DELAWARE ENGINEERING, D.P.C.

16 East Market Street
Red Hook, New York 12571

Tel: 518.452.1290 x402

August 4, 2023

To: ALL PLAN HOLDERS

Re: Port Ewen Fire District **Pages:** 85 (including this sheet)

Port Ewen Firehouse Construction Project

Addendum # 1

Contracts for Construction

The following items in this addendum apply to the Port Ewen Firehouse Construction Project:

ITEM #1: ADDITION – CONTRACT #4 – Specification 210002 Fire Protection Work

- Add Specification 210002 Fire Protection Work. Specification attached.

ITEM #2: ADDITION – CONTRACT #4 – Specification 210005 Coordinated Shop Drawings

- Add Specification 210005 Coordinated Shop Drawings. Specification attached.

ITEM #3: ADDITION – CONTRACT #4 – Specification 210007 Codes, Regulations, Standards and Fees

- Add Specification 210007 Codes, Regulations, Standards and Fees. Specification attached.

ITEM #4: ADDITION – CONTRACT #4 – Specification 210517 Sleeves and Sleeve Seals for Fire Protection Piping

- Add Specification 210517 Sleeves and Sleeve Seals for Fire Protection Piping. Specification attached.

ITEM #5: ADDITION – CONTRACT #4 – Specification 210518 Escutcheons for Fire Protection Piping

- Add Specification 210518 Escutcheons for Fire Protection Piping. Specification attached.

ITEM #6: ADDITION – CONTRACT #4 – Specification 211100 Facility Fire Protection Water Service Piping

- Add Specification 211100 Facility Fire Protection Water Service Piping. Specification attached.

ITEM #7: ADDITION – CONTRACT #4 – Specification 211313 Fire Protection Systems

- Add Specification 211313 Fire Protection Systems. Specification attached.

ITEM #8: ADDITION – CONTRACT #4 – Specification 221519 Packaged Air Compressor and Receivers

- Add Specification 221519 Packaged Air Compressor and Receivers. Specification attached.

ITEM #9: ADDITION – CONTRACT #4 – Specification 226301 Utility Piping For Facilities

- Add Specification 226301 Utility Piping For Facilities. Specification attached.

ITEM #10: ADDITION – CONTRACT #3 – Specification 230900 Sequence of Operation for HVAC Controls

- Add Specification 230900 Sequence of Operation for HVAC Controls. Specification attached.

ITEM #11: ADDITION – CONTRACT #3 – Specification 233000 Vehicle Extraction System

- Add Specification 233000 Vehicle Extraction System. Specification attached.

ITEM #12: REVISION – CONTRACT #4 – Drawing P104 D.W.V. Second Floor Plan

- See attached plan with revisions.

ITEM #13: ADDITION – CONTRACT #4 – Drawing P105 Venting First Floor Plan

- See attached plan.

ITEM #14: ADDITION – CONTRACT #4 – Drawing P106 Venting Second Floor Plan

- See attached plan.

ITEM #15: ADDITION – CONTRACT #4 – Drawing P107 Compressed Air Piping Plan

- See attached.

ITEM #16: REVISION – CONTRACT #3 – Drawing M000 Mechanical Cover Sheet

- See attached plan with revisions.

ITEM #17: REVISION – CONTRACT #3 – Drawing M001 Mechanical Schedules

- See attached plan with revisions.

ITEM #18: REVISION – CONTRACT #3 – Drawing M002 Mechanical Schedules

- See attached plan with revisions.

ITEM #19: REVISION – CONTRACT #3 – Drawing M101 HVAC Plan – First Floor

- See attached plan with revisions.

ITEM #20: REVISION – CONTRACT #3 – Drawing M102 HVAC Plan – Second Floor

- See attached plan with revisions.

ITEM #21: REVISION – CONTRACT #3 – Drawing M201 Piping Plan – First Floor

- See attached plan with revisions.

ITEM #22: REVISION – CONTRACT #3 – Drawing M202 Piping Plan – Second Floor

- See attached plan with revisions.

ITEM #23: ADDITION – CONTRACT #3 – Drawing M601 HW One-Line Diagram

- See attached plan.

ITEM #24: CLARIFICATION – CONTRACT #1 – Plantings

- The perennial plants can all be 1 Gal (#1) Containers
- The Shrubs should all be 5 Gal (#5) Container
- The Acer rubrum should be a 2” Caliper.

NOTE

This Addendum is being distributed through usinglesspaper.com to everyone on the plan holders list. Should there be an issue with the system, please contact Ablen Amrod, PE at aamrod@delawareengineering.com or 518-452-1290.

ATTENTION

PLEASE SIGN BELOW AND email to aamrod@delawareengineering.com to verify receipt of this Addendum.

RECEIVED BY: _____

Company Name: _____

SECTION 210002

FIRE PROTECTION WORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The sprinkler contractor (aka fire protection contractor) shall design and install sprinkler systems in accordance with the building and fire departments of the City of Port Ewen, NY; New York State Building and Fire Codes; the owner's insurance underwriter and all applicable NFPA standards.
   1. The sprinkler contractor shall design and install a new sprinkler system to serve the entire building.

B. These specifications are considered to be performance type for bidding purposes only. Sprinkler contractor shall retain a registered professional engineer in the State of New York to prepare all hydraulic calculations and to provide stamped fire protection shop drawings.

C. Sprinkler contractor to provide the following:
   1. Complete sprinkler system throughout the project area
   2. Low point drains equipped and sized as required by NFPA-13, 2013 edition. In general, all pipe shall pitch to drain as required, and must be capable of complete and total removal of water.
   3. Inspector's test connections.
   4. Identification tags at all valves, connections and drains.
   5. Shop drawings/hydraulic calculations to be completed per NFPA-13, 2013 Edition, Chapter 23.
   6. System design placards.
   7. System working drawings and hydraulic calculations in accordance with NFPA-13, 2013 Edition, Chapter 23.
   8. Hydrant flow test by the sprinkler contractor is required as part of the sprinkler contract.

1.02 DEFINITIONS

A. Definitions:
   1. Noted:
      a. As indicated on drawings and/or specified.
   2. Indicated or Shown:
      a. As indicated or shown on drawings.
   3. Concealed:
      a. Embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.
   4. Exposed:
      a. Not installed underground or concealed.
   5. Piping:
      a. Pipe, tube, fittings, flanges, valves, controls, hangers, traps, drains, insulation and items necessary or required in connection with or relating thereto.

6. Wiring:
   a. Conduits, fittings, wire, junction and outlet boxes, switches, cutouts, and receptacles and items necessary or required in connection with or relating thereto.
7. Control wiring:
   a. Wiring which is used for the logic control of systems and is generally 120 volts (AC or DC) or less. Such wiring methods are typically used by temperature control, communications and other automatic system.
8. Power wiring:
   a. Wiring which is used for other than logic control of systems and is generally 120 volts single phase and three phase AC. Such wiring methods are typically used for power and lighting system.

1.03 DRAWINGS AND SPECIFICATIONS

A. Intent:
   1. Provide all items and work called for in the specifications in accordance with the Contract Documents. This includes all incidentals, equipment, appliances, services hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete, safe, and functional fire protection systems. Perform start-up, commissioning and testing of each item and system to provide fully operable systems.
   2. The specifications do not describe all items necessary for the work; it is expected that, after review of the drawings and specifications, the sprinkler contractor shall be completely familiar with the function of all items included and that their bid shall reflect the inclusion of all hangers, racks, inserts, etc., necessary for a complete and operable system.
   3. Items of work shown on the drawings or called for in the specifications shall be furnished and installed as appearing in the specifications.
   4. When materials and equipment is provided by other trades or the Owner, the sprinkler contractor shall examine the Contract Documents to ascertain these requirements. Unless specifically indicated as being supplied or installed by others, all items of work indicated in the specifications shall be included by the sprinkler contractor in their bid.
   5. Exact equipment locations and routing of piping, ductwork, conduit, wireway, cable trays, etc., shall be governed by field conditions and/or Owner's Representative's instructions.
   6. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as a result of the sprinkler contractor's failure to check or verify dimensions, measurements, etc., shall be corrected at the sprinkler contractor’s expense.
   7. The sprinkler contractor shall inform the Owner's Representative of any conditions which obstruct, interfere with, or in any way prevent work from being completed in a first class manner.

B. Sprinkler contractor’s attention is directed to the fact that bidding documents may differ from the actual construction documents.
   1. Before commencing any construction work, the sprinkler contractor shall verify with the Owner's Representative that the sprinkler contractor’s documents are the latest issued documents.

1.04 PROTECTION OF EQUIPMENT

A. The sprinkler contractor shall at their own expense protect their work, material, and equipment, as is liable to injury during the construction period. The sprinkler contractor shall be held responsible for all damages and theft until their work is fully and finally accepted.

1.05 OBSTACLE, INTERFERENCES & COORDINATION

A. The drawings show the general arrangement of equipment and accessories. Drawings do not indicate all offsets, fittings, accessories and changes in elevation which may be necessary. The sprinkler contractor shall make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in remuneration. The sprinkler contractor shall provide offsets, fittings and accessories as may be required to meet such field conditions.

B. Equipment shall be installed to avoid interferences with the operation, servicing and maintenance of equipment.

1.06 BASIS OF DESIGN

A. The Basis of Design, as scheduled or identified on the contract documents, shall be considered to set the minimum standard for all respective equipment submittals.
   1. Substitutions to the Basis of Design shall meet, or exceed the performance scheduled or identified on the contract documents.
      a. If no such performance has been scheduled or identified on the contract documents, the substituted product shall meet, or exceed the performance as published by the manufacturer of the Basis of Design.
   2. Substitutions to the Basis of Design shall be provided, at no additional cost to Owner, with all the standard features, trim, etc. as provided by the manufacturer of the Basis of Design.
   3. Non-standard options shall be provided as scheduled or identified on the contract documents at no additional cost to the Owner.

1.07 INSTALLATION

A. All work described in these specifications and all work required by this Contract shall be executed in a thoroughly substantial and craftsman-like manner by skilled mechanics in the various trades involved. Follow manufacturer's instructions for installing, connecting and adjusting all equipment.

1.08 SUPPORTS

A. The sprinkler contractor shall furnish and install all necessary clamps, brackets, angles and all other items for the proper support of equipment whether indicated on drawings or not.

B. All supports necessary for mounting and/or supporting equipment, fixtures, apparatus, etc., shall be of steel or similar material. Wood supports are not acceptable. Where used in corrosive environments, supports shall be suitably protected from corrosion.

1.09 ANCHOR BOLTS, SLEEVES, INSERTS AND OPENINGS

A. The sprinkler contractor shall layout and install their work in advance of finish construction.

B. The sprinkler contractor shall furnish all sleeves for passage of conduits through structural masonry and concrete walls, floors, roof and elsewhere as shall be required for the proper protection of each pipe and duct passing through building surfaces.

C. The sprinkler contractor shall secure all large equipment items with high strength bolts, washers and locknuts. Embedded anchor bolts shall be drilled and set perpendicular to the face of the concrete. Use beveled washers to allow nuts to seat flush on bolts slightly out of perpendicularity. Level all equipment and machinery with wedges, shims and jack bolts and grout under the entire bearing surface.

1.10 EQUIPMENT LAYOUT

A. Install all equipment to permit removal (without damage to other parts) of wheels, filters, belt guards, sheaves, drives, motors, disconnects and all other parts requiring periodic replacement or maintenance.

B. Provide access panels in equipment for inspection of interiors and for proper maintenance.

C. Arrange equipment to permit access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging doors and access panels.

1. The sprinkler contractor shall provide the Owner's Representative with all special tools needed for proper operation, adjustment and maintenance of equipment.

1.11 CLEANING

A. The sprinkler contractor shall clean up and remove from the site all rubbish, debris and trash accumulated during the day as a result of sprinkler contractor’s work or their presence on the job.

1.12 ADMINISTRATION AND SUPERVISION

A. The sprinkler contractor shall personally supervise the work and shall have at all times a competent person, approved by the Owner's Representative, following the work to receive instructions and to act with authority for the sprinkler contractor.

1.13 REGULATORY REQUIREMENTS

A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Designer rules otherwise.

C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owner at the completion of the work. Copies of permits shall be given to the Owner prior to the start of work.

1.14 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing, and do not proceed with the work required until written instructions have been issued by the General Contractor.

B. The sprinkler contractor is solely responsible for verifying field measurements, conditions, and specifications information (for all trades) before ordering materials and equipment and before commencing work. The sprinkler contractor is solely responsible for verifying shop drawings (including shop drawings of other trades) before releasing related materials and equipment and before rough in. No consideration, claims, charges, or compensation will be granted due to any differences between the actual dimensions and any dimensions indicated on the drawings.

C. Report any apparent discrepancies or conflicts found at once to the Architect-Engineer for consideration and wait for a decision before proceeding with any work in the affected area.

D. The Architect-Engineer's decisions in cases of discrepancies, conflicts, and related to verification of measurements and conditions are final and binding upon the sprinkler contractor, make all installation accordingly.

1.15 ITEMS NOT SHOWN OR SPECIFIED

A. Provide any items of material not indicated on the drawings and/or not specified, but which are required for the complete and proper installation and/or operation of any part of the work, as if indicated and specified.

B. Provide any work not indicated on the drawings and/or not specified, but which is required for compliance with applicable codes and regulations, as if indicated and specified.

C. No consideration, claims, charges, or compensation will be granted for performing work required for complete and proper installation/operation or required for compliance with applicable codes and regulations.

1.16 COORDINATION

A. Drawings are diagrammatic. They indicate general arrangements of systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all access doors, electrical frames, electrical boxes, sleeves and openings needed for their work, and also furnish information necessary to permit trades affected by the work to install same properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer. Where the work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the sprinkler contractor involved without extra cost to the Owner.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the work, and repair all damages without extra cost to the Owner.

1.17 ELECTRICAL COORDINATION

A. Furnish and install various electrical items relating to the fire protection equipment and control apparatus. The sprinkler contractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. Sprinkler contractor shall all coordinate their respective portions of the work, as well as the electrical characteristics of the fire protection equipment.

C. All power wiring and local disconnect switches will be provided by the sprinkler contractor for the line voltage power.

D. 120V and above power wiring sources extended and connected to fire protection devices, control panels, transformers and switches shall be the responsibility of the sprinkler contractor.

E. Except where specifically indicated on the Drawings or in the Specifications, the sprinkler contractor will provide all motor controllers and disconnect switches except those furnished as an integral part of packaged equipment.

F. The electrical contractor shall be responsible for reviewing submittals (provided by the general contractor) of other trades prior to submitting electrical submittals, ordering or installing any electrical equipment, conduit, wire, materials, etc.
   1. Review:
      a. Mechanical equipment submittals.
      b. Plumbing equipment submittals.
      c. Owner supplied equipment submittals.

G. The sprinkler contractor must review and incorporate all the electrical loads and characteristics from all the shop drawings submittals of other trades as part of their submittals.

H. Where conflicts or potential conflicts exist, immediately refer the conflicts to the Architect-Engineer in writing for decision to prevent delay in installation of work.

1.18 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the sprinkler contractor shall have the prior approval of the Designer.

1.19 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.20 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

1.21 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of fire protection equipment at the site.

1.22 PORTABLE AND DETACHABLE PARTS

A. Sprinkler contractor shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenance of the fire protection systems until final completion of the work, at which time they shall be handed over to the Owner.

1.23 GUARANTEE/WARRANTY

A. Guarantee Work of this Section in writing for one year following the date of beneficial occupancy by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Owner's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. Obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
   1. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by the sprinkler contractor without any reimbursement.
   2. At nine months into the one-year guarantee period, the sprinkler contractor shall perform a 100% test of all installed equipment. Any device and/or part found to be defective shall be repaired and/or replaced at no cost to the Owner. The sprinkler contractor shall notify the fire department one month in advance of the 100% test.
   3. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.
   4. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by the sprinkler contractor or a separate service organization. Choice of service organization shall be subject to the Owner's approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
   5. Submit copies of equipment and material warranties to the Owner before final payment.
   6. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to the Owner.
   7. This Paragraph shall not be interpreted to limit the Owner's rights under applicable codes and laws and under this Contract.
   8. Other Sections of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
   9. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by the Owner, and shall not initiate the guarantee period.
   10. Non-durable items, such as electric lamps, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.
   11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to the Owner's satisfaction, advise the Owner in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will direct course of action.

1.24 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Sprinkler contractor shall provide manuals as follows:
   1. Each copy of the approved operating and maintenance manual shall contain copies of equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

a. TABLE OF CONTENTS
   i. Introduction
      1.) Explanation of manual and its purpose and use.
      2.) Description of the electrical systems.
      3.) Safety precautions necessary for equipment.
      4.) Illustrations, schematics and diagrams.
      5.) Installation drawing.
   ii. Maintenance
      1.) Maintenance and lubricating instructions.
      2.) Replacement charts.
      3.) Trouble shooting charts for equipment components.
      4.) Testing instructions for each typical component.
      5.) Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
   iii. Manufacturer's Literature

1.25 OPERATING INSTRUCTIONS

A. Sprinkler contractor shall:

1. Upon completion of their work, the sprinkler contractor shall instruct the Owner or their Representative in the complete operating and maintenance procedures and requirements of all equipment, materials and systems installed as part of this Contract.

2. Four (4) complete, bound sets of operating and maintenance instructions shall be supplied to the Owner's Representative for all systems. Instructions shall include cuts of the various items, including technical data for same, manufacturer's literature and maintenance instructions.

1.26 RECORD DOCUMENTS

A. Sprinkler contractor shall provide documents as follows:

1. The following record documents must be submitted to the Owner's Representative.
   a. Approved product data submittals.
   b. Operating and maintenance instructions for all systems.
   c. Written guarantee.
   d. Record drawings (“As Builts").
      i. The Owner's Representative shall supply the sprinkler contractor with AutoCAD background floor plans.
      ii. It shall be the sprinkler contractor's responsibility to note, as their work progresses, all deviations and changes therefrom.
      iii. At the end of the project all deviations and changes shall be transferred to AutoCAD. Sprinkler contractor shall furnish “As-Built” to the Owner's Representative.
      iv. The sprinkler contractor shall note all changes necessitated by field conditions, change order, etc., at the completion of their portion of the work.
   e. Copy of valve schedules.
   f. Check, Test, and Start-up Service Reports addressed to and in favor of Owner where equipment is specified for this procedure.

g. Receipts signed by Owner indicating Owner's receipt of any spare parts or equipment such as belts, valves, fuses and accessories required by other sections of this division to be furnished by the sprinkler contractor and turned over to the Owner.
h. Four (4) sets of hard copies and two (2) electronic copies of the above record documents must be submitted to the Owner's Representative; three of the sets will be forwarded to the Owner and the Owner's Representative will retain one copy. Record documents shall be arranged in the following manner:
i. Each set to be inserted in hard cover three ring binder(s). Each set must include one of each item required in Part. A.
j. Items in the binder(s) are to be separated using 8 1/2" x 11" index dividers with plastic insertable tabs. Tabs to be labeled as required to identify each item in binder.
k. Cover sheet in each binder indicating the following:
    i. Date
    ii. Project title and number
    iii. Owner's name and address
    iv. Sprinkler contractor's name and address
    v. Engineer's name and address
    vi. Table of Contents listing contents of each section in the binder(s).
l. All drawings to be inserted in pockets in the binder(s). Stapled sets of drawings will not be required to be inserted in binder pockets, but should be submitted with binder(s) and noted in Table of Contents.

1.27 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

1.28 EXTRA MATERIALS

A. Sprinkler contractor shall furnish Extra Materials to Owner upon substantial completion. Note that some Sections in this Specification also indicate extra materials to be provided. At a minimum, furnish:

1.29 WORK INCLUDED

A. In general, the Fire Protection work includes, but is not limited to:
    1. Design, furnish and install a new fire protection system in its entirety. Sprinkler contractor shall be responsible to provide a complete, safe, and working system meeting all code requirements.
    2. Completion of a Hydrant Flow Test.
    3. Coordination with local Fire and Building Departments with regard to testing, labeling and approval of submitted equipment and materials.
    4. Hydraulic calculations/dry system water delivery calculations/water supply flow duration calculations.
    5. Fire Protection system design, stamped construction drawings, shop and coordination drawings.

B. Obtain all city and state permits required and pay all fees. All design/shop drawings and hydraulic calculations shall be stamped by a professional engineer registered in the State of New York.

END OF SECTION 210002

SECTION 210005

COORDINATED SHOP DRAWINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Related Sections include the following:
   1. Division 01 Section "General Commissioning Requirements."

1.03 DESCRIPTION

A. Fire protection contractor shall prepare and submit coordinated shop drawings for Owner's, Architect's and Engineer's review.
   1. Note that contract drawings are schematic only, and fire protection contractor shall not scale drawings or build from as shown.
   2. Fire protection contractor is responsible to field verify all field conditions and install equipment and systems to meet all required clearances and provides all necessary access.
   3. Fire protection contractor shall field determine final locations and elevations that best suits the needs of the Project.
   4. SUBMITTALS
      a. Coordinated Shop Drawings shall be drawn to a scale not smaller than 3/8 inch equals 1 foot.
         i. Drawing sheets shall be same size as the Contract Drawings.
      b. Coordinated Shop Drawings shall depict fabrication, assembly, and installation details. Drawings shall show equipment/system plans, elevations and sections. Details of components, and attachments to other work shall also be included
      c. Fire protection contractor shall submit ten (10) hard copies of final coordinated shop drawings and one (1) electronic copy.
         i. Electronic copies shall be provided in AutoCad Revit format, and each trade shall have their work separated in "layers".

1.04 PROCEDURE

A. The contract documents are to be coordinated in the following manner:
   1. The MC shall have his sheet metal subcontractor prepare a first submission of ductwork shop drawings to 3/8" scale. These drawings are to incorporate all ductwork (including bottom of duct elevations), equipment and accessories as specified and shown on the contract drawings.
      a. All existing and proposed penetrations through walls, floor and decks must be shown on the drawings.
      b. All conflicts with buildings' construction will be resolved by the GC.
      c. The completed 3/8" scale drawings will be used for coordination with all other trades.

d. The sheet metal subcontractor will submit the 3/8" ductwork shop drawings to the MC.

2. The MC will then forward the ductwork shop drawings to the GC.
3. The GC will forward the ductwork shop drawings to the PC.
   a. The PC will incorporate his/her scope of work on the 3/8" ductwork shop drawings illustrating all plumbing equipment, piping, hangers.
      i. The PC will also prepare 3/8" shop drawings depicting all subsurface work.
      ii. The PC will include invert of pipes; elevations and pipe sizes allowing for insulation.
      iii. Any conflicts between the plumbing and ductwork shall be keyed by the PC with a red circle.
      iv. Coordination meetings will be requested by the PC to resolve the conflicts.
      v. All conflicts that arise between the plumbing and ductwork layouts must be resolved.
      vi. The GC will resolve any conflicts.
      vii. The PC shall complete his/her drawings depicting all resolutions.
   b. The PC shall "sign off" on each drawing when it is ascertained that no conflicts exist between the ductwork and plumbing work and forward the "signed of" drawings to the GC.
4. The GC will forward the final ductwork/plumbing shop drawings to the MC.
   a. The MC will incorporate all other heating and air conditioning: piping, equipment, hangers, including elevations and pipe sizes including insulation on the 3/8" scale drawings.
      i. Any conflicts between the MC, PC and ductwork should be “red circled”.
      ii. Coordination meetings will be requested by the MC to resolve the conflicts. All conflicts that arise between the MC, ductwork and PC must be resolved.
      iii. The GC will resolve any conflicts.
      iv. The MC shall complete his/her drawings depicting all resolutions.
   b. The MC shall "sign off" on each drawing when it is ascertained that no conflicts exist between the MC, ductwork and PC and forward the signed off drawings to the GC.
5. The GC will forward the final Ductwork/plumbing/ MC shop drawing to the EC.
   a. The EC will incorporate all electrical equipment including but not limited to light fixtures, switchgear, conduit & hangers.
      i. The EC will also include any subsurface work on the drawings prepared by the PC.
      ii. The EC will include elevations of light fixtures, conduit & conduit sizes. Any conflicts with the ductwork, PC and/or MC shall be keyed by the EC with a red circle.
      iii. Coordination meetings will be requested by the EC to resolve any conflicts. All conflicts that arise between the EC, MC, PC and ductwork must be resolved.
      iv. The GC will resolve any conflicts.
      v. The EC shall complete his/her drawings depicting all resolutions.
   b. The EC shall "sign off" on each drawing when it is ascertained that no conflicts exist between the EC, MC, PC and ductwork and forward the signed off drawings to the GC.
6. The GC will forward the final ductwork/plumbing/MC/EC shop drawings to the fire protection contractor (FP).
   a. The FP will incorporate all sprinkler equipment, piping, hangers and sprinkler heads as required by code.
      i. The FP will include elevations of piping and piping sizes. Any conflicts with the ductwork, PC, MC or EC shall be keyed by the FP with a red circle.

ii. Coordination meetings will be requested by the FP to resolve any conflicts. All conflicts that arise between the FP and the other trades must be resolved.
iii. The GC will resolve any conflicts.
iv. The FP shall complete his/her drawings depicting all resolutions.
v. The PC, MC, FP and GC shall "sign off" on each drawing when it is ascertained that no conflicts exist between the FP, MC, PC and GC.

b. GC shall then, and only then, disburse to the Design Team for review.

1.05 SCHEDULE OF SUBMISSIONS

A. The MC shall commence the ductwork shop drawings within two (2) weeks after award of contract (or authorization to proceed).

B. The sheet metal subcontractor (MC) shall submit the first submission ductwork shop drawings to the GC for review within the time frame and schedule as dictated by the GC.

C. After review of first submission ductwork shop drawings, corrections shall be made prior to transmitting to the plumbing contractor for his phase of the coordinated drawings.

D. Turn around time for each Contractor shall be two (2) weeks maximum.

E. Upon completion of all work of all trades as described above, all trades shall sign off on drawings indicating Company name, date of sign off and signature of Company Representative.
1. Signatures shall be understood to verify that each Contractor has shown their respective work on the drawings and have resolved all points of conflict and interference with other trades.
a. Completed signed off prints of coordinated drawings will be transmitted to all Contractors as outlined above for construction and installation. Revised and re-coordinated drawings may be required to attain approval for construction drawings

1.06 RECORD AND "AS BUILT" DRAWINGS

A. Each Contractor, after completing his segment of the coordinated drawings, shall print copies of the completed drawings and maintain same for his/her records.

B. At the completion of the project and at the option of the Owner's Representative, "as built" corrections will be made to these drawings by each of the aforementioned Contractors and returned to the Owner's Representative for his permanent files and records.

C. These "as builts" do not remove the obligation of "as builts" and record drawings as outlined under other sections of the specifications unless the Owner's Representative elects to do so.

END OF SECTION 210005

SECTION 210007

CODES, REGULATIONS, STANDARDS AND FEES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. The contract work, materials and equipment shall conform to the applicable requirements of all governing codes, rules and regulations of current issue including, but not necessarily limited to the following:
   1. All equipment shall meet the requirements of the 2020 New York State Building Code, 2020 New York State Fire Code, and 2020 New York State Energy Conservation Construction Code.
   2. All installations shall conform to design standards as outlined in NFPA 13, 2013 edition.
   3. All installations and materials shall conform to applicable New York State and Local building construction codes.
   4. When codes or regulations are not consistent, the more stringent code or regulation shall apply.

1.03 NON-COMPLIANCE

A. Should the sprinkler contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances and industry standards, he shall bear all costs arising in correcting the deficiencies.

1.04 INSPECTIONS

A. During and upon completion of the work, the sprinkler contractor shall obtain and submit to the Owner's Representative:
   1. Any local certificate required.
   2. Said certificate(s) shall be submitted to the Owner's Representative before final payment is made.

B. The sprinkler contractor is responsible for all fees associated with any required inspections.

1.05 APPLICABLE CODES

A. All workmanship and materials shall conform to all state laws, local ordinances, local utility company regulations, and applicable Codes and Standards. In case of conflict with the Contract Drawings and Specifications, such laws, regulations and codes shall govern, except that the Contract Drawings and Specifications shall apply wherever they may require workmanship or materials other than required by the Codes and Standards. Applicable Codes and Standards shall include all pertinent requirements of the following Organizations:

1. 2020 New York State Building Code of New York State
2. 2020 New York State Fire Code
3. 2020 New York State Energy Conservation Code
4. New York Uniform Code Supplement
5. Local Codes
6. National Fire Protection Association (NFPA)
7. Public Health Service Regulations
8. Local Utility Standards & Regulations
9. American National Standards Institute (ANSI)
10. Certified Ballast Manufacturer (CBM)
11. Electrical Testing Laboratories (ETL)
12. Independent Testing Laboratories (ITL)
13. National Electrical Code (NEC) Latest Edition
14. National Electrical Manufacturers Association (NEMA)
15. Underwriters Laboratories (UL)
16. American Society for Testing & Materials (ASTM)
17. Insulated Power Cable Engineers Association (IPCEA)
18. Institute of Electrical and Electronic Engineers, Inc. (IEEE)

1.06 PERMITS

A. If any permits are required, it shall be the full responsibility of the sprinkler contractor to obtain and pay for all appropriate permits from all applicable agencies, prior to installation of any equipment.

END OF SECTION 230007

SECTION 210517

SLEEVES & SLEEVE SEALS FOR FIRE PROTECTION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated

PART 2 - PRODUCTS

2.01 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.02 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 SLEEVE EXECUTION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Permanent sleeves are not required for holes in slabs formed by molded -PE or -PP sleeves.
   2. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
   3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

END OF SECTION 210517

SECTION 210518

ESCUTCHEONS FOR FIRE PROTECTION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 ESCUTCHEONS

A. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

B. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.02 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for set screw type fasteners.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Bare Piping at Floor Penetrations in All Spaces: One-piece, cast-iron type with holes for fasteners.
      b. Bare Piping at Wall Penetrations in All Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe and with OD that completely covers opening.
   1. New Piping: One-piece, floor-plate type.

3.02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 211100

FACILITY FIRE PROTECTION WATER-SERVICE PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Fire protection installation begins at floor flanges installed by the site contractor where shown on the civil plans.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements of well service company supplying water.
   2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

PART 2 - PRODUCTS

2.01 BACKFLOW PREVENTERS

A. Backflow Preventer Assemblies:
   1. Shall be double-check type or RPZ – as required by Authority Having Jurisdiction.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
      a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
      b. Conbraco Industries, Inc.; Apollo Valves.
      c. FEBCO; SPX Valves & Controls.
      d. Watts Water Technologies, Inc.
      e. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
   4. Operation: Continuous-pressure applications.
   5. Pressure Loss: per manufacturers cut sheets.
   6. End Connections: flanged
   7. Configuration: Designed for horizontal, straight through flow.
   8. Accessories:
      a. Valves: OS&Y gate type with flanged ends on inlet and outlet. Valves to be provided with properly adjusted tamper switches to be wired by the EC.

PART 3 - EXECUTION

3.01 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Install flanges, flange adaptors at connection point to sprinkler system piping.

C. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

3.02 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing, health department authorities having jurisdiction.

B. Support backflow preventer and piping on galvanized steel stanchions.

3.03 FIELD QUALITY CONTROL

A. Use backflow test procedure prescribed by authorities having jurisdiction.

B. Hydrostatic Tests: Test at not less than 200 psi for two hours.

C. Prepare test and inspection reports.

D. Sprinkler Contractor is responsible for flushing the incoming fire service main. The minimum flow rate shall be per the requirements of NFPA-13.

END OF SECTION 211100

SECTION 211313

FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gauges.

1.03 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.04 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

B. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing air under pressure that is connected to water supply through dry pipe valve. Air discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Drop in air pressure trips dry pipe valve allowing water to enter and fill the system. Water then discharges from open sprinklers.

C. Pre-Action Sprinkler System: pre-action sprinkler system: Automatic sprinklers are attached to piping containing gas (either nitrogen or compressed air) that is connected to a water supply through an alarmed valve. Gas discharges immediately from sprinklers when they are opened, which occurs when heat melts fusible link or destroys frangible device. Upon sensing a drop in downstream pressure, coupled with a signal from fire detectors in areas being served indicating that a fire condition exists, the pre-action valve releases water into piping downstream for distribution.

D. Sprinkler system design shall be approved by authorities having jurisdiction.

E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and all applicable state and local building codes. This requirement shall be based on site soil conditions as stated and calculated based on the current state building code.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: The sprinkler contractor is responsible for the completion of shop drawings as per NFPA-13. Include plans, elevations, sections, details, hydraulic calculations and attachments to other work.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.06 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Division 21 Section “Coordination Drawings”

B. Qualification Data: For qualified Installer and professional engineer.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Fire-hydrant flow test report.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping".

F. Field quality-control reports.

1.07 CLOSEOUT SUBMITTALS

A. As-built drawings

B. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.08 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
      a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. 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.

C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
   1. NFPA 13, "Installation of Sprinkler Systems."
   2. NFPA-14, “Installation of Standpipe Systems.”

1.09 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.02 STEEL PIPE, GALVANIZED STEEL AND FITTINGS

A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M. Pipe ends may be factory or field formed to match joining method. Pipe 1” to 2” inclusive to be standard weight schedule 40.

B. Schedule 30, Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10. Pipe 2½” and larger to be schedule 10.

D. For Pre-Action Sprinkler Systems: Schedule 40, Galvanized Steel Pipe: ASTM A 53 or ASTM A 795. Pipe ends may be factory or field formed to match joining method.

E. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern. Plain fittings to be used on wet and dry pipe systems internal to the building. Galvanized fittings to be used on all drains and all piping installed external to the building, provided with a galvanized interior.

F. Cast-Iron Flanges: ASME 16.1, Class 125.

G. Grooved-Joint, Steel-Pipe Appurtenances:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Anvil International, Inc.
      b. National Fittings, Inc.
      c. Tyco Fire & Building Products LP.
      d. Victaulic Company.
   2. Pressure Rating: 175 psig minimum.
   3. Factory Painted, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
   4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.03 COPPER TUBE AND FITTINGS

A. Pre-Action Sprinkler System, Seamless Copper Tube: ASTM B 75 or ASTM B 88. Pipe ends may be factory or field formed to match joining method.

B. Copper Solder Fittings: ASME B16.22 or ASME B16.18, Class 125, standard pattern.

2.04 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
   1. Valves shall be UL listed or FM approved.
   2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Ball Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide indicated on Drawings or approved equal:
      a. Anvil International, Inc.
      b. Victaulic Company.
   3. Standard: UL 1091 except with ball instead of disc.
   4. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
   5. Valve NPS 2: Bronze body with threaded ends or ductile-iron body with grooved ends.
   6. End Connections: Threaded.

C. Iron Butterfly Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide indicated on Drawings or approved equal:
      a. Anvil International, Inc.
      b. Kennedy Valve; a division of McWane, Inc.
      c. Milwaukee Valve Company.
      d. NIBCO INC.
      e. Tyco Fire & Building Products LP.
      f. Victaulic Company.
   3. Standard: UL 1091.
   4. Pressure Rating: 175 psig.
   5. Body Material: Cast or ductile iron.
   6. Style: Lug or wafer.
   7. End Connections: Grooved.

D. Check Valves:

   1. Manufacturers: Subject to compliance with requirements, products by one of the following or approved equal:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved equal:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. Crane Co.; Crane Valve Group; Jenkins Valves.
      c. Crane Co.; Crane Valve Group; Stockham Division.
      d. Fire-End & Croker Corporation.
      e. Fire Protection Products, Inc.
      f. Kennedy Valve; a division of McWane, Inc.
      g. Milwaukee Valve Company.
      h. Mueller Co.; Water Products Division.
      i. NIBCO INC.
      j. Potter Roemer.
      k. Reliable Automatic Sprinkler Co., Inc.
      l. Tyco Fire & Building Products LP.
      m. United Brass Works, Inc.
      n. Victaulic Company.
   3. Standard: UL 312.
   4. Pressure Rating: 250 psig minimum.
   5. Type: Swing check.
   6. Body Material: Cast iron.
   7. End Connections: Flanged or grooved.

E. Iron OS&Y Gate Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved equal:
      a. American Valve, Inc.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Jenkins Valves.
      d. Crane Co.; Crane Valve Group; Stockham Division.
      e. Milwaukee Valve Company.
      f. Mueller Co.; Water Products Division.
      g. NIBCO INC.
      h. Tyco Fire & Building Products LP.
   3. Standard: UL 262.
   4. Pressure Rating: 250 psig minimum.
   5. Body Material: Cast or ductile iron.
   6. End Connections: Flanged or grooved.

F. Indicating-Type Butterfly Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved equal:
      a. Anvil International, Inc.
      b. Kennedy Valve.
      c. Milwaukee Valve Company.
      d. NIBCO INC.
      e. Tyco Fire & Building Products LP.
      f. Victaulic Company.
   3. Standard: UL 1091.
   4. Pressure Rating: 175 psig minimum.
   5. Valves NPS 2 and Smaller:
      a. Valve Type: Ball or butterfly.
      b. Body Material: Bronze.
      c. End Connections: Threaded.
   6. Valves NPS 2-1/2 and Larger:
      a. Valve Type: Butterfly.
      b. Body Material: Cast or ductile iron.
      c. End Connections: Flanged, grooved, or wafer.
   7. Valve Operation: Integral prewired, two-circuit, supervisory switch and visual indicating device.

2.05 TRIM AND DRAIN VALVES

A. General Requirements:
   1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
   2. Pressure Rating: 175 psig minimum.

B. Angle Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Fire Protection Products, Inc.
      b. United Brass Works, Inc.

C. Ball Valves:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Anvil International, Inc.
      b. Conbraco Industries, Inc.; Apollo Valves.
      c. Fire-End & Croker Corporation.
      d. Fire Protection Products, Inc.
      e. Jomar International, Ltd.
      f. Kennedy Valve; a division of McWane, Inc.
      g. Legend Valve.
      h. Milwaukee Valve Company.
      i. NIBCO INC.
      j. Potter Roemer.
      k. Tyco Fire & Building Products LP.
      l. Victaulic Company.

D. Globe Valves:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Fire Protection Products, Inc.
      b. United Brass Works, Inc.

2.06 SPECIALTY VALVES

A. General Requirements:
   1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
   2. Pressure Rating:
      a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
   3. Body Material: Cast or ductile iron.
   4. Size: Same as connected piping.
   5. End Connections: Flanged or grooved.

B. Alarm Riser Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved equal:
   a. Reliable Automatic Sprinkler Co., Inc.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.
3. Standard: UL 193.
4. Design: For horizontal or vertical installation.
5. Include trim sets for bypass, drain, pressure gauges.
6. A Water Motor Assembly is not required.

C. Automatic (Ball Drip) Drain Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved equal:
   a. AFAC Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
3. Standard: UL 1726.
4. Pressure Rating: 175 psig minimum.
5. Type: Automatic draining, ball check.
6. Size: NPS 3/4.
7. End Connections: Threaded.

2.07 FIRE-DEPARTMENT CONNECTIONS

A. Fire-Department Connections:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved equal:
   a. Elkhart Brass Mfg. Company, Inc.
   b. Guardian Fire Equipment, Inc.
   c. Potter Roemer.
2. Standard: UL 405.
3. Type: 4” storz (or as required by the City of Worcester Fire Department) wall mounted as shown on the design plans.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlet: Hard Coated Aluminum 4” Storz style matching local fire-department size.
7. Caps: Hard Coated Aluminum, standard 4” Storz type, with gasket and chain.
8. Escutcheon Plate: Round, hard coated anodized aluminum, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: One.
12. Outlet Location: Back.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR."

14. Finish: Hard coated anodized aluminum.
15. Outlet Size: NPS 4

2.08 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   a. AGF Manufacturing Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   a. Elkhart Brass Mfg. Company, Inc.
   b. Fire-End & Croker Corporation.
   c. Potter Roemer.
2. Standard: UL 199.
3. Pressure Rating: 175 psig
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. AGF Manufacturing Inc.
      b. Tyco Fire & Building Products LP.
      c. Victaulic Company.
      d. Viking Corporation.
   2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
   3. Pressure Rating: 175 psig minimum.
   4. Body Material: Cast- or ductile-iron housing with sight glass.
   5. Size: Same as connected piping.
   6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Merit Manufacturing; a division of Anvil International, Inc.
   2. Standard: UL 1474.
   3. Pressure Rating: 250 psig minimum.
   4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
   5. Size: Same as connected piping.
   6. Length: Adjustable.
   7. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Drop Fittings:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. FlexHead Industries, Inc.
   2. Standard: UL 1474.
   3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
   4. Pressure Rating: 175 psig minimum.
   5. Size: Same as connected piping, for sprinkler.
   6. System hydraulic design to use the UL Listed friction losses through the hose assembly considering the actual assembly maximum length and minimum allowable turn radius.

2.09 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   1. Reliable Automatic Sprinkler Co., Inc.
   2. Tyco Fire & Building Products LP.
   3. Victaulic Company.
   4. Viking Corporation.

B. General Requirements:
   1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
   2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:
   1. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
   2. All sprinklers to be quick response.
   3. Residential sprinklers complying with UL 1626 shall be permitted in dwelling units and adjoining corridors as permitted by NFPA 13.

D. Sprinkler Finishes:
   1. Bronze.
   2. White Factory Painted.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
   1. Ceiling Mounting: White factory finish, two piece, recessed.
   2. Sidewall Mounting: White factory finish, two piece, recessed.

F. Sprinkler Guards:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Reliable Automatic Sprinkler Co., Inc.
      b. Tyco Fire & Building Products LP.
      c. Victaulic Company.
      d. Viking Corporation.
   2. Standard: UL 199.
   3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Fire-Lite Alarms, Inc.; a Honeywell company.
      b. Notifier; a Honeywell company.
      c. Potter Electric Signal Company.
   2. Standard: UL 464.
   3. Type: Vibrating, metal alarm bell.
   4. Size: 6-inch minimum-diameter.
   5. Finish: Red-enamel factory finish, suitable for outdoor use.

C. Water-Flow Indicators:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
      a. Potter Electric Signal Company.
      b. System Sensor; a Honeywell company.
   2. Standard: UL 346.
   3. Water-Flow Detector: Electrically supervised.

4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig
7. Design Installation: Horizontal or vertical.

D. Pressure Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
   a. Potter Electric Signal Company.
   b. System Sensor; a Honeywell company.
   c. Tyco Fire & Building Products LP.
   d. Viking Corporation.
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal
   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Kennedy Valve; a division of McWane, Inc.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal
1. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0 to 300 psig.

E. Water System Piping Gauge: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.01 PREPARATION

A. System design is to be based on a hydrant flow test conducted by the sprinkler contractor.

3.02 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire Protection Water Service Piping."

B. Install shutoff valve, riser check valve, pressure gauge, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Division 21 Section "Facility Fire Protection Water Service Piping."

3.03 PIPING INSTALLAION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
   1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes and individual sprinkler zones.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

J. Install alarm devices in piping systems.

K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

L. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

M. Fill sprinkler system piping with water.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire Protection Piping."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire Protection Piping."

3.04 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

C. Ream ends of pipes and tubes and remove burrs.

D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

G. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

3.05 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Where used, install sprinklers into flexible sprinkler hose fittings and install hose into listed bracket on ceiling grid.

C. Where residential sprinklers are to be used:
   1. Residential-type heads shall only be installed on wet sprinkler systems, unless otherwise permitted by their listing for dry or pre-action systems.
   2. When one or more residential-type heads are installed within a space, all sprinklers within that space shall also be residential-type.

3.06 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Furnish and install sign denoting fire department connection at exterior of buildings where applicable.

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   4. Energize circuits to electrical equipment and devices.
   5. Coordinate with fire-alarm tests. Operate as required.
   6. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.08 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Supervise and/or conduct underground flushing of fire service mains before connection of any interior piping. Flushing to be conducted with a minimum flow rate of 1,125 gpm which is maximum flow requirements of system.

3.09 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:
   1. Rooms without Ceilings: Upright sprinklers.
   2. Rooms with Suspended Ceilings: Recessed pendent sprinklers with white covers to conceal heads.
   3. Wall Mounting: Sidewall sprinklers.
   4. Spaces Subject to Freezing: Recessed pendent, dry sprinklers.

END OF SECTION 211313

SECTION 221519
PACKAGED AIR COMPRESSOR AND RECEIVERS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
B. Section Includes:
   1. Air compressor.
   2. Dew point monitor.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) - ASME BPVC Boiler and Pressure Vessel Code Section VIII Pressure Vessels.

1.03 ABREVIATIONS

A. SCFM – Standard Cubic Feet per Minute
B. PSI – Pounds per Square Inch

1.04 SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
B. Shop Drawings: Wiring Diagrams: For power, signal, and control wiring.
C. Submit inspector's certificate for Air Receiver with Operating and Maintenance Manuals.

1.05 QUALITY ASSURANCE

A. Air receivers shall meet requirements of ASME BPVC, Section VIII, and shall carry ASME approval stamp.

1.06 WARRANTY

A. The warranty on the air ends will be three years from date of shipment, and one year from the date of shipment on the overall system.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Saylor-Beall
B. Champion
C. Ingersoll Rand
D. Atlas Copco

2.02 AIR COMPRESSOR SYSTEM

A. Provide enclosed oil-less scroll air high pressure compressors and associated equipment and one ASME tank with FDA approved internal lining. Scroll Enclosed Series system shall be complete with multiple oil less scroll compressors, mounted inside of a rigid steel enclosure. Enclosures shall have a powder coated finish, and include sound deadening insulation. Noise levels shall not exceed 58 dBa with all compressor units in operation. Each compressor pump shall have a 1,725-rpm TEFC motor, V-belt drive, and air-cooled after cooler. System shall include the Powerex SOS (Scroll Operating System) controller for energy efficiency with a PBMI touch screen as standard.
B. Two separate packages shall be provided, designed to provide 37.5 SCFM total each at 145 PSIG.
C. Noise level shall not exceed 56 dBa with compressor in operation.
D. System shall include a solid state controller to operate the necessary compressor to maintain the pressure requirement and to minimize the operating cost.

2.03 PBMI SCREEN DISPLAY

A. The PBMI screens shall display the following:
    1. System pressure
    2. Compressor type
    3. Compressor status (for each compressor)
    4. Compressor run hours (per compressor)
    5. Model and Serial number of the unit
    6. Sequence of Operation
    7. Alarm screens
    8. Fault indication
    9. Alarm history
    10. Maintenance screens to include the following:
        a. Run hours (total and per compressor)
        b. Hours until scheduled maintenance alert
        c. A message window with required maintenance at set intervals for each compressor
    11. Alerts will be displayed and email notification sent for any of the following:
    12. Compressor maintenance
    13. Any general fault alarm

2.04 OIL-LESS SCROLL HP COMPRESSOR PUMP

A. The compressors shall be belt driven oil less rotary scroll single stage, air-cooled oilless construction with absolutely no oil needed for operation. The rotary design shall not require any inlet or exhaust valves and shall be rated for 100% continuous duty. Direct drive compressors

shall not be used. Tip seals shall be of a composite PTFE material and be rated for 10,000 hours operation. Compressor bearings shall be external to the air compression chamber and shall all be serviceable for extended compressor life. Bearing maintenance shall not be required until 5,000 run hours. Compressors with bearings that are not accessible for service have a limited life span and shall not be accepted. Compressors shall have an integral radial flow fan for cooling and shall not require any additional electric cooling fans. Each compressor shall have flexible connectors on intake and discharge.

B. Each compressor shall include a discharge check valve, a diverter isolation valve, an air-cooled after cooler and a high discharge temperature shut down switch. The discharge of the enclosure shall be fitted with a liquid separator.

2.05 MOTORS

A. Each compressor shall be belt driven by a 1.750 RPM, TEFC NEMA construction motor. Motors running at speeds higher than 1.750 RPM shall not be acceptable.

2.06 AIR RECEIVER

A. The system shall include vertical ASME air receivers rated for 200 PSI MAWP. Each tank shall be equipped with a pressure gauge, safety relief valve and automatic electronic tank drain with manual override. The receivers shall be internally lined with an FDA approved material for corrosion resistance.

2.07 DESICCANT AIR DRYER

A. The system shall include desiccant air dryers. The desiccant dryers shall provide a pressure dew point of -10 degrees F. Dryer controls shall include a re-pressurization cycle to prevent shocking of the desiccant bed prior to switching towers. An integral purge economizer control system shall be provided and shall reduce the purge air loss during periods of low demand. When the dryers are in the purge economizer mode, the time of the purge cycle is reduced to correspond with actual flow. The dryers shall be fitted with a .01 micron pre filter, a 1 micron after filter and a pressure regulating valve with gauge.

2.08 DEW POINT MONITOR

A. The system shall be supplied with an LCD dewpoint display and high dewpoint alarm with dry contacts for remote monitoring. The dew point sensor (probe) shall be of a rugged Hyper-Thin-Film Aluminum Oxide type, and installed so that the monitored airflow is downstream of the pressure regulator assembly. The monitor shall include a self-calibration mode to enable calibration of the dewpoint sensor without the need to return the sensor to the factory for calibration. The dew point monitor shall be Powerex model no. PDPM1001JJ with a dew point reading range of -60F to +54 deg. F.

2.09 COMPRESSED AIR CONDENSATE TRAPS

A. The system shall include two (2) Water Hog energy-saving, zero-loss fully automatic condensate traps capable of operating up to 200 PSI.

2.10 SYSTEM REGULATOR

A. The system shall be supplied with one (1) Watts Model # R119-08CG compressed air pressure regulator with gauge.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install compressor unit on a concrete foundation with a sole plate and isolators. Level, grout, and bolt in place.
B. Provide an air cock and drain connection on the horizontal casing.
C. Install full bore ball valve and anti-return valve on the compressor discharge.
D. Install replaceable cartridge-type filter silencer of adequate capacity for each compressor.
E. Place shut-off valve on the water inlet to the aftercooler. Pipe the drain to floor drain.
F. Pipe condensate drains to nearest floor drain.
G. Install valved bypass around air dryer. Factory-insulate the inlet and outlet connections of the dryer.
H. Install valved drip connections at low points of piping system.
I. Install branches to outlets from the top of the main line, with a shut-off valve after the branch take-off.
J. Install compressed air couplings, 3/8-inch (9.5 mm) female speed couplers, and pressure gauges where outlets are indicated.
K. Install tee pieces in lieu of elbows at changes in the direction of piping. Fit open end of each tee with plug.

3.02 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Prepare test and inspection reports.

3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, start-up, operate, and maintain the air compressor equipment.

END OF SECTION 221519

SECTION 226301
UTILITY PIPING FOR FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Utility Systems: Consisting of compressed air services; complete, ready for operation, including all necessary piping, fittings, and valves.

1.02 APPLICABLE PUBLICATIONS

A. American Society of Mechanical Engineers (ASME):

A13.1-2007 (R2013).....Scheme for the Identification of Piping Systems

B16.50-2013 .....Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings

B. ASME Boiler and Pressure Vessel Code -

BPVC Section IX-2015 .....Welding, Brazing, and Fusing Qualifications

C. American Society for Testing and Materials (ASTM):

B687-1999 (2011) .....Standard Specification for Brass, Copper, and Chromium-Plated Pipe Nipples

D. American Welding Society (AWS):

B2.2/B2.2M-2010.....Specification for Brazing Procedure and Performance Qualification

E. Manufacturing Standardization Society (MSS):

SP-72-2010a .....Ball Valves With Flanged or Butt-Welding Ends For General Service

1.03 SUBMITTALS

A. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.

1. Piping.
2. Valves.
3. Inlet and outlet cocks

B. Certification: The completed systems have been installed, tested, purged, analyzed and verified in accordance with the requirements of this specification.

1.40 QUALITY ASSURANCE

A. Equipment Installer: Show technical qualifications and previous experience in installing compressed air equipment on three similar projects. Submit names, phone numbers, and addresses of referenced projects. Installers shall meet the qualifications of ASSE Standard Series 6000.

B. Equipment Supplier: Provide evidence of equivalent product installed at three installations similar to this project that has been in satisfactory and efficient operation for three years. Submit names, phone numbers, and addresses where the product is installed.

C. Submit the testing agency's detailed procedure which shall be followed in the testing of this project. Include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, purity tests, etc., as required by this specification. For purity test procedures, include data on test methods, types of equipment to be used, calibration sources and method references.

D. Certification: Provide COR documentation 10 working days prior to submitting request for final inspection to include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits allowed by this specification.

PART 2 - PRODUCTS

2.01 PIPING AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedules 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.

3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

5. Material Group: 1.1.

6. End Connections: Threaded or butt welding to match pipe.

7. Lapped Face: Not permitted underground.

8. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.

9. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground, and stainless steel underground.

10. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

12. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

13. Mechanical Couplings:

    a. Steel flanges and tube with epoxy finish.

    b. Buna-nitrile seals.

    c. Steel bolts, washers, and nuts.

    d. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

B. Copper Tubing: Type "L", ASTM B819, seamless copper tube, hard drawn temper, with brazing fittings complying with ASME B16.50. Size designated reflecting nominal inside diameter.

1. Brazing Alloy: AWS A5.8M/A5.8, Classification BCuP, greater than 538 degrees C (1000 degrees F) melting temperature. Flux is strictly prohibited for copper-to-copper connections.

C. Stainless Steel: Fractional 316 stainless steel seamless tubing, ASTM A213/A269.

1. Stainless Steel Fittings:

    a. Process Gas Service: Fractional 316 stainless steel Swagelok-brand fittings, ASTM A276/A182. Where threaded connections are required to interface with copper, brass or bronze tubing/piping, ASME B1.20.1 NPT threaded connections shall be used. Alternate manufacturers are not permitted.

D. Apply piping identification labels at the time of installation in accordance with NFPA 99. Apply supplementary color identification in accordance with CGA Pamphlet C-9.

2.02 VALVES

A. Steel Piping:

1. Ball:

    a. Class 150.

    b. Valve pressure rating 250-psi non-shock cold working pressure.

    c. Maximum service temperature 250°F.

    d. Two-piece body.

    e. Full port.

    f. Silicon bronze stem.

g. Reinforced PTFE seat rings.

B. Copper Tubing:

1. Ball:

a. Bronze/ brass body, MSS SP-72, MSS SP-110, Type II, Class 150, Style 1, with tubing extensions for brazed connections, full port, three-piece or double union end connections, Teflon seat seals, full flow, 600 psig WOG minimum working pressure, with locking type handle, cleaned for oxygen use and labeled for intended service.

C. Stainless Steel Tubing:

1. Valves up to 1/2" in size: Fractional 316 stainless steel Swagelok-brand plug valve, P4T and P6T Series. Alternate manufacturers are not permitted.

2. Valves exceeding 1/2" in size: Fractional 316 stainless steel Swagelok-brand 3-piece ball valve, 60 Series. Alternate manufacturers are not permitted.

PART 3 - EXECUTION

3.01 PIPING SCHEDULE

A. Compressed Air Piping:

1. All piping shall be:

a. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.

3.02 MANUFACTURER'S INSTRUCTIONS

A. Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.03 PIPING CONNECTIONS AND INSTALLATION

A. Install shut-off valves at outlets, major branch lines and in locations as indicated.

B. Install quick-coupler chucks and pressure gauges on drop pipes.

C. Install unions to permit removal or replacement of equipment.

D. Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.

E. Grade piping at 1% slope minimum.

F. Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.

G. Make branch connections from top of main or quick branch drop pipe if using aluminum piping system.

H. Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

I. Provide drain from refrigerated air dryer.

3.04 FIELD QUALITY CONTROL

A. Site Tests/Inspection:

1. Testing: pressure test in accordance with requirements of Section 21 05 01 - Common Work Results for Mechanical, for 4 h minimum, to 1100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa.

B. Manufacturer's Field Services:

1. Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.

2. Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

C. Schedule site visits to review work at stages listed:

1. After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.

2. Twice during progress of work at 25% and 60% complete.

3. Upon completion of Work, after cleaning is carried out.

4. Obtain reports within 3 days of review and submit immediately to Owner’s Representative.

3.05 CLEANING

A. Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

B. Check entire installation is approved by authority having jurisdiction.

C. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION 226301

SECTION 230900

SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. BAS Contractor shall furnish all labor, materials, equipment, and services necessary to install Temperature Control & Sequence of Operation including all sensors, relays, actuators, and control devices as described herein.

1.02 SUBMITTALS

A. Submit shop drawings for each system (equipment) automatically controlled, containing the following information:
   1. Schematic flow and wiring diagrams showing fans, pumps, coils, dampers, valves, and control devices.
      a. Wiring diagrams are to be point-to-point.
   2. Label each control device with setting or adjustable range of control.
   3. Indicate between factory and field wiring.
   4. Indicate each control panel required, with internal and external wiring clearly indicated.
      a. Provide detail of panel face, including controls, instruments, and labeling.
      b. Include narrative description of sequence of operation and proposed location of any panels.
   5. Valve schedules with size, type, close-offs, failed position and CV calculations.
   6. Damper schedules.
   7. Warranties

B. Include copy of all shop drawings in each Maintenance Manual.

1.03 WARRANTY

A. Control systems specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner.
   1. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner.
   2. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.

PART 2 – SEQUENCE OF OPERATION

2.01 SYSTEM CONTROL / CONTROLLER:

A. Provide devices, hardware, software, controller(s) and control logic as required to accommodate the work of this Section.

B. BAS – Building Automation System: All system setpoints, sensors, equipment, etc. shall be viewable and modifiable thru a web-based system.
   1. Owner's intention is to view the system and make changes to the system, with the ability to "remote-in" from on or off site.
   2. At minimum, graphics shall be provided showing equipment in plan view and one-line diagram fashion. Setpoints and actual readings (of ALL sensors) shall be shown on the graphics.
   3. Alarms shall be sent to email addresses provided by the Owner.

C. Ethernet-based Network Router and/or Network Service Controller(s):
   1. Furnish Ethernet-based Network Server Controllers as required.
   2. These controllers shall connect directly over Ethernet at a minimum of 100mbps, and provide communication to the Standalone Digital Control Units and/or other Input/Output Modules.
   3. Network Server Controllers shall conform to BACnet device profile B-BC.
   4. Network controllers that utilize RS232 serial communications or ARCNET to communicate will not be accepted.
   5. Network Controllers shall be tested and certified by the BACnet Testing Laboratory (BTL) as Network Server Controllers (B-BC).

D. Standalone Digital Control Units (SDCUs):
   1. Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control.
   2. Each SDCU shall operate completely standalone, containing all of the I/O and programs to control its associated equipment.
   3. Each BACnet protocol SDCU shall conform to the BACnet device profile B-AAC.
   4. BACnet SDCUs shall be tested and certified by the BACnet Testing Laboratory (BTL) as Advanced Application Controllers (B-AAC).

2.02 HIGH TEMPERATURE WATER HEATING SYSTEM:

A. Boilers — BLR-1, 2 and 3
   1. See Section 235216 for boiler controller, controls and sequence of operation.
   2. Provide all necessary control/logic to perform the work of this Section. BAS CONTRACTOR may be required to provide additional control, above and beyond the manufacturer boiler controls, to perform the work of this Section.
   3. Space Heating Sequence of Operation:
      a. See Mechanical One-Line Diagram, Drawing M-601 for additional information.
      b. When outside temperature (T-OA) falls below setpoint (adj.) enable Space Heating Boiler System:
         i. Enable Main Loop Pumps (P-1A or P-1B).
            1.) Pump shall run continuously when enabled.
            2.) Pump shall be speed controlled by an Adjustable Speed Drive (ASD).
         ii. Furnish and install a hydronic loop differential pressure sensor (DP-M1A) at a hydraulically remote location.

1.) Modulate Pump's ASD to maintain differential pressure setpoint (adj.).
2.) Furnish and install a 2-way modulating control valve (CV-M1A).
a.) If pressure at DP-M1 causes pump (P-1A or P-1B) speed to fall below minimum setting (adj.), then modulate CV-M1A as required.

iii. Pump P-1A and P-1B shall lead/lag on a scheduled basis (adj.).
1.) If lead pump does not run when commanded, enable lag pump and alarm.

c. Upon the call for any boiler to come on-line, the circulating pump associated with the boiler (BP-x) shall be enabled and flow shall be made thru a circuit in boiler drawing return water from primary main manifold and returning heated water to primary main manifold downstream.
i. When flow is established, the burner shall fire (modulated) to add heat.
ii. The following is a general firing order scenario.
1.) When T-OA > 60°F (adj.) THEN BLR-1 and 2 in Off Mode.
2.) When T-OA < 60°F (adj.) THEN enable to fire as many boilers as necessary to maintain 130°F (adj.) supply temperature (at T-2).
3.) When T-OA < 45°F (adj.) THEN enable to fire as many boilers as necessary to maintain 140°F (adj.) supply temperature (at T-2).
4.) When T-OA < 30°F (adj.) THEN enable to fire as many boilers as necessary to maintain 160°F (adj.) supply temperature (at T-2).
5.) When T-OA < 20°F (adj.) THEN enable to fire as many boilers as necessary to maintain 180°F (adj.) supply temperature (at T-2).
iii. Boilers BLR-1 and 2 shall lead/lag/lag on a scheduled basis (adj.).

B. Glycol Loop:
1. Provide all necessary control/logic to perform the work of this Section. BAS CONTRACTOR may be required to provide additional control, above and beyond the manufacturer boiler controls, to perform the work of this Section.
2. Glycol Loop Heating Sequence of Operation:
a. See Mechanical One-Line Diagram, Drawing M-601 for additional information.
b. When outside temperature (T-OA) falls below setpoint (adj.) enable Glycol Heating Boiler System:
i. Enable Loop Pumps (P-2A or P-2B).
1.) Pump shall run continuously when enabled.
2.) Pump shall be speed controlled by an Adjustable Speed Drive (ASD).
ii. Furnish and install a hydronic loop differential pressure sensor (DP-M1B) at a hydraulically remote location.
1.) Modulate Pump's ASD to maintain differential pressure setpoint (adj.).
2.) Furnish and install a 2-way modulating control valve (CV-M1B).
a.) If pressure at DP-MB causes pump (P-1A or P-1B) speed to fall below minimum setting (adj.), then modulate CV-M1A as required.
iii. Pump P-2A and P-2B shall lead/lag on a scheduled basis (adj.).
1.) If lead pump does not run when commanded, enable lag pump and alarm.
c. Modulate control valve (CV-G1) as required for the following:
1.) When T-OA > 60°F (adj.) THEN close control valve.
2.) When T-OA < 60°F (adj.) THEN modulate control valve to maintain 125°F (adj.) supply temperature (at T-8).
3.) When T-OA < 45°F (adj.) THEN modulate control valve to maintain 135°F (adj.) supply temperature (at T-8).
4.) When T-OA < 30°F (adj.) THEN modulate control valve to maintain 155°F (adj.) supply temperature (at T-8).
5.) When T-OA < 20°F (adj.) modulate control valve to maintain 175°F (adj.)

supply temperature (at T-8).

2.03 RADIANT IN-FLOOR HOT WATER HEATING SYSTEM:

A. Furnish and install a space temperature Sensor for each space equipped with in-floor heating.
   1. Sensors shall be field located with Owner's Rep.

B. Manifold pumps (P-L-x) shall be enabled when heating system becomes enabled; and shall be disabled when space heating is disabled.
   1. See Typical Manifold Piping Detail.

C. Furnish and install 2-way, modulating, control valves (CV-L-x). Control valves shall modulate as required to maintain room temperature setpoint (adj.).
   1. Hot water supply temperature for in-floor loops (at T-L-x) shall not rise above 120F (adj.).

2.04 SNOW MELT HOT WATER HEATING SYSTEM:

A. For each snow melt loop, furnish and install a snow/ice sensor to be located in the exterior apron/entry pad.
   1. Sensors shall be field located with Owner's Rep. and installed per manuf's requirements.
B. See Part 2.02-B for glycol loop pump operation.
Cs. Manifold pumps (P-L5 and P-L6) shall be enabled when snow melt system becomes enabled; and shall be disabled when snow melt system is disabled.
   1s. Furnish and install 2-way, modulating, control valves (CV-L-5 and CV-L-6). Control valves shall modulate as required to maintain water supply temperature at T-L5A and T-L6A. Maximum hot water supply temperature shall be 130ºF (adj) at sensors T-L5A and T-L6A.
C. When snow or ice is no longer sensed, the system shall be disabled after a period of one (1) hour (adj.).
   1. Disable associated manifold pumps.

D. Alarm if hot water supply temperature at sensors T-L5A or T-L6A rises above 130ºF.

2.05 VARIABLE REFRIGERANT FLOW SYSTEM

A. Manufacturer's control system shall govern the control of the VRF system.
   1. See Section 23 74 19.

B. BAS CONTRACTOR shall furnish all materials and labor associated with the implementation of the manufacturer's control logic.

C. A complete and safe working system shall be provided.

D. Space Temperature:
   1. Furnish and install a programmable thermostat for each VRF Indoor Unit.
   2. Locate thermostat in field where directed by Owner's Rep.
   3. Thermostat shall be fully compatible with VRF system and manuf's control logic.

E. Temperature Setpoints shall be adjustable at BAS.

1. VRF system control logic shall modulate system as required to meet temperature setpoints (adj.).

2.06 HOT WATER HEATERS:

A. CABINET HEATERS — CH-x
   1. Provide space temperature sensor and maintain constant space temperature setpoint (adj.) by cycling fan on/off.
      a. Alarm if space temperature falls below 55°F (adj.).
   2. Locate sensor where field determined with Owner's Rep.
   3. Furnish and install an Aqua-stat, as shown on Cabinet Heater Detail.
      a. Fan shall not be enabled if high temperature water supply is less than 100°F (adj.).

B. UNIT HEATERS — UH-x
   1. Provide space temperature sensor and maintain constant space temperature setpoint (adj.) by cycling fan on/off.
      b. Alarm if space temperature falls below 55°F (adj.).
   2. Locate sensor where field determined with Owner's Rep.
      a. Spaces provide with multiple unit heaters shall average their sensors.
   3. Furnish and install an Aqua-stat, as shown on Unit Heater Detail.
      a. Fan shall not be enabled if high temperature water supply is less than 100°F (adj.).

C. FINNED TUBE RADIATION— FT-x
   1. Furnish and install a 2-way, modulating, control valve for each length of finned tube provided.
      a. See Finned Tube Detail for information.
   2. Provide a space temperature sensor and maintain temperature setpoint (adj.) by modulating the control valve.
      b. Alarm if space temperature falls below 55°F (adj.).
      c. Locate sensor where field determined with Owner's Rep.

FINNED TUBE RADIATION— RP-x
   1. Furnish and install a 2-way, modulating, control valve for each length of radiant heat panel provided.
      a. See Radiant Heat Panel Detail for information.
   2. Provide a space temperature sensor and maintain temperature setpoint (adj.) by modulating the control valve.
      b. Alarm if space temperature falls below 55°F (adj.).
      c. Locate sensor where field determined with Owner's Rep.

2.07 FANS:

A. Exhaust Fan EF-5:
   1. Mechanical Room Exhaust:
      a. Fan shall be controlled as follows:
         i. Furnish and install a space temperature sensor in Mechanical Room.
         ii. When space temperature rises above setpoint (adj), enable exhaust fan and open motorized damper MD-3.
            1.) BAS Contractor to furnish and install actuator.
         iii. When space temperature falls below setpoint (adj), disable exhaust fan and close motorized damper MD-1.
         iv. Exhaust fan and Mechanical and Electrical Room unit heaters shall not be enabled at

same time.

v. If room temperature falls below 40°F (adj.), close MD-3 and alarm at BAS.

B. Exhaust Fan EF-6, EF-7 and EF-8:
   1. Room Exhausts:
      a. Fan shall be enabled on a 24/7 basis.
         i. Alarm at BAS if exhaust fan fails to run.

C. Exhaust Fan EF-3 and EF-4
   1. Intermittent Exhaust:
      a. Fan shall be enabled via a manual switch in room.
         i. BAS Contractor to furnish and install switch, in lockable cover.
      b.

D. Exhaust Fan EF-1-1:
   1. Furnish and install all miscellaneous hardware, control, wiring, etc. necessary for a complete working exhaust system.
      a. Coordinate the components as they pertain to control voltage, etc.
   2. Furnish and install all miscellaneous hardware, control, wiring, etc. necessary for a complete working system.
      a. Coordinate the components as they pertain to control voltage, etc.
   3. Sequence:
      a. Exhaust Fan EF-1-1 shall be enabled and disabled based on carbon monoxide and nitrogen dioxide detection.
      b. Furnish and install a dual, carbon monoxide / nitrogen dioxide system to operate exhaust fan.
         i.) Alarm if exhaust commanded to run does not operate.
      c. When exhaust fan is enabled:
         i.) Open motorized dampers MD-4.
            1.) Provide all necessary control, hardware, software, etc. to integrate logic.
            2.) Provide all required actuators, wiring, etc.
            3.) Provide end switch to prove open.
            4.) Alarm if any damper fails to open.
            5.) Close dampers when fan is disabled.
      d. Carbon Monoxide/Nitrogen Dioxide Gas Detection System
         i. Provide Brasch Gas Detector Model GSE-NCM-LL0 combination NO2 & CO detector to function as a "Stand Alone" gas sensor and ventilation controller. The detector shall consist of remote CO/NO2 sensors (quantities shall be per manuf's recommendation based on coverage areas), control relays and digital control circuitry.
            1.) Acceptable Manufacturers:
               a.) Brasch
               b.) Honeywell
               c.) Navter
         ii. The detector shall be an ETL listed unit containing a control board and sensor board that conforms completely to the UL 3111-1 standard.
         iii. The NEMA 1 enclosure shall be constructed of heavy polycarbonate plastic, which consists of two pieces, cover and chassis. The cover shall close flush with the sides of the box and shall require a special tool to open it. The sensor module shall be protected from damage inside the enclosure and the cover shall contain screened openings to allow proper sensing. The openings shall conform to the UL 3111-1

standard.

iv. The detector shall contain an electro-chemical carbon monoxide (CO) sensor with temperature compensation circuits and an electro-chemical nitrogen dioxide (NO2) sensor.

v. The enclosure shall be provided with four (4), 1/2-inch pre-punched openings for connection of field conduit. The detector shall include factory-installed wiring that exits the enclosure and allows for installation without the detector being opened.

vi. The detector shall be protected against static discharge, excessive electrical noise, and tested for safety in accordance with the UL 3111-1 standard.

vii. The detector shall have a 1/2-inch minimum height, liquid crystal display (LCD) that will continually display the current nitrogen dioxide (NO2) and carbon monoxide (CO) level, in parts per million. The detector shall have a green "power" LED, a yellow "sensor-active" LED, a red "low-alert" LED, a red "high-alert" LED and a red "alarm" LED.

viii. Overcurrent Protection: The detector shall contain a power supply fuse rated for 0.125 amp at 250 VAC, (if 120 VAC powered). Each output relay shall have a fuse rated for 5 amp at 250 VAC. Fuses shall be of the time-lag type.

ix. Switches and Controls: The detector shall provide a 0–10 VDC signal in direct relationship to the nitrogen dioxide (NO2) and carbon monoxide (CO) gas concentrations. The signal shall modulate VFD speed in proportion to NO2 and CO levels. An external push button on the front of the enclosure shall be provided to silence the 106 dB internal alarm. The alarm circuit shall become active again, once the detector is no longer at alarm levels.

x. Output relays providing a normally closed set of contacts for the low-alert and for the alarm shall be provided. These relays shall provide a fail-safe that will automatically activate ventilation equipment upon power loss to the sensor. The low-alert and high-alert relays shall be capable of being configured in the field for a two speed fan control operations. These relays shall be suitable for the connection of 24 VAC, 24 VA inductive circuits.

xi. Switches shall be provided for field adjustment of the gas detection level for the low-alert, and of the on/off time delay for the low-alert and high-alert. Selectable CO detection levels shall range from 20 to 55 ppm and the NO2 detection levels shall range from 0.3 to 4.0 ppm. Selectable time delays shall range from 0 to 7 minutes, in 1 minute increments.

xii. Remote sensors shall be attached by means of a six conductor, shielded cable.

xiii. BAS Contractor shall be responsible to furnish and install the appropriate quantities and locations of NO2 and CO sensors in and around the Apparatus Bay as required to satisfy the manufacturer's requirements.

2.08 ENERGY RECOVERY VENTILATOR: ERV-1

A. General:

1. ERV shall be enabled on a 24/7 basis.
2. ERV shall be used to provide outdoor air and exhaust air to/from the building. In general, air will be discharged at 2°F (adj.) above return air temperatures during the heating season; and 2°F (adj.) below return air temperature during the cooling season.
   a. ERV will be equipped with a hot gas reheat coil. If space humidity or supply air humidity rises above setpoint(s), enable dehumidification mode per manufacturer's control logic.
      i. Furnish and install a space humidity sensor (in community room), an in-duct exhaust air humidity sensor and an in-duct supply air humidity sensor.

3. The ERV shall be equipped with an enthalpy wheel, a supply fan and an exhaust fan.
4. Provide DDC controls to enable, disable and monitor the ERVs and provide occupied/unoccupied control.

B. ERV shall be factory equipped with:
1. Supply Fan
   a. with factory-mounted adjustable speed drive
2. Exhaust Fan
   a. with factory-mounted adjustable speed drive
3. Enthalpy Wheel
4. Supply Air Dampers
   a. with factory-mounted DDC actuator
5. Outdoor Air/Return Air Dampers
   a. with factory-mounted DDC actuator
6. Filter Section
7. Air-Cooled Cooling Section
8. Hot Gas Reheat Section
9. Hot Water Coil Section

C. SEQUENCE OF OPERATION:
1. When Enabled:
   a. The supply fan and exhaust fan shall be enabled and run continuously, motorized dampers shall be opened, and enthalpy wheel shall rotate (unless logic calls for it to be stopped).
      i. Leaving air temperature (LAT) shall be sensed by an in-line air stream temperature sensor.
   b. During occupied mode, supply airflow must not fall below outdoor airflow setpoint.
2. Zone Setpoint Adjust:
   a. The Building operator shall be able to adjust the zone temperature heating and cooling setpoints through ERV controller.
3. Zone Optimal Start:
   a. The unit shall use an optimal start algorithm for morning start-up.
   b. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.
4. Zone Unoccupied Override:
   a. A timed local override control shall allow Building operator to override the schedule and place the unit into an occupied mode for an adjustable period of time.
   b. At the expiration of this time, control of the unit shall automatically return to the schedule.
5. Supply Fan:
   a. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties.
   b. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
   c. Alarms shall be provided as follows:
      i. Supply Fan Failure: Commanded on, but the status is off.
      ii. Supply Fan In Hand: Commanded off, but the status is on.
      iii. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
6. Supply Air Duct Static Pressure Control:

a. The controller shall measure duct static pressure and shall modulate the supply fan VFD speed to maintain duct static pressure setpoint (adj.).
b. The supply fan VFD speed shall not drop below 30% (adj.).
c. Alarms shall be provided as follows:
    i. High Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) greater than setpoint.
    ii. Low Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) less than setpoint.
    iii. Supply Fan VFD Fault
d. Furnish and install duct static pressure sensors as required.

7. Exhaust Fan:
    a. The exhaust fan shall run anytime the unit is commanded to run, unless shutdown on safeties.
    b. To prevent short cycling, the exhaust fan shall have a user definable (adj.) minimum runtime.
    c. Alarms shall be provided as follows:
        i. Exhaust Fan Failure: Commanded on, but the status is off.
        ii. Exhaust Fan In Hand: Commanded off, but the status is on.
        iii. Exhaust Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
8. Exhaust Air Duct Static Pressure Control:
    a. The controller shall measure duct static pressure and shall modulate the exhaust fan VFD speed to maintain duct static pressure setpoint (adj.).
    b. The exhaust fan VFD speed shall not drop below 30% (adj.).
    c. Alarms shall be provided as follows:
        i. High Supply Air Static Pressure: If the exhaust air static pressure is 25% (adj.) greater than setpoint.
        ii. Low Supply Air Static Pressure: If the exhaust air static pressure is 25% (adj.) less than setpoint.
        iii. Exhaust Fan VFD Fault
    d. Furnish and install duct static pressure sensors as required.
9. Economizer Mode:
    a. When outdoor air temperatures permit, the enthalpy wheel shall be stopped to allow for free-cooling.
10. Dirty Filters:
    a. Measure pressure differential across the filters; and signal shall be sent to the BAS to indicate the alarm condition.
11. Wheel Rotation Sensor:
    a. Unit shall automatically shut down if the heat exchanger wheel stops rotating (unless in free-cooling, defrost mode or unoccupied condition).
    b. Signal shall be sent to the BAS to indicate the alarm condition.
12. Defrost:
    a. Defrost capability shall be time-based, temperature initiated (-5ºF).
    b. Recirculated strategy whereas the supply fan circulates air and exhaust fan de-energizes.
13. Motorized Dampers:
    a. All motorized dampers shall completely close when ERV is not in operation and completely open when the unit is in operation.
    b. Note that outdoor air damper shall be mounted external to ERV. Operate damper as an integral part of ERV.
14. Timed Override:
    a. When a timed override is initiated by the user, the unit shall return to its user defined normal occupied mode for the user determined period of time (adj.).

15. Fire Shutdown:
    a. The unit shall shut down in response to smoke detection in the return air ductwork.
    b. Furnish and install a "listed" smoke detector in each return and/or supply duct to signal a contact closure to the BAS indicating the presence of a fire or other emergency condition.
16. Duct Static:
    a. A manual-reset, discharge air, high static safety shall disable fans and input to the controller upon sensing a static pressure higher than the normal operating setpoint.
    b. A manual-reset, outside air, low static safety shall disable fans and input to the controller upon sensing a static pressure lower than the normal operating setpoint.
    c. A manual-reset, return air, low static safety shall disable fans and input to the controller upon sensing a static pressure lower than the normal operating setpoint.
    d. Contractor to furnish and install in-duct static pressure sensors in supply and exhaust ductwork. Location shall be per manuf's recommendations.
17. Heating:
    i. When outdoor air temperature falls below 60°F (adj.), modulate two-way control valve as required to maintain space temperature setpoint at 65°F (adj).
    ii. When outdoor air temperature rises above 60°F (adj.) close two-way control valve.
    iii. Furnish and install a freeze-stat sensor serpentined on leaving air side of heating coil. If leaving air temperature falls below 40°F (adj):
        a.) Alarm at BAS and provide audible alarm in Apparatus Bay.
        b.) fully open two-way valve.
        d.) disabled ERV-1.
18. Provide actuated control for motorized dampers MD-1A/1B, 2A/2B, 3A/3B, 4A/4B. Fully open and close when occupancy is sensed in associated room. Furnish and install occupancy sensor for each motorized damper where directed in field.

2.09 HEAT RECOVERY VENTILATOR:

A. See Section 237202 for additional information.

B. Install manufacturer-provided controller where directed by Owner's Representative.

C. Provide all necessary wiring, relays, connections and accessories.

D. Sequence – HRV-1

1. Heat Recovery Ventilator shall be enabled and operate continuously 24/7 (adj.).
    a. Open motorized dampers MD-6 and MD-7 when Ventilator is enabled and close motorized dampers when Ventilator is disabled.
2. Heat Recovery Ventilator shall be controlled per manufacturer's control logic.
3. Furnish and install space temperature in Apparatus Bay, where directed in field by Owner's Rep. If space temperature falls below 50-deg F (adj.) for 15-minutes (adj.):
    a. Alarm BAS and sound audible Alarm in Apparatus Bay.
    b. Disable Heat Recovery Ventilator and close motorized dampers MD-6 and MD-7.

4. HRV-1 shall supply tempered air as follows:
    a. BAS Contractor shall furnish and install a discharge air sensor downstream of heating coil (HWC-1). BAS Contractor shall furnish and install a room temperature sensor in apparatus bay.

b. Heating:
   i. See In Duct Heating Coil Piping Detail.
   ii. When outdoor air temperature falls below 60°F (adj.), modulate two-way control valve as required to maintain space temperature setpoint at 65°F (adj).
   iii. When outdoor air temperature rises above 60°F (adj.) close two-way control valve.
   iv. Furnish and install a freeze-stat sensor serpentined on leaving air side of heating coil. If leaving air temperature falls below 40°F (adj):
      a.) Alarm at BAS and provide audible alarm in Apparatus Bay.
      b.) fully open two-way valve.
      d.) disabled HRV-1.

2.10 CEILING FANS:

A. See Section 233426 for additional information.

B. Install manufacturer-provided controller where directed by Owner's Representative.

C. Provide all necessary wiring, relays, connections and accessories.

D. All ceiling fans shall be enabled/disabled/controlled together at a single station in Apparatus Bay. Location shall be determined in field with Owner's Rep.

2.11 VEHICAL EXTRACTION SYSTEM:

A. Vehicle Extraction System and associated Exhaust Fan shall be enabled and disabled via a manufacturer furnished, remote, wall controller.

B. BAS Contractor shall provide all necessary controls to extend controller to BAS system.

C. When the vehicle extraction system is enabled, open motorized damper MD-4.
Close motorized damper MD-4 when the vehicle extraction system is disabled.
   1. If Apparatus Bay space temperature falls below 50°F (adj.), close motorized damper.
   2. Alarm is space temperature falls below 40F (adj.).

2.12 DOMESTIC WATER HEATERS:

A. Water Heater: WH-1
   1. Water Heater's integral setpoint shall be set to maintain 140F storage temperature:
      a. Thermostatic Mixing Valve (TMV-1) shall be arranged to deliver 110F domestic hot water supply.
   2. Recirculation Pump: RCP-1:
      a. Pump shall operate to maintain domestic water return temperature of 110°F (adj.).
   3. Recirculation Pump: RCP-2:
      a. Pump shall operate to maintain domestic water return temperature of 140°F (adj.).

PART 3 - EXECUTION

3.01 CLEANUP

A. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.02 WIRING, CONDUIT, AND CABLE.

A. See Section 271500, Horizontal Cabling for information.

3.03 INSTALLATION PRACTICES FOR FIELD DEVICES

A. Well-mounted sensors shall include thermal conducting compound within the well to insure good heat transfer to the sensor.

B. Actuators shall be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.

C. Relay outputs shall include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.

D. Water line mounted sensors shall be removable without shutting down the system in which they are installed.

E. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.

F. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building.

G. Enclosures
   1. For all I/O requiring field interface devices, these devices where practical shall be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
   2. FIPs shall contain power supplies for sensors, interface relays and contactors, safety circuits, and I/P transducers.
   3. The FIP enclosure shall be of steel construction with baked enamel finish, NEMA 1 rated with a hinged door and keyed lock. The enclosure shall be sized for twenty percent spare mounting space. All locks shall be keyed identically.
   4. All wiring to and from the FIP shall be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
   5. All outside mounted enclosures shall meet the NEMA-4 rating.
   6. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

H. Identification
   1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
   2. All field enclosures, other than controllers, shall be identified with a bakelite nameplate. The lettering shall be in white against a black or blue background.
   3. Junction box covers shall be marked to indicate that they are a part of the BAS system.
   4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
   5. All I/O field devices inside FIP's shall be labeled.

I. Location
   1. Space humidity or temperature sensors shall be mounted away from machinery generating heat, direct light and diffuser air streams.
   2. Outdoor air sensors shall be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.
   3. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

3.04 SYSTEM ACCEPTANCE TESTING

A. All application software shall be verified and compared against the sequences of operation. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint.

B. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.

C. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner.

D. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

3.05 TRAINING

A. Upon completion of the project and commissioning, the BAS Contractor shall provide a minimum of forty (40) hours of on-site training.

END OF SECTION 230900

SECTION 233000

VEHICLE EXHAUST EXTRACTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Vehicle exhaust extraction system with spring hose reel overhead storage, flexible hoses, exhaust pipe adapters, controls and exhaust fans.

1.03 SYSTEM DESCRIPTION

A. Spring Hose Reel.

B. Hose

C. Exhaust Pipe Adapter

D. Exhaust Fan

1.04 SUBMITTALS

A. Product Data: Indicate manufacturer's model number, technical data, and accessories, requirements for access, maintenance, weights and service-connections including dimensions.

B. Closeout Submittals: Operation and Maintenance data manual including spare parts list.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
   1. Ventaire.
   2. Nederman.
   3. Plymovent.

B. Spring Hose Reel.

   1. The hose reel frame shall consist of steel mounting brackets securely fastened between two steel frame side plates. The frame base mounting brackets shall be constructed of 12 gauge powder coated angular steel. The frame side plates shall be constructed of double reinforced, 12 gauge galvanized steel. The entire assembly shall be capable of being wall or ceiling mounted.

   2. The hose reel drum shall be constructed of 14 gauge reinforced galvanized steel and formed to 18" in diameter. The drum side plates shall be constructed of 16 gauge reinforced steel. The drum side plates shall have a rolled edge with a centered 18" diameter formed groove for additional strength. Four steel support bars shall be mounted inside the drum, fastening the drum sides together while increasing the drum strength.

   3. The hose reel shall have a mitered elbow, constructed of 16 gauge powder coated steel. Elbow assembly shall extend from hose reel inlet to the outlet of the reel. This allows the air velocities to remain constant through the entire reel. Hose assembly shall attach directly to hose reel elbow. Hose reels utilizing a sealed drum as part of the airstream shall not be acceptable.

   4. A hose guide shall be mounted to the drum to ensure proper hose storage while being retracted. A hose stop bar shall extend across the hose reel frame to prevent over rotation.

   5. The heavy-duty springs shall be constructed of carbon steel, coiled inside a 16 gauge steel spring case. The hose reel activation shall be initiated through a locking latch mechanism.

   6. Hose reel must be designed to store 25' of 6" hose.

   7. Hose reel shall be provided with a direct drive pressure blower. Blower to be mounted to hose reel using a fan to reel bracket. Flange mounted blowers are not acceptable.

   8. Hose reel shall be provided with a microswitch for fan control. Microswitch to be powered by control in fan starter. Fan to turn on when hose reel is extended. Fan remains energized until hose reel is retracted.

C. Vehicle Exhaust Hose

1. The hose shall be rated for a continuous operating temperature of 600°F, intermittent exhaust temperature rating of 1000°F. Hose material shall be double ply hose with an inner liner ply of woven fiberglass coated silicone rubber. A helically wound spring steel wire is imbedded between the inner liner ply and an exterior ply of woven Nomex coated with silicone rubber for maximum flexibility. Medium temperature material (polyester, thermoplastic, neoprene) will not be accepted.

D. Exhaust Pipe Adapter

1. Under Chassis Exhaust Pipe Adapter, Ventaire model TS60-VG, or equal.

a. Tapered cone with safety edge, constructed of minimum 20 gauge stainless steel. Provide with vise grip.

E. Direct Drive Pressure Blower
1. Cast aluminum housing with cast aluminum radial blade wheel.
2. Provide with fan to reel mounting bracket.
3. Accessories
a. Fan Control: Provide fan starter with HOA selector switch, Reset button & 120v control transformer.

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2.02 Overview of Project:

A. Each system above shall be provided with a fan, auto-start system, controls, support track, hoses and ductwork as described on the drawings and specifications.

2.03 General Procedures

A. The exhaust system shall be designed to vent 100 % of exhaust gases and particulate safely to the outside of the fire station. The exhaust system shall be designed and installed by factory authorized personnel, have been certified by the manufacturer of the exhaust system.

B. Manufacturers shall be ISO 9001 and ISO 140001 certified and be required to have a minimum of five years of proven manufacturing and distribution experience in the business of emergency vehicle exhaust extraction equipment.

2.04 General Design of Exhaust System

A. The suction rail system shall be designed to be installed within 18 inches of the side of the vehicle and not take up more than 20 inches of space from the side of the vehicle and nearest obstacle. The value of this trim line approach keeps the ceiling and aisles clear of obstructions.

2.05 Routine or Daily Maintenance

A. The system shall be able to also be used for common maintenance inside the fire station. The standard requirement of pump checking is for 5 minutes @ 1300 RPM. The idle time for the system shall be continuous for undetermined period of time.

2.06 Vehicle Airflow Requirements

A. Exhaust system shall be designed to extract vehicle exhaust particulate and gases by a continuance of negative pressure from vehicle tailpipe to the outside of fire station. The exhaust system shall pull exhaust into the nozzle by inducing ambient air, without the need of an airtight seal at vehicle tailpipe. The system shall be designed entirely for a negative pressure vacuum method of exhaust extraction. At no point in exhaust system will ducting be under positive pressure. Systems that allow for positive pressure generated by vehicle engine shall not be accepted.

2.07 Complete Package

B. Complete exhaust system including the exhaust fan, control box, ductwork, and extraction unit shall be proven and field-tested for a minimum of 5 years. All system components shall be labeled with manufacturer identification.

2.08 Air Testing of Exhaust System:

A. The overall design shall include individual systems for each apparatus that are specifically designed for the output CFM of the apparatus engine.

B. Testing shall be accomplished two ways:

1. At conclusion of installation of exhaust system all vehicles in facility will be operated for a period of 15-minutes to ensure that extraction hose, ducting, and fan have been sufficiently sized for all the vehicles operating in fire station.

2. Air balancing shall be performed to ensure that the designed CFM requirements are met for each bay.

2.09 Control Operation Overview:

A. The exhaust control system shall be designed to operate in complete symmetry with the operation of the vehicle engine, while it is inside the fire station. Exhaust fan energizes before vehicle starts and shall work in conjunction with the vehicle engine, no matter how long vehicle operates inside fire station. (Time-related shutoff switches shall not be accepted to avoid timing out of the exhaust fan while vehicle engine is still operating.)

B. No panic buttons or activation switches that incorporate door and/or alarm operation shall be accepted. System operation shall be initiated prior to the start up of the vehicle without any human intervention.

2.10 Method of Nozzle Attachment:

A. The system shall be designed so that attachment of exhaust hose is accomplished by the operator standing completely erect, and with one simple motion connect system to vehicle. The system attachment shall be a one step process and no bending shall be required. This will prevent exposure of exhaust to the breathing zone of the operator and possible strain to the lower back. At no time shall the exhaust nozzle fit underneath the emergency apparatus to ensure that system nozzle will be free from snagging the underside of vehicle chassis and wheels.

2.11 Method of System Release

A. The system shall not use the "pull-off" release, but rather a fall-away style of system disconnects. Systems that stretch the hose to its limit in order to disconnect from the fire apparatus will not be allowed.

2.12 Structural Support System

A. The exhaust system shall be suspended from the building structure by means of plated or painted steel strut designed to eliminate sway of overall exhaust system.

2.13 The System Track

A. The exhaust system shall be equipped with a lightweight track support system to convey the exhaust hose from door threshold to vehicle park position. This track must be designed for the specific use of fire station exhaust ventilation and be engineered to carry the specific weight of all exhaust system components attached to the track as well withstand the pull forces placed upon system when vehicle exits the station. System track must be supported a minimum of every 10 ft and no more than 4 ft of track shall be cantilevered from the end of the first and last support. A minimum of 3 supports shall be required.

B. The track shall be attached to the structure in a fashion that allows for side-to-side motion in the advent the fire apparatus is parked more than 2 feet away from track system. This sway will in no way affect the overall structural integrity of whole track and hose system.

C. System shall have specific compartments for the sole use of splicing support tracks together without using external splice plates.

2.14 The System Balancer:

A. The balancer shall be reducing torque style and shall use a total amount of 27 feet of cable. The hose balancer cable shall be capable of stretching to a minimum of 4 ft from outside of threshold of bay door for an outside connection to the fire apparatus provided that the suction rail system is terminated within 2 feet of exiting door. This system attachment shall be performed outside the station house bay door will ensure that no vehicle exhaust gases will enter the station house. The system balancer shall be designed with the capability of replacing cable without having to change out complete balancer unit

2.15 Hydraulic Shock Absorber

A. The track system end stop shall be an adjustable hydraulic shock piston that will absorb the trolley / balancer assembly inertia at point of disconnection from vehicle. This function shall be able to resist shock for speeds of vehicle up to 20 mph. The shock absorber shall be designed to receive these system release impacts without bouncing or jamming up at end of the track system. The shock absorber piston must be designed to receive 100,000 impacts before service.

2.16 Electronic Sensor System

A. An electronic device shall be designed to release the exhaust hose from the accelerating apparatus. The electronic sensing unit shall be equipped with a circuit board that can be programmed to disconnect the exhaust system at the threshold door despite the varying speeds of the emergency apparatus. Exhaust hose system shall not use the exhaust pipe to carry the exhaust system to the threshold door.

2.17 Permanent Magnet

A. The release mechanism of the hose disconnect shall be free of electronic connectors or other sources of power so that repositioning of disconnect point is accomplished without the use of tools.

2.18 Horizontal Hose

A. The exhaust system shall be designed with a flex hose able to withstand exhaust temperatures of 340 degrees minimum. The complete operation of exhaust system shall have the proven experience of 100,000 releases of apparatus.

B. The flexible hose shall be designed to expand and retract along the track height without any portion of the flexible horizontal hose hanging down more than 12 inches from bottom of track profile. This method of carrying the horizontal hose shall incorporate a sliding device that attaches to the top of horizontal hose every 12 inches. Multiple attachments to the horizontal hose shall be required to keep all the horizontal hose up and out of the way of station aisle way. No hoses shall be acceptable that are glued together neoprene-coated polypropylene fabric with wire helix structure.

2.19 Galvanized 90 degree Elbow

A. The exhaust system shall include a fixed method of turning exhaust gases at the suspension point of hose system. A minimum of 45 degree elbow shall be incorporated at the suspension point to avoid premature wear due to excessive pulling or tugging upon release of exhaust hose from accelerating fire apparatus.

2.20 Vertical Hose

A. The system hose shall be designed to withstand temperatures up to 370 degrees intermittent, and 340 degrees for continuous operation. The hose is fabricated using a mechanical clinch and is designed to wear a minimum of 1 year no matter how many runs the vehicle makes.

B. The vertical hose shall not be used as the structural member of the exhaust system, but rather, hang from the rail without having to carry the weight of the entire vertical and lower hose assembly.

2.21 Handle

A. The exhaust system shall have a handle incorporated into the overall design of the hose system, which has been specifically designed to eliminate bending or stooping, over when system is attached to the vehicle. The system handle shall be made from a soft foam material incapable of scrapping the side of fire apparatus. Handle must be permanently attached to hose system in such a way so that the connection requires no twisting or turning of operator wrists and arms to make a correct attachment to the vehicle.

B. The attachment method shall be a one-step method. No twisting of forearms and wrists to grab, also no leaning forward pull to the system to the door threshold shall be accepted. The disconnection of the ergonomic handle from vehicle shall be accomplished in an easy fashion by pressing a small toggle by right thumb of operator. A plastic shield to avoid accidental malfunction protects release toggle on handle.

2.22 Nozzle

A. The nozzle shall have a high temperature rubber gasket attached to its outer edge to prevent the nozzle from scrapping the side of the vehicle. The face of the nozzle shall incorporate three 10 gage anodized steel bars that act as a combination debris screen and backer surface to hold nozzle against outside edge of tail pipe.

B. The nozzle shall have a flexible internal leaf spring to adapt to a variety of tail pipe styles including both internal and external to the chassis. The nozzle shall also be a minimum of 8” diameter to enable ambient air induction when the vehicle is in operation. This will keep temperatures inside exhaust hose at a minimum. This feature also eliminates the need for explosion proof motors.

2.23 Lower Hose:

A. The lower hose shall be designed to withstand a 500ºF engine temperature in conjunction with induced ambient air for cooling.

B. The lower hose shall be utilized in an ambient air-cooled design that will eliminate the need for short cycle replacement, resulting from high pulling stresses representative of sealed system designs. The lower hose shall not be glued, but rather stitched so that the hose does not pull apart or fatigue due to high temperature.

2.24 Anchor Plate

A. Anchor plate shall be instrumental in the method of release and form two-point connection with its primary pulling point at the side of the vehicle.

2.25 Exhaust Fan

A. The exhaust fan shall be sized for a minimum of 600 CFM per extraction unit. Total exhaust fan CFM requirement is required and must be validated by certified air balancer because of ambient air induction method of exhaust extraction which creates a longer lasting system.

2.26 Ductwork

A. Exhaust ducting shall be spiral G-90 galvanized pipe and shall be a minimum of 24 gage. The seals on the connection shall be with 400-degree silicone. Brazing and welding at joints are not required because duct system is designed for 4" of negative pressure and at these pressures the silicone sealant is sufficient to seal the system. The lateral fittings shall be brazed or welded and must be designed with a minimum 45 degree branch taps for a smooth convergence of two or more air streams.

2.27 Auto-Start Control System:

A. The Electronic control shall incorporate a transmitter in the vehicle to ensure that the exhaust fan energizes before vehicle engine starts up. Control unit shall be FCC-approved and shall not interfere with radio communications garage doors or on-board computers. The transmitter shall be mounted on the dash in a nonpermanent fashion so that minor changes in orientation can be made without making permanent changes to the vehicle dashboard.

B. The control shall create a direct link between the engine operation and the exhaust fan operation no matter how long apparatus is running inside fire station.

C. Any control method that is initiated by the door operation shall not be accepted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Test for proper operation and adjust until proper operation is achieved.
C. Before acceptance, conduct a demonstration in the presence of the Owner's representative that all equipment operates properly in every aspect. Conduct a detailed user/operator training session at time and place agreed upon by Owner's representative.

3.02 ADJUSTING AND BALANCING

A. Adjust and balance system for proper ventilation.

3.03 PROTECTION

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

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to inspect the installed assembly, start-up and train Owner's maintenance personnel to adjust, operate, and maintain vehicle exhaust extraction system.

END OF SECTION 233000

GENERAL MECHANICAL NOTES:

1. CONTRACTOR(S) SHALL PROVIDE ALL ITEMS, ARTICLES, EQUIPMENT, TOOLS, APPLIANCES, MATERIALS AND METHODS REQUIRED FOR COMPLETED SYSTEMS.
2. PROVIDE ALL LABOR, SCAFFOLDING, SUPPORTS, SUPERVISION AND INCIDENTALS REQUIRED TO MODIFY AND/OR INSTALL THE SYSTEMS COMPLETE.
3. CONTRACTOR(S) SHALL LOCATE AND PROTECT THE OWNER'S EQUIPMENT, PIPING AND UTILITIES SCHEDULED TO REMAIN FROM DAMAGE DURING CONSTRUCTION.
4. ALL WORK SHALL BE EXECUTED IN A THOROUGHLY SUBSTANTIAL AND CRAFTSMAN LIKE MANNER BY SKILLED MECHANICS IN THE VARIOUS TRADES INVOLVED. FOLLOW MANUFACTURERS' INSTRUCTIONS FOR INSTALLING, CONNECTING AND ADJUSTING ALL EQUIPMENT.
5. CONTRACTOR(S) SHALL FIELD VERIFY ALL DIMENSIONS OF EXISTING ELEMENTS, EQUIPMENT, AND OTHER CONDITIONS HAVING A BEARING ON THE WORK. CONTRACTOR(S) SHALL COORDINATE WITH OTHER TRADES TO ELIMINATE ANY INTERFERENCES WITH LIGHTING FIXTURES, DUCTWORK, PIPING, ETC.
6. CONTRACTOR(S) SHALL PERFORM ALL VERIFICATIONS, OBSERVATIONS, TESTS, AND EXAMINATIONS OF THE WORK PRIOR TO THE ORDERING OF ANY EQUIPMENT AND THE ACTUAL CONSTRUCTION.
7. CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER CONTRACT.
8. CONTRACTOR(S) SHALL FURNISH AND INSTALL ALL MATERIALS AS REQUIRED FOR COMPLETE SYSTEMS, INCLUDING ALL PARTS OBVIOUSLY OR REASONABLY INCIDENTAL TO A COMPLETE INSTALLATION, WHETHER SPECIFICALLY INDICATED OR NOT.
9. FOLLOW MANUFACTURERS' INSTRUCTIONS FOR INSTALLING, CONNECTING AND ADJUSTING ALL EQUIPMENT.
10. DRAWINGS ARE NOT TO BE SCALED. DRAWINGS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY.
11. DIMENSIONS SHOWN ARE TO FINISH SURFACES UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS REQUIRED CLEARANCE. THEREFORE, IT IS CRITICAL TO FIELD VERIFY DIMENSIONS. SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, EXISTING CONDITIONS AND/OR DESIGN INTENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A CLARIFICATION FROM THE OWNER PRIOR TO PROCEEDING WITH THE WORK.
12. DETAILS ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE WORK.
13. DRAWINGS ARE DIAGRAMMATIC ONLY, FINAL ROUTING OF DUCTWORK AND EQUIPMENT LOCATIONS SHALL BE DETERMINED IN THE FIELD. ADDITIONAL OFFSETS, ELBOWS, ETC., SHALL BE PROVIDED AND INSTALLED WITHOUT ADDITIONAL COST TO THE OWNER.
14. THE MC SHALL FURNISH TO THE GC ALL INFORMATION REQUIRED FOR SETTING OF WALL, ROOF, AND PARTITION OPENINGS FOR MECHANICAL WORK. THIS INFORMATION SHALL BE FURNISHED IN A TIMELY MANNER SUCH THAT CONSTRUCTION SCHEDULE IS NOT JEOPARDIZED.
15. THE TEMPERATURE CONTROL CONTRACTOR SHALL COORDINATE THERMOSTAT/TEMPERATURE SENSOR LOCATIONS WITH ARCHITECTURAL PLANS AND/OR THE OWNER. THERMOSTATS SHALL BE INSTALLED 48-INCHES ABOVE FINISHED FLOORS UNLESS OTHERWISE NOTED.
16. ALL PIPING AND DUCTS IN FINISHED ROOMS OR SPACES SHALL BE CONCEALED IN A FURRED CHASE OR ABOVE THE CEILING, UNLESS NOTED OTHERWISE.
17. ACCESS PANELS IN CEILINGS AND WALLS ARE REQUIRED FOR ALL VALVES, TRAPS, DAMPERS, CLEANOUTS, CONTROLS, ETC.
18. DIMENSIONS SHOWN ON DRAWINGS FOR DUCTWORK ARE INSIDE CLEAR. FIELD VERIFY ALL DIMENSIONS BEFORE FABRICATING DUCTWORK.
19. ALL DUCTWORK SHALL BE SEALED AND TESTED FOR LEAKS PRIOR TO COVERING WORK.
20. CONTRACTOR SHALL INSTALL ALL BALANCING DEVICES NECESSARY TO ACHIEVE PROPER ADJUSTING AND BALANCING OF MECHANICAL SYSTEMS.
21. PROVIDE FLEXIBLE CONNECTOR AT ALL DUCTWORK CONNECTIONS TO AIR HANDLING EQUIPMENT.
22. INSTALL ALL DUCTWORK AND PIPING AS HIGH ABOVE FINISH FLOOR AS CONDITIONS PERMIT. FURNISH & INSTALL OFFSETS, ELBOWS, ETC., TO RECESS PIPING & DUCTWORK BETWEEN STRUCTURAL TEE'S WHERE POSSIBLE.

TYPICAL ABBREVIATIONS

AC	AIR CONDITIONING UNIT	HV	HEATING AND VENTILATING UNIT
AFF	ABOVE FINISH FLOOR	HW	HOT WATER
AFC	ABOVE FINISH CEILING	HWS	HOW WATER SUPPLY
AHU	AIR HANDLING UNIT	HWR	HOW WATER RETURN
AD	ACCESS DOOR	LAV	LAVATORY
AS	AIR SEPARATOR	LD	LINEAR CEILING DIFFUSER
BOD	BOTTOM OF DUCT	LBS/HR	POUNDS PER HOUR
BOT	BOTTOM	MW	MAKE-UP WATER
BP	BOILER PUMP	MAX.	MAXIMUM
CA	COMBUSTION AIR	MIN.	MINIMUM
CBV	CIRCUIT BALANCING VALVE	MSK	MOP SINK
CO	CLEAN OUT	NOM.	NOMINAL
CP	CONDENSATE PUMP	OA	OUTDOOR AIR
CU	CONDENSING UNIT	P	PUMP(HVAC CIRCULATOR)
CH	CABINET HEATER	PRV	PRESSURE REDUCING VALVE
DF	DRINKING FOUNTAIN	RA	RETURN AIR
DCWS	DOMESTIC COLD WATER SUPPLY	RF	RETURN FAN
DHWS	DOMESTIC HOT WATER SUPPLY	RH	RELATIVE HUMIDITY
DHWR	DOMESTIC HOT WATER RETURN	S&R	SUPPLY AND RETURN
DN	DOWN	SA	SUPPLY AIR
DW	DISHWASHER	SD	SMOKE DAMPER
EA	EXHAUST AIR	SK	SINK
EDH	ELECTRIC DUCT HEATER	SP	STATIC PRESSURE
EER	ENERGY EFFICIENCY RATIO	SUSP. CLG.	SUSPENDED CEILING
EF	EXHAUST FAN	S.S.	STAINLESS STEEL
ERV	ENERGY RECOVERY VENTILATOR	UH	UNIT HEATER
ET	EXPANSION TANK	UV	UNIIT VENTILATOR
EUH	ELECTRIC UNIT HEATER	VD	VOLUME DAMPER
(E)	EXISTING	UR	URINAL
FC.	FLEXIBLE CONNECTION	VFD	VARIABLE FREQUENCY DRIVE
FCU	FAN COIL UNIT	S.G.	SUCTION GUIDE
FL.	FLOOR	T.D.V.	TRIPLE DUTY VALVE
FD	FIRE DAMPER	N.C.	NORMALLY CLOSED
FTR	FIN TUBE RADIATION	N.O.	NORMALLY OPEN
GF	GLYCOL FEEDER	WC	WATER CLOSET
HC	HEATING COIL		
HP	HORSEPOWER		

MECHANICAL LEGEND:

- 26x12 — NEW RECTANGULAR DUCTWORK
- 10Ø — NEW ROUND DUCTWORK
- NEW FLEXIBLE DUCTWORK
- T — THERMOSTAT
- SUPPLY DIFFUSER
- RETURN DIFFUSER
- EXHAUST DIFFUSER
- MAKE-UP DUCT RISER
- SUPPLY DUCT RISER
- RETURN DUCT RISER
- EXHAUST DUCT RISER
- TURNING VANES
- VOLUME DAMPER
- M — MOTORIZED DAMPER
- AD — ACCESS DOOR
  - FURNISHED BY MC
  - FOR INSTALLATION BY GC

MECHANICAL PIPING LEGEND:

- DIRECTION OF FLOW
- PIPE TURNING DOWN
- PIPE TURNING UP
- TOP TAKE OFF
- BOTTOM TAKE OFF
- BALL VALVE
- CHECK VALVE
- UNION
- HWS — HOT WATER SUPPLY PIPING
- HWR — HOT WATER RETURN PIPING
- C — CONDENSATE PIPING
- R — REFRIGERANT PIPING
- GHWS — GLYCOL HOT WATER SUPPLY PIPING
- GHWR — GLYCOL HOT WATER RETURN PIPING

1

CONVECTOR SCHEDULE - RADIANT HEAT PANEL

TAG	SERVICE	MANUF.	MODEL NO.	MOUNTING	DEPTH (IN.)	HEIGHT (IN.)	LENGTH	GPM	BTUH/LF	AWT	REMARKS
RHP-1-1	109 CORRIDOR	RUNTAL	RF-3	WALL	1 5/8"	8 5/8"	3 ft	1.0	690	160	
RHP-1-2	111 TOILET	RUNTAL	RF-3	WALL	1 5/8"	8 5/8"	3 ft	1.0	690	160	
RHP-1-3	112 TOILET	RUNTAL	RF-3	WALL	1 5/8"	8 5/8"	3 ft	1.0	690	160	
RHP-1-4	113 TOILET	RUNTAL	RF-3	WALL	1 5/8"	8 5/8"	2 ft	1.0	690	160	
RHP-2-1	207 MEN	RUNTAL	RF-3	WALL	1 5/8"	8 5/8"	3 ft	1.0	690	160	
RHP-2-2	205 WOMEN	RUNTAL	RF-3	WALL	1 5/8"	8 5/8"	3 ft	1.0	690	160	

NOTES:
1. COLOR TO BE SELECTED BY ARCHITECT (FOR BIDDING PURPOSES FIGURE PREMIUM COLOR).
2. PROVIDE HORIZONTAL PIPE TRIM AS REQ'D TO CONCEAL ALL PIPING
   a. TRIM PANELS MUST BE PROVIDED BY RHP MANUF. AND SHALL EXACTLY MATCH STYLE, COLOR AND TYPE OF RADIANT HEAT PANEL.
3. CONTRACTOR SHALL DETERMINE REQ'D PIPING CONNECTION.
4. FURNISH WITH INTEGRAL AIR VENT.
5. PROVIDE WALL BRACKET FOR MOUNTING PER MANUF'S REQUIREMENTS.

MECHANICAL KEYED EQUIPMENT LEGEND:

- VRF X — VARIABLE REFRIGERANT FLOW UNIT
- CU X — CONDENSING UNIT
- EF X — EXHAUST FAN
- HRV X — HEAT RECOVERY VENTILATOR
- UH X — HYDRONIC UNIT HEATER
- CH X — HYDRONIC CABINET HEATER
- HRB X — VRF HEAT RECOVERY BOX
- CF X — CEILING FAN
- HR X — HOSE REEL
- P X — HYDRONIC PUMP
- BLR X — BOILER
- ET X — EXPANSION TANK
- AS X — AIR SEPARATOR
- HX X — PLATE & FRAME HEAT EXCHANGER
- BF X — CHEMICAL BAG FILTER
- LV X — LOUVER
- HR X — MOTORIZED HOSE REEL
- ERV X — AIR TO AIR ENERGY RECOVERY VENTILATOR
- KEF X — KITCHEN EXHAUST FAN
- BP X — BOOSTER PUMP
- MAU X — MAKE-UP AIR UNIT
- HWC X — HOT WATER COIL
- RHP X — RADIANT HEAT PANEL
- FT X — FIN TUBE RADIATION
- HMF X — IN-SLAB INDOOR HEATING MANIFOLD
- SMF X — IN-SLAB OUTDOOR HEATING MANIFOLD
- ED-x / XXX CFM — EXHAUST AIR DIFFUSER
- RD-x / XXX CFM — RETURN AIR DIFFUSER
- RG-x / XXX CFM — RETURN AIR GRILLE
- SD-x / XXX CFM — SUPPLY AIR DIFFUSER
- SG-x / XXX CFM — SUPPLY AIR GRILLE
- LD-x / XXX CFM — SUPPLY AIR LINEAR DIFFUSER

APPLICABLE CODES:

2020 BUILDING CODE OF NEW YORK STATE
2020 MECHANICAL CODE OF NEW YORK STATE
2020 ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: N.T.S.
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

HESNOR ENGINEERING ASSOCIATES
WWW.HESNOR.COM
KEYSTONE ASSOCIATES
WWW.KEYSTONEASSOCIATES.COM
DELAWARE ENGINEERING, D.P.C.
WWW.DELAWAREENGINEERING.COM

REVISIONS

NO.	DATE	DESCRIPTION
1	08/04/2023	ADDENDUM #1

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

MECHANICAL COVER SHEET

SHEET: M000

BID PLANS

VRF FAN COIL SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	TYPE	CFM	EXT. S.P. (IN. W.C.)	NOMINAL TONS	RATED CAPACITY			ELECTRIC		WEIGHT (LBS.)	REMARKS
								COOLING		HEATING (MBH)	AMPS	SYSTEM		
								TOTAL (MBH)	SENSIBLE (MBH)					
VRF-1-1	114 COMMUNITY ROOM	LENNOX	VMDB036H4-3P	DUCTED	1,200	0.60	3.0	31,353	21,724	35,595	5.0	208/1/60	124	SEE NOTES
VRF-1-2	114 COMMUNITY ROOM	LENNOX	VMDB048H4-3P	DUCTED	1,370	0.60	4.0	41,804	28,966	45,764	5.0	208/1/60	124	SEE NOTES
VRF-1-3	120 CHEIF'S OFFICE	LENNOX	VMDB007H4-3P	DUCTED	220	0.32	0.5	6,096	4,224	6,780	1.25	208/1/60	51	SEE NOTES
VRF-1-4	118 READY ROOM	LENNOX	VMDB015H4-3P	DUCTED	450	0.60	1.25	13,064	9,051	14,407	3.13	208/1/60	100	SEE NOTES
VRF-1-5	122 KITCHEN	LENNOX	VWMC030H4-3P	WALL MOUNT	700	-	2.5	26,127	18,006	28,200	0.65	208/1/60	38	SEE NOTES
VRF-2-1	219 GENERAL OFFICE	LENNOX	VMDB018H4-3P	DUCTED	480	0.6	1.5	15,677	10,862	18,343	3.13	208/1/60	100	SEE NOTES
VRF-2-2	223 COMMON AREA	LENNOX	VMDB030H4-3P	DUCTED	780	0.60	2.5	26,127	18,104	29,698	5.0	208/1/60	100	SEE NOTES
VRF-2-3	203 CORRIDOR	LENNOX	VHIB048H4-3P	DUCTED	1,429	0.80	4.0	41,804	28,966	47,167	7.6	208/1/60	166	SEE NOTES
VRF-2-4	200 CHIEF'S OFFICE	LENNOX	VMDB007H4-3P	DUCTED	220	0.32	0.5	6,096	4,224	6,780	1.25	208/1/60	51	SEE NOTES

NOTES:
1. REFER TO DETAILS AND MANUF.'S RECOMMENDATION OF REFRIGERANT PIPE SIZING AND FITTINGS.
2. PROVIDE W/ CONDENSATE PUMP.
3. PROVIDE W/ 7-DAY PROGRAMMABLE THERMOSTAT.

VRF CONDENSING UNIT SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	RATED CAPACITY		REFRIG.	EER	ELECTRIC		WEIGHT (LBS.)	REMARKS
				COOLING CAPACITY (MBH)	HEATING CAPACITY (MBH)			MCA	SYSTEM		
CU-1	OUTSIDE	LENNOX	VRB120L4M-3Y	116,854	128,266	R410A	12.3	82.6	208/3/60	1,093	SEE NOTES
CU-2	OUTSIDE	LENNOX	VRB096LM-3Y	88,500	102,195	R410A	12.7	75	208/3/60	1,093	SEE NOTES

NOTES:
1. UNIT SHALL BE MOUNTED ON PRE-FABRICATED EQUIPMENT SUPPORTS (24" HIGH EQUIPMENT RAILS) WITH NEOPRENE RUBBER ISOLATION PADS.
2. PROVIDE WITH AIR GUIDE AND HAIL GUARD KITS FOR LOW AMBIENT OPERATION.

RATED CAPACITY BASED ON:
HEATING - INDOOR: 70.0°F (DB), OUTDOOR: -4.0°F (DB) & 4.4°F (WB)
COOLING - INDOOR: 75.0°F (DB) & 62.0°F (WB), OUTDOOR: 91.0°F (DB)

HEAT RECOVERY VENTILATOR SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	SUPPLY FAN		EXHAUST FAN		WEIGHT (LBS.)	SUMMER				WINTER		ELECTRIC			REMARKS
				CFM	EXT. SP. (IN. W.C.)	CFM	EXT. SP. (IN. W.C.)		EAT (DB °F)	EAT (WB °F)	LAT (DB °F)	LAT (WB °F)	EAT (DB °F)	LAT (DB °F)	MCA	MOP	SYSTEM	
HRV-1	APPARATUS BAY	RENEWAIRE	EV450JIN--S11E----GNTF--L	400	0.75	400	0.75	199	90.0	71.0	79.0	66.4	-7.0	49.3	10.1	15	120/1/60	SEE NOTES

NOTES:
1. PROVIDE W/ MERV-8 FILTERS.

VRF HEAT RECOVERY BOX SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	TYPE	REFRIG.	PORTS	ELECTRIC		WEIGHT (LBS.)	REMARKS
						NO. / MAX	MCA	SYSTEM		
HRB-1-1	107 MECHANICAL	LENNOX	V8MSBB06-3P	HEAT RECOVERY	R-410A	5/6	0.4	208/1/60	84	
HRB-2-1	217 RECORD FILES	LENNOX	V8MSBB04-3P	HEAT RECOVERY	R-410A	4/4	0.4	208/1/60	84	

EXHAUST FAN SCHEDULE

TAG	MANUF.	MODEL NO.	TYPE	CFM	DRIVE	EXT. SP. (IN)	RPM	WEIGHT (LBS)	ELECTRIC		REMARKS
									FLA	SYSTEM	
EF-1-1	COOK	30XLPH	WALL	5800	BELT	0.40	791	301	7.8	208/3/60	SEE NOTES
EF-1-2	COOK	GCVF-180	CEILING	150	DIRECT	0.75	1349	17	1.2	115/1/60	SEE NOTES
EF-1-3	COOK	100 SQN28DO60VF	IN-LINE	230	DIRECT	0.75	2611	70	4.4	115/1/60	SEE NOTES
EF-1-4	COOK	GCVF-180	CEILING	150	DIRECT	0.75	1349	17	1.2	115/1/60	SEE NOTES
EF-1-5	COOK	GCVF-700	CEILING	300	DIRECT	0.75	1498	37	4.4	115/1/60	SEE NOTES
EF-1-6	COOK	GCVF-700	CEILING	225	DIRECT	0.75	1498	37	4.4	115/1/60	SEE NOTES
EF-1-7	COOK	GCVF-700	CEILING	225	DIRECT	0.75	1498	37	4.4	115/1/60	SEE NOTES
EF-1-8	COOK	GCVF-180	CEILING	150	DIRECT	0.75	1349	17	1.2	115/1/60	SEE NOTES
EF-2-1	COOK	GCVF-180	CEILING	150	DIRECT	0.75	1349	17	1.2	115/1/60	SEE NOTES

NOTES:
1. PROVIDE WITH THE FOLLOWING OPTIONS:
   - INTEGRAL BACKDRAFT DAMPER.
   - WHITE ALUMINUM GRILLE (CEILING MOUNTED).

** - DAMPERS SHALL HAVE AN AIR LEAKAGE RATE OF NOT GREATER THAN 20 CFM/SQFT WHERE NOT LESS THAN 24" IN EITHER DIMENSION AND 40 CFM/SQFT WHERE LESS THAN 24" IN EITHER DIMENSION. THE RATE OF AIR LEAKAGE SHALL BE DETERMINED AT 1.0" W.C. WHEN TESTED IN ACCORDANCE WITH AMCA 500D FOR SUCH PURPOSE. THE DAMPERS SHALL BE LABELED BY AN APPROVED AGENCY.

DIFFUSER AND GRILLE SCHEDULE

TAG	MODEL NO.	MANUF.	NECK SIZE	LENGTH	FACE SIZE	MOUNTING TYPE	MATERIAL	DAMPER	REMARKS
ED-1	UNI2	NAILOR	6"ø	-	24"x24"	LAY-IN	ALUMINUM	VOLUME DAMPER	SEE NOTES
ED-2	UNI2	NAILOR	8"ø	-	24"x24"	LAY-IN	ALUMINUM	VOLUME DAMPER	SEE NOTES
EG	6155H-O	NAILOR	12"x10"	-	12"x10"	SURFACE	STEEL		SEE NOTES
EG-1	6155H-O	NAILOR	10" x 6"	-	10" x 6"	SURFACE	STEEL		SEE NOTES
EG-2	6155H-O	NAILOR	12" x 12"	-	12"x12"	SURFACE	STEEL		SEE NOTES
LD-1	5310(I)-1219	NAILOR	8"ø	48"		LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
LD-2	5310(I)-1219	NAILOR	10"ø	48"		LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
RD-1	UNI2	NAILOR	6"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
RD-2	UNI2	NAILOR	8"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
RD-4	UNI2	NAILOR	12"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
RD-5	UNI2	NAILOR	14"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
RG-1	6155H-O	NAILOR	16" x 8"	-	16" x 8"	SURFACE	STEEL	INTEGRAL DAMPER	SEE NOTES
SD-1	UNI2	NAILOR	6"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
SD-2	UNI2	NAILOR	8"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
SD-3	UNI2	NAILOR	10"ø	-	24"x24"	LAY-IN	STEEL	VOLUME DAMPER	SEE NOTES
SG-1	51DH-O	NAILOR	8" x 6"	-	8" x 6"	SURFACE	STEEL	INTEGRAL DAMPER	SEE NOTES
SG-2	51DH-O	NAILOR	14"x12"	-	24"x24"	SURFACE	STEEL	VOLUME DAMPER	SEE NOTES
SG-3	51DH-O	NAILOR	60" x 60"	-	60" x 60"	SURFACE	STEEL	INTEGRAL DAMPER	SEE NOTES

NOTES:
1. ARCHITECT TO SELECT COLOR.
2. PROVIDE AUXILIARY FRAME AS REQUIRED FOR SURFACE MOUNTING.
3. PROVIDE SQUARE TO ROUND ADAPTER WHERE REQUIRED.

HYDRONIC UNIT HEATER SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	SIZE	CFM	BTUH	GPM	EWT (°F)	LWT (°F)	WPD (FT)	ELECTRIC		REMARKS
											HP	SYSTEM	
UH-1-4	107 MECHANICAL	MODINE	HSB/HC 18L	12-3/8"(H) x 13"(W) x 11" (D)	230	8,700	1.2	180	140	0.1	1/60	120/1/60	SEE NOTES
UH-2-1	201 MEZZANINE STORAGE	MODINE	HSB/HC 18L	12-3/8"(H) x 13"(W) x 11" (D)	230	8,700	1.2	180	140	0.1	1/60	120/1/60	SEE NOTES

NOTES:
1. VERTICAL MOUNT. PROVIDE WITH WALL-MOUNTING BRACKET.
2. FURNISH WITH LINE-VOLTAGE THERMOSTAT (WALL-MOUNTED).
3. PROVIDE WITH INTEGRAL DISCONNECT.

DUCT INSULATION SCHEDULE

SERVICE	TEMP. RANGE (°F)	LOCATION	TYPE	DUCT SIZE	THICKNESS	JACKET	REMARKS
SUPPLY AIR DUCTWORK	55 - 95	ALL	MFB	ALL	R-6	NONE	
OUTDOOR AIR DUCTWORK	55 - 95	ALL	MFB	ALL	R-6	NONE	
GREASE DUCTWORK	- SEE NOTE 2 -						

NOTES:
1. SEE SECTION 23 07 13.

2. WRAP WITH APPROVED FIELD-APPLIED GREASE DUCT ENCLOSURE MATERIAL IN ACCORDANCE WITH ASTM E 2336. ENCLOSURE MATERIALS SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS TO PROVIDE AND MAINTAIN FIRE-RATED ENCLUSURE THROUGHOUT ENTIRE LENGTH AND MEET CLEARANCE REQUIREMENTS FROM COMUSTIBLE MATERIALS.
   SEE SECTION 23 51 01 FOR ADDITIONAL INFORMATION.

TYPE:
MFB - MINERAL FIBER BLANKET

HYDRONIC CABINET HEATER SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	OUTPUT (BTU/H)	MOUNTING	DEPTH (IN)	WIDTH (IN)	LENGTH (IN)	GPM	EFT (°F)	LFT (°F)	WPD (FT)	ELECTRIC		REMARKS
													MCA	SYSTEM	
CH-1-1	108 CORRIDOR	BEACON MORRIS	RC-1200-U2	16,400	CEILING RECESS	9-1/2	25	35	0.9	180	140	1.5	0.8	120/1/60	SEE NOTES
CH-1-2	126 LOBBY	BEACON MORRIS	RC-1200-U2	16,400	CEILING RECESS	9-1/2	25	35	0.9	180	140	1.5	0.8	120/1/60	SEE NOTES
CH-1-3	S1 STAIR-1	BEACON MORRIS	RC-1200-U2	16,400	WALL/RECESS	9-1/2	25	35	0.9	180	140	1.5	0.8	120/1/60	SEE NOTES
CH-1-4	S2 STAIR-2	BEACON MORRIS	RC-1200-U2	16,400	WALL/RECESS	9-1/2	25	35	0.9	180	140	1.5	0.8	120/1/60	SEE NOTES

NOTES:
1. PROVIDE DISCONNECT FOR INSTALLATION BY EC.
2. PROVIDE WITH W120 RECESSED KIT & LOW TEMP AQUASTAT.
3. SHALL BE SUITABLE FOR USE WITH PROPYLENE GLYCOL/WATER SYSTEMS.
4. PROVIDE HANGING BRACKET AND INSTALL PER MANUF'S REQUIREMENTS.

LOUVER SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	DIMENSIONS		MATERIAL	MOTORIZED DAMPER	REMARKS
				WIDTH	HEIGHT			
LV-1	106 STORAGE	NAILOR	LE-23	16"	12"	ALUMINUM	YES	SEE NOTES
LV-2	107 MECHANICAL	NAILOR	LE-23	28"	16"	ALUMINUM	YES	SEE NOTES
LV-3	105 SCBA	NAILOR	LE-23	66"	16"	ALUMINUM	YES	SEE NOTES
LV-4	HRV-1 EA	NAILOR	LE-23	16"	16"	ALUMINUM	YES	SEE NOTES
LV-5	HRV-1 OA	NAILOR	LE-23	16"	16"	ALUMINUM	YES	SEE NOTES
LV-6	100 APPARATUS BAY OA	NAILOR	LE-23	60"	60"	ALUMINUM	YES	SEE NOTES
LV-7	215 DRESS UNIFORM	NAILOR	LE-23	16"	16"	ALUMINUM	YES	SEE NOTES
LV-8	ERV-1 OA	NAILOR	LE-23	28"	24"	ALUMINUM	YES	SEE NOTES
LV-8	MUA-1 OA	NAILOR	LE-23	36"	30"	ALUMINUM	YES	SEE NOTES
LV-9	ERV-1 EA	NAILOR	LE-23	28"	24"	ALUMINUM	YES	SEE NOTES

NOTE:
1. ALL LOUVERS SHALL BE PROVIDED WITH THE FOLLOWING FEATURES:
   - TAMCO 9000 BF MOTORIZED DAMPER
     - SHALL BE CLASS 1 AND HAVE AN AIR LEAKAGE RATE OF NOT GREATER THAN 4 CFM/SQFT OF DAMPER SURFACE AREA @ 1.0" W.C. AND SHALL BE LABELED BY AN APPROVED AGENCY WHEN TESTED IN ACCORDANCE WITH AMCA 500D FOR SUCH PURPOSE.
     - ACTUATOR(s) SHALL BE FURNISHED BY MC, INSTALLED BY CONTROLS CONTRACTOR.
   - INSULATED BOX CONSTRUCTION
   - BIRD SCREEN
2. VERIFY EXACT DIMENSIONS WITH STRUCTURAL AND ARCHITECTURAL DRAWINGS PRIOR TO ORDERING.
3. FINISH TO BE SELECTED BY ARCHITECT. FOR BIDDING PURPOSES, FIGURE PREMIUM COLOR.

BID PLANS

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1' - 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

HESNOR ENGINEERING ASSOCIATES
WWW.HESNOR.COM
KEYSTONE ASSOCIATES
ARCHITECTS, ENGINEERS & SURVEYORS, LLC
WWW.KEYSTONEASSOCIATES.COM
DELAWARE ENGINEERING, D.P.C.
CIVIL AND ENVIRONMENTAL CONSULTANTS
WWW.DELAWAREENGINEERING.COM

REVISIONS

NO.	DATE	DESCRIPTION

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

MECHANICAL SCHEDULES

SHEET: M001

PLATE & FRAME HEAT EXCHANGER SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	HEAT EXCHANGED (kBTU/H)	HOT SIDE (100% H2O)					COLD SIDE (40% PG / 60% H2O)					REMARKS
					FLUID	FLUID FLOW (GPM)	EFT (°F)	LFT (°F)	P.D. (PSI)	FLUID	FLUID FLOW (GPM)	EFT (°F)	LFT (°F)	P.D. (PSI)	
HX-1	BLR-1	TACO	~~TB10TX24~~ AQ2L-FG	~~120~~ 650	HW	~~6~~ 33.5	180	140	~~8~~ 2.9	HGW	~~7~~ 34.9	135	175	~~8~~ 3.7	NOTE 1

NOTES:
1. PROVIDE WITH THE FOLLOWING OPTIONS:
   - FLANGED CONNECTIONS

FLUID:
HGW: 40% PROPYLENE GLYCOL / 60% WATER
HW: 100% WATER

AIR SEPARATOR SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	FLUID	MOUNTING	CONNECTION	PIPE SIZE (IN.)	WEIGHT (LBS)	REMARKS
AS-1	BLR-1	TACO	~~49-150~~ 49-200	~~HW~~ HGW	IN-LINE	THREADED	~~1 1/2"~~ 2"	30	NOTE 1
AS-2	BLR-2	TACO	~~49-150~~ 49-200	~~HW~~ HGW	IN-LINE	THREADED	~~1 1/2"~~ 2"	30	NOTE 1

NOTES:
1. WRAP WITH R-12.5 INSULATION

FLUID:
HGW: 40% PROPYLENE GLYCOL / 60% WATER
HW: 100% WATER

AIR-TO-AIR ENERGY RECOVERY VENTILATOR SCHEDULE

TAG	MANUF.	MODEL NO.	AIRFLOWS			FAN EXTERNAL S.P.		COOLING				HOT WATER COIL					HEAT RECOVERY CONDITIONS				ELECTRICAL			REMARKS
			SUPPLY (CFM)	EXHAUST (CFM)	O.A. (CFM)	SUPPLY (IN. W.C.)	EXHAUST (IN. W.C.)	EAT (DB/WB °F)	LAT (DBWB °F)	TOTAL (MBH)	SENSIBLE (MBH)	EAT (DB/WB °F)	LAT (DBWB °F)	FLUID	GPM	TOTAL (MBH)	WINTER		SUMMER		SYSTEM	MCA	MOP	
																	EAT (DB °F)	LAT (DB °F)	EAT (DB/WB °F)	LAT (DB/WB °F)				
ERV-1	AAON	CFA-007-A-A-2-DA00H	2,390	1,300	2,390	1.00	1.00	83.05 / 66.20	57.83 / 56.29	74.72	68.25	24.5 / 21.5	93.3 / 56.6	GHW	~~7.0~~ 11	193.8	-7.0	24.54	90.0 / 71.0	83.05 / 66.20	230/3/60	28	45	SEE NOTES

NOTES:
1. PROVIDE WITH THE FOLLOWING OPTIONS:
   - 120V CONVENIENCE OUTLET, GFI, FACTORY WIRED
   - HOT GAS RE-HEAT, MODULATING
   - OUTDOOR AIR RAIN HOOD
   - SINGLE-POINT ELECTRICAL CONNECTION
   - FUSIBLE DISCONNECT
   - PREMIUM EFFICIENCY MOTORS
   - FACTORY MOUNTED ADJUSTABLE SPEED DRIVE (ASD) ON SUPPLY FAN MOTOR AND EXHAUST FAN MOTOR.
   - DUAL WALL CONSTRUCTION
   - RECIRCULATION/BYPASS DAMPER FOR UNOCCUPIED MODE
   - INSULATED BLADE OUTSIDE & EXHAUST AIR DAMPERS
   - ENERGY RECOVERY WHEEL
   - DIGITAL SCROLL COMPRESSOR ON THE LEAD CIRCUIT
   - START/STOP FROST PROTECTION
   - 4 STAGE STAINLESS STEEL LP GAS HEAT
   - 2-INCH MERV-8 AND 4-INCH MERV-12 FILTERS
   - MAKE-UP AIR CONTROLLER
2. W/ VIBRATION ISOLATION SUPPORT RAILS UNDER LONG SIDES OF UNIT.

GHW: 40% PROPYLENE GLYCOL / 60% WATER

UNIT

CONDENSING UNIT SCHEDULE

TAG	MANUF.	MODEL NO.	SERVICE	CAPACITY (TONS)	REFRIG.	EER	ELECTRIC		WEIGHT (LBS)	REMARKS
							MCA	SYSTEM		
CU-3	AAON	CFA-003-A-A-8-DA00H	OUTSIDE	36,600	R410A	12	17	208/1/60	397	SEE NOTES

NOTES:
1. PROVIDE WITH THE FOLLOWING OPTIONS:
   - VIBRATION ISOLATION
   - 120V CONVENIENCE OUTLET

STARTER TYPE:
PCU - PACKAGED CONTROL UNIT INTEGRAL TO EQUIPMENT. SINGLE POINT ELECTRICAL CONNECTION.

MAKE-UP AIR UNIT SCHEDULE

TAG	MANUF.	MODEL NO.	SUPPLY AIR (CFM)	OUTSIDE AIR (CFM)	E.S.P.	WEIGHT (LBS.)	HOT WATER COIL								ELECTRICAL			REMARKS
							TOTAL (MBH)	SENSIBLE (MBH)	EAT DB (°F)	LAT DB (°F)	EFT (°F)	LFT (°F)	FLUID	FLUID FLOW RATE (GAL/MIN)	MCA	MOP	SYSTEM	
MAU-1	CAPTIVEAIRE	AI-16Z	1,900	1,900	0.5	530	~~100.7~~ 165	100.7	~~6.0~~ 0	~~55.0~~ 80	~~160.0~~ 175	~~152.0~~ 135	GHW	~~24.2~~ 9.1	7.8	15	208/3/60	SEE NOTES

NOTES:
1. MOTORIZED BACKDRAFT DAMPER FOR A1-D HOUSING - SHALL MEET AMCA CLASS 1A RATING
2. SEPARATE 120V WIRING PACKAGE (REQUIRED AND USED ONLY FOR DCV OR PREWIRE WITH VFD) - THREE PHASE ONLY.
3. W/ VIBRATION ISOLATION SUPPORT RAILS UNDER LONG SIDES OF UNIT.
4. 2 YEAR PARTS WARRANTY

GHW: 40% PROPYLENE GLYCOL / 60% WATER

EXPANSION TANK SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	FLUID	MOUNTING	TANK VOLUME (GAL.)	PRESSURE (PSIG)	WEIGHT (LBS)	REMARKS
ET-1	BLR-1	TACO	~~CA-300-125~~ CA-500-125	HW	FLOOR	~~79~~ 132	125	~~320~~ 420	NOTE 1
ET-2	BLR-2	TACO	~~CX-30-125~~ CA-450-125	HGW	FLOOR	~~8~~ 119	125	~~45~~ 400	NOTE 1

NOTES:
1. WRAP WITH R-12.5 INSULATION

FLUID:
HGW: 40% PROPYLENE GLYCOL / 60% WATER
HW: 100% WATER

BOILER SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	FUEL		FLUID	INPUT MBH (MAX.)	OUTPUT MBH (MAX.)	EFFICIENCY	REMARKS
				FUEL	SUPPLY PRESSURE RANGE (IN W.C.)					
BLR-1	107 MECHANICAL	LOCHINVAR	~~KBXB0400N~~ KBX1000N	NG	8 - 14	HW	~~399~~ 999	~~387~~ 969	97%	SEE NOTES
BLR-2	107 MECHANICAL	LOCHINVAR	~~KBXB0400N~~ KBX1000N	NG	8 - 14	HW	~~399~~ 999	~~387~~ 969	97%	SEE NOTES

NOTES:
1. FURNISH WITH THE FOLLOWING OPTIONS:
   - SINGLE POINT ELECTRICAL CONNECTION
   - MANUF. PROVIDE LOOSE BOILER PUMP (BP-x)
   - FLOW SWITCH
   - HIGH AND LOW PRESSURE SWITCHES
   - LOW WATER CUT-OFF WITH MANUAL RESET AND TEST
   - PRESSURE AND TEMPERATURE GAUGES
   - HIGH EXHAUST PRESSURE SWITCH
   - HIGH LIMIT THERMOSTAT, MANUAL RESET

FLUID:
HW: 100% WATER

HYDRONIC PUMP SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	TYPE	FLUID	GPM	HEAD (FT.)	RPM	VFD	ELECTRIC		REMARKS
										HP	SYSTEM	
~~BP-1~~	~~107 MECHANICAL~~	~~TACO~~	~~VR15~~	~~A~~	~~HW~~	~~20~~	~~20~~	~~3,250~~	~~YES~~	~~2/3~~	~~208/1/60~~	BY BOILER MANUF.
~~BP-2~~	~~107 MECHANICAL~~	~~TACO~~	~~VR15~~	~~A~~	~~HW~~	~~20~~	~~20~~	~~3,250~~	~~YES~~	~~2/3~~	~~208/1/60~~	BY BOILER MANUF.
~~P-1~~	~~107 MECHANICAL~~	~~TACO~~	~~1915~~	~~A~~	~~GHW~~	~~13~~	~~35~~	~~1,760~~	~~NO~~	~~3/4~~	~~120/1/60~~	BY BOILER MANUF.
P-1A	107 MECHANICAL	TACO	~~VR15~~ 1919	A	HW	~~25~~ 50	~~30~~ 45	~~3,250~~ 1,760	YES	~~2/3~~ 1.5	~~208/1/60~~ 208/3/60	
P-1B	107 MECHANICAL	TACO	~~VR15~~ 1919	A	HW	~~25~~ 50	~~30~~ 45	~~3,250~~ 1,760	YES	~~2/3~~ 1.5	~~208/1/60~~ 208/3/60	
P-2A	107 MECHANICAL	TACO	~~0034-E~~ 1915	A	~~GHW~~ HGW	~~7~~ 36	~~25~~ 30	~~3,250~~ 1,760	YES	~~1/5~~ 3/4	~~120/1/60~~ 208/3/60	
P-2B	107 MECHANICAL	TACO	~~0034-E~~ 1915	A	~~GHW~~ HGW	~~7~~ 36	~~25~~ 30	~~3,250~~ 1,760	YES	~~1/5~~ 3/4	~~120/1/60~~ 208/3/60	
P-L1	~~100 APPARATUS BAY~~	TACO	~~2420~~ IL0011	A	HW	~~7~~ 6	~~25~~ 20	~~3,450~~ 3,250	NO	~~1/10~~ 1/8	120/1/60	
P-L2	~~100 APPARATUS BAY~~	TACO	~~2410~~ IL0011	A	HW	~~6~~ 8	20	~~3,450~~ 3,250	NO	~~1/10~~ 1/8	120/1/60	
P-L3	~~100 APPARATUS BAY~~	TACO	~~2410~~ IL0011	A	HW	~~4~~ 8	20	~~3,450~~ 3,250	NO	~~1/10~~ 1/8	120/1/60	
P-L4	~~101 VINTAGE BAY~~	TACO	~~2410~~ IL009	A	HW	4	20	~~3,450~~ 3,250	NO	~~1/10~~ 1/8	120/1/60	
P-L5	~~127 LOBBY~~	TACO	~~2420~~ IL008	A	~~HW~~ HGW	~~7~~ 2	~~25~~ 10	~~3,450~~ 3,250	NO	~~1/10~~ 1/25	120/1/60	
P-L6	~~100 APPARATUS BAY~~	TACO	~~2420~~ 1915	A	~~HW~~ HGW	~~7~~ 26	~~25~~ 40	~~3,450~~ 1,760	NO	~~1/10~~ 1	~~120/1/60~~ 208/3/60	

NOTES:
A: INLINE

VFD FURNISHED INTEGRAL TO PUMP

HOT WATER COIL SCHEDULE

TAG	MANUF.	MODEL NO.	UNIT WIDTH	UNIT HEIGHT	CFM	BTUH	MAX APD (IN. W.C.)	EAT (°F)	LAT (°F)	MAX WPD (FT.)	GPM	EFT (°F)	LFT (°F)	ROWS	FPI	REMARKS
HWC-1	~~NORTEK~~	Z-8-A-2-B-12-12	12"	12"	400 CFM	18,745	0.11	50.0	91.6	0.4	2.2	180.0	160.0	2	8	SEE NOTES

FLUID:
GHW: 40% PROPYLENE GLYCOL / 60% WATER

KITCHEN EXHAUST FAN SCHEDULE

TAG	MANUF.	MODEL NO.	TYPE	CFM	DRIVE	EXT. SP. (IN)	RPM	WEIGHT (LBS)	ELECTRIC		REMARKS
									HP (MOTOR)	SYSTEM	
KEF-1	CAPTIVEAIRE	DU180HFA	UPBLAST	2,250	DIRECT	1.25	1118	177	1.5	208/3/60	SEE NOTES

PIPE AND EQUIPMENT INSULATION SCHEDULE

SERVICE	TEMP. RANGE (°F)	LOCATION	TYPE	PIPE SIZE	THICKNESS	JACKET	REMARKS
HWS&R	~~55~~ 180-140	ALL	FG	1/2" - 1-1/4"	1-1/2"	~~YES - NOTE 2~~ NO	SEE NOTES
				1-1/2" - 2-1/2"	2"		
				3"	2-1/2"		
GHWS&R	~~55~~ 180-140	ALL	FG	1/2" - 1-1/4"	1-1/2"	~~YES - NOTE 2~~ NO	SEE NOTES
				1-1/2" - 2-1/2"	2"		
				3"	2-1/2"		
COLD CONDENSATE	55	ALL	FG	ALL	1/2"	YES - NOTE 2	SEE NOTES
REFRIGERANT	~~55~~ -	ALL	~~FG~~ CCE	ALL	~~1/2"~~ 1"	YES - NOTE 2	SEE NOTES
EXPANSION TANK	~~55~~ 180-140	ALL	FG	~~ALL~~ -	~~1/2"~~ R-12.5	YES - ~~NOTE 2~~ PVC	SEE NOTES
AIR SEPARATOR	~~55~~ 180-140	ALL	FG	~~ALL~~ -	~~1/2"~~ R-12.5	YES - ~~NOTE 2~~ PVC	SEE NOTES

NOTES:
1. SEE SECTION 23 07 19.
2. ALL EXTERIOR PIPING (INCLUDING IN ROOFTOP MECHANICAL ROOMS) SHALL BE FITTING WITH AN ALUMINUM JACKET (SEE SPECIFICATION FOR DETAILS).

TYPE:
FG - FIBROUS GLASS INSULATION
CCE - ARMAFLEX CLOSED CELL ELASTOMER
PVC - PVC JACKET/COVER

VEHICLE EXTRACTION SCHEDULE

MANUF.	MODEL	NUMBER OF BAYS	HOSES	EF
NEDERMAN	MAGNA - TRACK HS	6	6"Ø @ 600 CFM EACH	10 HP 3,600 CFM @ 7" ESP. MODEL: NCF 80-20

NOTES:
1. PROVIDE WITH:
   A. AUTO START CONTROL PANEL WITH RECEIVER.
   B. LOW-LEVEL EXHAUST NOZZLES (1-PER BOX)
   C. ENTRANCE, MIDDLE AND END STRUT ASSEMBLIES.
2. COODRINATE INSTALLATION WITH FIRE DEPARTMENT AND VEHICLE EXHAUST VENDOR, PRIOR TO ANY EQUIPMENT ORDERS.

CHEMICAL BAG FILTER SCHEDULE

TAG	SERVICE	MANUF.	MODEL NO.	FLUID	DIAMETER	HEIGHT	FILTER	WEIGHT (LBS)	REMARKS
BF-1	BLR-1	ROSEDALE	NC08-30-2P-1-1/2P-150-S-B-PB	HW	8-5/8"	45"	BAG		NOTE 1

NOTES:
1. EACH BAG FILTER:
   - PROVIDE WITH (20) TWENTY POLYPROPYLENE BAG FILTERS, 5-MICRON (MODEL: PO-5-G2RPO).

FLUID:
HW: 100% WATER

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: N.T.S.
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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REVISIONS

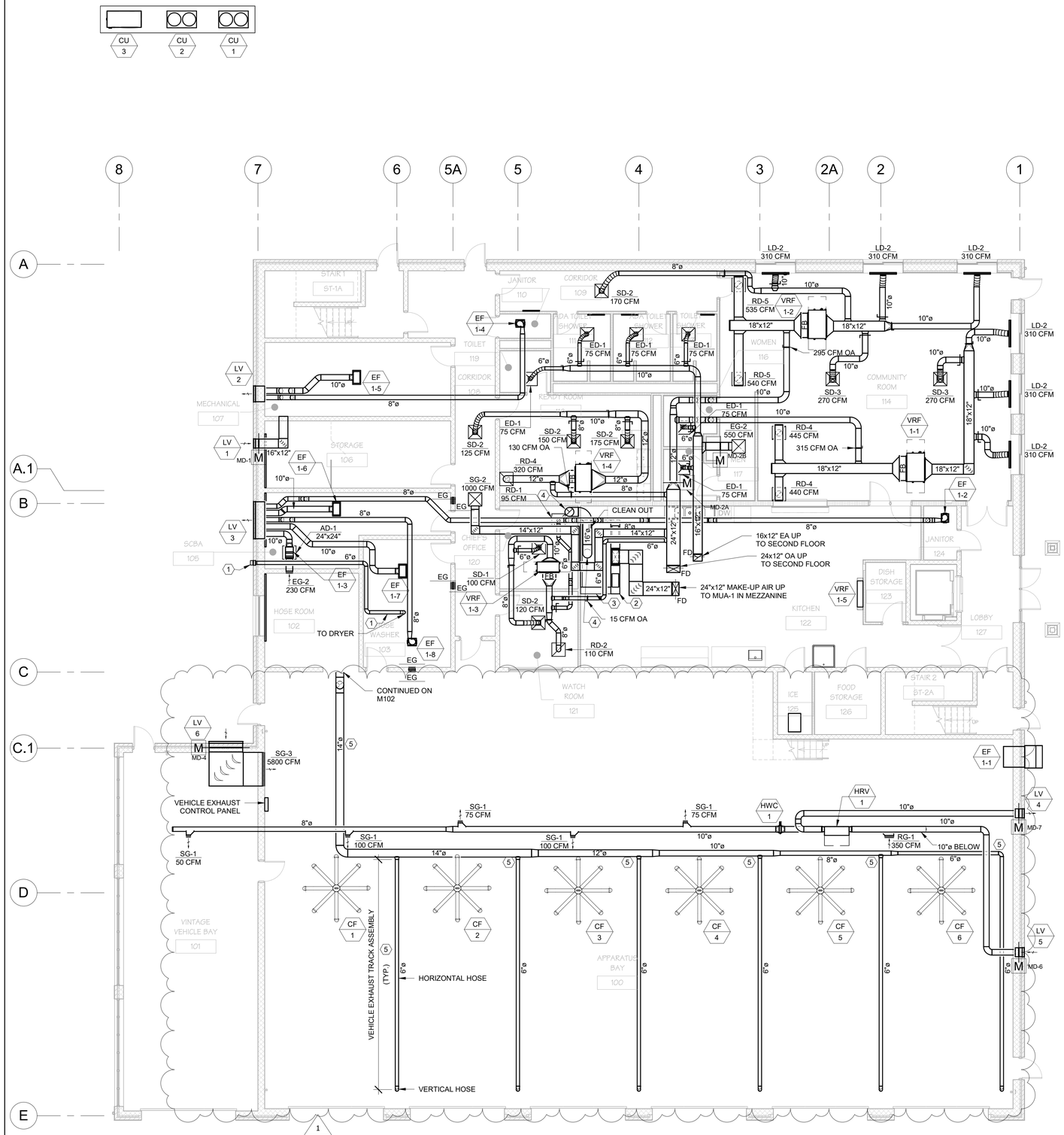
NO.	DATE	DESCRIPTION
1	08/04/2023	ADDENDUM #1

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

MECHANICAL SCHEDULES

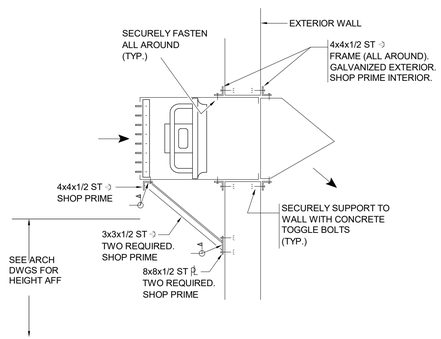
BID PLANS

SHEET: M002



KEYED NOTES

1. CLOTHES DRYER EXHAUST (4"ø):
   - DUCT SHALL BE CONSTRUCTED OF MIN. 26 GAGE RIGID METAL, HAVING SMOOTH INTERIOR SURFACES WITH JOINTS RUNNING IN THE DIRECTION OF AIRFLOW. SHALL NOT BE CONNECTED WITH SHEET-METAL SCREWS OR FASTENING MEANS WHICH EXTEND INTO THE DUCT.
   - TERMINATE WITH WALL CAP (BROAN MODEL WC650 OR EQUAL) WITH ALUMINUM PIPE AND COLLAR. TRANSITION DUCTWORK AS REQUIRED. CAP SHALL BE PRIMED AND PAINTED. ARCHITECT SHALL SELECT COLOR.
   - TERMINATION SHALL BE A MINIMUM OF 3-FEET FR. ANY OPERABLE WINDOW. FIELD DETERMINE EXACT LOCATION.
2. HOOD SUPPLY PLENUM
   - FURNISHED AND INSTALLED BY KITCHEN VENDOR. MECHANICAL CONTRACTOR TO MAKE DUCT TRANSITION TO HOOD AS REQ'D.
3. EXHAUST HOOD
   - FURNISHED AND INSTALLED BY KITCHEN VENDOR.
4. 16"ø GREASE DUCT FROM HOOD BELOW TO KEF-1 ON ROOF ABOVE. TRANSITION AS REQUIRED FOR CONNECTIOS. SEE SECTION 23 51 01.
5. VEHICLE EXTRACTION EXHAUST SYSTEM
   - MC TO PROVIDE A COMPLETE SAFE WORKING SYSTEM. SHALL INCLUDE DUCT, HOSES, FAN, CONTROL, ETC.
   - SEE SECTION 23 30 00 FOR INFO.
   - DUCTWORK SHALL BE SPIRAL G-90 GALVENIZED MIN. 22-GAUGE. DESIGNED FOR 4-INCHES NEGATIVE PRESSURE.
   - SUPPORT SYSTEM PER MANUF'S REQUIREMENTS AND STRUCTURAL DETAILS.



WALL LOUVERED EXHAUST FAN DETAIL

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1' - 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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KEYSTONE ASSOCIATES ARCHITECTS, ENGINEERS AND PLANNERS, LLC
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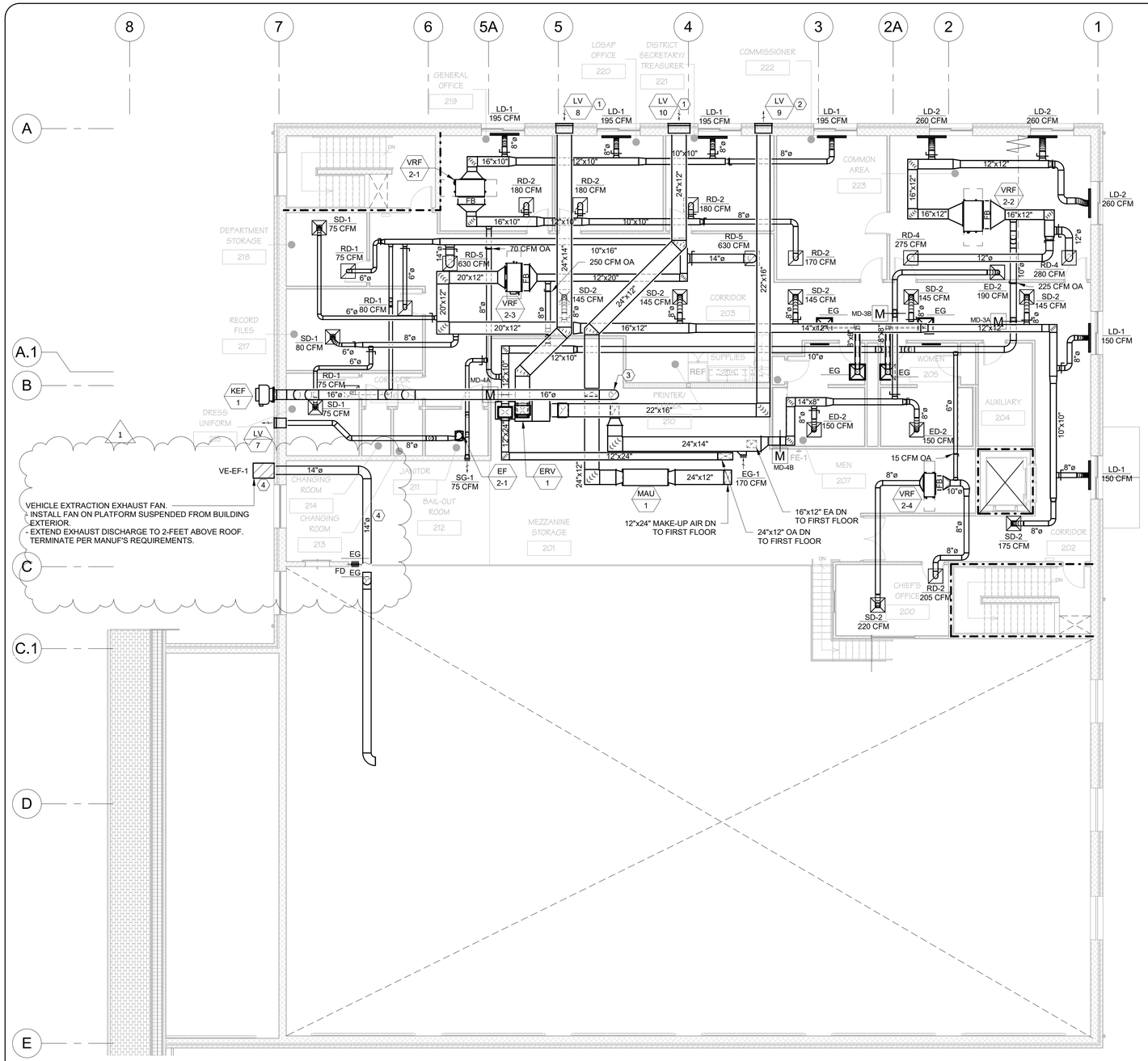
NO.	DATE	DESCRIPTION
1	08/04/2023	ADDENDUM #1

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

HVAC PLAN - FIRST FLOOR

BID PLANS

SHEET: M101



1

KEYED NOTES

1. INTAKE SHALL BE NO CLOSER THAN 10-FEET HORIZONTALLY FROM ANY EXHAUST, PARKING, VENTS, ETC.
   - BRING ANY CONCERNS TO ENGINEER'S ATTENTION.
2. EXHAUST SHALL BE NO CLOSER THAN 3-FEET FROM ANY OPERABLE OPENINGS.
   - BRING ANY CONCERNS TO ENGINEER'S ATTENTION.
3. 16"ø GREASE DUCT FROM HOOD BELOW TO KEF-1. TRANSITION AS REQUIRED FOR CONNECTIOS. SEE SECTION 23 51 01.
4. VEHICLE EXTRACTION EXHAUST SYSTEM
   - MC TO PROVIDE A COMPLETE SAFE WORKING SYSTEM. SHALL INCLUDE DUCT, HOSES, FAN, CONTROL, ETC.
   - SEE SECTION 23 30 00 FOR INFO.
   - DUCTWORK SHALL BE SPIRAL G-90 GALVENIZED MIN. 22-GAUGE. DESIGNED FOR 4-INCHES NEGATIVE PRESSURE.
   - SUPPORT SYSTEM PER MANUF'S REQUIREMENTS AND STRUCTURAL DETAILS.

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1' - 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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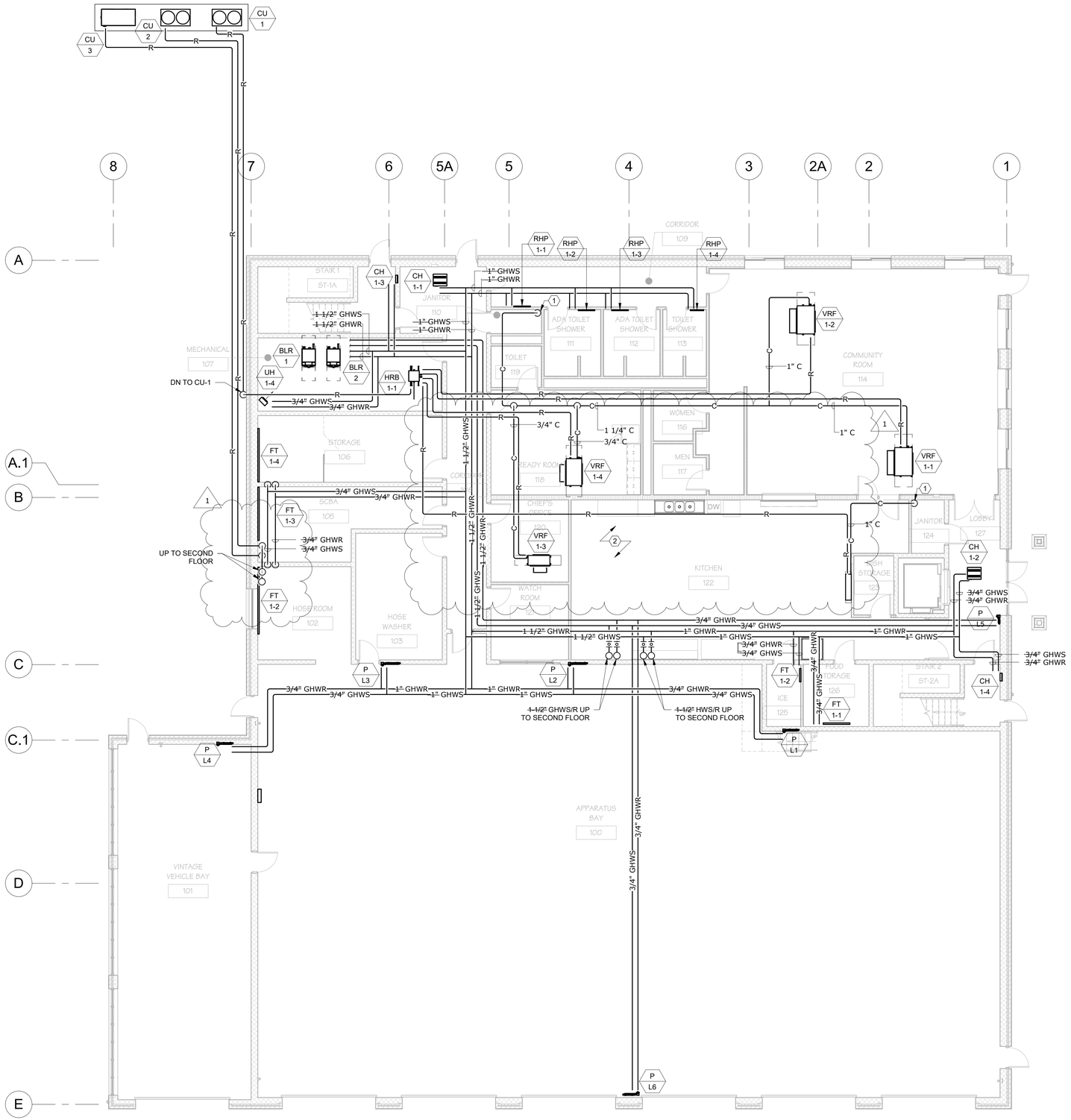
1	08/04/2023	ADDENDUM #1

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

HVAC PLAN - SECOND FLOOR

SHEET: M102

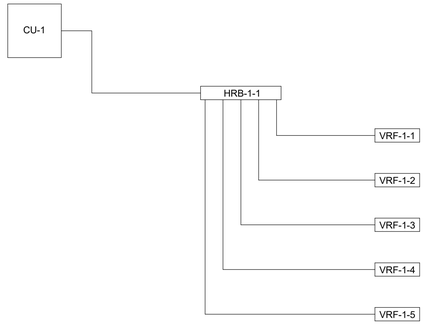
BID PLANS



CONDENSATE PIPING

1. INSTALL NEW CONDENSATE PIPING SYSTEM FOR ALL NEW FURNACES, VRF FAN COILS AND HEAT RECOVERY BOX. PIPING SHALL BE TYPE L COPPER. CONTRACTOR SHALL BE RESPONSIBLE FOR PIPING ELEVATIONS.

2. PRIOR TO ORDERING ANY EQUIPMENT:
   - CONTRACTOR SHALL WALK SITE WITH OWNER'S REP AND ENGINEER TO "PROVE" INSTALLATION OF NEW CONDENSATE PIPING SYSTEM.



FIRST FLOOR VRF REFRIGERANT PIPING ONE-LINE DIAGRAM

GENERAL NOTE
SEE DWG M601 FOR HOT WATER ONE-LINE DIAGRAM

KEYED NOTES

1. EXTEND CONDENSATE DOWN TO JAN SINK. TERMINATE W/ AIR GAP. INSTALL VERTICAL CONDENSATE PIPE EXPOSED AND TIGHT TO WALL. VERTICAL EXPOSED PIPE SHALL BE SUPPORTED AT 3 EQUAL INTERVALS (MIN.).

2. SEE HW ONE LINE DIAGRAM, DWG M601 FOR PIPING SIZING AND ADDITIONAL INFORMATION.

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1' - 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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ARCHITECTS, ENGINEERS AND LAND SURVEYORS, PLLC
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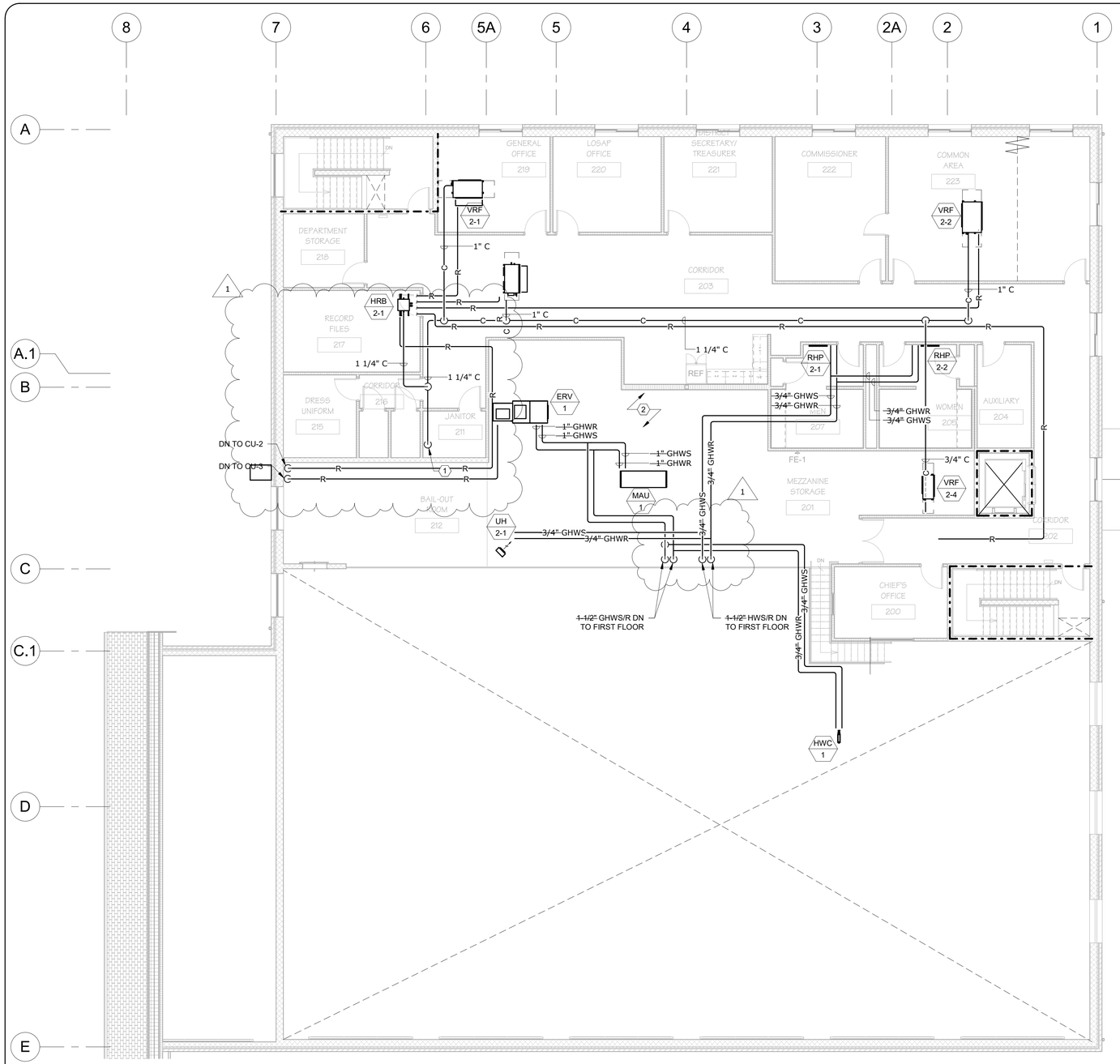
PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

PIPING PLAN - FIRST FLOOR

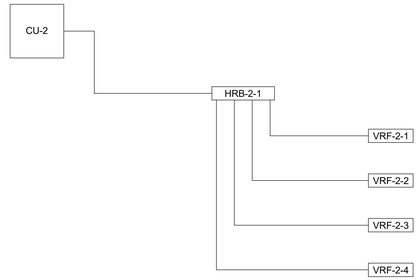
SHEET: M201

BID PLANS



CONDENSATE PIPING

1. INSTALL NEW CONDENSATE PIPING SYSTEM FOR ALL NEW FURNACES, VRF FAN COILS AND HEAT RECOVERY BOX. PIPING SHALL BE TYPE L COPPER. CONTRACTOR SHALL BE RESPONSIBLE FOR PIPING ELEVATIONS.
2. PRIOR TO ORDERING ANY EQUIPMENT:
   - CONTRACTOR SHALL WALK SITE WITH OWNER'S REP AND ENGINEER TO "PROVE" INSTALLATION OF NEW CONDENSATE PIPING SYSTEM.
3. SEE DIVISION 15 PART 15.4.9 ON SHEET M-601 FOR ADDITIONAL INFORMATION.



SECOND FLOOR VRF REFRIGERANT PIPING ONE-LINE DIAGRAM

KEYED NOTES

1. EXTEND CONDENSATE DOWN TO JAN SINK. TERMINATE W/ AIR GAP. INSTALL VERTICAL CONDENSATE PIPE EXPOSED AND TIGHT TO WALL. VERTICAL EXPOSED PIPE SHALL BE SUPPORTED AT 3 EQUAL INTERVALS (MIN.).
2. SEE HW ONE LINE DIAGRAM, DWG M601 FOR PIPING SIZING AND ADDITIONAL INFORMATION.

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1'- 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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1	08/04/2023	ADDENDUM #1

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

PIPING PLAN - SECOND FLOOR

SHEET: M202

BID PLANS

T-OA OUTSIDE AIR TEMP.

WATTS MODEL: LF-009
3/4" DCWS
RPZ
N.C.
PRV
WATTS MODEL: LF-223
BY MC
EXTEND TO FL. DRAIN

CONDENSATE TRAP. INSTALL CONDENSATE PIPE/TUBING IN ACCORDANCE WITH MANUF'S INSTRUCTIONS. (TYP.)

WATER — 40% PROPYLENE GLYCOL

- PIPING SHALL BE 3/4-INCH CROSS-LINKED POLYETHYLENE (PEX) WITH OXYGEN BARRIER AT 9-INCHES ON CENTER. (TYP. OF SNOWMELT LOOPS)

TYPICAL MANIFOLD:
- SHALL BE STAINLESS STEEL MANIFOLD KIT WITH FULL ISOLATION AND BALANCE VALVE FOR EACH CIRCUIT.
- SIZE: 1-1/2" (UNLESS OTHERWISE NOTED).

TYPICAL CIRCUIT PIPING:
- SHOWN SCHEMATICALLY ONLY. CIRCUIT QUANTITIES AND LENGTHS ARE FOR BIDDING PURPOSES ONLY. FINAL QUANTITIES AND LENGTHS MAY VARY. FINAL CIRCUIT QUANTITIES AND LENGTHS SHALL BE SUBMITTED AS PART OF CONTRACTOR's SHOP DRAWING SUBMITTAL AND SHALL BE AS PREPARED BY RADIANT SYSTEM VENDOR USING VENDOR's SOFTWARE AND THE FINAL BUILDING PLANS.

- PIPING SHALL BE 3/4-INCH CROSS-LINKED POLYETHYLENE (PEX) WITH OXYGEN BARRIER AT 12-INCHES ON CENTER. (TYP.)

LOOP	BTUH	SF		GPM	CIRCUITS		
L-6	245,000	1,475	SNOW MELT	26	7-CIRCUITS	C-1	299 FT.
						C-2	282 FT.
						C-3	290 FT.
						C-4	278 FT.
						C-5	287 FT.
						C-6	288 FT.
						C-7	289 FT.
L-5	15,000	75	SNOW MELT	2	1-CIRCUIT	C-1	107 FT.
L-2	80,114	2,425	APPARATUS ROOM	8	9-CIRCUITS	C-1	293 FT.
						C-2	277 FT.
						C-3	264 FT.
						C-4	272 FT.
						C-5	261 FT.
						C-6	274 FT.
						C-7	261 FT.
						C-8	277 FT.
						C-9	260 FT.
L-1	65,000	1,960	APPARATUS ROOM	6	7-CIRCUITS	C-1	277 FT.
						C-2	279 FT.
						C-3	277 FT.
						C-4	276 FT.
						C-5	280 FT.
						C-6	271 FT.
						C-7	280 FT.
L-3	80,000	2,450	VINTAGE VEHICLE BAY	8	9-CIRCUITS	C-1	268 FT.
						C-2	272 FT.
						C-3	268 FT.
						C-4	270 FT.
						C-5	270 FT.
						C-6	269 FT.
						C-7	268 FT.
						C-8	268 FT.
						C-9	270 FT.
L-4	34,000	1,050	APPARATUS ROOM	4	4-CIRCUITS	C-1	263 FT.
						C-2	260 FT.
						C-3	257 FT.
						C-4	299 FT.

REVISIONS		
NO.	DATE	DESCRIPTION
1	08/04/2023	ADDENDUM #1 NEW DRAWING ISSUED

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: N.T.S.
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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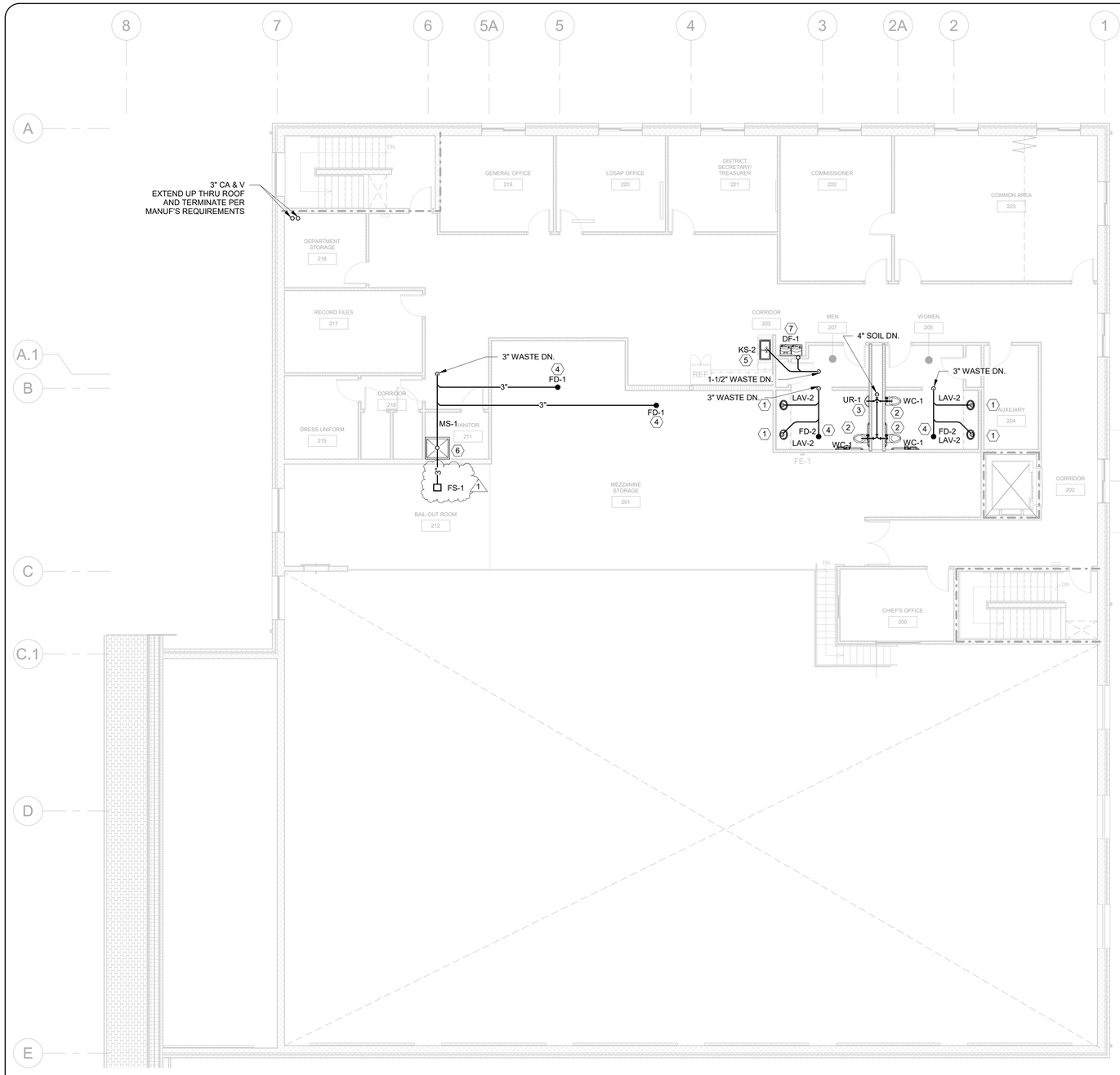
PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

HW ONE-LINE DIAGRAM

BID PLANS

SHEET: M601



KEYED NOTES

#	
1	1-1/2" WASTE TO LAVATORY. (TYP.)
2	3" SOIL TO WATER CLOSET. (TYP.)
3	2" SOIL WASTE TO URINAL. (TYP.)
4	3" WASTE TO FLOOR DRAIN. (TYP.)
5	1-1/2" WASTE TO KITCHEN SINK.
6	3" WASTE TO MOP SINK.
7	1-1/2" WASTE TO DRINKING FOUNTAIN.

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1'- 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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PORT EWEN FIRE
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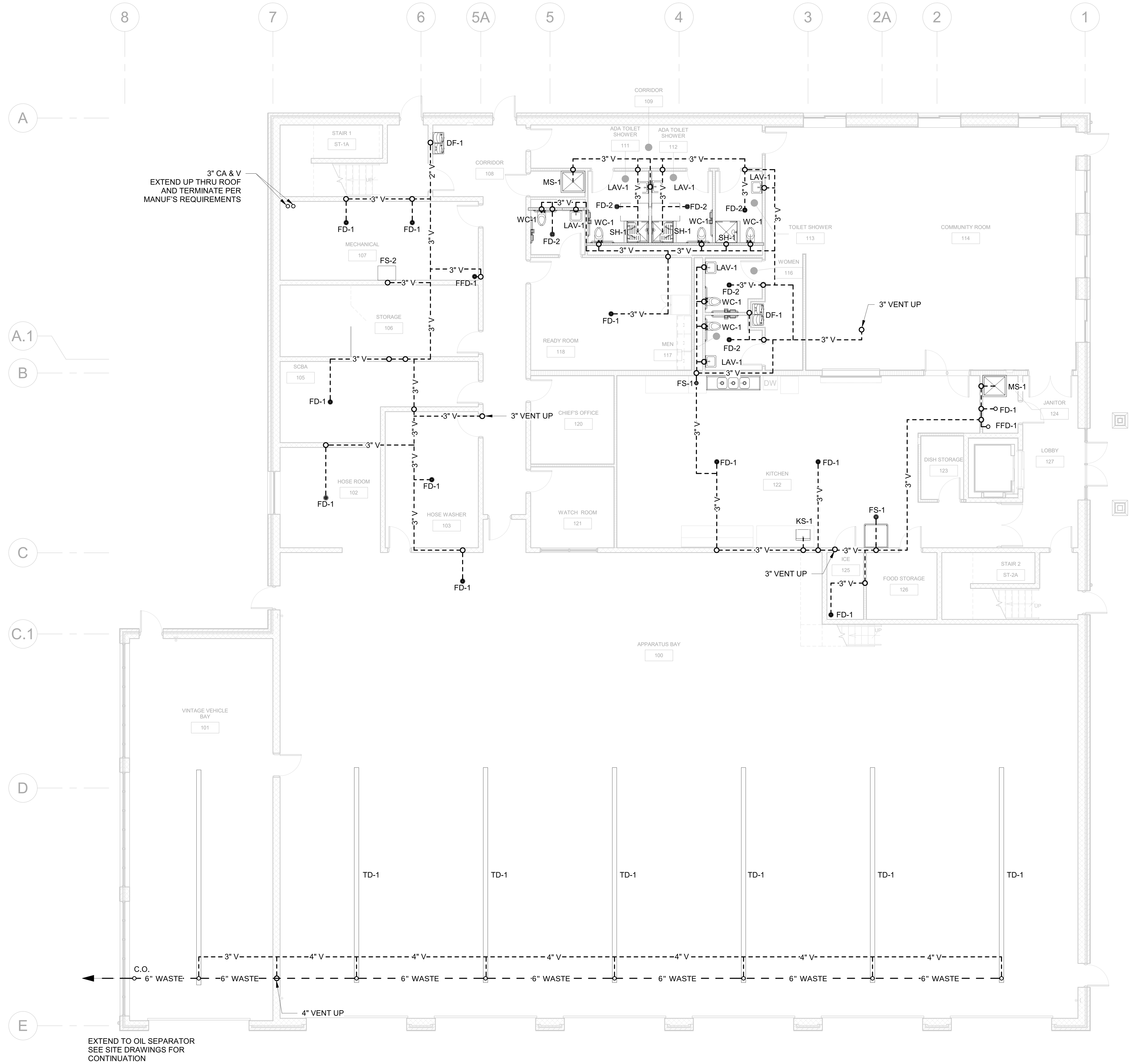
YORK

D.W.V. SECOND FLOOR PLAN

SHEET:
P104

BID PLANS



1 VENTING - FIRST FLOOR PLAN
1/8" = 1'-0"

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1'-0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
FILE:

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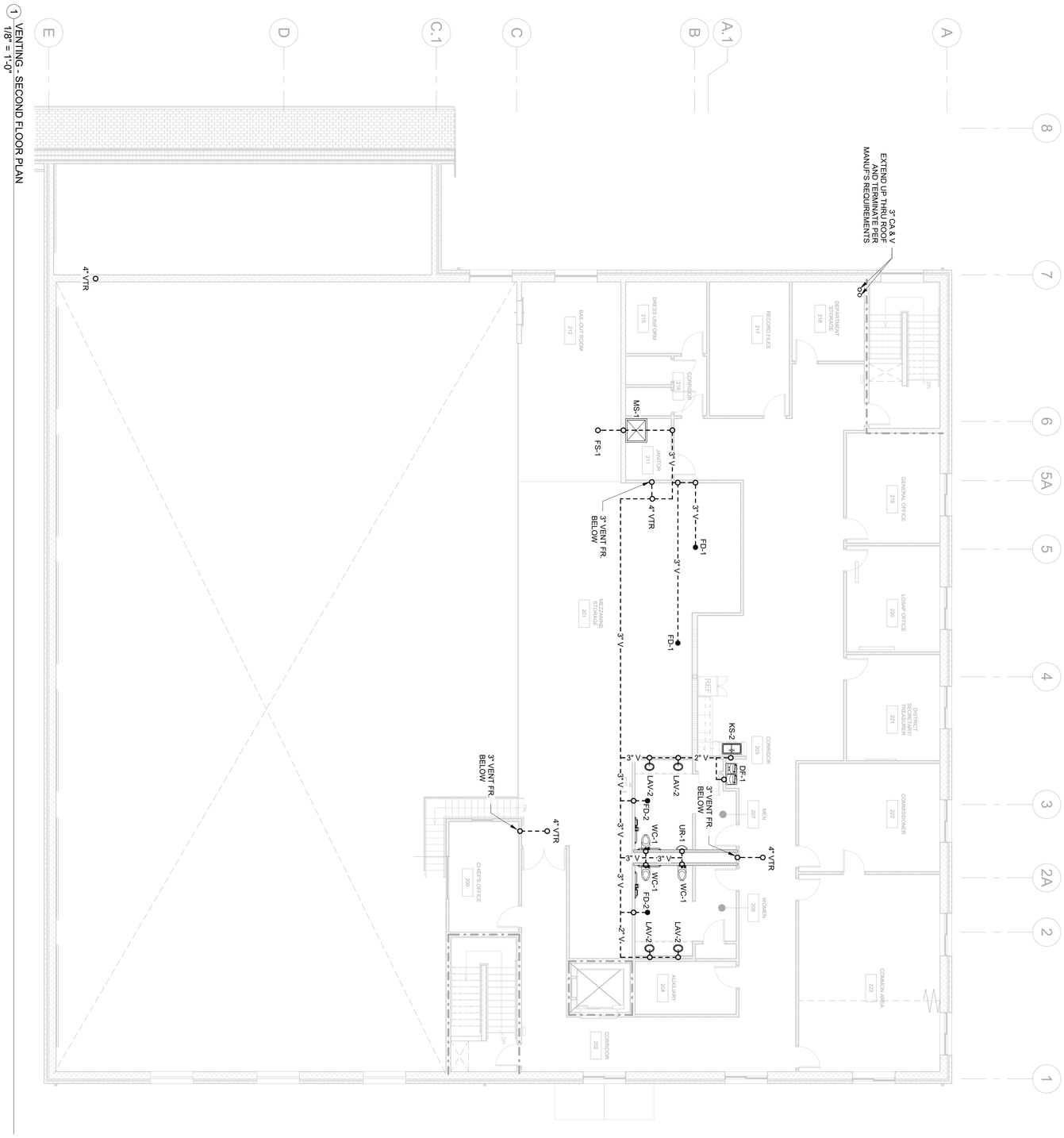
1	08/04/2023	ADDENDUM #1 NEW DRAWING ISSUED

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

VENTING FIRST FLOOR PLAN

BID PLANS

SHEET:
P105



BID PLANS

SHEET:						
P106	VENTING SECOND FLOOR PLAN	PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK	REVISIONS			
			NO.	DATE	DESCRIPTION	
			1	08/04/2023	ADDENDUM #1 NEW DRAWING ISSUED	

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DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1' - 0"
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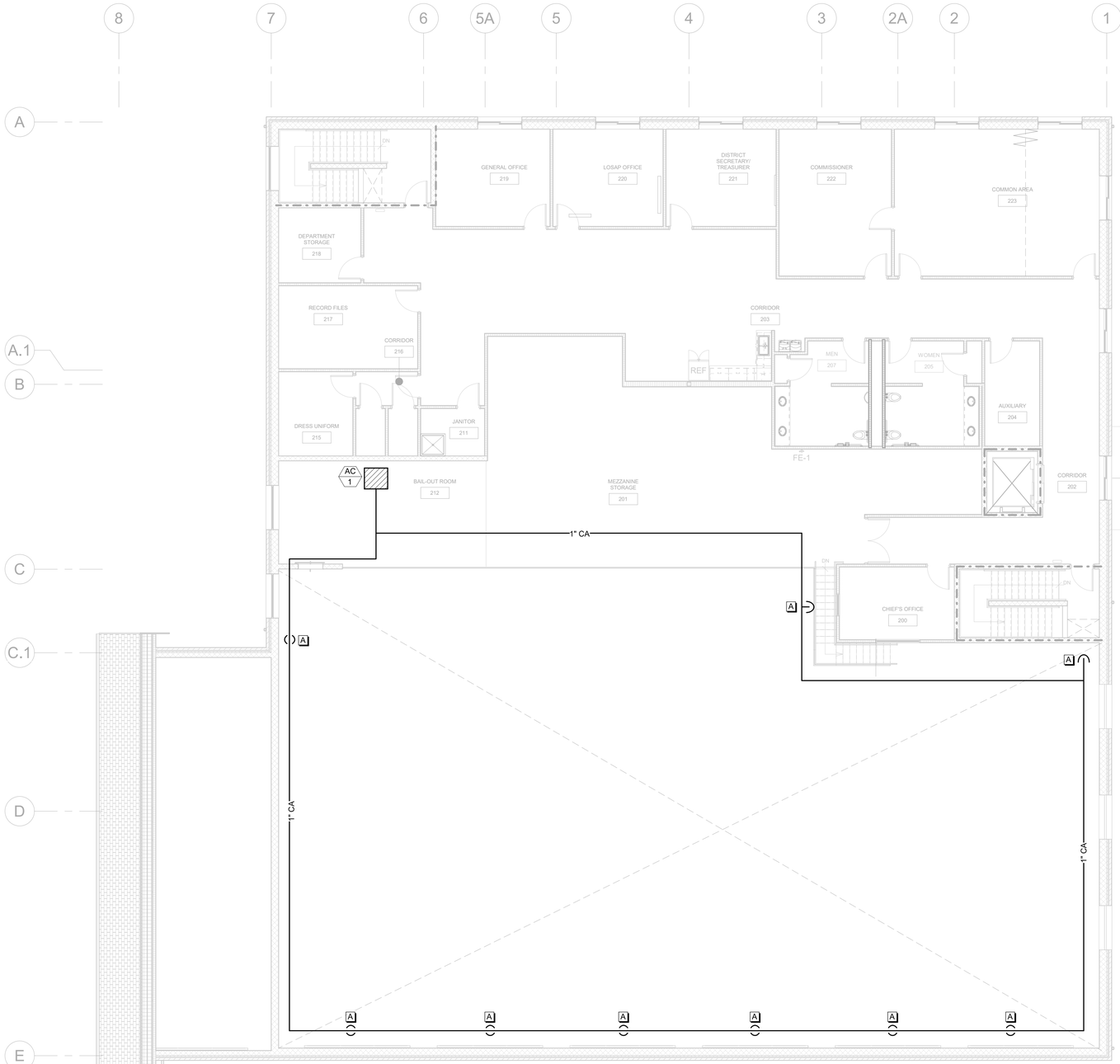
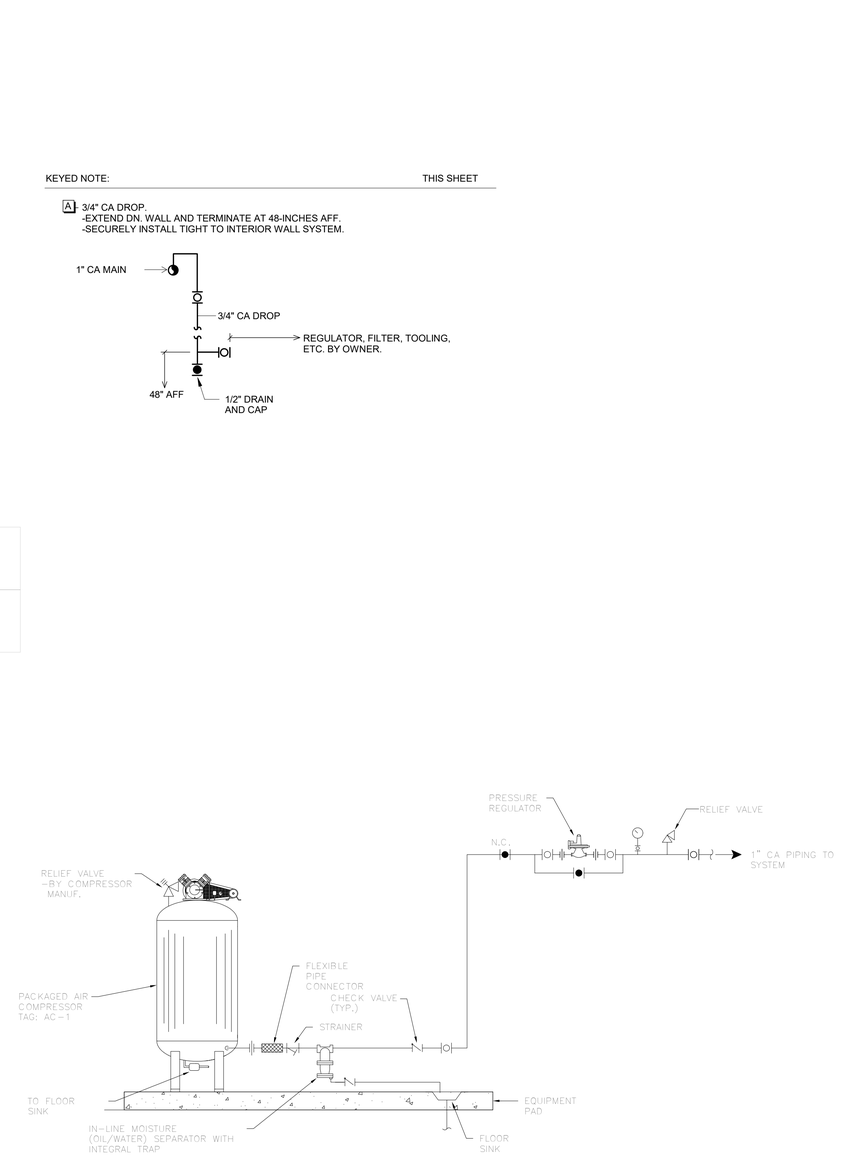
FILE:



1 COMPRESSED AIR PIPING PLAN
1/8" = 1'-0"

KEYED NOTE: THIS SHEET

A 3/4" CA DROP.
-EXTEND DN. WALL AND TERMINATE AT 48-INCHES AFF.
-SECURELY INSTALL TIGHT TO INTERIOR WALL SYSTEM.



TYPICAL AIR COMPRESSOR INSTALLATION

AIR COMPRESSOR SCHEDULE

TAG	MANUF.	MODEL No.	TYPE	TANK SIZE (GAL)	MAX PRESSURE (PSIG)	CFM @ 90 PSI	MOTOR HP	SYSTEM	DIMENSIONS	OPERATING WEIGHT (LBS)	REMARKS
AC-1	INGERSOLL RAND	2475N7.5	TWO STAGE RECIPROCATING	80	175	24.3	7.5	208/1/60	38"Øx69"(H)	611	SEE NOTES

NOTES:
1. ASME – RATED
2. PROVIDE WITH THE FOLLOWING OPTIONS:
   - ELECTRONIC TIME DRAIN
   - INTEGRAL SAFETY RELIEF VALVE
   - SEQUENCER PANEL
   - VIBRATION ISOLATOR PADS
   - AIR FILTER (QUIET INTAKE)
   - AIR-COOLED AFTERCOOLER
   - MAGNETIC STARTER

DATE: 06/21/2023
DRAWN BY: AOS
SCALE: 1/8" = 1' - 0"
REVIEWED BY: TJH
PROJECT NO.: 20-2006
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REVISIONS

NO.	DATE	DESC.
1	08/04/2023	ADDENDUM #1 NEW DRAWING ISSUED

PORT EWEN FIRE DEPARTMENT, ULSTER, NEW YORK

COMPRESSED AIR PIPING PLAN

BID PLANS

SHEET: P107