

ADDENDUM NO. 2

February 27, 2026

**Carmel Middle School Mid-Life Cycle Renovation
300 S. Guilford Road
Carmel, IN 46032**

TO: ALL BIDDERS OF RECORD

This Addendum forms a part of and modifies the Bidding Requirements, Contract Forms, Contract Conditions, the Specifications and the Drawings dated January 23, 2026, by Fanning/Howe Associates. Acknowledge receipt of the Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of Pages ADD 2-1 through ADD 2-2, 28 31 11-1 Digital, Addressable Fire Alarm System and Addendum 2, and Fanning/Howey's Addendum No. 2, consisting of 2, 6 items, 3 pages New Project Manual Section: 23 52 33 – Water Tube Boilers Revised Project Manual Sections: 23 21 13 – Hydronic Piping, 23 81 23 – Computer-Room Air-Conditioners, and 26 05 33 – Conduit and Boxes for Electrical Systems Revised Drawing Sheets: MC107, MC108, MC109, M-401, M-601, M-602, EF103, EF106, EF107, and EF108.

A. SPECIFICATION SECTION 01 12 00 MULTIPLE CONTRACT SUMMARY

A. Bid Category No. 1 – General Trades

Add the following Clarification:

6. Include Fire Protection demo and rework of heads at all locations receiving new ceilings.

E. Bid Category No 5 Mechanical/Plumbing/Electrical

Add the following Sections

Section 01 51 10 - Temporary Electricity, Lighting & Warning Systems
Section 23 52 33 - Water Tube Boilers

Delete the following Section:

Section 23 52 16 - Condensing Boilers

Replace Sheet:

28 31 11-1 Digital, Addressable Fire Alarm System

Revise the following Clarification:

5. All Fire Alarm devices are new with a complete new system. Include demo and removal of all existing fire alarm devices. This includes removal and replacement of all existing wiring.E.

2. Smoke-Developed Index: 50 or less.

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

1.7 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Construction Manager no fewer than two weeks in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Construction Manager's written permission.

1.8 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: While building is occupied by Owner prior to construction activities, maintain existing equipment fully operational. Existing system will be deactivated during construction. Coordinate with fire alarm monitoring company, Owner, and Construction Manager for duration of fire alarm outage during summer break.

B. Schedule interim checks of system during construction as required to validate new work and maintain schedule. Update Owner and CM with biweekly construction progress updates.

~~C. Equipment Removal: Remove existing disconnected fire-alarm equipment. Wiring shall be removed at Pleasant View. Wiring in good condition may be reused at Zionsville Middle School.~~

1.9 SOFTWARE SERVICE AGREEMENT

Removal of Existing Fire Alarm Devices and all Existing Fire Alarm Cabling is required at Carmel Middle School

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system.

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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system.

ADDENDUM NO. 2

Carmel Middle School (CAM) Mid-Life Cycle Renovation

Carmel Clay Schools
Carmel, Indiana

Project No. 222009.00

Index of Contents

Addendum No. 2, 6 items, 3 pages

New Project Manual Section: 23 52 33 – Water Tube Boilers

Revised Project Manual Sections: 23 21 13 – Hydronic Piping, 23 81 23 – Computer-Room Air-Conditioners,
and 26 05 33 – Conduit and Boxes for Electrical Systems

Revised Drawing Sheets: MC107, MC108, MC109, M-401, M-601, M-602, EF103, EF106, EF107, and
EF108

February 27, 2026

I hereby certify that this Addendum was prepared by me or under my direct supervision and that I am a duly registered Architect/Engineer under the Laws of the State of Indiana.

FANNING/HOWEY ASSOCIATES, INC.
ARCHITECTS/ENGINEERS/CONSULTANTS



Paul A. Miller, License No. AR10800161
Expiration Date: 12/31/2027

TO: ALL BIDDERS OF RECORD

ADDENDUM NO. 2 to Drawings and Project Manual, dated January 23, 2026, for the Carmel Middle School (CAM) Mid-Life Cycle Renovation for Carmel Clay Schools, 5201 E. Main St., Carmel, Indiana 46033; as prepared by Fanning/Howey Associates, Inc., Indianapolis, Indiana.
This Addendum shall hereby be and become a part of the Contract Documents the same as if originally bound thereto.

The following clarifications, amendments, additions, revisions, changes, and modifications change the original Contract Documents only in the amount and to the extent hereinafter specified in this Addendum.

Each bidder shall acknowledge receipt of this Addendum in his proposal or bid.

NOTE: Bidders are responsible for becoming familiar with every item of this Addendum. (This includes miscellaneous items at the very end of this Addendum.)

RE: ALL BIDDERS

ITEM NO. 1. PROJECT MANUAL, TABLE OF CONTENTS

- A. Volume #3, Page 00 01 10-1, DIVISION 23: Add Section 23 52 33 – Water Tube Boilers.
- B. Volume #3, Page 00 01 10-1, DIVISION 23: Delete Section 23 52 16 – Condensing Boilers.

ITEM NO. 2. NEW PROJECT MANUAL SECTION

- A. New Project Manual Sections 23 52 33 – Water Tube Boilers is included with and hereby made a part of this Addendum.

ITEM NO. 3. REVISED PROJECT MANUAL SECTIONS

- A. Sections 23 21 13 – Hydronic Piping, 23 81 23 – Computer-Room Air-Conditioners, and 26 05 33 – Conduit and Boxes for Electrical Systems have been revised, dated 02/27/26, and are included with and hereby made a part of this Addendum.

ITEM NO. 4. PROJECT MANUAL, SECTION 07 54 00 – THERMOPLASTIC MEMBRANE ROOFING

- A. Add 2.4, N., 1., e., 1) as follows:
 - “1) Fastener length shall be sufficient to penetrate all layers of the roof assembly, coverboard, insulation, substrate board and penetrate steel deck as required by manufacturer.”
- B. Replace 3.6, E., 2., h., as follows:
 - “h. Loosely lay base layer of insulation units over substrate.”
- C. Replace 3.6, E., 3., i., as follows:
 - “i. Loosely lay each layer of insulation units over substrate.”
- D. Article 3.7, A: Add “new and existing” between “over” and “insulation” at beginning of paragraph.

- E. Replace 3.7, A., 4., as follows:
- “4. Mechanically fasten cover board and roof assembly utilizing the Induction Fastening System to resist uplift pressure at corners, perimeter and field of roof.
- a. Fastener and plate setting shall be executed with an automatic setting device to ensure uniformity and correct setting torque.
 - b. Coordinate with Induction Fastening System and membrane roofing installation.”
- F. Add 3.8, L., M., N., and O., as follows:
- “L. Hot-Air Welding of Seam Overlaps, General:
1. All seams shall be hot-air welded. All membrane to be welded shall be clean and dry.
 - a. All mechanics interceding to use hot-air welding equipment shall have completed a training course provided by either the membrane or welding equipment manufacturer prior to welding.
 2. Hot-air welding equipment shall be allowed to warm up as directed by manufacturer prior to welding.
 3. Seam overlaps shall be minimum 3 inches wide when automatic machine-welded and 4 inches wide when hand-welding, except for certain approved details.
 - a. Width of membrane seams shall not be less than 1-1/2 inches regardless of seaming technique.
- M. Hand-Welding
1. The back edge of the seam shall be welded with a narrow, but continuous weld to prevent loss of hot air during the final welding.
 2. The nozzle shall be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to “flow”, the hand roller is positioned perpendicular to the nozzle and rolled lightly. For straight seams, the 1-1/2 inch wide nozzle is recommended for use. For corners and compound connections, the 3/4 inch wide nozzle shall be used.
- N. Machine Welding
1. Machine welded seams are achieved by the use of approved automatic welding equipment. When using this equipment, all instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated simultaneously off the generator.
 2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.
- O. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation. Sealing of seams of overlapping adjacent roof membrane sheets, or overlap seams between flashing components and roof membrane sheets must be accomplished using hot air equipment specified by the membrane manufacturer for the specific membrane type, in strict compliance with roof membrane manufacturer's requirements and specifications. Width of membrane seams shall be not less than 1.5 inches regardless of seaming technique.
1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane. Following are guidelines for seam probing to identify cold welds, voids or other deficiencies:
 - a. Allow seams to cool to ambient temperature before probing after approximately 30 minutes.
 - 1) Seams may be probed using tools such as a cotter key extractor that has been filed down, a blunted or dull awl or any round-tipped tool. Continuous probing will tend to sharpen the tip of the probe, so blunting the tip will need to be done on a regular basis.

- b. Draw the probing tool along the edge of the seam. Apply firm pressure to the seam, but not into the bottom membrane sheet. The tool will not penetrate the edge of a properly welded seam. Seams should be the specified width and free of voids.
 - c. Mark deficiencies with a water-soluble marker.
 - d. Probe repaired seams after they have cooled completely. If repair is acceptable, wipe off the marker.
2. Test Cuts
- a. On-site evaluation of welded seams shall be made daily by the Contractor to ensure membrane seam weld quality. One inch wide cross-section samples of welded-seams shall be taken at least three times per day. Test cuts shall be taken at each start-up of welding equipment, midpoint, and at each completion of the welding process. Correct welds display failure from shearing of the membrane prior to separation of the weld. Weld quality is essential. Adjust equipment settings as necessary to assure quality welds. Based on test cut findings, appropriate membrane seam remedies must be instituted. All membrane test cut locations shall be documented and membrane test cut samples shall be labeled and provided with the required daily construction reports.
 - b. Test cuts or seam samples may not represent the overall membrane seam construction. If test can or seam samples indicate defects, further sampling must be performed to establish the scope of corrective action.
 - c. Additional test cuts of suspect membrane seams shall be taken at the direction of the A/E or manufacturer's representative.
 - d. Each test cut shall be patched by Contractor at no additional cost to the Owner.
3. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
4. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
5. Where 3 or more membrane sheets overlap, the T-joints shall be treated with a handheld hot air seaming tool, or other methods as approved by the roof membrane manufacturer to ensure continued seam integrity at this point.
6. Caution: Where solvents are used to clean membrane seams, ensure presence of adequate safety and first aid information. Instruct welding operator as to appropriate amounts of heat to be used. Excessive solvent/heat will cause damage to roof membrane and certain types of insulation material. Minimize solvent dispersion of top of roof membrane.
- a. Voltage fluctuations and climate conditions will affect the temperature of the heat welding equipment and subsequent quality of the seam. Contractor must take all necessary precautions to ensure seal quality. Contractor shall continuously monitor seam quality.

G. Add 3.9, A., 1., as follows:

- "1. Provide adhered base flashings, wall flashings, and general flashings where required and mechanical fastened system is not appropriate. Adhere membrane installation includes special vertical and horizontal conditions of the existing building."

ITEM NO. 5. PROJECT MANUAL, SECTION 23 52 16 – CONDENSING BOILERS

A. Delete this Section in its entirety.

ITEM NO. 6. REVISED DRAWING SHEETS

A. Drawing Sheets: MC107, MC108, MC109, M-401, M-601, M-602, EF103, EF106, EF107, and EF108 have been revised, dated 2/27/26, and is included with and hereby made a part of this Addendum. These Drawings supersede the original documents.

END OF ADDENDUM

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Hot-water heating piping.
 - 2. Chilled-water piping.
- B. Related Sections include the following:
 - 1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.
 - ~~2. Division 23 Section "Polypropylene Hydronic Piping Option"~~
 - ~~a. The polypropylene hydronic piping option can be bid as an option to copper and or black steel piping for heating and chilled water systems. Approved fittings and connectors shall be used to transition to all valves and accessories. Refer to Section 23-21-14.~~

1.2 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
 - 1. Hot-Water Heating Piping: 125 psig at 200 deg F.
 - 2. Chilled-Water Piping: 125 psig at 200 deg F.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 2. Chemical treatment.
 - 3. Hydronic specialties.
 - 4. Grooved fittings and joint couplings, provide applicable styles used.

1.4 CLOSEOUT SUBMITTALS

- A. General: Closeout Submittals are to be submitted with O and M Manuals only. Do not submit with other ACTION and INFORMATIONAL Submittals.
 - 1. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - 1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped or identified for quality assurance and traceability.
- E. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.6 EXTRA MATERIALS

- A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Grooved-Copper Fittings option: ASME B16.22.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Tyco-Grinnell
 - b. Anvil Gruvlok.
 - c. Victaulic Company of America.
 - 2. Grooved-End Copper Fittings: ASME B16.22 wrought copper and ASTM B 75, copper tube or ASME B16.18 and ASTM B 584, bronze casting, manufactured to copper tube dimensions. Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.
 - 3. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, EHP gasket rated for maximum 250 deg F for use with housing, and electroplated steel bolts and nuts.
- D. Copper or Bronze Pressure-Seal Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Stadler-Viega (Propress)
 - b. Nibco
 - c. Elkhart
 - 2. Housing: Copper.
 - 3. O-Rings and Pipe Stops: EPDM.
 - 4. Tools: Manufacturer's special tools.
 - 5. Minimum 200-psig working-pressure rating at 250 deg F.
- E. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. T-DRILL Industries Inc.
- F. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Tyco-Grinnell.
 - b. Anvil Gruvlok.
 - c. Victaulic Company of America.
 - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 234, Grade WPB steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 3. Couplings: Rigid pattern, unless otherwise indicated, ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - a. NPS 2 through NPS 12:
 - 1) Rigid Type: Housings shall be cast with bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
 - a) NPS 2 through NPS 6: Installation-Ready, for direct stab installation without field disassembly, with grade EHP gasket rated to +230 deg. F.
 - b) Zero-Flex Style.
 - 2) Flexible Type: For use in locations where vibration attenuation and stress relief air required. Three flexible couplings may be used in lieu of a flexible connector. The couplings shall be placed in close proximity to the source of the vibration.
 - 3) Flange Adapter: Flat face, ductile iron housings with elastomer pressure responsive gasket, for direct connection to ANSI Class 125 or 150 flanged components.
 - b. 14 inch through 24 inch with lead-in chamfer on housing key and wide width FlushSeal® gasket.
 - 1) Rigid Type: Housing key shall fill the wedge shaped AGS groove and provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
 - 2) Flexible Type: Housing key shall fit into the wedge shaped AGS groove and allow for linear and angular pipe movement.
 - 3) Flange Adapter: Flat face, ductile iron housings with elastomer pressure responsive gasket, for direct connection to ANSI Class 125 or 150 flanged components.

- I. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 PVC PIPE AND FITTINGS

- A. PVC Material: The material used in the manufacture of the pipe shall be a rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784. This compound shall be light gray in color.
- B. Pipe Dimensions: All sizes of PVC Schedule 80 pipe shall be manufactured by and ISO 9001 certified manufacture in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to the standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785.
- C. Pipe Markings: Product marking shall meet the requirements of ASTM D1785 and shall include: the manufacturer's name (or the manufacturer's trademark when privately labeled); the nominal pipe size; the material designation code; the pipe schedule and pressure rating in PSI for water @ 73°F; the ASTM designation D1785.
- D. Threaded metal to plastic connections are not permitted. Where transitions between plastic and metal pipe and fittings occur, compression style metal to plastic unions, flanges, or grooved connections shall be utilized.
- E. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Tyco-Grinnell.
 - b. Anvil Gruvlok.
 - c. Victaulic Company of America.
 - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 234, Grade WPB steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 3. Couplings: Rigid pattern, unless otherwise indicated, ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - a. NPS 2 through NPS 12:
 - 1) Flexible Type: For use in locations where vibration attenuation and stress relief air required. Three flexible couplings may be used in lieu of a flexible connector. The couplings shall be placed in close proximity to the source of the vibration.

2.4 CPVC PIPE AND FITTINGS

- A. CPVC Material: The material used in the manufacture of the pipe shall be a rigid polyvinyl chloride (PVC) compound, Type IV Grade I, with a Cell Classification of 23447 as defined in ASTM D1784. This compound shall be light gray in color.
- B. Pipe Dimensions: All sizes of CPVC Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM F 441 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to the standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1784.
- C. Pipe Markings: Product marking shall meet the requirements of ASTM F 441 and shall include: the manufacturer's name (or the manufacturer's trademark when privately labeled); the nominal pipe size; the material designation code; the pipe schedule and pressure rating in PSI for water @ 73°F; the ASTM designation D1784.

2.5 POLYPROPYLENE RESIN (PP-R) PIPE AND FITTINGS

- A. Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389 or CSA B137.11. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Hydronic hot water and heating piping shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389 or CSA B137.11. All pipe shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11. Pipe shall be Aquatherm® Climatherm® as manufactured by Aquatherm, Inc.
- B. Fittings shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11. Fittings shall be Aquatherm® Climatherm® as manufactured by Aquatherm, Inc.
- C. Installation of polypropylene resin (PP-R) piping, fittings, and system components shall be in strict accordance with the manufacture written instructions.

2.6 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- E. Grooved Joint Lubricants: Lubricate gaskets in accordance with the manufacturer's recommendations with lubricant supplied by the coupling manufacturer that is suitable for the gasket elastomer and system media.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.
- H. PVC solvent Joints: Solvent-cemented joints should be utilized in a two step process with primer manufactured for thermoplastic piping systems conforming to ASTM F656 and solvent cement conforming to ASTM 2564. Primer shall be clear. Solvent-cement shall be clear, medium-bodied and medium-setting and formulated for PVC piping.
- I. CPVC solvent joints: Solvent-cemented joints should be utilized in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM F493. Primer shall be clear. Solvent-cement shall be clear, medium-bodied and medium-setting and formulated for CPVC piping.

2.7 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
 - 2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric-Flange Kits:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation.
 - 2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- G. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Tyco-Grinnell
 - b. Anvil Gruvlok
 - c. Perfection Corporation; a subsidiary of American Meter Company.
 - d. Precision Plumbing Products, Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Victaulic Company of America.
 - 2. Electroplated steel nipple or ductile iron casing with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.8 VALVES

- A. Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."
- C. Bronze, Calibrated-Orifice, Balancing Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Griswold Controls.
 - e. Taco.
 - f. Nexus.
 - g. Tour & Andersson.
 - h. Tyco-Grinnell.
 - i. Victaulic Company
 - 2. Body: Bronze or a metal copper alloy, ball, globe, or plug type with calibrated orifice or venturi.
 - 3. Ball: Brass or stainless steel.
 - 4. Disc: A metal copper-alloy.
 - 5. Plug: Resin.
 - 6. Seat: PTFE or EPDM.
 - 7. End Connections: Threaded or socket.
 - 8. Pressure Gauge Connections: Integral seals for portable differential pressure meter.
 - 9. Handle Style:
 - a. Lever, with memory stop to retain set position.
 - b. Hand wheel, with memory stop to retain set position.
 - 10. CWP Rating: Minimum 300 psig.
 - 11. Maximum Operating Temperature: 230 deg F.
 - 12. Valve shall be selected between 2 and 6 feet water pressure drop. Verify optimal sizing with manufacturer.
- D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Griswold Controls.
 - e. Taco.
 - f. Nexus.
 - g. Tour & Andersson; available through Victaulic Company of America.
 - h. Tyco-Grinnell.
 - i. Victaulic Company
 - 2. Body: Cast-iron, ductile iron, or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
 - 3. Ball: Brass or stainless steel.
 - 4. Stem Seals: EPDM O-rings.
 - 5. Disc: A metal copper-alloy or glass and carbon-filled PTFE.
 - 6. Seat: PTFE or EPDM.
 - 7. End Connections: Flanged or grooved.
 - 8. Pressure Gauge Connections: Integral seals for portable differential pressure meter.
 - 9. Handle Style:
 - a. Lever, with memory stop to retain set position.
 - b. Hand wheel, with memory stop to retain set position.
 - 10. CWP Rating: Minimum 250 psig.

11. Maximum Operating Temperature: 230 deg F.
12. Valve shall be selected between 2 and 6 feet water pressure drop. Verify optimal sizing with manufacturer.

E. Diaphragm-Operated, Pressure-Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - d. Conbraco Industries, Inc.
 - e. Spence Engineering Company, Inc.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Sized for a maximum operating temperature 225 degrees F.
11. Sized for a maximum operating pressure of 125 psig.
12. Valve Size and Capacity: Selected to suit system in which installed. Refer to detail in Contract Documents.
13. Operating Pressure: Inlet pressure up to 300 psig. Outlet pressure field adjustable from 10 to 35 psig.

F. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amtrol, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - d. Conbraco Industries, Inc.
 - e. Spence Engineering Company, Inc.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer: removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

G. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bell & Gossett Domestic Pump; a Division of ITT Industries.
 - b. Flow Design Inc.
 - c. Nexus
 - d. Griswold Controls.
2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.

6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F.
10. Valve size to be selected between 2 and 6 feet water pressure drop (WPD). Verify optimal sizing to minimize pressure drop with unit manufacturer.
11. Removable flow cartridge.

2.9 AIR CONTROL DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Amtrol, Inc.
 2. Armstrong Pumps, Inc.
 3. Bell & Gossett Domestic Pump; a division of ITT Industries.
 4. Taco.
 5. Wessels.
- B. Manual Air Vents:
 1. Body: Bronze.
 2. Internal Parts: Nonferrous.
 3. Operator: Screwdriver or thumbscrew.
 4. Inlet Connection: NPS 1/2.
 5. Discharge Connection: NPS 1/8.
 6. CWP Rating: 150 psig.
 7. Maximum Operating Temperature: 225 deg F.
- C. Automatic Air Vents:
 1. Body: Bronze or cast iron.
 2. Internal Parts: Nonferrous.
 3. Operator: Noncorrosive metal float.
 4. Inlet Connection: NPS 1/2.
 5. Discharge Connection: NPS 1/4.
 6. CWP Rating: 150 psig.
 7. Maximum Operating Temperature: 240 deg F.
- D. Expansion Tanks:
 1. Tank: Welded steel, rated for 125-psig working pressure and 240 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gauge glass. Tanks shall be factory tested with taps fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.
 3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
 4. Gauge Glass: Full height with dual manual shutoff valves, 3/4-inch diameter gauge glass, and slotted-metal glass guard.
- E. Diaphragm or Bladder-Type Expansion Tanks:
 1. Tank: Welded steel, rated for 125-psig working pressure and 240 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 2. Diaphragm or Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
 3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

- F. Tangential-Type Air Separators:
 1. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.
 2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
 3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
 4. Blowdown Connection: Threaded.
 5. Size: Match system flow capacity.

- G. In-Line Air Separators:
 1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
 2. Maximum Working Pressure: Up to 175 psig.
 3. Maximum Operating Temperature: Up to 300 deg F.

- H. Combination Air Eliminator and Dirt Separator – Option in lieu of installing air separator and side loop filter.
 1. Performance Requirements:
 - a. Air Separation: Removal of 99.6 percent of entrained air in the system.
 - b. Dirt Separation: Removal of 80 percent of all particles 30 micron and larger with 100 passes.
 2. Coalescing type air eliminator and dirt separator equal to Spirovent by Spirotherm, or approved equal.
 - a. Air eliminator and dirt separator to be sized for schedule water flow and will replace the air separator only for chilled water system. The aluminum bag filter to be installed from drain outlet of air eliminator and dirt separator to downstream side to reintroduce clean glycol back into the chilled water system.
 - b. All details for the air separator will apply to air eliminator and dirt separator.
 - c. All cost and manufacturer requirements are to be included under base bid if option is to be pursued.

- I. Performance Requirements
 1. Air Separation:
 - a. 100 percent of free air.
 - b. 100 percent entrained air.
 - c. Removal of 99.6 percent of dissolved air in the system.
 2. Dirt Separation:
 - a. Removal of 80 percent of all particles 30 micron and larger within 100 passes.
 3. Coalescing medium to extend full length of shell filling the entire vessel with no open space or voids between them to suppress turbulence and provide high efficiency. Partial fill units are not acceptable.
 - a. Coalescing medium to be copper or stainless steel.
 4. Combination air eliminator and dirt separator to be sized for schedule water flows.
 5. Rated for 150 psig working pressure.
 6. Maximum entering water velocity to be less than 10 feet per second.
 7. Accessories:
 - a. Blow-down valve
 - b. Skim valve
 - c. Automatic air vent

- J. Air Purgers:
 1. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
 2. Maximum Working Pressure: 150 psig.
 3. Maximum Operating Temperature: 250 deg F.

2.10 HYDRONIC PIPING SPECIALTIES

- A. Y-Pattern Strainers:

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HYDRONIC PIPING

1. Body: ASTM A 536, Grade 65-45-12, ductile iron with coupled cover or ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
 2. End Connections: Threaded ends for NPS 2 and smaller; grooved or flanged ends for NPS 2-1/2 and larger.
 3. Strainer Screen: 40 or 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent total free area.
 4. CWP Rating: 300 psig.
 5. Include blow down valve with cap and chain.
- B. Stainless-Steel Bellow, Flexible Connectors:
1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
 2. End Connections: Threaded or flanged to match equipment connected.
 3. Performance: Capable of 3/4-inch misalignment.
 4. CWP Rating: 150 psig.
 5. Maximum Operating Temperature: 250 deg F.
 6. Three flexible style couplings may be used in lieu of flexible connectors for vibration attenuation and stress relief for services to 230 deg. F. The couplings shall be placed in close proximity to the source of the vibration.
- C. Spherical, Rubber, Flexible Connectors:
1. Body: Fiber-reinforced rubber body.
 2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
 3. Performance: Capable of misalignment.
 4. CWP Rating: 150 psig.
 5. Maximum Operating Temperature: 250 deg F.
 6. Three flexible style couplings may be used in lieu of flexible connectors for vibration attenuation and stress relief for services to 230 deg. F. The couplings shall be placed in close proximity to the source of the vibration.
- D. Expansion fittings are specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure seal joints.
 2. Type L, drawn-temper copper tubing, grooved, mechanical joint coupling and fittings, and grooved mechanical joints.
 3. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 4. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- D. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure seal joints.
2. Type L, drawn-temper copper tubing, grooved, mechanical joint coupling and fittings, and grooved, mechanical joints.
3. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
4. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

3.2 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main as denoted on Drawings.
- C. Install calibrated-orifice, balancing valves or automatic flow control valves in the return pipe of each heating or cooling terminal as denoted on Drawings.
- D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01, for installation requirements.
- F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.
- G. Insulation: Where insulation is indicated, install extended stem valves arranged in a proper manner to receive insulation.

3.3 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.

- J. Select system components with pressure rating equal to or greater than system operating pressure.
 - K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
 - L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap and chain, at low points in piping system mains and elsewhere as required for system drainage.
 - M. Reduce pipe sizes using eccentric reducer fitting installed with level side up for horizontal piping.
 - N. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."
 - O. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
 - P. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
 - 1. Unions or flanges are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).
 - Q. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2. All strainers shall contain blow down valve.
 - R. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."
 - 1. For water systems, use adequate numbers of flexible style couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with coupler manufacturer instructions and as approved by the engineer.) Where expansion loops are required, use flexible style couplings on the loops.
 - S. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."
 - T. Freeze Protection
 - 1. Do not install any hydronic piping which includes domestic cold and hot water, fire and sprinkler water, chilled water, heating water, condenser water piping, etc. within 12 feet of an exterior wall or roof opening utilized for fresh air intake or building relief air.
 - 2. Any piping installed closer than 12 feet of an exterior wall or roof opening shall be moved or rerouted around the perimeter of the opening in order to prevent possible freezing of hydronic piping.
 - U. Install dielectric fittings as specified between connections of all dissimilar metals.
- 3.4 HANGERS AND SUPPORTS
- A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
 - B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

- C. Pipe attachments shall be located adjacent to fittings at each offset or change in direction, at ends of branches over 5 feet long, at riser pipes, and along piping where necessary to prevent sags, bends, or vibration. Piping risers shall be supported at each floor level.
- D. Hanger rod must hang perpendicular before and after pipe covering or insulation is applied.
 - 1. Support piping from rolled steel beams or channels from any point on either top or bottom flanges.
 - 2. Support piping from open web steel joists from hangers connected to either top or bottom chords within 3 inches of center of chord panel points (intersection of diagonal or vertical chord with top or bottom chord). Joist reinforcement will be required if hangers are not installed at panel points. Refer to structural details.
 - 3. In addition to maximum spacing of hangers or supports specified below, the number and spacing of hangers and supports shall be such as to equally distribute loads to all structural members in the system.
 - 4. Connections to structural members shall be clamping devices which do not damage or deform structural elements. Welding to or drilling holes in structural members is not permitted unless specifically approved by Architect.
 - 5. Threaded rod shall not be bent. Provide swivel connection or other means to prevent stress on threaded rod.
- E. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- F. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 - 6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 - 7. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.
 - 8. NPS 6: Maximum span, 17 feet; minimum rod size, 1/2 inch.
 - 9. NPS 8: Maximum span, 19 feet; minimum rod size, 5/8 inch.
 - 10. NPS 10: Maximum span, 20 feet; minimum rod size, 3/4 inch.
 - 11. NPS 12: Maximum span, 23 feet; minimum rod size, 7/8 inch.
 - 12. NPS 14: Maximum span, 25 feet; minimum rod size, 1 inch.
 - 13. NPS 16: Maximum span, 27 feet; minimum rod size, 1 inch.
 - 14. NPS 18: Maximum span, 28 feet; minimum rod size, 1-1/4 inches.
 - 15. NPS 20: Maximum span, 30 feet; minimum rod size, 1-1/4 inches.
- G. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- H. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.
- I. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads, which permit support and hanging in accordance with ANSI B31.1, B31.3, and B31.9.

3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- 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 unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
 - 1. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions.
 - 2. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
 - 3. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer.
 - 4. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products.
 - a. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training of jobsite visit(s).)
- J. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.
- K. Pressure-Sealed Joints: Use manufacturer-recommended PFT series tool and procedure. Leave insertion marks on pipe after assembly.

3.6 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.
- C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.
- D. Install tangential air separator in pump suction. Install blowdown piping with full-port ball valve; extend full size to nearest floor drain.
- E. Install welded steel type expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.
 - 1. Install tank fittings that are shipped loose.
 - 2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.
- F. Install bladder or diaphragm type expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install ports for pressure gauges and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gauges for HVAC Piping."

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens. All piping in the entire building is to be flushed, regardless of installation method.
 - a. Clean water shall be water that has been through the permanent project softener and permanent project domestic water filtration, or from an approved public water supply, by A/E.
 - b. All rooms, branch piping, and equipment will be isolated prior to initiating flush/clean/fill.
 - c. The main piping will be filled with clean water and mild cleaning agents.
 - d. A water quality sample will be taken by the chemical treatment company.
 - e. The drain valve(s) at the end of each pipe run will be opened, with a hose routed outside the building.
 - f. Utilizing the main circulating pumps, this water will be re-circulated for a minimum of 48 hours.
 - g. After initial flush, this water will be removed and the process repeated until water sample is deemed acceptable by F/H and CxA.
 - h. Once the main piping is approved clean, the drain valves to each room or branch will be opened individually until clean water is flowing from the drain valve.
 - i. The individual strainers will be removed, cleaned, and reinstalled. Multiple strainer cleanings may be required during the flush/clean/fill procedure.
 - j. At that point, the isolation valves to each room will be opened and the total system will be filled.
 - k. Utilizing the main circulating pumps, this water will be re-circulated for a minimum of 48 hours.

- l. The drain valves to each room or branch will be opened individually until clean water is flowing from the drain valve.
 - m. The individual strainers will be removed, cleaned, and reinstalled. Multiple strainer cleanings may be required during the flush/clean/fill procedure.
 - n. The process is to be repeated until water sample is deemed acceptable by F/H and/or CxA.
 - 4. Isolate all equipment and all equipment coils from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
 - 6. Corrosion inhibitor to be applied after flushing and before filling the piping system.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 6. Prepare written report of testing.
- C. Perform the following before operating the system:
 - 1. Open manual valves fully.
 - 2. Inspect pumps for proper rotation.
 - 3. Set makeup pressure-reducing valves for required system pressure.
 - 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 - 5. Set temperature controls so all coils are calling for full flow.
 - 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 - 7. Verify lubrication of motors and bearings.

3.9 PREPARATION AND CLEANING PROCEDURES

- A. Preparation
 - 1. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.
 - 2. Place terminal control valves in open position during cleaning.
- B. Cleaning Sequence
 - 1. Add cleaner to closed systems at concentration recommended by manufacturer. Hot Water Heating Systems: Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water and repeat until system cleaner is removed.
 - 2. Chilled Water Systems: Circulate for 48 hours, then drain systems as quickly as possible. Refill with clean water, circulate for 24 hours, then drain. Refill with clean water and repeat until system cleaner is removed.

3. Use neutralizer agents on recommendation of system cleaner supplier and approval of A/E.
 4. Remove, clean, and replace strainer screens.
 5. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.
- C. Closed System Treatment and Cleaning
1. Provide one shot feeder on each system. Install isolating and drain valves and necessary piping. Install around circulating pumps unless indicated otherwise.
- D. Refer to Division 23 Section 232500 – HVAC Water Treatment for additional requirements.

END OF SECTION 23 21 13

SECTION 23 52 33 - WATER-TUBE BOILERS

PART 1 - GENERAL

1.1 1.1 RELATED DOCUMENTS

- A. Contract Documents to include Conditions and Drawings.

1.2 SUMMARY

- A. This Section includes packaged flexible water-tube boilers for generating hot water.
 - 1. Boilers.
 - 2. Controls and boiler trim.
 - 3. Fuel burning system.

1.3 ACTION SUBMITTALS

- A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL/QUALITY ASSURANCE/CONTROL SUBMITTALS

- A. Source quality-control test reports.
- B. Field quality-control test reports.
- C. Warranty: Special warranty specified in this Section.
- D. Other Informational Submittals:
 - 1. ASME "A" Stamp Certification and Report: Submit "A" stamp certificate of authorization as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.
 - 2. Startup service reports.

1.5 CLOSEOUT DOCUMENTS

- A. General: Closeout Submittals are to be submitted with O and M Manuals only. Do not submit with other ACTION and INFORMATIONAL Submittals:
 - 1. Operation and Maintenance Data: For boilers, components, and accessories to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Factory tests to confirm construction of the unit per ASME

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 WARRANTY

- A. General Warranty: Boiler Package shall be warranted against defects in workmanship and materials for 12 months after start-up or 18 months from ship date, whichever shall be less.

- B. Thermal Shock Warranty: The boiler vessel shall be warranted for 25 years against thermal shock on a non-prorated basis.

PART 2 - PRODUCTS

2.1 FLEXIBLE WATER-TUBE BOILERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bryan Steam, LLC.
 - 2. Cleaver-Brooks; div. of Aqua-Chem, Inc.
 - 3. Unilux
- B. Description: Factory-fabricated and field-assembled, water-tube boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket, flue-gas vent, supply and return connections, and controls.
- C. Heat-Exchanger Design: Straight steel tubes rolled into steel headers.
 - 1. Accessible head plates at both ends.
 - 2. Handholes or couplings in headers for water-side inspections.
 - 3. Accessible drain and blowdown tappings, both high and low, for surface and mud removal.
 - 4. Lifting lugs on top of boiler.
 - 5. Built-in air separator.
- D. Combustion Chamber: Equipped with minimum 2-1/2-inch, 2700 deg F poured refractory on floor and minimum 2-inch lap-jointed cast refractory with fiber-blanket joint seals on side walls. Combustion chamber shall have flame observation ports in front or back.
- E. Casing:
 - 1. Insulation: Minimum 2-inch thick, mineral-fiber insulation surrounding the heat exchanger and combustion chamber.
 - 2. Top Flue Connection: Constructed of aluminized steel.
 - 3. Jacket: Mirror-finish stainless steel, with screw-fastened closures.
 - 4. Jacket: Sheet metal, with screw-fastened closures and protective finish.
 - 5. Mounting base to secure boiler to concrete base.
 - a. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when mounting base is anchored to building structure.
 - 6. Control Compartment Enclosure: NEMA 250, Type 1A.

2.2 TRIM

- A. The boiler shall be provided with the following trim and controls
 - 1. Safety-Relief Valve(s)
 - 2. Combination thermometer and pressure gauge
 - 3. Water temperature control operator
 - 4. High limit safety control
 - 5. Low water cutoff
- B. Optional boiler trim and controls
 - 1. Manual reset type high limit
 - 2. Manual reset type low water cutoff
 - 3. Auxiliary low water cutoff
 - 4. Low water cutoff feeder
 - 5. UL, CSD-1, FM, GE-GAP, NFPA-85 or other insurance requirements
 - 6. Barometric damper
 - 7. Other controls and boiler trim, as specified Controls:

- C. Refer to Division 23 Section "Instrumentation and Control for HVAC."

2.3 GAS BURNER AND CONTROL EQUIPMENT

- A. Boiler operating controls shall include the following devices and features:
 - a. Control transformer.
 - b. Set-Point Adjust: Set points shall be adjustable.
 - c. Operating Pressure Control: Factory wired and mounted to cycle burner.
 - d. Low-Water Cutoff and Pump Control: Cycle feedwater pump(s) for makeup water control.
 - e. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At 0 deg F outside-air temperature, set supply-water temperature at 200 deg F; at 60 deg F outside-air temperature, set supply-water temperature at 180 deg F.
 - f. Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.
- 2. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.
 - a. High Cutoff: Automatic reset stops burner if operating conditions rise above maximum boiler design pressure.
 - b. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
 - c. Blocked Vent Safety Switch: Manual-reset switch factory mounted on draft diverter.
 - d. Rollout Safety Switch: Factory mounted on boiler combustion chamber.
 - e. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.
- 3. Building Management System Interface: Factory install hardware and software to enable building management system to monitor, control, and display boiler status and alarms.
 - a. Monitoring: On/off status, low water level alarm.
 - b. Control: On/off operation, hot water supply temperature set-point adjustment.
 - c. A communication interface with building management system shall enable building management system operator to remotely control and monitor the boiler from an operator workstation. Control features available, and monitoring points displayed, locally at boiler control panel shall be available through building management system. The boiler control interface shall utilize LonWorks, BACnet, or TCP/IP open protocol. Coordinate exact requirements with the temperature control contractor.

2.4 ELECTRICAL POWER

- A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.
- B. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.
 - 1. House in NEMA 250, Type 1 enclosure.
 - 2. Wiring shall be numbered and color-coded to match wiring diagram.
 - 3. Install factory wiring outside of an enclosure in a metal raceway.
 - 4. Provide branch power circuit to each motor and to controls with disconnect switch or circuit breaker.
 - 5. Provide each motor with overcurrent protection.
 - 6. Division 26 shall provide a fused disconnect to each boiler. Control voltage transformer shall be provided by unit manufacturer.

2.5 VENTING KITS

- A. Vent Damper: Motorized, UL listed for use on atmospheric burner boiler equipped with draft hood; motor to open and close damper; stainless-steel vent coupling and damper blade; keyed wiring harness connector plug; and dual-position switches to permit burner operation.
- B. Kit: Complete system, ASTM A 959, Type 29-4C stainless steel, pipe, vent terminal, thimble, indoor plate, vent adapter, condensate trap, and sealant.
- C. Combustion-Air Intake: Stainless steel, pipe, vent terminal with screen, inlet air coupling, and sealant.

2.6 SOURCE QUALITY CONTROL

- A. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.
- B. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
- C. Allow Owner access to source quality-control testing of boilers. Notify Architect 14 days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
 - 1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping, flues/vents and electrical connections.
- B. Examine mechanical spaces for suitable conditions where boilers will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

- A. Install boilers level on concrete base. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.
- B. Install gas-fired boilers according to NFPA 54.
- C. Assemble boiler tubes in sequence and seal each tube joint.
- D. Assemble and install boiler trim.
- E. Install electrical devices furnished with boiler but not specified to be factory mounted.
- F. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to boiler to allow service and maintenance.
- C. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.
- D. Connect hot-water piping to supply- and return-boiler tapplings with shutoff valve and union or flange at each connection.
- E. Install piping from safety relief valves to nearest floor drain.
- F. Install piping from safety valves to drip-pan elbow and to nearest floor drain.
- G. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.
- H. Boiler Flue Venting:
 - 1. Install venting kit and combustion-air intake.
- I. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- J. Connect wiring according to Division 26 Section "Low-Voltage, Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 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.
- B. Tests and Inspections:
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Burner Test: Adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency.
 - b. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
 - c. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.
- E. Performance Tests:
 - 1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
 - 2. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment in order to comply.
 - 3. Perform field performance tests to determine the capacity and efficiency of the boilers.
 - a. For dual-fuel boilers, perform tests for each fuel.
 - b. Test for full capacity.

- c. Test for boiler efficiency at low fire 20, 40, 60, 80, 100, 80, 60, 40 and 20 percent of full capacity. Determine efficiency at each test point.
4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Architect in advance of test dates.
8. Document test results in a report and submit to Architect.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 52 33

SECTION 23 81 23 - COMPUTER-ROOM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of computer-room air-conditioning units:
 - 1. Ceiling-mounting units.
 - 2. Console units.

1.2 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

1.3 INFORMATIONAL/QUALITY ASSURANCE/CONTROL SUBMITTALS

- A. Field quality-control test reports.
- B. Warranties: Special warranties specified in this Section.

1.4 CLOSEOUT DOCUMENTS

- A. General: Closeout Submittals are to be submitted with O and M Manuals only. Do not submit with other ACTION and INFORMATIONAL Submittals:
 - 1. Operation and Maintenance Data: For computer-room air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- E. ASME Compliance: Fabricate and label water-cooled condenser shell to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 01.
- F. Units shall be designed to operate with HCFC-free refrigerants.

1.6 COORDINATION

- A. Coordinate layout and installation of computer-room air-conditioning units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of computer-room air-conditioning units that fail in materials or workmanship within specified warranty period.
- B. Warranty Period for Unit: Manufacturer's standard, but not less than five years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan Belts: One set for each belt-drive fan.
 - 2. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTING UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Compu-Aire, Inc.
 - 2. Data Aire Inc.
 - 3. Liebert Corporation.
 - 4. Stulz Investment Corp. of America.
 - 5. Trane Company (The); North American Commercial Group.
- B. Description: Self-contained, factory assembled, prewired, and prepiped; consisting of cabinet, fan, filters, and controls; for horizontal ceiling mounting to fit 24-by-48-inch T-bar ceiling opening.
- C. Cabinet: Galvanized steel with baked-enamel finish, insulated with 1/2-inch thick duct liner.
- D. Evaporator Fan: Forward curved, centrifugal, and directly driven by two-speed motor.
 - 1. Motor: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - a. Noise Rating: Quiet.
- E. Compressor: Hermetic, with resilient suspension system, oil strainer, and internal motor overload protection.
 - 1. Refrigeration Circuit: Low-pressure switch, manual-reset high-pressure switch, thermal-expansion valve with external equalizer, sight glass with moisture indicator, service shutoff valves, charging valves, and charge of refrigerant.
- F. Evaporator Coil: Direct-expansion cooling coil of seamless copper tubes expanded into aluminum fins. Mount coil assembly over stainless-steel drain pan having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.
- G. Air-Cooled Condenser: Integral copper-tube aluminum-fin coil with propeller or centrifugal fan, direct driven.
 - 1. Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.
- H. Electric-Resistance Heating Coil: Finned-tube electric elements with contactor, dehumidification relay, and high-temperature-limit switch.

- I. Filter: 1-inch thick, disposable, glass-fiber media.
- J. Control System: Unit-mounted panel with main fan contactor, compressor contactor, compressor start capacitor, control transformer with circuit breaker, solid-state temperature control modules, time-delay relay, reheat contactor, and high-temperature thermostat. Provide solid-state, wall-mounting control panel with start-stop switch, and adjustable temperature set point.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install computer-room air-conditioning units level and plumb, maintaining manufacturer's recommended clearances. Install according to ARI Guideline B.
- B. Curb Support: Install and secure roof-mounting units on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.
- C. Install suspended components level. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.
- D. Install air-cooled condenser on rubber-in-shear vibration isolators.
- E. Support suspended units from structure using threaded steel rods and elastomeric or spring hanger having 1-inch deflection. Vibration-control devices and installation requirements are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Water and Drainage Connections: Comply with applicable requirements in Division 23 Section "Domestic Water Piping." Provide adequate connections for water-cooled units, condensate drain, and humidifier flushing system.
- D. Hot-Water Heating Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Provide shutoff valves in inlet and outlet piping to reheat coils.
- E. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Provide shutoff valves and piping.
- F. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.
- G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 2. After installing computer-room air-conditioning units and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Verify that computer-room air-conditioning units are installed and connected according to manufacturer's written instructions and the Contract Documents.
- C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.
- D. Complete installation and startup checks according to manufacturer's written instructions.
- E. After startup service and performance test, change filters and flush humidifier.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain computer-room air-conditioning units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 81 23

SECTION 26 05 33 - CONDUIT AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes conduits, fittings, boxes, outlet boxes, floor boxes, enclosures, and cabinets for electrical wiring. The term raceway shall also apply to conduit and boxes.
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" for mounting heights of devices.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RMC: Rigid metal conduit.
- F. RNC: Rigid nonmetallic conduit.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.4 COORDINATION

- A. HVAC Control and Monitoring: Verify locations of temperature control panels with Building Management System installer.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. RMC: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel or aluminum.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Die-cast type, pot-metal type, and indenter type fittings are not permitted.
 - 2. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.

3. Fittings for EMT: Steel, compression type.

- G. Joint Compound for RMC or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
1. Gangable boxes are not permitted.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic.
- F. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

2.3 FLUSH FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used; except in kitchens use modular, above-floor type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, duplex flap-type, solid brass with satin finish.
- D. Carpet Flange: Solid brass with satin finish.
- E. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
- F. Voice and Data Communication Outlet: One rectangular face device cover suitable for accepting rectangular face device type 106-module frame.
1. Inserts and 106-module frames are specified in Division 27 Section "Communications Copper Horizontal Cabling"

2.4 TELCOMMUNICATIONS CONDUIT BODIES

- A. General Description: Conduit bodies specifically designed to maintain the required bend radius for data and communications cabling, complying with BISCITDMM "Horizontal Distribution Systems" Chapter.
1. Material: Die-cast aluminum.

2.5 SURFACE MOUNTED METALLIC RACEWAY- SINGLE AND DUAL CHANNEL

- A. **Finish Type Surface Raceways (power/technology raceways):**

1. **Size as required for cables installed in raceway.**
 2. **Provide with manufacturer's matching finish type surface backbox, finish to match raceway, gang requirements per device requirements.**
 3. **Provide for device or equipment locations on existing walls in finished spaces.**
 4. **Finish type surface metal raceway shall not be used for new construction work.**
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:**
1. **Panduit Corp.**
 2. **Hubbell Incorporated.**
 3. **Wiremold Company (The)**
- C. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles. Provide all required fittings for a complete raceway system.**
- D. Configuration: Single channel or dual channel raceway with surface mounted backboxes and dividers (for use on existing wall only), ganging requirements per application.**
- E. Raceway Material: Metal with Off-White finish.**
- F. Backboxes: Metal surface mount type backboxes with Off-White finish with all dividers and/or accessories to wiring to pass through the backbox via the raceway/backbox system.**
- G. Power Receptacles: NEMA WD 6, Configuration 5-20R, off-white finish (finish to match raceway).**
- H. See technology specifications for RJ-45 jacks and technology faceplate requirements.**

PART 3 - EXECUTION

3.1 CONDUIT APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:**
1. **Exposed Conduit: RMC or IMC.**
 2. **Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.**
 3. **Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.**
 4. **Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.**
- B. Comply with the following indoor applications, unless otherwise indicated:**
1. **Exposed, Not Subject to Physical Damage: EMT.**
 2. **Exposed and Subject to Physical Damage: RMC. Includes raceways in the following locations:**
 - a. **Loading dock.**
 - b. **Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.**
 - c. **Kitchens.**
 3. **Concealed in Ceilings and Interior Walls and Partitions: EMT.**
 4. **Concealed in Exterior Walls: RNC, Type EPC-40-PVC**
 5. **Concealed Under Slabs-on-Grade: RNC, Type EPC-40-PVC.**
 6. **Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.**
 7. **Damp or Wet Locations: RMC or IMC.**
 8. **Conduits for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.**
 9. **Conduits for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.**
 10. **Conduits for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.**

11. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

- C. Minimum RMC, IMC, EMT, or RNC, Type EPC-40-PVC Size: 1/2-inch trade size, unless indicated otherwise.
- D. Minimum FMC or LFMC Size: 1/2-inch trade size, unless indicated otherwise.
- E. Conduit Fittings: Compatible with raceways and suitable for use and location.
 - 1. RMC or IMC: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 OUTLET AND DEVICE BOX APPLICATION

- A. Flush Boxes in Masonry Walls and Partitions: Use masonry boxes at least 3.5 inches deep.
- B. Flush Boxes in Gypsum-Board Partitions: Use square boxes at least 2.125 inches deep with raised box covers.
- C. Flush Device Boxes in Ceilings: Use square boxes at least 2.125 inches deep with raised box covers.
- D. Flush Outlet Boxes in Ceilings: Use 4-inch round or octagonal boxes at least 2.125 inches deep.
- E. **Surface Boxes and Raceways: Use surface raceway on existing walls where approved by Owner. Coordinate routing to minimize amount and visual impact of surface raceway.**

3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support conduits as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Conceal conduit and EMT within finished walls, ceilings, and below floors, unless otherwise indicated.
- G. Conduits Beneath Concrete Slabs:
 - 1. Install conduit parallel or at right angles building lines, at least 1 inch below top of drainage fill.
 - 2. Arrange conduits to cross building expansion joints at right angles with expansion fittings.
 - 3. Do not embed conduits in concrete slabs.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Conduit Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

- K. Install conduit sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed conduits, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install conduit sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- L. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations.
- M. Recessed Boxes in Masonry Walls: Coordinate work with masonry contractor. Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Box shall be vertically plumb and flush with plane of wall, or slightly recessed. All boxes installed improperly will be replaced at Contractors expense. Provide oversized plate for all boxes that have exposed joints.
- N. Recessed Boxes in Gypsum-Board Partitions: Coordinate work with drywall contractor. Box shall be vertically plumb and flush with plane of wall, or slightly recessed. All boxes installed improperly will be replaced at Contractors expense. Provide oversized plate for all boxes that have exposed joints.
- O. Metal Floor box installations: Install all conduit and boxes level prior to pouring concrete. If owner representative is not present before the concrete is poured, take a minimum of 3 digital photograph of typical installation. Verify finished floor surface prior to pour. When installed in tile or finished concrete floor, ensure that final surface fitting and plate will be flush and not protrude above the finished plane. Install trim kit after floor is poured to fit flush with finished surface.
- P. Non-Metal Floor box installations: Install all conduit and boxes level prior to pouring concrete. If owner representative is not present before the concrete is poured, take a minimum of 3 digital photograph of typical installation. Verify finished floor surface prior to pour. When installed in tile or finished concrete floor, ensure that final surface fitting and plate will be flush and not protrude above the finished plane.
- Q. Conduits less than 3-inch trade size may be field bent, unless indicated otherwise. Use factory 45 and 90 degree, and special radius elbows for conduits 3-inch and larger.
- R. Conduits for Branch Circuits: Electrically continuous.
- S. Finished Spaces: Provide escutcheons where conduits penetrate surfaces of finished spaces. Match finish of adjacent surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 26 05 33

CARMEL MIDDLE SCHOOL (CAM) MID-LIFE CYCLE RENOVATION

300 SOUTH GUILFORD ROAD
CARMEL, IN 46032

CARMEL CLAY SCHOOLS

5001 EAST MAIN STREET
CARMEL, IN 46033
317-844-9961



ARCHITECT



317.848.9966 WWW.FHAI.COM
350 E NEW YORK ST, SUITE 300, INDIANAPOLIS, IN 46204

EXISTING VAV SCHEDULE HEATING COIL															
VAV No.	ROOM SERVED	COOLING CFM	HEATING CFM	EXT.S.P.	MBH	GPM	EAT	LAT	EWT	LWT	MIN ROWS	ELECTRICAL DATA	Duct Inlet Diamet	MANUFACTURER	MODEL
VAV-A1	A108	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 12
VAV-A2	A108	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 12
VAV-A3	A104	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A4	A109	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A5	A103	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A6	A109	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A7	A102	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-A8	A111	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A9	A101	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A10	A112	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A11	A119	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A12	A115	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A13	A114	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A14	A113	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-A15	A121	350 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-A16	A107	350 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-A17	A107	350 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-B1	B116	1,200 CFM	700 CFM	0.5 in-wg	41.6	3.5 GPM	55 F	110 F	180 F	156 F	2	277 V-160 Hz	12"	Enviro Tec Inc.	SDR-WC - SIZE 12
VAV-B2	B113	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B3	B117	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B4	B112	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B5	B118	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B6	B111	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B7	B109	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B8	B110	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B9	B121	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B10	B109	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B11	B101	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B12	B102	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B13	B103	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B14	B107	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B15	B108	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-B16	B115	350 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-B17	B115	350 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-C1	C134 C135	975 CFM	600 CFM	0.5 in-wg	32.4	2.5 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-C2	C134	650 CFM	450 CFM	0.5 in-wg	24.3	2.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C3	C133	350 CFM	250 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-C4	C129 C138	300 CFM	175 CFM	0.5 in-wg	9.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-C5	C124	350 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-C6	C126 C128	600 CFM	350 CFM	0.5 in-wg	18.9	1.5 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C7	C132	400 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C8	C115 C116 C117 C121	700 CFM	350 CFM	0.5 in-wg	16.9	1.5 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C9	C123	450 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C10	C122	350 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C11	C112	350 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C12	C111	350 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C13	C110	350 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C14	C109	350 CFM	200 CFM	0.5 in-wg	10.8	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C15	C108	175 CFM	100 CFM	0.5 in-wg	5.4	0.5 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-C16	C106 C114	625 CFM	350 CFM	0.5 in-wg	18.9	1.5 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C17	C103	1,100 CFM	750 CFM	0.5 in-wg	40.5	3.0 GPM	55 F	105 F	180 F	153 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-C18	C151 C154 C155	750 CFM	450 CFM	0.5 in-wg	24.3	2.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C19	C149	750 CFM	450 CFM	0.5 in-wg	24.3	2.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C20	C141	1,500 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	14"	Enviro Tec Inc.	SDR-WC - SIZE 14
VAV-C21	C158 C159	350 CFM	225 CFM	0.5 in-wg	12.2	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	5"	Enviro Tec Inc.	SDR-WC - SIZE 5
VAV-C22	C157	450 CFM	275 CFM	0.5 in-wg	14.9	1.5 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-C23	C160	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-C24	C161	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-C25	C162	900 CFM	650 CFM	0.5 in-wg	35.1	3.0 GPM	55 F	105 F	180 F	157 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-C26	C139	1,500 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	14"	Enviro Tec Inc.	SDR-WC - SIZE 14
VAV-C27	C163	900 CFM	650 CFM	0.5 in-wg	35.1	3.0 GPM	55 F	105 F	180 F	157 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-C28	C130 C137	750 CFM	450 CFM	0.5 in-wg	24.3	2.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-C29	C133	350 CFM	225 CFM	0.5 in-wg	12.2	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6

EXISTING VAV SCHEDULE HEATING COIL															
VAV No.	ROOM SERVED	COOLING CFM	HEATING CFM	EXT.S.P.	MBH	GPM	EAT	LAT	EWT	LWT	MIN ROWS	ELECTRICAL DATA	Duct Inlet Diamet	MANUFACTURER	MODEL
VAV-D1	D103	450 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-D2	D104	1,500 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	12"	Enviro Tec Inc.	SDR-WC - SIZE 12
VAV-D3	D105	500 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-D4	D106	1,500 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	14"	Enviro Tec Inc.	SDR-WC - SIZE 14
VAV-D5	D107	1,000 CFM	700 CFM	0.5 in-wg	37.8	3.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	10"	Enviro Tec Inc.	SDR-WC - SIZE 10
VAV-D6	D110	500 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	8"	Enviro Tec Inc.	SDR-WC - SIZE 8
VAV-D7	D111 D112 D113	400 CFM	250 CFM	0.5 in-wg	13.5	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-D8	D116 D117	250 CFM	150 CFM	0.5 in-wg	8.1	1.0 GPM	55 F	105 F	180 F	155 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-D9	D118	500 CFM	300 CFM	0.5 in-wg	16.2	1.5 GPM	55 F	105 F	180 F	158 F	2	277 V-160 Hz	6"	Enviro Tec Inc.	SDR-WC - SIZE 6
VAV-D10	D108	750 CFM	450 CFM	0.5 in-wg	24.3	2.0 GPM	55 F	105 F	1						

CARMEL MIDDLE SCHOOL (CAM) MID-LIFE CYCLE RENOVATION

300 SOUTH GUILFORD ROAD
CARMEL, IN 46032

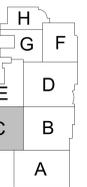
CARMEL CLAY SCHOOLS
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ARCHITECT



317.848.0966 WWW.FHAI.COM
30 E NEW YORK ST. SUITE 300, INDIANAPOLIS, IN 46204



KEY PLAN

100% CONSTRUCTION DOCUMENTS



DRAWN BY: BWB
PROJECT NUMBER: 22209.00
PROJECT ISSUE DATE: 01.23.2026

REV. NO.	DESCRIPTION	DATE
1	Addendum 2	2.27.2026

FIRST FLOOR FIRE ALARM PLAN - UNIT C

EF103

FIRE ALARM PLAN GENERAL NOTES

- ALL NEW FIRE ALARM WORK SHALL BE COORDINATED WITH EXISTING FIRE ALARM EQUIPMENT FOR CONTINUOUS COVERAGE OF FACILITY WHILE OCCUPIED. SCHEDULE SWITCHOVER AND OUTAGES AT A TIME AGREEABLE TO OWNER. DURING PERIODS WHEN SCHOOL IS NOT IN SESSION, PROVIDE PROPOSED WORK PLAN WITH ANTICIPATED OUTAGE SCHEDULE FOR REVIEW AT START OF PROJECT. OWNER'S SCHOOL SCHEDULE SHALL NOT BE IMPACTED BY FIRE ALARM REPLACEMENT. SCHEDULE ALL OUTAGES WITH A MINIMUM OF TWO WEEKS NOTICE FOR OWNER SCHEDULING. COORDINATE THROUGH CONSTRUCTION MANAGER.
- FIRE ALARM LAYOUT IS SHOWN ON THESE PLANS FOR COVERAGE AREAS ONLY. EXISTING INFORMATION WAS GATHERED FROM VISUAL OBSERVATION WITHOUT REMOVING CEILING TILES AND OWNERS EXISTING INFORMATION. CONTRACTOR SHALL PROVIDE FULL DESIGN DOCUMENTS PREPARED BY A NICET ACCREDITED FIRE ALARM DESIGNER AS PART OF THEIR BID, INCLUDING LAYOUT AND CALCULATIONS (DELEGATED DESIGN). CONTRACTOR SHALL PROVIDE DEVICES FOR COMPLETE AUDIBLE AND VISUAL COVERAGE. CONTRACTOR SHALL SELECT VISUAL DEVICES WITH CANDELA RATINGS AS REQUIRED AND PROVIDE SUPPLEMENTAL DEVICES WHERE REQUIRED. CONTRACTOR SHALL ASSUME 80 DECIBELS AS ROOM AMBIENT NOISE LEVEL FOR AUDIBLE DESIGN.
- NOTIFICATION MANAGE CIRCUIT (NMAC) POWER SUPPLIES/BOOSTERS ARE NOT SHOWN ON THIS PLAN. CONTRACTOR SHALL PLACE UNITS IN CUSTODIAL CLOSETS OR ELECTRICAL ROOMS AS REQUIRED AND CONNECT TO NEARBY POWER PANEL WITH A DEDICATED CIRCUIT WITH 2 #12, #12 G N 3/4" CONDUIT AND RED LOCKING HANDLE ON CIRCUIT BREAKER. UPDATE PANELBOARD DIRECTORIES FOR IMPACTED PANELS.
- PROVIDE WIRE GUARDS ON DEVICES IN GYM AND SIMILAR SPACES.
- CONTRACTOR SHALL REMOVE AND REINSTALL CEILING TILES AS REQUIRED FOR SCOPE OF WORK. REPLACE ALL TILES DAMAGED DURING CONSTRUCTION WITH NEW TILES MATCHING EXISTING.
- EXISTING WALL MATERIALS MAY BE PLASTER AND LATH AND/OR GYPSUM WALLBOARD. CONTRACTOR SHALL PROVIDE LABOR AND MATERIALS AS NECESSARY FOR CUTTING IN NEW DEVICE BOXES.
- VERIFY EXACT QUANTITY AND LOCATIONS OF ALL SPRINKLER CONNECTIONS PRIOR TO FIRE ALARM SHOP DRAWING SUBMITTAL.
- PROVIDE TWO WEEK NOTICE TO CITY OF CARMEL FIRE DEPARTMENT FOR FINAL INSPECTION AND TESTING. COORDINATE SO THAT ANY CORRECTIVE WORK CAN OCCUR PRIOR TO RETURN OF STUDENTS TO SCHOOL.
- PROVIDE CONNECTIONS TO BUILDING FIRE RESPONDER DISTRIBUTED ANTENNA SYSTEM FOR MONITORING.
- THE ENTIRE BUILDING SHALL BE CONNECTED TO THE NEW FIRE ALARM PANEL AT THE COMPLETION OF THIS WORK IN THE SAME LOCATION THAT THE EXISTING FIRE ALARM PANEL WAS REMOVED FROM.
- PROVIDE CATEGORY 6 CABLE TO FIRE ALARM DEVICES FROM EXISTING NEARBY IDF.
- ALL DEVICES SHOWN ARE EXISTING DEVICES BEING REPLACED WITH NEW DEVICES UNLESS OTHERWISE NOTED.

SHEET KEYNOTES

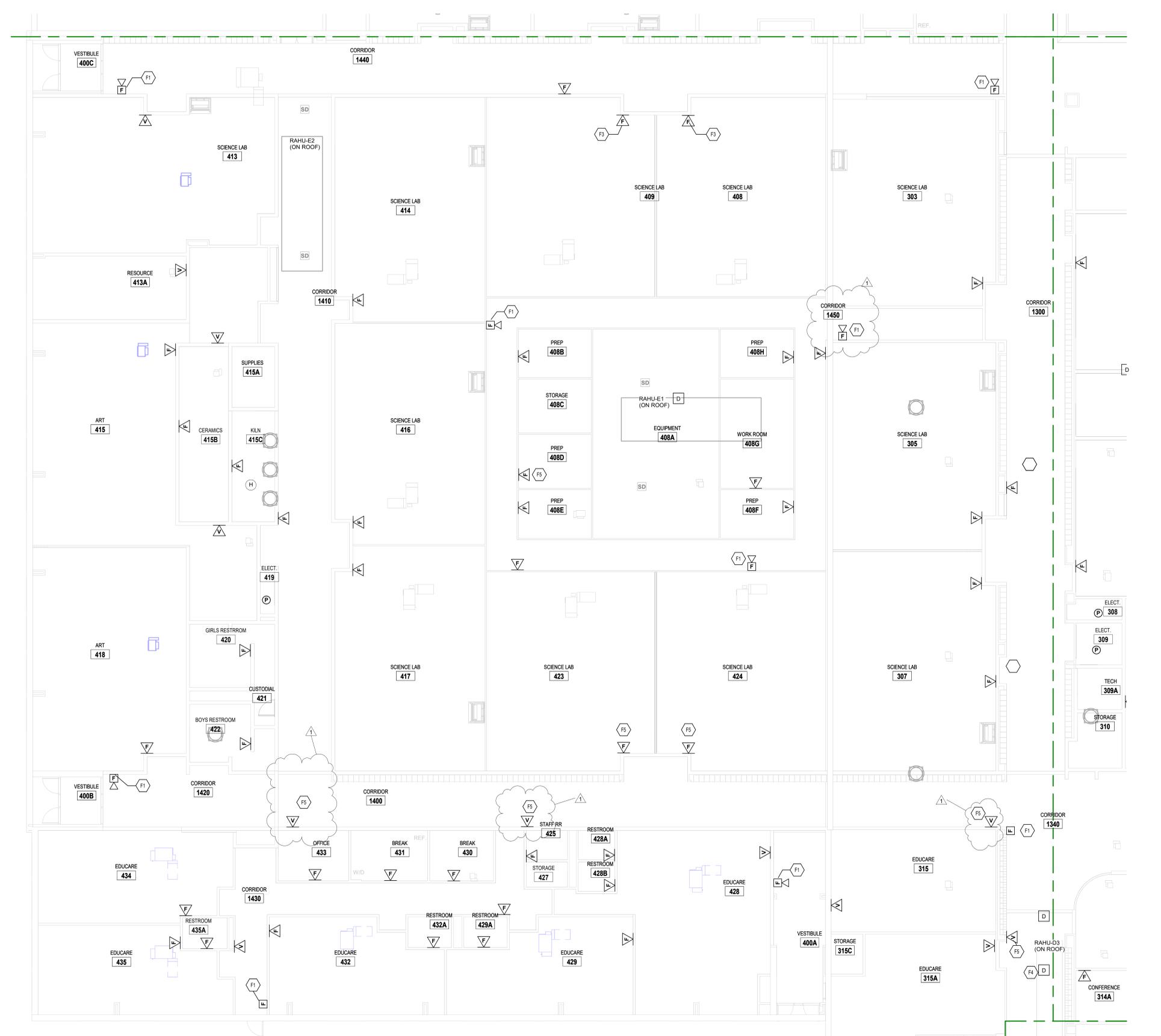
- F1 DISCONNECT AND REMOVE EXISTING PULL STATION COMPLETE. AT GYPSUM WALLS, REMOVE BOX AND ABANDON CONDUIT. PATCH WALL WITH WALLBOARD MATERIAL AND FINISH TO MATCH ACCORDING TO ARCHITECTURAL PLANS. FOR BLOCK OR BRICK WALLS, INSTALL A BLANK STAINLESS STEEL COVER PLATE.
- F3 PROVIDE A NEW HORN / STROBE DEVICE AT THIS LOCATION AT PROPER HEIGHT. REWORK EXISTING AS REQUIRED WITH SURFACE RACEWAY IF WALL IS NOT FISHPLE.
- F4 PROVIDE DUCT DETECTOR ABOVE CEILING FOR MECHANICAL UNIT ON ROOF. PROVIDE REMOTE INDICATOR LIGHTS FOR EACH DETECTOR IN CEILING.
- F5 NEW DEVICE IN NEW LOCATION.

VERIFICATION NOTE

CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CLEARANCES AND ALL EXISTING FIELD CONDITIONS BEFORE STARTING CONSTRUCTION. COMMENCEMENT OF WORK CONSTITUTES ACCEPTANCE OF CONDITIONS.

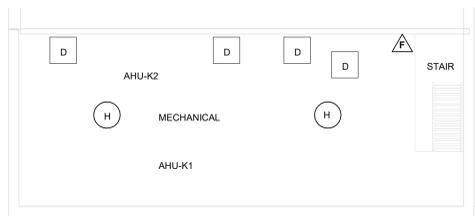
SHOULD DIFFERENT CONDITIONS BE ENCOUNTERED, CONTACT THE ARCHITECT BEFORE PROCEEDING WITH WORK.

ROOM LEGEND		
ROOM NO.	ROOM NAME	AREA (SF)
302	STORAGE	204 SF
303	SCIENCE LAB	1204 SF
304	CLASSROOM	921 SF
304A	PRODUCTION	373 SF
305	SCIENCE LAB	1204 SF
306	CLASSROOM	921 SF
307	SCIENCE LAB	1277 SF
308	ELECT.	40 SF
309	ELECT.	69 SF
309A	TECH	66 SF
310	STORAGE	97 SF
311	BOYS RESTROOM	238 SF
314	TEACHERS RESOURCE	435 SF
314A	CONFERENCE	135 SF
315	EDUCARE	603 SF
315A	EDUCARE	632 SF
315B	RESTROOM	71 SF
315C	STORAGE	45 SF
316	CLASSROOM	984 SF
317	EDUCARE	727 SF
400A	VESTIBULE	209 SF
400B	VESTIBULE	72 SF
400C	VESTIBULE	72 SF
404	CLASSROOM	852 SF
405	STAFF LOUNGE	485 SF
406	WORK ROOM	120 SF
407	TEACHER BREAK ROOM	989 SF
408	SCIENCE LAB	1184 SF
408A	EQUIPMENT	944 SF
408B	PREP	127 SF
408C	STORAGE	141 SF
408D	PREP	141 SF
408E	PREP	127 SF
408F	PREP	128 SF
408G	WORK ROOM	286 SF
408H	PREP	133 SF
409	SCIENCE LAB	1180 SF
410	HEALTH	1134 SF
411	HEALTH	1097 SF
412	LARGE GROUP INSTRUCTION	1549 SF
413	SCIENCE LAB	1265 SF
413A	RESOURCE	347 SF
414	SCIENCE LAB	1189 SF
415	ART	1633 SF
415A	SUPPLIES	93 SF
415B	CERAMICS	316 SF
415C	KILN	170 SF
416	SCIENCE LAB	1171 SF
417	SCIENCE LAB	1192 SF
418	ART	1196 SF
419	ELECT.	23 SF
420	GIRLS RESTROOM	187 SF
421	CUSTODIAL	48 SF
422	BOYS RESTROOM	188 SF
423	SCIENCE LAB	1178 SF
424	SCIENCE LAB	1182 SF
425	STAFF RR	43 SF
427	STORAGE	37 SF
428	EDUCARE	967 SF
428A	RESTROOM	39 SF
428B	RESTROOM	39 SF
429	EDUCARE	561 SF
429A	RESTROOM	48 SF
430	BREAK	115 SF
431	BREAK	138 SF
432	EDUCARE	549 SF
432A	RESTROOM	48 SF
433	OFFICE	127 SF
434	EDUCARE	613 SF
435	EDUCARE	557 SF
435A	RESTROOM	49 SF
1240	CORRIDOR	2309 SF
1300	CORRIDOR	3025 SF
1340	CORRIDOR	1103 SF
1350	CORRIDOR	2021 SF
1400	CORRIDOR	1193 SF
1410	CORRIDOR	1408 SF
1420	CORRIDOR	386 SF
1430	CORRIDOR	629 SF
1440	CORRIDOR	1924 SF
1450	CORRIDOR	1375 SF
1460	CORRIDOR	881 SF



FIRST FLOOR FIRE ALARM PLAN - UNIT C
SCALE: 1/8" = 1'-0"

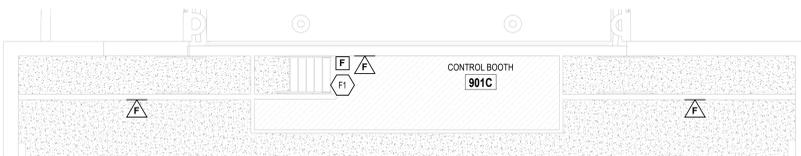
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SECOND FLOOR MECHANICAL ROOM FIRE ALARM PLAN

SCALE: 1/8" = 1'-0"

MECHANICAL ROOM - SECOND FLOOR ABOVE DRESSING ROOMS



CONTROL BOOTH AND UPPER AUDITORIUM SEATING AREA

SCALE: 1/8" = 1'-0"

CONTROL BOOTH AND BACK OF UPPER AUDITORIUM SEATING AREA - PLAN ROTATED 90 DEGREES COUNTERCLOCKWISE FROM BELOW

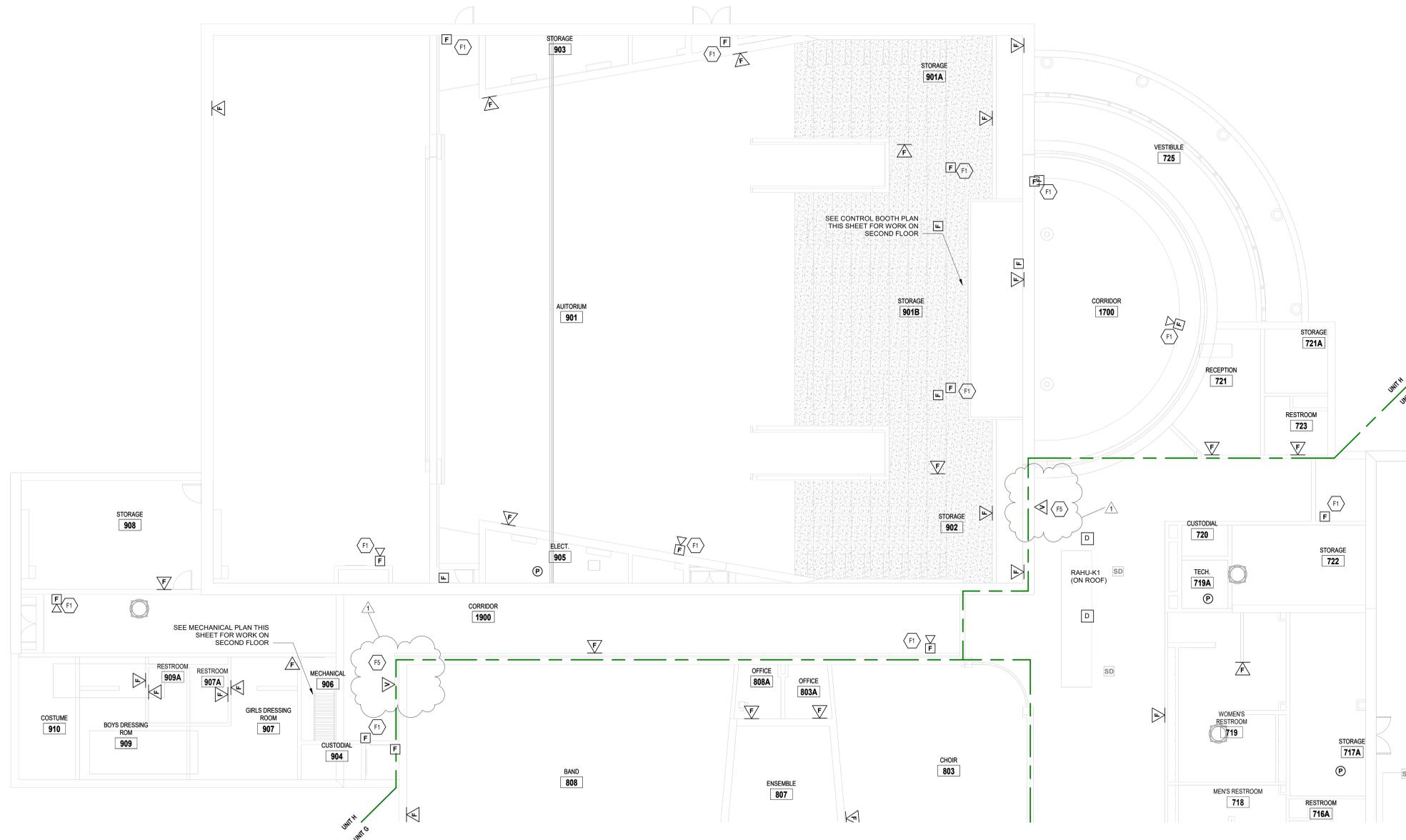
ROOM LEGEND		
ROOM NO.	ROOM NAME	AREA (SF)
716	OFFICE	164 SF
716A	RESTROOM	54 SF
717	THE SCOTT CENTER	7420 SF
717A	STORAGE	353 SF
718	MENS RESTROOM	322 SF
719	WOMENS RESTROOM	421 SF
719A	TECH	57 SF
720	CUSTODIAL	35 SF
721	RECEPTION	266 SF
721A	STORAGE	103 SF
722	STORAGE	272 SF
723	RESTROOM	80 SF
725	VESTIBULE	564 SF
803	CHOIR	1057 SF
803A	OFFICE	60 SF
807	ENSEMBLE	512 SF
808	BAND	2336 SF
808A	OFFICE	60 SF
901	AUDITORIUM	8653 SF
901A	STORAGE	222 SF
901B	STORAGE	324 SF
901C	CONTROL BOOTH	285 SF
902	STORAGE	234 SF
903	STORAGE	142 SF
904	CUSTODIAL	54 SF
905	ELECT.	146 SF
906	MECHANICAL	74 SF
907	GRLS DRESSING ROOM	260 SF
907A	RESTROOM	53 SF
908	STORAGE	505 SF
909	BOYS DRESSING ROM	259 SF
909A	RESTROOM	54 SF
910	COSTUME	178 SF
1700	CORRIDOR	2564 SF
1720	CORRIDOR	1389 SF
1900	CORRIDOR	1558 SF

FIRE ALARM PLAN GENERAL NOTES

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- F5 NEW DEVICE IN NEW LOCATION.



FIRST FLOOR FIRE ALARM PLAN - UNIT H

SCALE: 1/8" = 1'-0"

CARMEL MIDDLE SCHOOL (CAM) MID-LIFE CYCLE RENOVATION

300 SOUTH GUILFORD ROAD
CARMEL, IN 46032

CARMEL CLAY SCHOOLS

501 EAST MAIN STREET
CARMEL, IN 46033
317-844-9961

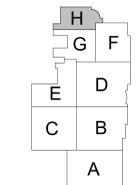


ARCHITECT

FANNING HOWEY

317.848.0966 WWW.FHAI.COM

350 E NEW YORK ST, SUITE 300, INDIANAPOLIS, IN 46204



KEY PLAN

100% CONSTRUCTION DOCUMENTS



DRAWN BY: ISD

PROJECT NUMBER: 222099.00

PROJECT ISSUE DATE: 01.23.2026

REV. NO.	DESCRIPTION	DATE
1	Addendum 2	2.27.2026

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FIRST FLOOR FIRE ALARM PLAN - UNIT H

EF108