCALE: NOT TO SCALE

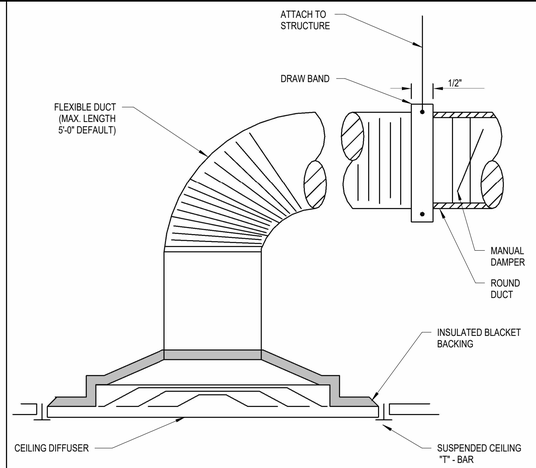


NOTES

1. SEE DIVISION 23 SPECIFICATIONS FOR VALVE INFORMATION AND REQUIREMENTS.

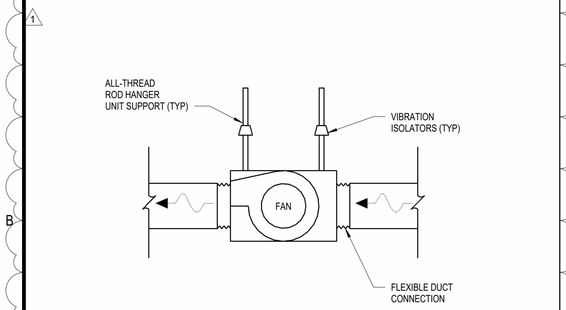
C3 UNIT HEATER PIPING DETAIL (HORIZONTAL)

SCALE: NOT TO SCALE



C4 CEILING DIFFUSER DETAIL

SCALE: NOT TO SCALE

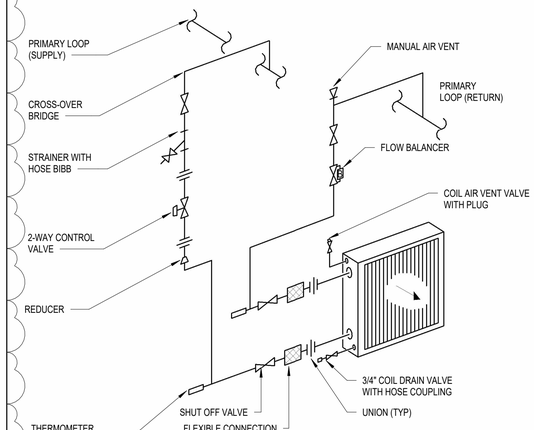


NOTES:

1. REFER TO SPECIFICATIONS FOR MOUNTING SPECIFICATIONS.

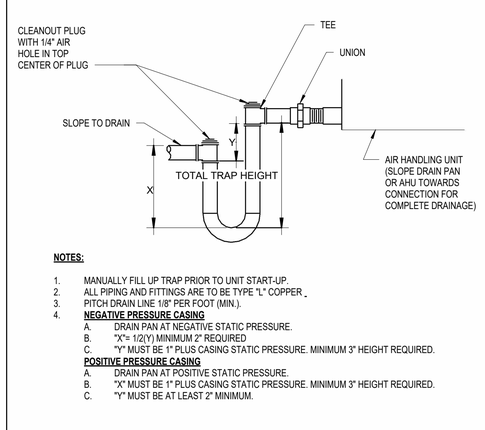
B1 CENTRIFUGAL IN-LINE FAN DETAIL

SCALE: NOT TO SCALE



B2 MAKE UP AIR UNIT DETAIL

SCALE: NOT TO SCALE



NOTES:

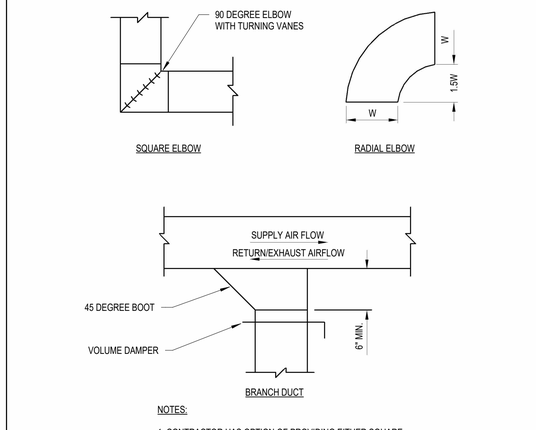
1. MANUALLY FILL UP TRAP PRIOR TO UNIT START-UP.
2. ALL PIPING AND FITTINGS ARE TO BE TYPE "L" COPPER .
3. PITCH DRAIN LINE 1/8" PER FOOT (MIN.).
4. **NEGATIVE PRESSURE CASING**
   - A. DRAIN PAN AT NEGATIVE STATIC PRESSURE.
   - B. "X"= 1/2(Y) MINIMUM 2" REQUIRED
   - C. "Y" MUST BE 1" PLUS CASING STATIC PRESSURE. MINIMUM 3" HEIGHT REQUIRED.

POSITIVE PRESSURE CASING

- A. DRAIN PAN AT POSITIVE STATIC PRESSURE.
- B. "X" MUST BE 1" PLUS CASING STATIC PRESSURE. MINIMUM 3" HEIGHT REQUIRED.
- C. "Y" MUST BE AT LEAST 2" MINIMUM.

B3 AC UNIT CONDENSATE DRAIN DETAIL

SCALE: NOT TO SCALE

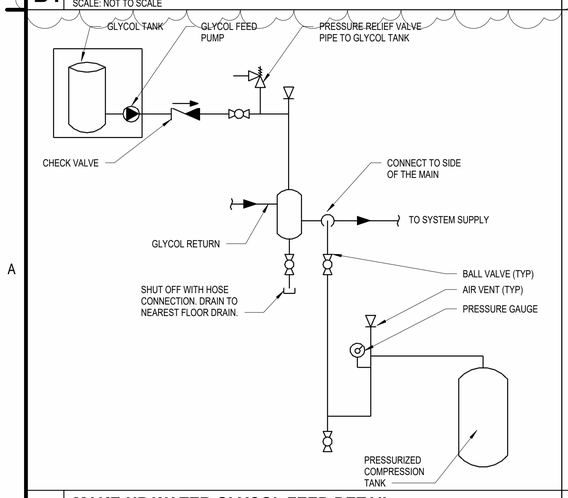


NOTES:

1. CONTRACTOR HAS OPTION OF PROVIDING EITHER SQUARE ELBOW WITH TURNING VANES OR LONG RADIUS ELBOW.

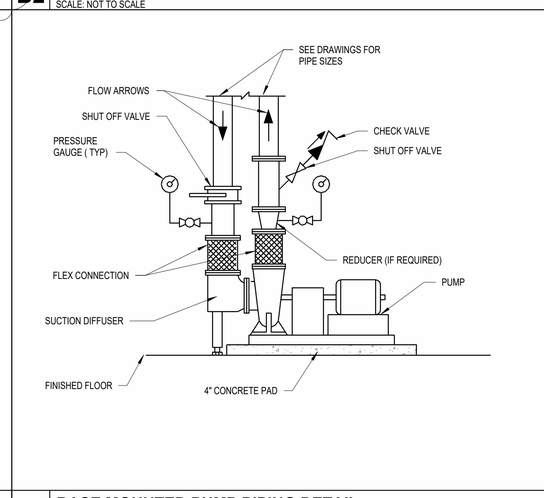
B4 DUCT DETAIL

SCALE: NOT TO SCALE



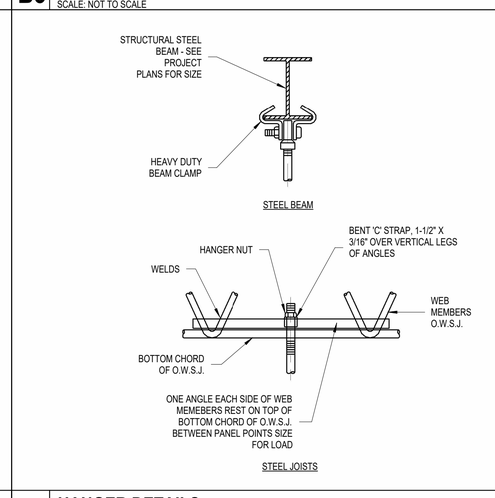
A1 MAKE-UP WATER GLYCOL FEED DETAIL

SCALE: NOT TO SCALE



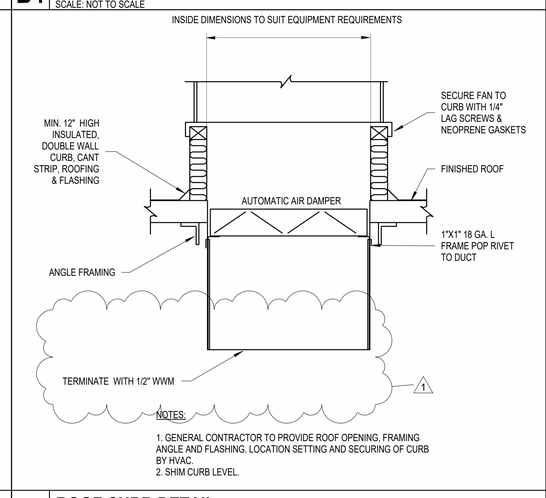
A2 BASE MOUNTED PUMP PIPING DETAIL

SCALE: NOT TO SCALE



A3 HANGER DETAILS

SCALE: NOT TO SCALE



NOTES:

1. GENERAL CONTRACTOR TO PROVIDE ROOF OPENING, FRAMING ANGLE AND FLASHING. LOCATION SETTING AND SECURING OF CURB BY HVAC.
2. SHIM CURB LEVEL.

A4 ROOF CURB DETAIL

SCALE: NOT TO SCALE

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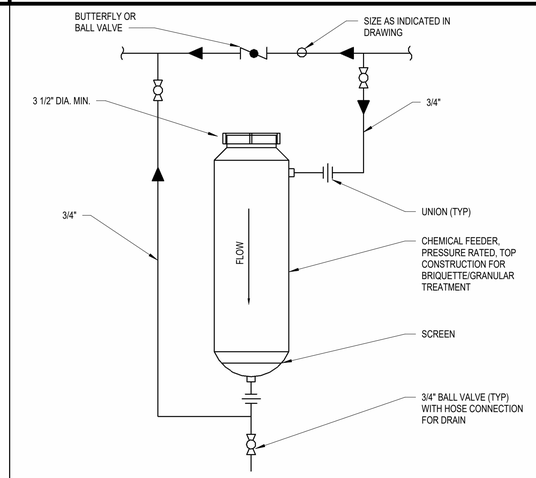
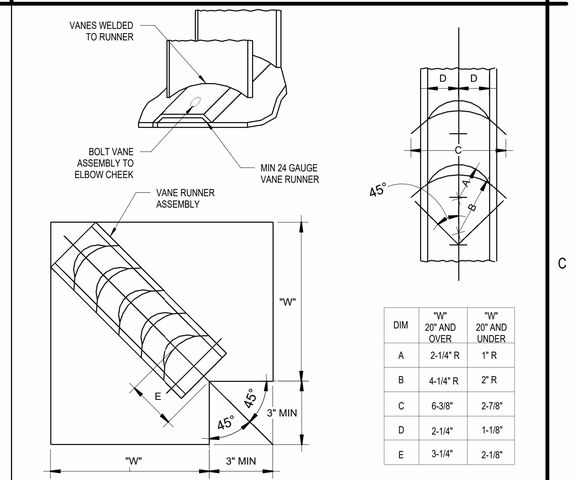
DETAILS

M-501

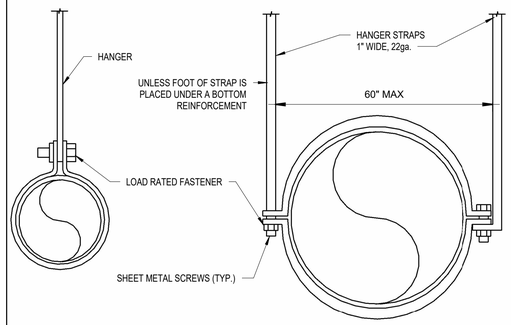


C3 MANUAL CHEMICAL FEEDER DETAIL
SCALE: NOT TO SCALE

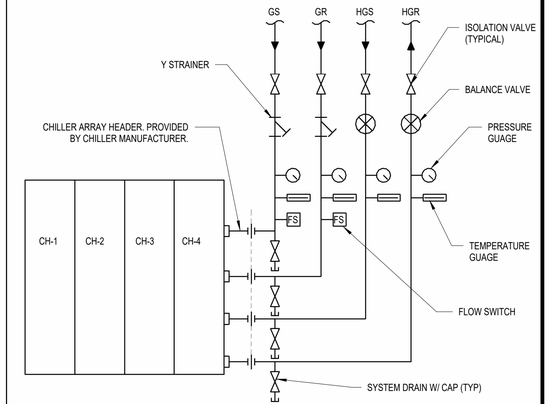


DIM	"W" 20" AND OVER	"W" 20" AND UNDER
A	2-1/4" R	1" R
B	4-1/4" R	2" R
C	6-3/8"	2-7/8"
D	2-1/4"	1-1/8"
E	3-1/4"	2-1/8"

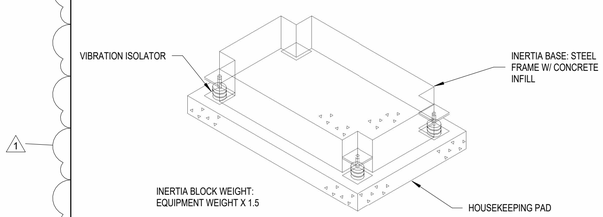
C4 VANED ELBOW DETAIL
SCALE: NOT TO SCALE



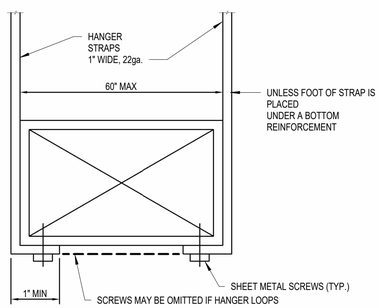
B3 RIGID ROUND DUCT SUPPORT DETAIL
SCALE: NOT TO SCALE



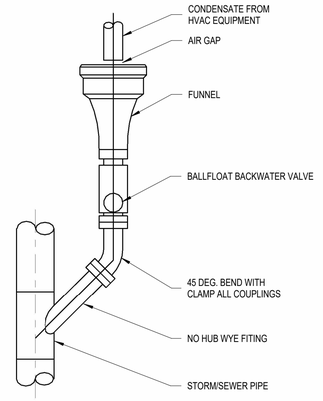
B4 MODULAR CHILLER SCHEMATIC
SCALE: NOT TO SCALE



A2 PUMP INERTIA BASE DETAIL
SCALE: NOT TO SCALE



A3 RIGID DUCT SUPPORT DETAIL
SCALE: NOT TO SCALE



A4 CONDENSATE PIPE CONNECTION TO OW DRAIN PIPE DETAIL
SCALE: NOT TO SCALE

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3/27/2026
REGISTRATION EXPIRES: 10/31/2026

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ITHACA TOMPKINS
INTERNATIONAL AIRPORT
72 BROWN ROAD
ITHACA, NY 14850

MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1

REVISIONS

PROJECT NO:	158.095.001
DATE:	MARCH 2026
DRAWN BY:	A.M. CALABRESE
DESIGNED BY:	A.M. CALABRESE
CHECKED BY:	A.J. MILNE, P.E.

NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK EDUCATION LAW

DETAILS

M-503

HEAT PUMP DOAS UNIT SCHEDULE-(DOAS)(NOT IN CONTRACT)

UNIT NO.	LOC.	AREA SERVED	AIR FLOW (CFM)	HEAT PUMP - HEATING PERFORMANCE		HEAT PUMP - COOLING PERFORMANCE						COMPRESSORS		ELECTRIC PREHEAT				WATER-SIDE PERFORMANCE (25%P.G.)								SUPPLY AIR FAN			EER (SEER)	ELECTRICAL DATA				WEIGHT (LBS)	BASIS OF DESIGN		REMARKS
				INPUT MBH	EAT (°F)	LAT (°F)	TOTAL MBH	SENSIBLE MBH	EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)	QUANTITY	# OF STAGES	KW	MBH	EAT(°F)	LAT(°F)	APD	COOLING				HEATING PERFORMANCE				ESP (IN WG)	RPM	HP		VOLTS	PHASE	MCA	MOCP		MANUFACTURER	MODEL	
																				EWT (°F)	LWT (°F)	GPM	WPD (FT.HD.)	EWT (°F)	LWT (°F)	GPM	WPD (FT.HD.)											
DOAS-1	EXTERIOR	OFFICE AREA	1680	95.1	35	87.2	92.4	60.4	88.0	71.0	52.1	52.1	1	--	30	102.4	-5.0	35.0	0.02	85.0	95.0	24.0	15.4	35.0	28.2	24.0	15.4	1.50	1760	2	13.1	480	3	65	70	1365	AAON	RNA-008-A-A-3-GL B0A-00000	ALL

NOT IN CONTRACT

1. PROVIDE UNIT WITH SINGLE POINT POWER CONNECTION.
2. PROVIDE MERV 13 PLEATED FILTERS.
3. PROVIDE UNIT WITH R-454B REFRIGERANT.
4. PROVIDE UNIT WITH VARIABLE CAPACITY COMPRESSOR
5. PROVIDE SCR CONTROL ON ELECTRIC PREHEAT HEATER
6. PROVIDE UNIT WITH 115V CONVENIENCE OUTLET
7. PROVIDE UNIT WITH DOUBLE WALL CONSTRUCTION WITH R-16 FOAM INSULATION
8. PROVIDE UNIT WITH SIDE DISCHARGE DUCT CONFIGURATION

LOUVER SCHEDULE (L)

UNIT NO.	SERVICE	TYPE	DEPTH (IN.)	WIDTH (IN.)	HEIGHT (IN.)	FREE AREA (SQ FT)	% FREE AREA	CFM	APD (IN WG)	FACE VELOCITY(FPM)	MATERIAL	FINISH	BIRD SCREEN	BASIS OF DESIGN		REMARKS
														MANUFACTURER	MODEL	
LV-1	MAU-1	FIXED, DRAINABLE	6	60	48	10.00	50	3750	0.10	375	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-2	MAU-2	FIXED, DRAINABLE	6	60	48	10.00	50	3750	0.10	375	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-3	MAU-3	FIXED, DRAINABLE	6	60	48	10.00	50	3750	0.10	375	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-4	MAU-4	FIXED, DRAINABLE	6	60	48	10.00	50	3750	0.10	375	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-5	MAU-5	FIXED, DRAINABLE	6	60	48	10.00	50	3750	0.10	375	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-6	MAU-6	FIXED, DRAINABLE	6	60	48	10.00	50	3450	0.10	345	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-7	MAU-7	FIXED, DRAINABLE	6	60	48	10.00	50	3450	0.10	345	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	EHH-601	1,3
LV-8	F-4	FIXED, DRAINABLE	6	18	18	1.13	50	900	0.10	800	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	ESD	2,3
LV-9	F-5	FIXED, DRAINABLE	6	18	18	1.13	50	400	0.10	356	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	ESD	2,3
LV-10	F-4	FIXED, DRAINABLE	6	18	18	1.13	50	750	0.10	667	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	ESD	2,3
LV-11	F-4	FIXED, DRAINABLE	6	18	18	1.13	50	400	0.10	356	ALUMINUM	2-COAT KYNAR	Yes	GREENHECK	ESD	2,3

1. PROVIDE 24 VAC AUTOMATIC AIR DAMPER INTERLOCK DAMPER TO OPEN WHEN SUPPLY FAN IS ON.
2. PROVIDE BACKDRAFT DAMPER
3. COORDINATE FINAL COLOR/FINISH WITH ARCHITECT.

MAKE UP AIR SCHEDULE (MAU) - HYDRONIC

UNIT NO.	LOCATION	AREA SERVED	SUPPLY (CFM)	MIN OA (CFM)	HOT WATER HEATER							SUPPLY FAN					ELECTRICAL			WEIGHT (LBS)	BASIS OF DESIGN		REMARKS
					CAPACITY (MBH)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	APD (IN WG)	GPM	TYPE	FAN BHP	RPM	TSP (IN WG)	ESP (IN WG)	VOLTS	PHASE	HP		MANUFACTURER	MODEL	
MAU-1	ARFF GARAGE	ARFF GARAGE	3750	0	310.0	-5.0	70.4	130	110	0.4	32	DIRECT	3.18	2519	3.4	2.0	480	3	5	1450	DAIKIN	CAH008GHGC	ALL
MAU-2	ARFF GARAGE	ARFF GARAGE	3750	0	310.0	-5.0	70.4	130	110	0.4	32	DIRECT	3.18	2519	3.4	2.0	480	3	5	1450	DAIKIN	CAH008GHGC	ALL
MAU-3	SRE GARAGE	SRE GARAGE	3450	0	281.0	-5.0	70.0	130	110	0.6	29.4	DIRECT	3.59	3422	3.7	2.0	480	3	3	1425	DAIKIN	CAH006GHGC	ALL
MAU-4	SRE GARAGE	SRE GARAGE	3450	0	281.0	-5.0	70.0	130	110	0.6	29.4	DIRECT	3.59	3422	3.7	2.0	480	3	3	1425	DAIKIN	CAH006GHGC	ALL
MAU-5	SRE GARAGE	SRE GARAGE	3450	0	281.0	-5.0	70.0	130	110	0.6	29.4	DIRECT	3.59	3422	3.7	2.0	480	3	3	1425	DAIKIN	CAH006GHGC	ALL
MAU-6	SRE GARAGE	SRE GARAGE	3450	0	281.0	-5.0	70.0	130	110	0.6	29.4	DIRECT	3.59	3422	3.7	2.0	480	3	3	1425	DAIKIN	CAH006GHGC	ALL
MAU-7	SRE GARAGE	SRE GARAGE	3450	0	281.0	-5.0	70.0	130	110	0.6	29.4	DIRECT	3.59	3422	3.7	2.0	480	3	3	1425	DAIKIN	CAH006GHGC	ALL

1
1. PROVIDE UNIT WITH SINGLE POINT POWER CONNECTION.
2. PROVIDE MERV 8 PREFILTERS AND MERV 13 PLEATED FILTERS.
3. PROVIDE UNIT WITH R-13 INJECTED FOAM INSULATION.
4. PROVIDE UNIT WITH HORIZONTAL (END TO END) DUCT CONFIGURATION.
5. PROVIDE UNIT WITH FREEZE PROTECTION
6. PROVIDE UNIT WITH FACE AND BYPASS OPTION.

FAN SCHEDULE (EF & F)

MARK	SERVICE	LOCATION	TYPE	ARRANGEMENT	CFM	MIN AIRFLOW (CFM)	ESP (IN WG)	BHP	RPM	MAX. SONES	ELECTRICAL DATA			BASIS OF DESIGN		REMARKS
											VOLTS	PHASE	HP(WATTS)	MANUFACTURER	MODEL	
EF-1	BATHROOM	ROOF	BELT	DOWNBLAST	975	975	.5	.19	1389	8.2	480	3	1/4	GREENHECK	GB-100	8
EF-2	GARAGE EXHUAST	ARFF GARAGE	BELT	DOWNBLAST	3700	500	.25	.41	559	9.8	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-3	GARAGE EXHUAST	ARFF GARAGE	BELT	DOWNBLAST	3700	0	.25	.41	559	9.8	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-4	GARAGE EXHUAST	SRE GARAGE	BELT	DOWNBLAST	3450	1050	.25	.36	532	8.9	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-5	GARAGE EXHUAST	SRE GARAGE	BELT	DOWNBLAST	3450	0	.25	.36	532	8.9	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-6	GARAGE EXHUAST	SRE GARAGE	BELT	DOWNBLAST	3450	0	.25	.36	532	8.9	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-7	GARAGE EXHUAST	SRE GARAGE	BELT	DOWNBLAST	3450	0	.25	.36	532	8.9	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-8	GARAGE EXHUAST	SRE GARAGE	BELT	DOWNBLAST	3450	0	.25	.36	532	8.9	480	3	1/2	GREENHECK	GB-220	1,3,4,5,9
EF-9	KITCHEN	KITCHEN	DIRECT	IN-LINE	150	150	.375	.04	1692	5.6	120	1	- -	GREENHECK	SQ-70-VG	8
F-1	EXTRACTOR	WASHER/EXTRACTOR	DIRECT	INLINE	300	300	1.5	--	1560	--	120	1	1/2	TJERNLUND	CDB8	8
F-2	DRYER	CBAS	DIRECT	INLINE	160	160	--	--	3000	--	120	1	(50)	TJERNLUND	LB2	8
F-4	MECHANICAL	MECHANICAL	DIRECT	INLINE	900	450	.5	.14	1579	7.8	120	1	1/4	GREENHECK	SQ-9-M1-VG	2,3,5,6,9
F-5	ELECTRICAL	ELECTRICAL	DIRECT	INLINE	400	0	.5	.08	1634	8.1	120	1	1/6	GREENHECK	SQ-90	2,3,5,6,9
F-6	TOOL PARTS &WORKSHOP	MECHANICAL	DIRECT	INLINE	750	0	.5	.11	1448	7.6	120	1	1/6	GREENHECK	SQ-9-M1-VG	2,3,5,6,9
F-7	SHOP STORAGE	MECHANICAL	DIRECT	INLINE	400	0	.5	.08	1634	7.1	120	1	1/6	GREENHECK	SQ-90	2,3,5,6,9

1. PROVIDE 14" H ROOF CURB.
2. PROVIDE BACKDRAFT DAMPER.
3. PROVIDE 24VAC AUTOMATIC AIR DAMPER AT OPENING.
4. FAN SHALL BE INTERLOCKED WITH MAU'S. REFER TO SOO.
5. FAN SHALL BE TIED INTO A THERMOSTAT AND OPERATE WHEN THE SPACE TEMPERATURE EXCEEDS SETPOINT.
6. PROVIDE NEOPRENE VIBRATION ISOLATORS.
7. PROVIDE POSITIVE AIR FLOW PRESSURE SWITCH
8. NOT IN CONTRACT
9. PROVIDE WITH VFD IF EC MOTOR IS NOT AVAILABLE.

1

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UNIT HEATER SCHEDULE- HOT-GLYCOL (UH)

UNIT NO.	LOCATION	MOUNTING HEIGHT	SUPPLY CFM	HEATING PERFORMANCE - 30%P.G.						ELECTRICAL			WEIGHT (LBS)	BASIS OF DESIGN		REMARKS
				CAPACITY (MBH)	EAT(°F)	LAT(°F)	EWT(°F)	LWT(°F)	GPM	VOLTS	PHASE	HP		MANUFACTURER	MODEL	
UH-1	ARFF GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-2	ARFF GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-3	ARFF GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-4	SRE GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-5	SRE GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-6	SRE GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-7	SRE GARAGE	18'-0"	2660	60	60.0	80.8	130.0	110.0	11	480	3	1/3	70	MODINE	V 139	ALL
UH-8	STORAGE	10'	695	19	60.0	82.0	130.0	110.0	2	120	1	1/25	50	MODINE	HC 33	1
UH-9	STORAGE	10'	695	19	60.0	82.0	130.0	110.0	2	120	1	1/25	50	MODINE	HC 33	1
UH-10	MECHANICAL ROOM	10'	695	19	60.0	82.0	130.0	110.0	2	120	1	1/25	50	MODINE	HC 33	1

1
1. UNIT HEATERS SHALL BE TIED INTO A WALL MOUNTED THERMOSTAT AND OPERATE WHEN SPACE TEMPERATURE EXCEEDS SETPOINT.
2. PROVIDE UNIT WITH THE TRUNCONE ACCESSORY
3. COORDINATE WITH ELECTRICAL LIGHTING LAYOUT FOR FINAL LOCATIONS OF UNIT HEATER. PROPOSED TO BE LOCATED BETWEEN TRUCK BAYS.

AIR COOLED CONDENSING UNIT SCHEDULE (ACCU)

UNIT NO.	LOCATION	UNIT SERVED	REFRIGERANT TYPE	TOTAL HEAT REJECTION (MBH)	AMBIENT (F)	COMPRESSORS			FANS			EER (SEER)	ELECTRICAL				BASIS OF DESIGN		REMARKS
						QTY	TYPE	# OF STAGES	QTY	CFM (EA)	HP (EA)		VOLTS	PHASE	MCA	MOP	MANUFACTURER	MODEL	
ACCU-1	EXTERIOR	DS-1	R454b	36	90	1	INVERTER	VARIABLE	1	3413	0.185	10.5	208	1	25	45	HITACHI	RAS-4.0PNNBDH1	ALL

1
1. PROVIDE UNIT WITH SINGLE POINT POWER CONNECTION.
2. PROVIDE 18"H QUICKSLING EQUIPMENT STAND.
3. ACCU-1 SHALL POWER INDOOR UNIT (DS-1)
4. PROVIDE WITH LOW AMBIENT KIT.

DUCTLESS INDOOR SPLIT SYSTEM SCHEDULE (DS)

UNIT NO.	CONDENSING UNIT LOCATION	AREA SERVED	NOMINAL CAPACITY (TONS)	TOTAL COOLING (MBH)	SENSIBLE COOLING (MBH)	NOMINAL CFM	MINIMUM SEER	ELECTRIC		BASIS OF DESIGN		REMARKS
								VOLTS	PHASE	MANUFACTURER	MODEL	
DS-1	IT ROOM	TELECOM ROOM	3.0	36.8	36.8	940	14	208	1	HITACHI	RCI-4.0PNN1DH	ALL

1. UNIT SHALL BE POWERED FROM ACCU-1.
2. PROVIDE DIGITAL WALL MOUNTED THERMOSTAT
3. PROVIDE CONDENSATE PUMP AND ROUTE TO NEAREST DRAIN.

DIFFUSER AND GRILLE SCHEDULE (S&R)

TYPE	DESCRIPTION	FACE SIZE	MAX. N.C.	APD	MATERIAL	FINISH	CEILING TYPE	BASIS OF DESIGN		REMARKS
								MANUFACTURER	MODEL	
E1	PERFORATED EXHAUST REGISTER	SEE PLANS	25	0.08	STEEL	WHITE	LAY-IN	PRICE	PDR	1,2,4
R1	PERFORATED RETURN REGISTER	SEE PLANS	25	0.08	STEEL	WHITE	LAY-IN	PRICE	PDR	1,2,4
R2	RETURN GRILLE	SEE PLANS	25	0.08	STEEL	WHITE	N/A	PRICE	535	1,2,4
S1	SQUARE CONE DIFFUSER	SEE PLANS	25	0.08	STEEL	WHITE	LAY-IN	PRICE	SCD	1,2,4
S2	HIGH CAPACITY DRUM LOUVERS	SEE PLANS	30	0.10	STEEL	WHITE	N/A	PRICE	HCD	1,2,3

1. COORDINATE FINAL COLOR/FINISH SELECTION WITH ARCHITECT.
2. PROVIDE OPPOSED BLADE DAMPER.
3. PROVIDE SPIRAL DUCT MOUNTING FRAME WITH INTEGRAL DAMPER.
4. PROVIDE INSULATED BACKING BLANKET.

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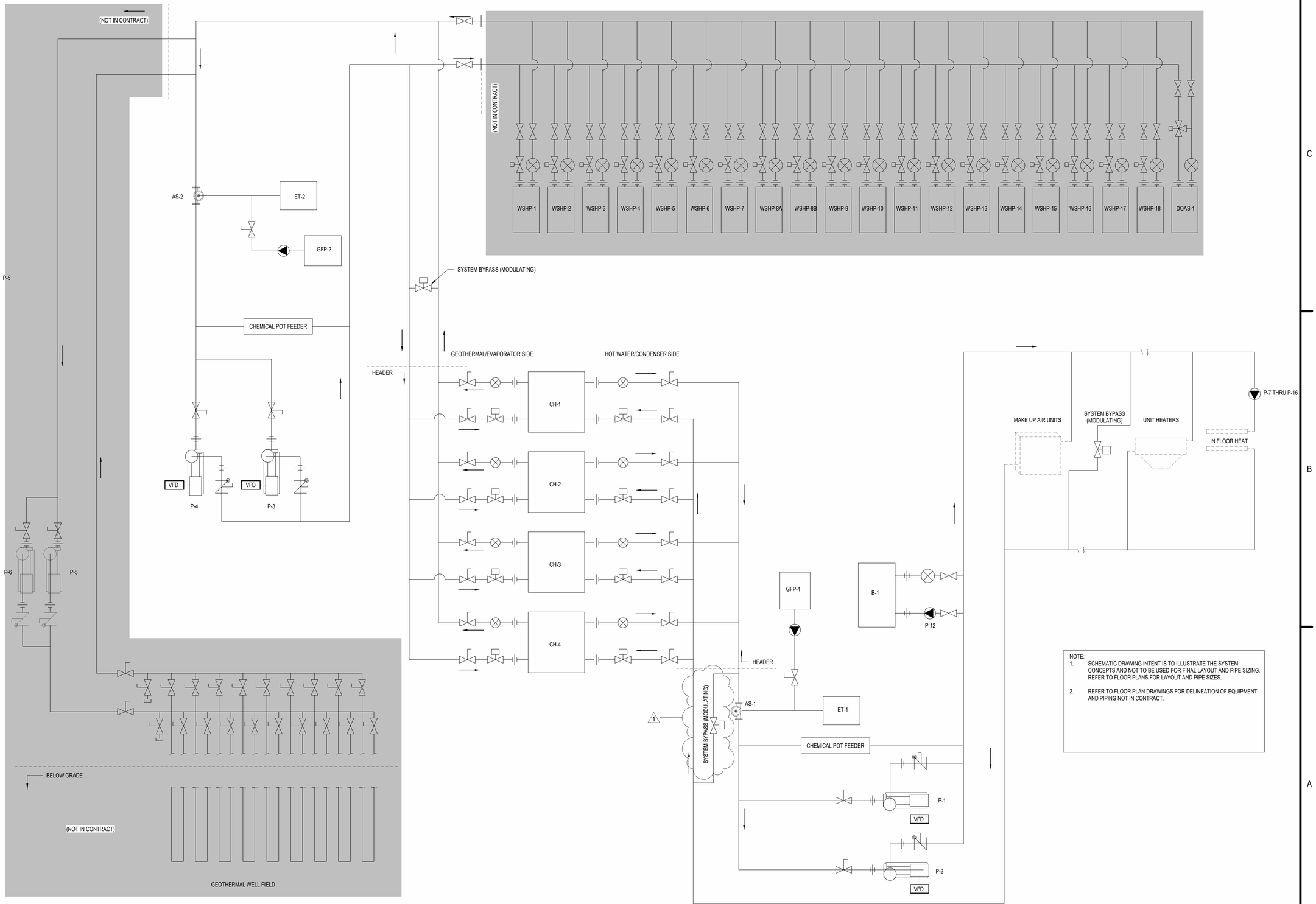
DESIGNED BY: A.M. CALABRESE
CHECKED BY: A.J. MILNE, P.E.

SCHEDULES

M-601



NOTE:
1. SCHEMATIC DRAWING INTENT IS TO ILLUSTRATE THE SYSTEM CONCEPTS AND NOT TO BE USED FOR FINAL LAYOUT AND PIPE SIZING. REFER TO FLOOR PLANS FOR LAYOUT AND PIPE SIZES.
2. REFER TO FLOOR PLAN DRAWINGS FOR DELINEATION OF EQUIPMENT AND PIPING NOT IN CONTRACT.

A1 WATER-TO-WATER SOURCE HEAT PUMP SYSTEM SCHEMATIC
SCALE: NOT TO SCALE

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DESIGNED BY:	A.M. CALABRESE
CHECKED BY:	A.J. MILNE, P.E.

SCHEMATICS

M-701

SEQUENCE OF OPERATIONS

WATER SOURCE HEAT PUMP (WSHP) – GEOTHERMAL SYSTEM (NOT IN CONTRACT):

NOT IN CONTRACT

1. BUILDING AUTOMATION SYSTEM (BAS) INTERFACE
   THE WSHP UNIT CONTROLLER SHALL RECEIVE COMMANDS FROM THE BAS INCLUDING OCCUPIED/UNOCCUPIED MODE, HEAT/COOL MODE, MORNING WARM-UP, AND DEHUMIDIFICATION (IF APPLICABLE). IF BAS COMMUNICATION IS LOST OR NOT PRESENT, THE UNIT SHALL OPERATE USING FACTORY DEFAULT MODES AND SETPOINTS.
2. OCCUPIED MODE
   DURING OCCUPIED OPERATION THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY. DX HEATING AND COOLING SHALL MODULATE TO MAINTAIN ACTIVE SPACE TEMPERATURE SETPOINT (72˚F, ADJ).
3. UNOCCUPIED MODE
   THE UNIT SHALL CYCLE TO MAINTAIN SETBACK TEMPERATURES. WHEN SPACE TEMPERATURE FALLS BELOW 60.0°F (ADJ.), THE SUPPLY FAN SHALL START AND DX HEATING SHALL ENABLE. WHEN SPACE TEMPERATURE RISES ABOVE 64.0°F (ADJ.), THE FAN SHALL STOP AND HEATING SHALL DISABLE. WHEN SPACE TEMPERATURE RISES ABOVE 85.0°F (ADJ.), THE SUPPLY FAN SHALL START AND DX COOLING SHALL ENABLE. WHEN SPACE TEMPERATURE FALLS BELOW 80.0°F (ADJ.), THE FAN SHALL STOP AND COOLING SHALL DISABLE.
4. COOLING CONTROL
   DX COOLING SHALL STAGE BASED ON DEVIATION FROM SPACE AIR TEMPERATURE SETPOINT AND SHALL DISABLE WHEN TEMPERATURE FALLS BELOW SETPOINT. DURING LOW SENSIBLE LOAD CONDITIONS THE SUPPLY FAN MAY MODULATE TO ENHANCE DEHUMIDIFICATION PERFORMANCE.
5. HEATING CONTROL
   DX HEATING SHALL ENABLE WHEN SPACE TEMPERATURE FALLS BELOW SETPOINT AND DISABLE WHEN ABOVE SETPOINT.
6. SUPPLY FAN OPERATION
   SUPPLY FAN SHALL OPERATE CONTINUOUSLY IN OCCUPIED MODE AND CYCLE AS REQUIRED IN UNOCCUPIED MODE. IF FAN STATUS IS NOT PROVEN WITHIN 30 SECONDS (ADJ.) THE FAN SHALL BE COMMANDED OFF AND AN ALARM SHALL ANNUNCIATE AT THE BAS, AND MANUAL RESET SHALL BE REQUIRED.
7. FILTER STATUS
   DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR PRESSURE ACROSS FAN/FILTER. IF FAULT PERSISTS FOR 40 SECONDS AFTER FAN COMMAND A FAN FAILURE ALARM SHALL ANNUNCIATE AT THE BAS, THE FAN SHALL STOP, AND MANUAL RESET SHALL BE REQUIRED.
8. REFRIGERANT LEAK MITIGATION
   UNIT SHALL MONITOR REFRIGERANT LEAK DETECTION EVERY 5 SECONDS. UPON DETECTION MITIGATION SHALL ACTIVATE. SUPPLY FAN SHALL REMAIN OPERATIONAL AND ALL COMPRESSORS SHALL BE DISABLED FOR DURATION OF MITIGATION PLUS 5 MINUTES.
9. CONTROL VALVE.
   ISOLATION VALVE SHALL OPEN WHEN ANY COMPRESSOR IS ACTIVE AND SHALL CLOSE WHEN ALL CALLS ARE DISABLED.

SRE / ARFF EXHAUST FANS (EF)

1. BUILDING AUTOMATION SYSTEM (BAS) INTERFACE
   THE SRE / ARFF EXHAUST FANS SHALL BE CONTROLLED AUTOMATICALLY BY THE BAS BASED ON CARBON MONOXIDE (CO) AND NITROGEN DIOXIDE (NO2) SENSOR INPUTS.
2. NORMAL AND MINIMUM OPERATION
   DURING NORMAL CONDITIONS WHEN CO AND NO2 LEVELS ARE BELOW ALARM SETPOINTS, THE BAS SHALL MAINTAIN THE MINIMUM REQUIRED EXHAUST AIRFLOW FOR THE SPACE. ONE (1) EXHAUST FAN SHALL OPERATE CONTINUOUSLY AS THE LEAD FAN AND MAINTAIN AN EXHAUST AIRFLOW SETPOINT OF 0.05 CFM/SQFT (ADJ) IF CO OR NO2 LEVELS BEGIN TO RISE ABOVE THEIR RESPECTIVE SETPOINTS, ADDITIONAL EXHAUST FANS SHALL BE ENABLED AND MODULATED AS REQUIRED TO MAINTAIN GAS CONCENTRATIONS BELOW SETPOINT. THE LEAD FAN SHALL ROTATE AUTOMATICALLY BASED ON RUN TIME.
3. LEAD FAN SELECTION
   THE LEAD EXHAUST FAN SHALL BE SELECTED BY THE BAS AND SHALL ROTATE AUTOMATICALLY BASED ON RUN TIME TO EQUALIZE WEAR. UPON FAILURE OF THE LEAD FAN THE BAS SHALL ENABLE THE NEXT AVAILABLE FAN AND ANNUNCIATE AN ALARM.
4. HIGH GAS MITIGATION OPERATION
   UPON DETECTION OF CARBON MONOXIDE (CO) OR NITROGEN DIOXIDE (NO2) ABOVE THE HIGH LIMIT SETPOINT, ALL EXHAUST FANS SERVING THE SPACE SHALL BE ENABLED. WHEN IN HIGH CONTAMINANT MODE, ALL ENABLED EXHAUST FANS SHALL MODULATE TOGETHER AND RAMP UP IN UNISON TO MAINTAIN GAS CONCENTRATIONS BELOW SETPOINT. FAN SPEED SHALL INCREASE AS REQUIRED UP TO MAXIMUM AIRFLOW WHEN GAS CONCENTRATIONS CONTINUE TO RISE.
5. RETURN TO MINIMUM OPERATION
   WHEN CO AND NO2 LEVELS HAVE REMAINED BELOW SETPOINT FOR 15 MINUTES (ADJUSTABLE) THE BAS SHALL COMMAND ALL NON LEAD EXHAUST FANS OFF AND RETURN THE LEAD EXHAUST FAN TO MINIMUM AIRFLOW OPERATION. ALL NON-LEAD EXHAUST FANS SHALL BE COMMANDED OFF, AND THE LEAD EXHAUST FAN SHALL RESUME MODULATION TO MAINTAIN MINIMUM EXHAUST AIRFLOW.
6. EXHAUST AIR DAMPERS
   THE EXHAUST AIR DAMPER ASSOCIATED WITH EACH FAN SHALL OPEN PRIOR TO FAN START AND SHALL PROVE FULLY OPEN. WHEN A FAN IS COMMANDED OFF ITS ASSOCIATED DAMPER SHALL CLOSE.
7. FAN STATUS
   IF ANY EXHAUST FAN FAILS TO PROVE STATUS WITHIN 30 SECONDS ADJUSTABLE THE FAN SHALL BE COMMANDED OFF AND AN ALARM SHALL ANNUNCIATE AT THE BAS. MANUAL RESET SHALL BE REQUIRED.

MAKE-UP AIR UNITS (MAU) – SRE AND ARFF

1. BUILDING AUTOMATION SYSTEM (BAS) INTERFACE
   THE MAKE-UP AIR UNITS SHALL BE CONTROLLED BY THE BAS AND SHALL OPERATE IN DIRECT COORDINATION WITH THE ASSOCIATED EXHAUST FANS.
2. NORMAL AND MINIMUM OPERATION
   DURING NORMAL CONDITIONS WHEN CO AND NO$_2$ LEVELS ARE BELOW ALARM SETPOINTS, THE BAS SHALL MAINTAIN THE MINIMUM REQUIRED MAKE-UP AIRFLOW FOR THE SPACE. ONE (1) MAKE-UP AIR UNIT SHALL OPERATE CONTINUOUSLY AS THE LEAD UNIT AND SHALL MODULATE TO MAINTAIN A MAKE-UP AIRFLOW SETPOINT MATCHING THE MINIMUM EXHAUST AIRFLOW OF 0.05 CFM/SQFT (ADJ.). IF CO OR NO2 LEVELS BEGIN TO RISE ABOVE THEIR RESPECTIVE SETPOINTS, ADDITIONAL MAKE-UP AIR UNITS SHALL BE ENABLED AND MODULATED IN COORDINATION WITH THE EXHAUST FANS TO MAINTAIN SPACE PRESSURE AND GAS CONCENTRATIONS BELOW SETPOINT. THE LEAD MAKE-UP AIR UNIT SHALL ROTATE AUTOMATICALLY BASED ON RUN TIME.
3. LEAD UNIT SELECTION
   THE LEAD MAKE-UP AIR UNIT SHALL BE SELECTED BY THE BAS AND SHALL ROTATE AUTOMATICALLY BASED ON RUN TIME. UPON FAILURE OF THE LEAD UNIT THE BAS SHALL ENABLE THE NEXT AVAILABLE UNIT AND ANNUNCIATE AN ALARM.
4. HIGH GAS MITIGATION OPERATION
   UPON DETECTION OF CO CONCENTRATION OF 50 PPM OR GREATER OR NO2 CONCENTRATION OF 3 PPM OR GREATER ALL MAKE-UP AIR UNITS SERVING THE AREA SHALL BE ENABLED. EACH UNIT SHALL MODULATE UP TO FULL DESIGN AIRFLOW TO TRACK EXHAUST AIRFLOW AND MAINTAIN SPACE PRESSURE AS SPECIFIED BY THE ENGINEER OF RECORD.
5. RETURN TO MINIMUM OPERATION
   WHEN CO AND NO2 LEVELS HAVE REMAINED BELOW SETPOINT FOR 15 MINUTES ADJUSTABLE THE BAS SHALL COMMAND ALL NON LEAD MAKE-UP AIR UNITS OFF AND RETURN THE LEAD MAKE-UP AIR UNIT TO MINIMUM AIRFLOW OPERATION.
6. SUPPLY AIR TEMPERATURE CONTROL
   THE HEATING COIL CONTROL VALVE SHALL MODULATE TO MAINTAIN A LEAVING AIR TEMPERATURE SETPOINT MEASURED BY A SUPPLY AIR TEMPERATURE SENSOR LOCATED DOWNSTREAM OF THE UNIT. THE LEAVING AIR TEMPERATURE SETPOINT SHALL BE ADJUSTABLE THROUGH THE BAS (70 DEGREES ADJ).
7. OUTDOOR AIR DAMPERS
   THE OUTDOOR AIR DAMPER ASSOCIATED WITH EACH MAKE-UP AIR UNIT SHALL OPEN PRIOR TO SUPPLY FAN START AND SHALL PROVE FULLY OPEN. WHEN A UNIT IS COMMANDED OFF ITS ASSOCIATED DAMPER SHALL CLOSE.
8. SUPPLY FAN STATUS
   IF A MAKE-UP AIR UNIT SUPPLY FAN FAILS TO PROVE STATUS WITHIN 30 SECONDS ADJUSTABLE THE FAN SHALL BE COMMANDED OFF AND AN ALARM SHALL ANNUNCIATE AT THE BAS. MANUAL RESET SHALL BE REQUIRED.
9. INTERLOCK WITH EXHAUST SYSTEM
   LOSS OF ASSOCIATED EXHAUST FAN OPERATION SHALL COMMAND THE MAKE-UP AIR UNIT TO A SAFE STATE AS DETERMINED BY THE BAS SEQUENCE OR ENGINEER OF RECORD.

HOT WATER PUMPS – P-1 & P-2 (MODULAR CHILLERS, UHS, AND MAU COILS)

1. GENERAL
   HOT WATER PUMPS SHALL SERVE MODULAR CHILLERS, UNIT HEATERS, AND MAU HEATING COILS. PUMPS SHALL BE ENABLED ONLY WHEN THERE IS A CALL FOR HEATING FROM ANY CONNECTED COIL.
2. ENABLE AND DISABLE
   PUMPS SHALL START WHEN ANY CALL FOR HEATING IS ACTIVE AND SHALL STOP WHEN NO HEATING CALLS EXIST.
3. VARIABLE SPEED OPERATION
   PUMPS SHALL MODULATE SPEED BASED ON A DIFFERENTIAL PRESSURE (DP) SENSOR LOCATED IN THE DISTRIBUTION PIPING TO MAINTAIN SYSTEM DP. PUMP SPEED SHALL INCREASE AS VALVE OPENING INCREASES AND DECREASE AS VALVES CLOSE.
4. MINIMUM FLOW PROTECTION
   THE HOT WATER PUMP SHALL MAINTAIN A MINIMUM SPEED TO ENSURE REQUIRED MINIMUM FLOW. THE REMOTE COIL SHALL HAVE A THREE WAY BYPASS VALVE TO ALLOW PUMP MINIMUM FLOW UNDER LOW LOAD CONDITIONS.
5. MULTIPLE PUMP LEAD/LAG OPERATION
   IF MULTIPLE HOT WATER PUMPS ARE PROVIDED, THEY SHALL OPERATE IN A LEAD/LAG CONFIGURATION WITH AUTOMATIC ROTATION BASED ON ACCUMULATED RUN TIME. PUMPS SHALL BE STAGED TO OPERATE CONCURRENTLY AS REQUIRED TO SATISFY SYSTEM FLOW OR DIFFERENTIAL PRESSURE DEMAND. UPON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL AUTOMATICALLY START, AND AN ALARM SHALL BE ANNUNCIATED AT THE BAS.
6. PUMP STATUS AND ALARMS
   IF A HOT WATER PUMP FAILS TO PROVE STATUS WITHIN 30 SECONDS ADJUSTABLE THE PUMP SHALL BE COMMANDED OFF AND AN ALARM SHALL ANNUNCIATE AT THE BAS. MANUAL RESET SHALL BE REQUIRED.

MODULAR HEAT PUMP UNITS (HOT WATER MODEL) – 4 UNIT ARRAY

1. GENERAL
   THE FOUR (4) FWCD SERIES MODULAR HEAT PUMP UNITS SHALL BE HEADERED TO PROVIDE HOT WATER TO THE DISTRIBUTION SYSTEM FROM THE GEOTHERMAL LOOP. EACH UNIT SHALL HAVE FACTORY CONTROLS AND SHALL COMMUNICATE WITH THE BAS OVER BACNET OR MODBUS.
2. BAS INTERFACE
   THE BAS SHALL SEND ENABLE/DISABLE COMMANDS AND HOT WATER TEMPERATURE SETPOINTS. EACH UNIT SHALL PROVIDE STATUS, ALARMS, AND OPERATING DATA TO THE BAS.
3. ENABLE / DISABLE
   UNITS SHALL ENABLE ON A CALL FOR HEATING WHEN DISTRIBUTION HOT WATER TEMPERATURE FALLS BELOW SETPOINT (130°F, ADJ.) MINUS DIFFERENTIAL. UNITS SHALL DISABLE WHEN DISTRIBUTION HOT WATER TEMPERATURE IS ABOVE SETPOINT PLUS DIFFERENTIAL AND NO LOAD EXISTS.
4. STAGING / ARRAY CONTROL
   UNITS SHALL STAGE BASED ON SYSTEM LOAD. ADDITIONAL UNITS SHALL ENABLE IN SEQUENCE AS HOT WATER DEMAND INCREASES. UNITS SHALL DISABLE IN REVERSE SEQUENCE AS LOAD DECREASES. LEAD UNIT SHALL BE ROTATED PERIODICALLY TO BALANCE RUN TIME.
5. CAPACITY CONTROL
   EACH UNIT SHALL MODULATE CAPACITY TO MAINTAIN HOT WATER TEMPERATURE SETPOINT WITHIN MANUFACTURER`S CONTROL BAND. PART-LOAD OPERATION SHALL BE HANDLED INTERNALLY BY THE UNIT CONTROLLER.
6. FLOW INTERLOCKS
   THE UNITS SHALL MONITOR GEOTHERMAL LOOP FLOW VIA PUMPS AND FLOW SWITCHES. UNITS SHALL NOT ENABLE IF LOOP FLOW IS BELOW MINIMUM. THE DISTRIBUTION LOOP SHALL PROVIDE THREE-WAY BYPASS AT REMOTE COILS TO MAINTAIN MINIMUM HOT WATER FLOW.
7. PROTECTIONS
   EACH UNIT SHALL PROVIDE HIGH AND LOW PRESSURE PROTECTION, COMPRESSOR/HEAT PUMP OVERLOAD PROTECTION, AND INTERNAL SAFETY SHUTDOWNS. DISCRETE ALARMS SHALL ANNUNCIATE TO THE BAS.
8. COMMUNICATION FAILSAFE
   IF COMMUNICATION WITH THE BAS IS LOST, EACH UNIT SHALL CONTINUE TO OPERATE USING FACTORY DEFAULT CONTROL LOGIC TO PROVIDE HOT WATER LOAD AS BEST AS POSSIBLE.
9. ALARMS AND STATUS
   THE FOLLOWING CONDITIONS SHALL ANNUNCIATE AT THE BAS:
   - UNIT ENABLE/DISABLE
   - COMPRESSOR FAULTS
   - LOW OR HIGH PRESSURE
   - COMMUNICATION LOSS
   - LOW FLOW
   - OTHER MANUFACTURER DETECTED ALERTS

BOILER OPERATION (B-1)

1. GENERAL
   THE BOILER SHALL ACT AS SUPPLEMENTAL HEAT-SOURCE FOR THE BUILDING HEATING DISTRIBUTION SYSTEM. IF ALL MODULAR CHILLERS ARE RUNNING AND CANNOT MEET THE HOT-WATER LOOP TEMPERATURE SETPOINT (130°F), THE BOILER CIRCULATION PUMP (P-17) SHALL ENABLE AND THE BOILER SHALL STAGE ON ACCORDINGLY TO HELP SATISFY THE SUPPLY TEMPERATURE SETPOINT.
2. ENABLE AND DISABLE
   THE BOILER SHALL ENABLE UPON A CALL FOR HEATING FROM THE BUILDING AUTOMATION SYSTEM (BAS) WHEN HOT WATER SUPPLY TEMPERATURE FALLS BELOW SETPOINT. THE BOILER SHALL DISABLE WHEN HOT WATER SUPPLY TEMPERATURE RISES ABOVE SETPOINT AND NO HEATING LOAD EXISTS.
3. TEMPERATURE CONTROL
   THE BOILER SHALL MODULATE FIRING RATE TO MAINTAIN HOT WATER SUPPLY TEMPERATURE SETPOINT AS PROVIDED BY THE BAS IN THE HOT WATER LOOP (BUILDING LOOP).
4. SAFETIES
   THE BOILER SHALL SHUT DOWN UPON HIGH LIMIT TEMPERATURE, LOW WATER CUTOUT, ELEMENT FAILURE, OR OTHER FACTORY SAFETY CONDITIONS. ALARMS SHALL ANNUNCIATE AT THE BAS.

MECHANICAL ROOM VENTILATION (F-7)

1. TEMPERATURE CONTROL
   THE MECHANICAL ROOM EXHAUST FAN SHALL ENABLE WHEN SPACE TEMPERATURE EXCEEDS 80°F (ADJ.). THE FAN SHALL DISABLE WHEN SPACE TEMPERATURE FALLS BELOW 75°F (ADJ.).
2. REFRIGERANT LEAK DETECTION
   UPON DETECTION OF A REFRIGERANT LEAK BY THE LEAK DETECTION SYSTEM, THE MECHANICAL ROOM EXHAUST FAN SHALL ENABLE AND OPERATE CONTINUOUSLY UNTIL THE ALARM CONDITION IS CLEARED. IF THE REFRIGERANT LEAK DETECTION SYSTEM FAILS, LOSES COMMUNICATION, OR SIGNAL IS NOT PRESENT, THE EXHAUST FAN SHALL DEFAULT TO CONTINUOUS OPERATION. AN ALARM SHALL ANNUNCIATE AT THE BAS.

ELECTRICAL ROOM AND TOOL STORAGE VENTILATION (F-8 & F-9)

1. TEMPERATURE CONTROL
   THE EXHAUST FAN SHALL ENABLE WHEN SPACE TEMPERATURE EXCEEDS 80°F (ADJ.). THE FAN SHALL DISABLE WHEN SPACE TEMPERATURE FALLS BELOW 75°F (ADJ.).
2. FAILSAFE
   IF SPACE TEMPERATURE SENSOR FAILS THE FAN SHALL OPERATE CONTINUOUSLY UNTIL THE SENSOR IS RESTORED.

IN-FLOOR HEATING

1. GENERAL
   THE IN-FLOOR HEATING SYSTEM SHALL PROVIDE RADIANT HEATING TO MAINTAIN SPACE TEMPERATURE. THE SYSTEM SHALL UTILIZE HOT WATER CIRCULATING THROUGH EMBEDDED FLOOR PIPING.
2. HEATING ENABLE
   THE BAS SHALL ENABLE THE IN-FLOOR HEATING SYSTEM WHEN SPACE TEMPERATURE FALLS BELOW THE HEATING SETPOINT (60°F. ADJ.).
3. CIRCULATION PUMP OPERATION
   THE IN-FLOOR HEATING CIRCULATION PUMP SHALL ENABLE WHEN THERE IS A CALL FOR HEATING FROM THE ASSOCIATED SPACE TEMPERATURE SENSOR. THE PUMP SHALL DISABLE WHEN THE HEATING CALL IS SATISFIED.
4. TEMPERATURE CONTROL
   THE BAS SHALL MONITOR BOTH SPACE TEMPERATURE AND FLOOR TEMPERATURE SENSORS. THE HOT WATER CONTROL VALVE SHALL MODULATE TO MAINTAIN THE SPACE HEATING SETPOINT WHILE LIMITING FLOOR SURFACE TEMPERATURE.
5. FLOOR TEMPERATURE LIMITING
   THE FLOOR TEMPERATURE SENSOR SHALL PROVIDE MAXIMUM FLOOR TEMPERATURE LIMIT CONTROL TO PREVENT OVERHEATING OF THE FLOOR SURFACE. IF FLOOR TEMPERATURE EXCEEDS THE MAXIMUM FLOOR SETPOINT 85 (ADJ.), THE HOT WATER VALVE SHALL MODULATE CLOSED UNTIL FLOOR TEMPERATURE RETURNS BELOW THE LIMIT.
6. SYSTEM DISABLE
   WHEN SPACE TEMPERATURE RISES ABOVE THE HEATING SETPOINT AND FLOOR TEMPERATURE IS SATISFIED, THE HOT WATER VALVE SHALL CLOSE AND THE CIRCULATION PUMP SHALL STOP.
7. FAILSAFE OPERATION
   IF A FLOOR TEMPERATURE SENSOR FAILS, THE SYSTEM SHALL CONTINUE TO OPERATE BASED ON SPACE TEMPERATURE CONTROL ONLY AND AN ALARM SHALL ANNUNCIATE AT THE BAS.

UNIT HEATERS (UH-1 THRU UH-7)

1. GENERAL
   UNIT HEATERS SHALL PROVIDE SUPPLEMENTAL HEATING TO MAINTAIN SPACE TEMPERATURE. REFER TO PLANS TO SEE WHAT UNIT HEATERS ARE PAIRED WITH WHAT IN-FLOOR HEATING MANIFOLDS.
2. ENABLE
   WHEN SPACE TEMPERATURE FALLS BELOW HEATING SETPOINT THE HOT WATER VALVE SHALL OPEN AND THE UNIT HEATER FAN SHALL ENABLE.
3. DISABLE
   WHEN SPACE TEMPERATURE RISES ABOVE HEATING SETPOINT THE HOT WATER VALVE SHALL CLOSE AND THE FAN SHALL DISABLE.

GLYCOL FEED PUMPS

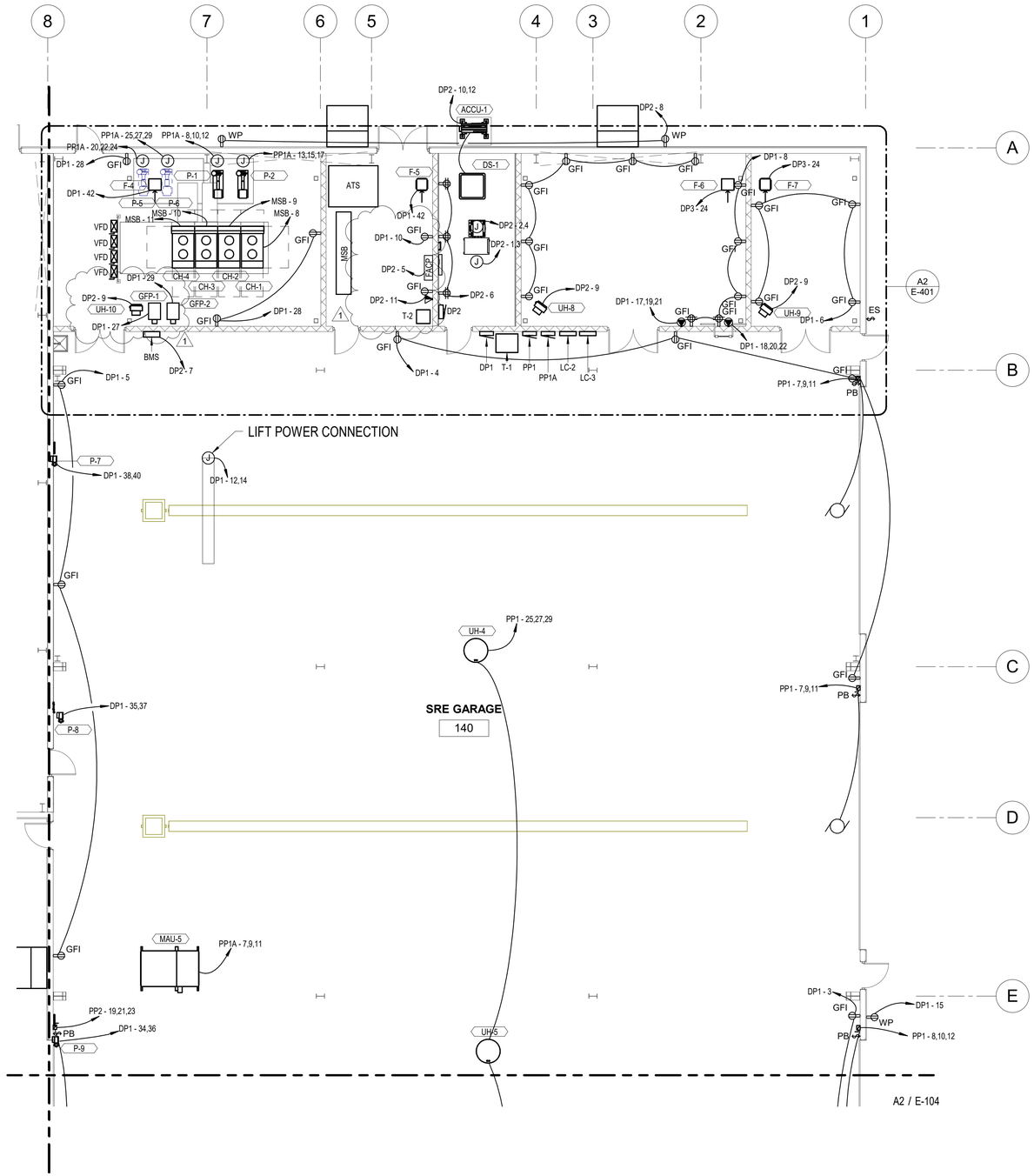
1. GENERAL
   THE GLYCOL FEED PUMP SHALL MAINTAIN PROPER GLYCOL CONCENTRATION AND SYSTEM PRESSURE IN THE CLOSED LOOP SYSTEM.
2. OPERATION
   THE PUMP SHALL ENABLE WHEN SYSTEM PRESSURE FALLS BELOW THE LOW PRESSURE SETPOINT.
3. DISABLE
   THE PUMP SHALL STOP WHEN SYSTEM PRESSURE IS RESTORED ABOVE THE HIGH PRESSURE SETPOINT.
4. ALARMS
   LOW GLYCOL LEVEL OR PUMP FAILURE SHALL ANNUNCIATE AT THE BAS.

COMMUNICATION ROOM AIR CONDITIONING

1. GENERAL
   THE COMMUNICATION ROOM AIR CONDITIONER SHALL MAINTAIN SPACE TEMPERATURE FOR SENSITIVE ELECTRONIC EQUIPMENT.
2. TEMPERATURE CONTROL
   THE UNIT SHALL ENABLE WHEN SPACE TEMPERATURE RISES ABOVE 75°F (ADJ.),THE UNIT SHALL DISABLE WHEN SPACE TEMPERATURE FALLS BELOW 70°F (ADJ.). CONTINUOUS OPERATION
   THE SUPPLY FAN SHALL OPERATE CONTINUOUSLY WHILE THE UNIT IS ENABLED.
3. ALARMS
   HIGH SPACE TEMPERATURE OR UNIT FAILURE SHALL ANNUNCIATE AT THE BAS.

Points List - HEATING SYSTEM

Point Name	POINTS										ALARMS					
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SPT)	ANALOG VALUE (INTERLOCK KNOW)	BINARY VALUE (INTERLOCK KNOW)	NETWORK (NET)	CHP ANALOG UNIT	CHP BINARY UNIT	BINARY	ASCII DIAGNOSTIC	DIGITAL FAIL	DIGITAL ALARM/TOTAL FAIL
CH1 GEOTHERMAL WATER RETURN ISO VALVE OPEN STATUS **CH1 GEOBV**	X	X													
CH1 GEOTHERMAL RETURN ISO VALVE OUTPUT **CH1 GEOBV**				X											
CH1 GEOTHERMAL WATER SUPPLY ISO VALVE OPEN STATUS **CH1 GEOBV**	X		X												
CH1 GEOTHERMAL WATER SUPPLY ISO VALVE OUTPUT **CH1 GEOBV**				X											
CH1 ENTERING WATER TEMPERATURE **CH1 ENT**		X								X	X				
CH1 HOT WATER RETURN ISO VALVE OPEN STATUS **CH1 HWBV**	X	X													
CH1 HOT WATER RETURN ISO VALVE OUTPUT **CH1 HWBV**				X											
CH1 HOT WATER SUPPLY ISO VALVE OPEN STATUS **CH1 HWBV**	X	X													
CH1 HOT WATER SUPPLY ISO VALVE OUTPUT **CH1 HWBV**				X											
CH1 ISO VALVE OPEN STATUS **CH1 IVLV**	X		X												
CH1 LEAVING WATER TEMPERATURE **CH1 LWT**		X								X	X				
CH1 ISO VALVE COMMAND **CH1 IVLV**	X			X											
CH1 SUPPLY WATER DIFFERENTIAL PRESSUE **CH1 DP**	X	X										X			
CH1 WATER FLOW STATUS **CH1 FLW**	X					X									
CH2 GEOTHERMAL WATER RETURN ISO VALVE OUTPUT **CH2 GEOBV**				X											
CH2 GEOTHERMAL WATER RETURN ISO VALVE OPEN STATUS **CH2 GEOBV**	X	X													
CH2 GEOTHERMAL WATER SUPPLY ISO VALVE OPEN STATUS **CH2 GEOBV**	X	X													
CH2 GEOTHERMAL WATER SUPPLY ISO VALVE OUTPUT **CH2 GEOBV**				X											
CH2 ENTERING WATER TEMPERATURE **CH2 ENT**		X								X	X				
CH2 HOT WATER RETURN ISO VALVE OPEN STATUS **CH2 HWBV**	X	X													
CH2 HOT WATER RETURN ISO VALVE OUTPUT **CH2 HWBV**				X											
CH2 HOT WATER SUPPLY ISO VALVE OPEN STATUS **CH2 HWBV**	X	X													
CH2 HOT WATER SUPPLY ISO VALVE OUTPUT **CH2 HWBV**				X											
CH2 ISO VALVE COMMAND **CH2 IVLV**	X			X											
CH2 ISO VALVE OPEN STATUS **CH2 IVLV**	X		X												
CH2 LEAVING WATER TEMPERATURE **CH2 LWT**		X								X	X				
CH2 WATER FLOW STATUS **CH2 FLW**	X					X									
CH2 SUPPLY WATER DIFFERENTIAL PRESSUE **CH2 DP**	X	X										X			
CH3 GEOTHERMAL WATER RETURN ISO VALVE OPEN STATUS **CH3 GEOBV**	X	X													
CH3 GEOTHERMAL WATER RETURN ISO VALVE OUTPUT **CH3 GEOBV**				X											
CH3 GEOTHERMAL WATER SUPPLY ISO VALVE OPEN STATUS **CH3 GEOBV**	X	X													
CH3 GEOTHERMAL WATER SUPPLY ISO VALVE OUTPUT **CH3 GEOBV**				X											
CH3 ENTERING WATER TEMPERATURE **CH3 ENT**	X	X								X	X				
CH3 HOT WATER RETURN ISO VALVE OPEN STATUS **CH3 HWBV**	X	X													
CH3 HOT WATER RETURN ISO VALVE OUTPUT **CH3 HWBV**				X											
CH3 HOT WATER SUPPLY ISO VALVE OPEN STATUS **CH3 HWBV**	X	X													
CH3 HOT WATER SUPPLY ISO VALVE OUTPUT **CH3 HWBV**				X											
CH3 ISO VALVE COMMAND **CH3 IVLV**	X			X											
CH3 ISO VALVE OPEN STATUS **CH3 IVLV**	X		X												
CH3 LEAVING WATER TEMPERATURE **CH3 LWT**		X								X	X				
CH3 SUPPLY WATER DIFFERENTIAL PRESSUE **CH3 DP**	X	X										X			
CH3 WATER FLOW STATUS **CH3 FLW**	X					X									
CH4 GEOTHERMAL WATER SUPPLY ISO VALVE OPEN STATUS **CH4 GEOBV**	X	X													
CH4 GEOTHERMAL WATER RETURN ISO VALVE OUTPUT **CH4 GEOBV**				X											
CH4 GEOTHERMAL WATER RETURN ISO VALVE OPEN STATUS **CH4 GEOBV**	X	X													
CH4 GEOTHERMAL WATER SUPPLY ISO VALVE OUTPUT **CH4 GEOBV**				X											
CH4 ENTERING WATER TEMPERATURE **CH4 ENT**	X	X								X	X				
CH4 HOT WATER RETURN ISO VALVE OPEN STATUS **CH4 HWBV**	X	X													
CH4 HOT WATER RETURN ISO VALVE OUTPUT **CH4 HWBV**				X											
CH4 HOT WATER SUPPLY ISO VALVE OUTPUT **CH4 HWBV**				X											
CH4 HOT WATER SUPPLY ISO VALVE OPEN STATUS **CH4 HWBV**	X	X													
CH4 ISO VALVE COMMAND **CH4 IVLV**	X			X											
CH4 ISO VALVE OPEN STATUS **CH4 IVLV**	X		X												
CH4 SUPPLY WATER DIFFERENTIAL PRESSUE **CH4 DP**	X	X										X			
CH4 LEAVING WATER TEMPERATURE **CH4 LWT**	X	X								X	X				
CH4 WATER FLOW STATUS **CH4 FLW**	X					X									
GEOTHERMAL WATER DISTRIBUTION SUPPLY DIFFERENTIAL PRESSURE **GEOWS DP**	X	X								X	X				
GEOTHERMAL WATER DISTRIBUTION SUPPLY FLOW **GEOWS DF**	X	X										X			
GEOTHERMAL WATER DISTRIBUTION PUMP 1 SPEED **GEOWD P1**	X			X											
GEOTHERMAL WATER DISTRIBUTION PUMP 1 START STOP **GEOWD P1**	X				X										
GEOTHERMAL WATER DISTRIBUTION PUMP 1 SPEED **GEOWD P1**	X			X											
GEOTHERMAL WATER DISTRIBUTION PUMP 1 STATUS **GEOWD P1**	X		X												
GEOTHERMAL WATER DISTRIBUTION PUMP 2 START STOP **GEOWD P2**	X				X										
GEOTHERMAL WATER DISTRIBUTION PUMP 2 STATUS **GEOWD P2**	X		X												
HOT WATER DISTRIBUTION PUMP 1 START STOP **HWD P1**	X				X										
HOT WATER DISTRIBUTION PUMP 1 SPEED **HWD P1**	X			X											
HOT WATER DISTRIBUTION PUMP 1 STATUS **HWD P1**	X		X												
HOT WATER DISTRIBUTION PUMP 2 START STOP **HWD P2**	X				X										
HOT WATER DISTRIBUTION PUMP 2 SPEED **HWD P2**	X			X											
HOT WATER DISTRIBUTION PUMP 2 STATUS **HWD P2**	X		X												
HOT WATER DISTRIBUTION SUPPLY DIFFERENTIAL PRESSURE **HWS DP**	X	X										X			
INTERMEDIATE HOT WATER RETURN TEMPERATURE **IHW RT**	X	X								X	X				
INTERMEDIATE HOT WATER SUPPLY TEMPERATURE **IHW ST**	X	X								X	X				
LOW TEMPERATURE LOOP HOT WATER PUMP START/STOP **LTHWLP SS**	X				X										
LOW TEMPERATURE LOOP HOT WATER PUMP STATUS **LTHWLP STS**	X		X												
OUTDOOR AIR TEMPERATURE LOCAL **OAT**	X	X										X			
PRIMARY GEOTHERMAL WATER RETURN TEMPERATURE **PGEOW RT**	X	X								X	X				
PRIMARY GEOTHERMAL WATER SUPPLY TEMPERATURE **PGEOW ST**	X	X								X	X				
CH BANK LEAVING WATER TEMPERATURE **CH BLWT**	X	X													
BAS COMMUNICATION STATE **BAS COM**					X										
CHILLED WATER DISTRIBUTION PUMP 1 FAILURE **CHWD P1**	X				X							X			
CHILLED WATER DISTRIBUTION PUMP 2 FAILURE **CHWD P2**	X				X							X			
CHILLED WATER SUPPLY DIFFERENTIAL PRESSURE SETPOINT **CHWS DP SP**	X				X										
CHILLED WATER SUPPL



A2 **FIRST FLOOR - AREA C**
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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03/27/2026
REGISTRATION EXPIRES: 02/28/2027

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NEW ARFF/SRE BUILDING
ITHACA TOMPKINS
INTERNATIONAL AIRPORT
72 BROWN ROAD
ITHACA, NY 14850

MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1

REVISIONS

PROJECT NO:	158.095.001
DATE:	MARCH 2026
DRAWN BY:	F.K. NEILEY, P.E.
DESIGNED BY:	F.K. NEILEY, P.E.
CHECKED BY:	S.H. SHOVA

NO ALTERATION PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK EDUCATION LAW

ELECTRICAL POWER PLAN - AREA C

E-103

Switchboard: MSB

Location: ELECTRICAL 136 | **Volts:** 480/277 Wye | **A.I.C. Rating:**
Supply From: | **Phases:** 3 | **Mains Type:** SWITCH
Mounting: FLOOR | **Wires:** 4 | **Mains Rating:**
Enclosure: NEMA 1 | **MCB Rating:** 2000 A

Notes:

CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	Load	Remarks
1	PP4	3	400 A	400 A	38476 VA	
2	PP3	3	400 A	400 A	46523 VA	
3	PP1	3	400 A	400 A	141432 VA	
4	PP2	3	400 A	400 A	19349 VA	
5	T-4	3	200 A	175 A	86262 VA	
6	T-3	3	200 A	175 A	28932 VA	
7	T-1	3	200 A	175 A	80652 VA	
8	CH-1	3	200 A	200 A	112934 VA	
9	CH-2	3	200 A	200 A	112934 VA	
10	CH-3	3	200 A	200 A	112934 VA	
11	CH-4	3	200 A	200 A	112934 VA	
12	T-2	3	100 A	50 A	8920 VA	
13	ARFF VEHICLE CHARGING	3	200 A	200 A	125000 VA	
14	ELECTRIC BOILER	3	600 A	600 A	360000 VA	
15						
16						
17						
18						
19						
20						
				Total Conn. Load:	1387206 VA	
				Total Amps:	1669 A	

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	34866 VA	100.00%	34866 VA		
Lighting	13261 VA	100.00%	13261 VA	**Total Conn. Load:**	1387206 VA
Motor	1920 VA	100.00%	1920 VA	**Total Est. Demand:**	1353656 VA
Other	666026 VA	100.00%	666026 VA	**Total Conn. Current:**	1669 A
Power	594310 VA	100.00%	594310 VA	**Total Est. Demand Current:**	1628 A
RECEPTACLE	77100 VA	56.49%	43550 VA		

Notes:

PANEL SCHEDULE PP1

BUS SIZE: 400 A | **MAIN TYPE:** MLO | **INSTALLATION:** SURFACE
VOLTS: 480/277 Wye | **GND. BAR TYPE:** COPPER | **LOCATION:**
PHASE: 3 | **SC RATING:**
WIRE: 4 | **ENCLOSURE:** TYPE 1 | **NOTES:**
POLES: 42

CIRCUIT DESCRIPTION	WIRE SIZE	CONDUIT	CB. AMPS	Poles	CKT	A	B	C	CKT	Poles	CB. AMPS	CONDUIT	WIRE SIZE	CIRCUIT DESCRIPTION
					1				2					
COMPRESSOR	3-#8, 1-#10	1"	40 A	3	3				4	3	225 A	2 1/2"	3-#4/0, 1-#4/0, 1-#4	PP1A
					5				6					
OVERHEAD DOORS	3-#12, 1-#12	3/4"	20 A	3	7				8					
					9				10	3	20 A	3/4"	3-#12, 1-#12	OVERHEAD DOORS
					11				12					
EF-4,5	3-#12, 1-#12	3/4"	15 A	3	13				14					
					15				16	3	50 A	1"	3-#6, 1-#10	DWH-2
					17				18					
EF-6,7	3-#12, 1-#12	3/4"	20 A	3	19				20	1	20 A	3/4"	1-#12, 1-#12, 1-#12	SRE LIGHTING
					21				22	1	20 A	3/4"	1-#12, 1-#12, 1-#12	SRE LIGHTING
					23				24	1	20 A	3/4"	1-#12, 1-#12, 1-#12	LC-2
UH-4,5,6,7	3-#12, 1-#12	3/4"	20 A	3	25				26	1	20 A	3/4"	1-#12, 1-#12, 1-#12	ELEC RM, COMM RM, MECH RM LIGHTING
					27				28	1	20 A	3/4"	1-#12, 1-#12, 1-#12	LC-3
					29				30	1	20 A	3/4"	1-#12, 1-#12, 1-#12	LIGHTING - OFFICE, TOOL RM
PARKING LOT LIGHTING	1-#12, 1-#12, 1-#12	1"	20 A	1	31				32	1	20 A	3/4"	1-#12, 1-#12, 1-#12	LIGHTING - EXTERIOR
					33				34	1	20 A	3/4"	1-#12, 1-#12, 1-#12	LIGHTING - EXTERIOR PERSONNEL DOORS
					35				36	1	20 A	3/4"	1-#12, 1-#12, 1-#12	LIGHTING - EXTERIOR
					37				38					
					39				40	3	--	--	--	SPACE
					41				42					

PANEL SCHEDULE PP1A

BUS SIZE: 225 A | **MAIN TYPE:** MLO | **INSTALLATION:** SURFACE
VOLTS: 480/277 Wye | **GND. BAR TYPE:** COPPER | **LOCATION:**
PHASE: 3 | **SC RATING:**
WIRE: 4 | **ENCLOSURE:** TYPE 1 | **NOTES:**
POLES: 42

CIRCUIT DESCRIPTION	WIRE SIZE	CONDUIT	CB. AMPS	Poles	CKT	A	B	C	CKT	Poles	CB. AMPS	CONDUIT	WIRE SIZE	CIRCUIT DESCRIPTION
					1				2					
MAU-3	3-#12, 1-#12	3/4"	15 A	3	3				4	3	15 A	3/4"	3-#12, 1-#12	MAU-4
					5				6					
MAU-5	3-#12, 1-#12	3/4"	15 A	3	7				8					
					9				10	3	20 A	1"	3-#12, 1-#12	P-1
					11				12					
P-2	3-#12, 1-#12	1"	20 A	3	13				14					
					15				16	3	25 A	1"	3-#10, 1-#10	P-3
					17				18					
P-4	3-#10, 1-#10	1"	25 A	3	19				20					
					21				22	3	25 A	1"	3-#10, 1-#10	P-5
					23				24					
P-6	3-#10, 1-#10	1"	25 A	3	25				26					
					27				28					
					29				30					
					31				32					
					33				34					
					35				36					
					37				38					
					39				40					
					41				42					

PANEL SCHEDULE PP2

BUS SIZE: 400 A | **MAIN TYPE:** MCB | **INSTALLATION:** SURFACE
VOLTS: 480/277 Wye | **MAIN BREAKER:** 400 A | **LOCATION:**
PHASE: 3 | **GND. BAR TYPE:** COPPER
WIRE: 4 | **SC RATING:** | **NOTES:**
POLES: 42 | **ENCLOSURE:** TYPE 1

CIRCUIT DESCRIPTION	WIRE SIZE	CONDUIT	CB. AM...	Poles	CK T	A	B	C	CK T	Poles	CB. AM...	CONDUIT	WIRE SIZE	CIRCUIT DESCRIPTION
					1				2					
MAU-6	3-#12, 1-#12	3/4"	15 A	3	3				4	3	20 A	3/4"	3-#12, 1-#12	EF-8
					5				6					
MAU-7	3-#12, 1-#12	3/4"	15 A	3	7				8					
					9				10					
					11				12					
OVERHEAD DOORS	3-#12, 1-#12	3/4"	20 A	3	13				14					
					15				16	3	20 A	3/4"	3-#12, 1-#12	OVERHEAD DOORS
					17				18					
OVERHEAD DOORS	3-#12, 1-#12	3/4"	20 A	3	19				20					
					21				22					
					23				24					
					25				26					
					27				28					
					29				30					
					31				32					
					33				34					
					35				36					
					37				38					
					39				40					
					41				42					

PANEL SCHEDULE DP1

BUS SIZE: 400 A | **MAIN TYPE:** MCB | **INSTALLATION:** SURFACE
VOLTS: 120/208 Wye | **MAIN BREAKER:** 400 A | **LOCATION:**
PHASE: 3 | **GND. BAR TYPE:** COPPER
WIRE: 4 | **SC RATING:** | **NOTES:**
POLES: 54 | **ENCLOSURE:** TYPE 1

CIRCUIT DESCRIPTION	WIRE SIZE	CONDUIT	CB. AM...	Poles	CK T	A	B	C	CK T	Poles	CB. AM...	CONDUIT	WIRE SIZE	CIRCUIT DESCRIPTION
SRE GARAGE RECEPTACLES	1-#12, 1-#12, 1-#12	3/4"	20 A	1	1				2	1	20 A	3/4"	1-#12, 1-#12, 1-#12	SRE GARAGE RECEPTACLES
SRE GARAGE RECEPTACLES	1-#12, 1-#12, 1-#12	3/4"	20 A	1	3				4	1	20 A	3/4"	1-#12, 1-#12, 1-#12	SRE GARAGE RECEPTACLES
SRE GARAGE RECEPTACLES	1-#12, 1-#12, 1-#12	3/4"	20 A	1	5				6	1	20 A	3/4"	1-#12, 1-#12, 1-#12	SHOP OFFICE RECEPTACLES
TOOL PARTS RECEPTACLES	1-#12, 1-#12, 1-#12	3/4"	20 A	1	7				8	1	20 A	3/4"	1-#12, 1-#12, 1-#12	TOOL PARTS RECEPTACLES
RECIRC PUMP	1-#12, 1-#12, 1-#12	3/4"	20 A	1	9				10	1	20 A	3/4"	1-#12, 1-#12, 1-#12	UTILITY ROOMS RECEPTACLES
DRYER	1-#12, 1-#12, 1-#12	3/4"	20 A	1	11				12	2	25 A	3/4"	2-#10, 1-#10	LIFT POWER
MEZZANINE RECEPTACLES	1-#12, 1-#12, 1-#12	3/4"	20 A	1	13				14					
EXTERIOR RECEPTACLES	1-#12, 1-#12, 1-#12	3/4"	20 A	1	15				16	1	20 A	3/4"	1-#12, 1-#12, 1-#12	SRE ROOF RECEPTACLES
					17				18					
WELDING RECEPTACLE	3-#6, 1-#10	1"	50 A	3	19				20	3	50 A	1"	3-#6, 1-#10	WELDING RECEPTACLE
					21				22					
BOOSTER PUMP	2-#10, 1-#10	3/4"	25 A	2	23				24	2	20 A	3/4"	2-#12, 1-#12	P-12
					25				26					
GFP-1	1-#12, 1-#12, 1-#12	3/4"	20 A	1	27				28	1	20 A	3/4"	1-#12, 1-#12, 1-#12	MECHANICAL ROOM RECEPTACLES
GFP-2	1-#12, 1-#12, 1-#12	3/4"	20 A	1	29				30					
P-11	2-#12, 1-#12	3/4"	20 A	2	31				32	2	20 A	3/4"	2-#12, 1-#12	P-10
					33				34					
P-8	2-#12, 1-#12	3/4"	20 A	2	35				36	2	20 A	3/4"	2-#12, 1-#12	P-9
					37				38					
P-12	2-#12, 1-#12	3/4"	20 A	2	39				40	2	20 A	3/4"	2-#12, 1-#12	P-7
					41				42	1	20 A	1 1/2"	1-#12, 1-#12, 1-#12	F-4, F-5
LANDSIDE EV CHARGER (FUTURE)		2"	20 A	2	43	...			44	2	50 A	2"	2-#3, 1-#6	LANDSIDE EV CHARGER
					45		...		46					
OIL-WATER SEPARATOR	2-#10, 1-#10	1"	30 A	2	47			...	48	2	20 A	2"		AIRSIDE EV CHARGER (FUTURE)
					49	...			50					
AIRSIDE EV CHARGER (FUTURE)	2-#4, 1-#6	2"	50 A	2	51		...		52	2	50 A	2"	2-#6, 1-#10	GENERATOR PANEL
					53			...	54					

1

PANEL SCHEDULE DP2

BUS SIZE: 100 A | **MAIN TYPE:** MCB | **INSTALLATION:** SURFACE
VOLTS: 120/208 Wye | **MAIN BREAKER:** 100 A | **LOCATION:**
PHASE: 3 | **GND. BAR TYPE:** COPPER
WIRE: 4 | **SC RATING:** | **NOTES:**
POLES: 30 | **ENCLOSURE:** TYPE 1

CIRCUIT DESCRIPTION	WIRE SIZE	CONDUIT	CB. AM...	Poles	CK T	A	B	C	CK T	Poles	CB. AM...	CONDUIT	WIRE SIZE	CIRCUIT DESCRIPTION
DATA RACK	2-#10, 1-#10	3/4"	30 A	2	1				2	2	30 A	3/4"	2-#10, 1-#10	DATA RACK
					3				4					
FACP	1-#12, 1-#12, 1-#12	3/4"	20 A	1	5				6	1	20 A	3/4"	1-#12, 1-#12, 1-#12	COMM QUAD RECEPTACLES
BMS	1-#12, 1-#12, 1-#12	3/4"	20 A	1	7				8	1	20 A	3/4"	1-#12, 1-#12, 1-#12	EXTERIOR RECEPTACLES
UH-8,9,10	1-#12, 1-#12, 1-#12	3/4"	20 A	1	9				10	2	45 A	1"	2-#6, 1-#10	ACCU-1, DS-1
BMS RECEPTACLE	1-#12, 1-#12, 1-#12	3/4"	20 A	1	11				12					
					13				14					
					15				16					
					17				18					
					19				20					
					21				22					
					23				24					
					25				26					
					27				28					
					29				30					

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MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1

REVISIONS

PROJECT NO: 158.095.001
DATE: MARCH 2026
DRAWN BY: F.K. NEILEY, P.E.
DESIGNED BY: F.K. NEILEY, P.E.
CHECKED BY: S.H. SHOVA

ELECTRICAL SCHEDULES

E-602

MASTER LUMINAIRE SCHEDULE

FIXTURE DESCRIPTION	MANUFACTURER AND MODEL NUMBER	NUMBER AND TYPE OF LAMP	VOLTS	MOUNTING	DRIVER	REMARKS
D	H.E. WILLIAMS #17-4-L55/840-AF-DRV-UNV OR APPROVED EQUAL	42.3W LED	UNV	SUSPENDED 10'-3" A.F.F.	NON-DIMMING	PROVIDE EM/10W OPTION AS NOTED. SURFACE MOUNT LUMINAIRE IN IT ROOM.
E	H.E. WILLIAMS #97-4-L95/840-FR-DIM-UNV OR APPROVED EQUAL	64.8W LED	UNV	SUSPENDED 18'-6" A.F.F.	DIM	PROVIDE EM/10W OPTION AS NOTED.
SA	H.E. WILLIAMS #VWPV-L30/840-T3-DBZ-CGL-EM4W-DIM-UNV OR APPROVED EQUAL	27W LED	UNV	WALL MOUNT 6" ABOVE DOOR	DIM	
SB	NLS LIGHTING #NV-1-T3-16L-1-40K8-UNV-WM-BRZ OR APPROVED EQUAL	56W LED	UNV	WALL MOUNT 20' A.F.F.	NON-DIMMING	
SC	NLS LIGHTING #NV-1-T3-16L-1-40K8-UNV-DPS3-BRZ OR APPROVED EQUAL	56W LED	UNV	POLE, 20' MOUNTING HEIGHT	NON-DIMMING	
SD	NLS LIGHTING #NV-1-T4-16L-1-40K8-UNV-DPS3-BRZ OR APPROVED EQUAL	56W LED	UNV	POLE, 20' MOUNTING HEIGHT	NON-DIMMING	
X	H.E WILLIAMS #EXIT-R-EM-WHT-D OR APPROVED EQUAL	2.5W LED	UNV	SURFACE	NON-DIMMING	

CONTRACT RESPONSIBLE		ENCLOSURE		DISCONNECT TYPE		STARTER TYPE		CONTROLS		LOCATION	
G	GENERAL	1	NEMA 1 - INDOOR GENERAL	1	NON-FUSED SAFETY SWITCH	1	MAGNETIC X-LINE	1	START/STOP PB W/PILOT LIGHT IN COVER	A	AT EQUIPMENT
M	MECHANICAL	3R	NEMA 3R - EXTERIOR RAINPROOF	2	FUSED SAFETY SWITCH	2	COMBINATION X-LINE	2	H-O-A SWITCH W/PILOT LIGHT ON COVER	B	REMOTE
H	HVAC	4	NEMA 4 - OUTDOOR WATERTIGHT	3	TOGGLE SWITCH	3	MANUAL	3	AUXILIARY CONTACTS	C	IN MOTOR CONTROL CENTER
E	ELECTRICAL	4X	NEMA 4X - CORROSION RESISTANT	4	INTEGRAL TO STARTER	4	REDUCED VOLTAGE	4	CONTROL TRANSFORMER	D	IN MECHANICAL ROOM
P	PLUMBING	7	NEMA 7 - INDOOR EXPLOSION PROOF	5	CORD & PLUG	5	VFD	5	PROVIDED BY EQUIPMENT MANUFACTURER	E	IN ELECTRICAL ROOM
FP	FIRE PROTECTION	12	NEMA 12 - INDOOR DUST-TIGHT	6	PART OF CONTROL PANEL	6	SOFT START	6	REMOTE PUSHBUTTON STATIONS	F	OTHER (SEE REMARKS)
C	COMMUNICATIONS	13	NEMA 13 - INDOOR OIL TIGHT	7	BY EQUP. MANF.	7	TWO-SPEED	7	PART OF DIRECT DIGITAL CONTROL SYSTEM (DDC)		
O	OWNER			8	OTHER (SEE REMARKS)	8	BY EQUP. MANF.	8	CONTROL PANEL		
						9	OTHER (SEE REMARKS)	9	OTHER (SEE REMARKS)		

EQUIPMENT CONNECTION SCHEDULE

EQUIPMENT			ELECTRICAL SUPPLY							WIRING BETWEEN	DISCONNECT						WIRING BETWEEN	STARTER						REMARKS
UNIT NO.	FURN. BY	LOCATION	HP	KW	MCA	FLA	MOCP	VOLT	PHASE		FURNISHED BY	INSTALLED BY	TYPE	SIZE	ENCL	LOCATION		FURNISHED BY	INSTALLED BY	TYPE	SIZE	ENCL	LOCATION	
ACCU-1	M	EXTERIOR			25		45	208 V	1	E	E	E	1	60	3R	A	E	M	M	-	-	3R	A	
B-1	M	MEZZANINE		360			600	480 V	3	E	E	E	2	600	1	A	M	M	M	-	-	1	A	
CH-1	M	MECHANICAL ROOM			136		200	480 V	3	E	M	M	-	200	1	A	M	M	M	-	-	1	A	
CH-2	M	MECHANICAL ROOM			136		200	480 V	3	E	M	M	-	200	1	A	M	M	M	-	-	1	A	
CH-3	M	MECHANICAL ROOM			136		200	480 V	3	E	M	M	-	200	1	A	M	M	M	-	-	1	A	
CH-4	M	MECHANICAL ROOM			136		200	480 V	3	E	M	M	-	20	1	A	M	M	M	-	-	1	A	
DS-1	M	IT ROOM						208 V	1	E	E	E	-	-	1	A	E	M	M	-	-	-	B	POWERED FROM ACCU-1.
EF-2	M - ADD ALT. NO. 1	ARFF ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
EF-3	M - ADD ALT. NO. 1	ARFF ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
EF-4	M	SRE ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
EF-5	M	SRE ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
EF-6	M	SRE ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
EF-7	M	SRE ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
EF-8	M	SRE ROOF	1/2				15	480 V	3	E	E	E	2	2	3R	A	E	E	E	2	2	3R	A	
F-4	M	MECHANICAL ROOM	1/4					120 V	1	E	E	E	3	-	1	A	E	M	M	-	-	1	A	
F-5	M	ELECTRICAL ROOM	1/6					120 V	1	E	E	E	3	-	1	A	E	M	M	-	-	1	A	
F-6	M	MECHANICAL ROOM	1/4					120 V	1	E	E	E	3	-	1	A	E	M	M	-	-	1	A	
F-7	M	MECHANICAL ROOM	1/4					120 V	1	E	E	E	3	-	1	A	E	M	M	-	-	1	A	
GFP-1	M	MECHANICAL ROOM	1					120 V	1	E	E	E	3	-	1	A	E	E	E	1	-	1	A	
GFP-2	M	MECHANICAL ROOM	1					120 V	1	E	E	E	3	-	1	A	E	E	E	1	-	1	A	
MAU-1	M - ADD ALT. NO. 1	ARFF GARAGE	5					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
MAU-2	M - ADD ALT. NO. 1	ARFF GARAGE	5					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
MAU-3	M	SRE GARAGE	3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
MAU-4	M	SRE GARAGE	3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
MAU-5	M	SRE GARAGE	3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
MAU-6	M	SRE GARAGE	3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
MAU-7	M	SRE GARAGE	3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
P-1	M	MEZZANINE	7.5					480 V	3	E	E	E	2	40	1	A	E	E	E	5	-	1	A	
P-2	M	MEZZANINE	7.5					480 V	3	E	E	E	2	40	1	A	E	E	E	5	-	1	A	
P-3	M	MEZZANINE	10					480 V	3	E	E	E	2	20	1	A	E	E	E	5	-	1	A	
P-4	M	MEZZANINE	10					480 V	3	E	E	E	2	20	1	A	E	E	E	5	-	1	A	
P-5	NOTE 1	MECHANICAL ROOM	10					480 V	3	E	E	E	2	30	1	A	E	E	E	5	-	1	A	
P-6	NOTE 1	MECHANICAL ROOM	10					480 V	3	E	E	E	2	30	1	A	E	E	E	5	-	1	A	
P-7	M	SRE GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-8	M	SRE GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-9	M	SRE GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-10	M	SRE GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-11	M	SRE GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-12	M	SRE GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-13	M - ADD ALT. NO. 1	ARFF GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-14	M - ADD ALT. NO. 1	ARFF GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-15	M - ADD ALT. NO. 1	ARFF GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-16	M - ADD ALT. NO. 1	ARFF GARAGE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
P-17	M	MEZZANINE	1					208 V	1	E	E	E	2	10	1	A	M	M	M	-	-	1	A	
UH-1	M - ADD ALT. NO. 1	ARFF GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-2	M - ADD ALT. NO. 1	ARFF GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-3	M - ADD ALT. NO. 1	ARFF GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-4	M	SRE GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-5	M	SRE GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-6	M	SRE GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-7	M	SRE GARAGE	1/3					480 V	3	E	E	E	1	30	1	A	M	M	M	-	-	1	A	
UH-8	M	STORAGE	1/25					120 V	1	E	E	E	3	30	1	A	M	M	M	-	-	1	A	
UH-9	M	STORAGE	1/25					120 V	1	E	E	E	3	30	1	A	M	M	M	-	-	1	A	
UH-10	M	MECHANICAL ROOM	1/25					120 V	1	E	E	E	3	30	1	A	M	M	M	-	-	1	A	

NOTES:

1. EQUIPMENT IS BY OTHERS. PROVIDE POWER CONNECTION TO LOCATION OF EQUIPMENT AS SHOWN ON DRAWINGS. PROVIDE DISCONNECTS AND STARTERS AS SHOWN.

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CERTIFICATE OF AUTHORIZATION# 0021365

STATE OF NEW YORK · FRANCESCA K. NEILEY · 032409 · PROFESSIONAL ENGINEER

03/27/2026

REGISTRATION EXPIRES: 02/28/2027

ITH
flyithaca.com

NEW ARFF/SRE BUILDING
ITHACA TOMPKINS INTERNATIONAL AIRPORT
72 BROWN ROAD
ITHACA, NY 14850

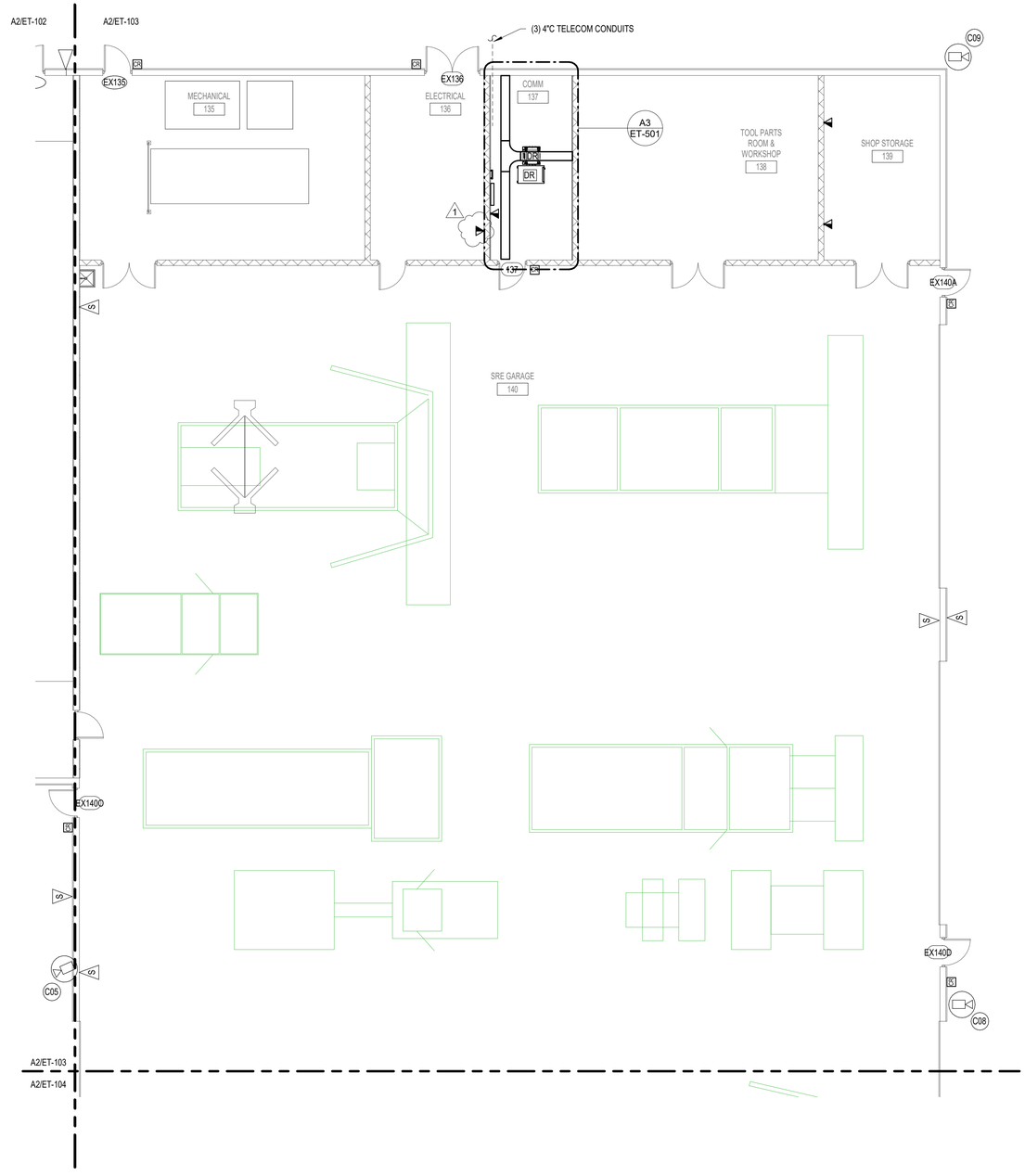
MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1

REVISIONS

PROJECT NO: 158.095.001
DATE: MARCH 2026
DRAWN BY: F.K. NEILEY, P.E.
DESIGNED BY: F.K. NEILEY, P.E.
CHECKED BY: S.H. SHOVA

ELECTRICAL SCHEDULES

E-604



PLAN NORTH

A2 FIRST FLOOR COMMUNICATIONS PLAN - AREA C
SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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CERTIFICATE OF AUTHORIZATION# 0021365

STATE OF NEW YORK FRANCESCA K. TAYLOR 032910 LICENSED PROFESSIONAL ENGINEER
03/27/2026

REGISTRATION EXPIRES: 02/28/2027

ITH
flyithaca.com

NEW ARFF/SRE BUILDING
ITHACA TOMPKINS
INTERNATIONAL AIRPORT
72 BROWN ROAD
ITHACA, NY 14850

MARK	DATE	DESCRIPTION
1	3/27/26	ADDENDUM NO. 1

REVISIONS

PROJECT NO:	158.095.001
DATE:	MARCH 2026
DRAWN BY:	W. BARLEY, RCDD
DESIGNED BY:	W. BARLEY, RCDD
CHECKED BY:	F.K. NEILEY, P.E.

FIRST FLOOR COMMUNICATIONS PLAN - AREA C

ET-103

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PRE-BID MEETING MINUTES
FOR THE

ARFF – SRE BUILDING (PHASE 2)

AT THE
ITHACA TOMPKINS INTERNATIONAL AIRPORT
ITHACA, NY

MARCH 26, 2026, 1:00PM

I. INTRODUCTION

A. Welcome to the Pre-Bid Meeting for the ARFF – SRE Building (Phase 2) project at the Ithaca Tompkins International Airport.

B. Individual attendee introduction and affiliation.
   1. Josh Nalley – ITH Airport Deputy Director, Airport Fire Chief
   2. Francesca Neiley – C&S Design Project Manager
   3. Tom Horth – C&S Program Manager

II. PROJECT DESCRIPTION

A. General Description:

The Work of Project is defined by the Contract Documents and consists of the following:
Project involves construction of a new approximate 23,700 sq.ft. Snow Removal Equipment (SRE) Facility with utility room support space, along with a new approximate 10,000 sq.ft. Airport Rescue & Fire Fighting (ARFF) Facility. Each facility will be comprised of pre-engineered metal buildings on concrete foundations and shall be configured for vehicle bays. Project is being packaged as a Base Bid (Phase 2-SRE Facility) and Add Alternate Bid No. 1 (Phase 3-ARFF Facilities). The majority of associated sitework and utility preparation work to serve the new buildings is being progressed under a separate project and is expected to be completed prior to the start of this project. Sitework will be completed under this phase to make the buildings usable.

Multi-Prime Contracts for this Project include the following:
1. Contract #1 – General Construction (GC-1)
2. Contract #2 - Mechanical Construction (MC-1)
3. Contract #3 - Electrical Construction (EC-1)
4. Contract #4 - Plumbing Construction (PC-1)

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1.1 SCHEDULE OF ADD-ONS

1. **ADD ALTERNATE BID NO. 1: New ARFF Building**
   - Addition to the contract for the construction of a new 10,000 sq.ft. Airport Rescue & Fire Fighting (ARFF) Facility, including all associated foundations, sitework, and interface work with SRE Facility (Base Bid).

2. **ADD ALTERNATE BID NO. 2: Backup Generator**
   - Addition to the contract for the procurement and installation of a new diesel-engine-driven generator set, including outdoor enclosure, concrete mounting pad, anchorage, bollards, associated sitework, and commissioning.

ALLOWANCES:

1.2 TEMPORARY RESTROOM FACILITY RENTAL (GENERAL CONTRACT)

1. Temporary Restroom Rental allowance shall cover all costs associated with the procurement of temporary restroom facilities for use by Airport staff. Receipted rental charges for fully equipped restroom space shall be covered under this item, including installation and all materials and labor for such by the General Contractor. All work or coordination of that work required to provide utility service or service modifications for temporary office support that are not performed by the utility companies shall be performed by the General Contractor and included within the General Contractor's base bid lump sum cost. Monies remaining in the rental allowance shall be credited back to the Owner by Change Order.

   Allowance No. 1: General Contract Temporary Restroom Rental Allowance ALG-1:

   Note: An allowance for Temporary Restroom Facility rental cost of Fifty thousand Dollars 00/100 ($50,000) shall be included in the Base Bid amount for the General Contract.

1.3 GENERAL UTILITY ALLOWANCE (ELECTRICAL CONTRACT)

1. Utility allowance shall cover all costs associated with providing utility service or service modifications to accommodate the building construction that are not performed by the utility companies shall be performed by the Electrical Contractor and included within the Electrical Contractor's base bid lump sum cost. Monies remaining in the utility allowance shall be credited back to the Owner by Change Order.

2. Allowance No. 2: Electrical Contract Utility Allowance ALE-1:

   Note: An allowance for utility service or service modification costs to accommodate the building construction in the amount of Fifty Thousand Dollars 00/100 ($50,000) shall be included in the Base Bid amount for the Electrical Contract.

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1.4 TEMPORARY HEATING UTILITY ALLOWANCE (MECHANICAL CONTRACT)

1. Temporary heating utility allowance shall cover all costs associated with providing temporary heat to the finished building(s) in a designated manner and for a period of time agreed upon by the Owner. Receipted rental charges for temporary heating systems shall be covered under this item, including installation and all materials and labor for such by the Mechanical Contractor. Cost shall be included within the Mechanical Contractor's base bid lump sum cost. Monies remaining in the utility allowance shall be credited back to the Owner by Change Order.

2. Allowance No. 3: Mechanical Contract Temporary Heating Utility Allowance ALM-1:

Note: An allowance for temporary heating systems to condition the finished buildings in the amount of Fifty Thousand Dollars 00/100 ($50,000) shall be included in the Base Bid amount for the Mechanical Contract.

B. Construction Phasing:

i. Work phasing review.

1. Single Work Area "A"

Contract Duration (Section 80-08):

Schedule	Liquidated Damages Cost	Allowed Construction Time
Base Bid	**$1,500/Calendar Day**	**180 Calendar Days**
Base Bid plus Add Alternate Bid No. 1	**$1,500/Calendar Day**	**240 Calendar Days**
Base Bid plus Add Alternate Bid No. 1 plus Add Alternate Bid No. 2	**$1,500/Calendar Day**	**240 Calendar Days**

ii. Site Access and Staging Area.

1. Access to airport will be through existing gate off of Warren Road. A gate guard is required all times during construction hours when the gate is left open.

2. Flaggers shall be provided to provide line of site direction to all vehicles entering and existing the Work Area or individual escorts may be used.

3. All spoils to be disposed of off-site.

iii. Miscellaneous Notes:

1. Engineers Office – A pay item has been included for a field office for this project under Item C-105, Mobilization

2. Radios need to be provided and paid under Item C-105, Mobilization.

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III. SAFETY AND OPERATIONAL REQUIREMENTS

A. Safety during construction is the No. 1 priority for the protection of the Airport users, employees and the contractor's employees. The Contractor is responsible for safety during Construction on Airport Projects.

B. Attachment "A" to Section 70 – Construction Safety Phasing Plan (CSPP)

1. FAA AC relating to safety and security: 150/5370-2G "Operational Safety on Airports During Construction". The AC can be found here: https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentNumber/150_5370-2
2. The CSPP document has been submitted to the FAA for review and approval. Changes must be submitted to the Owner and FAA for approval. FAA review and approval can be expected to take a minimum of sixty business days.
3. Safety Plan Compliance Document (SPCD) Certification is located with the Proposal. This document describes how the Contractor will comply with the requirements stated in the CSPP and FAA Advisory Circular.

C. Security requirements are included in the CSPP: Section 3.5c "Security".

1. Contractor must provide padlocks for the access gate(s) and gate must be kept locked at all times.
2. If a gate is left open, the contractor must post a guard to ensure no unauthorized entry.
3. Open, unattended gates are subject to fines by the FAA of up to $10,000.00. Fines incurred by the Owner will be passed on to the contractor.
4. The Contractor is required to comply with the Airport Security Plan.
5. The badging and escorting procedures are located in the CSPP.
   Please note that the Contractor will need to escort all deliveries from the access gate to their destination and back.

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IV. XBE, BIDDER'S LIST, & CIVIL REQUIREMENTS

A. DBE participation is encouraged.
   a. Bidders are required to complete the Bidder's List Collection Form and indicate whether subs/suppliers are DBE-certified or not.

B. SBE participation is encouraged.
   a. Bidders are required to complete the SBE Utilization Plan, Letter of Intent, and Verification Form if necessary (completed/signed by each SBE subcontractor, supplier or manufacturer)

C. EEO participation goals for this contract are 2.6% minority and 6.9% female. Goals must be met unless otherwise approved.

D. Other civil rights requirements are contained in the Code of Federal Regulations, Title 49 – Transportation, Part 23 – Participation of Disadvantaged Business Enterprises in Airport Concessions, and in Part 26 – Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.

V. LABOR REQUIREMENTS

A. Contractor must pay the higher prevailing wage rate as a minimum in accordance with the current Federal and State Wage Rate Schedules.

B. Additional labor requirements are as contained in the Code of Federal Regulations, Title 49 – Transportation, Part 18, Section 18.36.

VI. ADDENDA

A. Any future changes or modifications identified at this meeting will be made by addendum to all prospective bidders.

B. Other questions raised after this meeting may be submitted in writing to Tompkins County Purchasing through BidNet.

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VII. SUBMISSIONS

Bids are due on **Thursday, April 23, 2026 at 2:00pm**. Upload one full copy of the completed Proposal Section only (plus bond) at the following location:
https://www.tompkinscountyny.gov/All-Departments/Finance-Department/Purchasing-Division

Respondents who do not have or cannot obtain internet access must contact the Purchasing Division, (607) 274-5500 for further submission instructions.

1. Scanned copies of bid security/bid bond are acceptable when uploading proposal to BidNet. The official closing date for this bid is 4/23/2026. All scanned submissions are due in Bidnet by the 2pm ET deadline on that day.

2. Mail or hand deliver One (1) Original and One (1) Copy of completed Proposal Forms enclosed, including Federal certifications, Certification for Receipt of Addenda (if issued), and original 10% Bid Bond in a sealed envelope to the following address for receipt within 2 business days of bid opening:

   Ithaca Tompkins International Airport
   Attn: Ms. Roxan Noble, Airport Director
   72 Brown Road
   Ithaca, NY 14850

   Label the envelope:
   "*Proposal for New ARFF/SRE Building – Phase 2 (ARFF/SRE Building)*"

VIII. QUESTIONS & GENERAL DISCUSSION

1. This project is seeking FAA/Federal funding and award will be contingent upon receipt of a grant. If successful, a grant may be announced as late as September 2026. Award of the contract will be issued at that same time or sooner. Assume Spring 2027 construction start date. An administrative NTP may be issued in the Fall of 2026 to initiate submittal reviews, etc.

2. Engineers Opinion of Probable Construction Cost – for Bonding Purposes:
   a. Base Bid (SRE Building): $11,240,000
   b. ARFF Building (Add Alt. No. 1): $4,300,000
   c. Backup Generator (Add Al. No. 2): $450,000

3. Building Permit shall be procured by the GC. AHJ is County of Tompkins. AHJ is Arel LeMaro, Director of Facilities:
   alemaro@tompkins-co.org
   607-274-0350 (office)
   607-327-1309 (cell)

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For bidding purposes, assume permit fee is 0.4% of the total construction amount.

4. Electrical permit shall be procured by the Electrical Contractor. NYSEG has been contacted and a planner has been assigned.

5. Domestic water and sanitary system permits are not required under this project as they will have been addressed under the Phase 1 Sitework project (2026 Construction).

ATTENDEES:

Name	Affiliation	Email	Phone
~~Roxan Noble~~	ITH Airport Director	rnoble@tompkins-co.org	
Josh Nalley	ITH Airport Deputy Director / ARFF Chief	jnalley@tompkins-co.org	
Francesca Neiley	C&S – Design Project Manager	fneiley@cscos.com	
Tom Horth	C&S - Program Manager	thorth@cscos.com	
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GABRIEL SEIJAS	VRH CONSTRUCTION	G.SEIJAS@VRHCORP.com	646-942-0256
Michael Sisson	Marchuska Brothers Const.	michael.sisson@marchuskabrothers.com	607-343-7696
Jim Dalpe	VIP Structures	jdalpe@vipstructures.com	315-382-9183
[illegible]			

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Name	Affiliation	Email	Phone
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Josh Nalley	ITH Airport Deputy Director / ARFF Chief	jnalley@tompkins-co.org	
Francesca Neiley	C&S – Design Project Manager	fneiley@cscos.com	
Tom Horth	C&S - Program Manager	thorth@cscos.com	
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Jim Brown	Lechase	Jim.Brown@lechase.com	607-327-1241
JIM HARMON	LECHASE	JAMES.HARMON@LECHASE.COM	315-992-4353

Ithaca Tompkins International Airport
ARFF-SRE Building Package (Phase 2)
Pre-Bid Meeting

March 26, 2026

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