ADDENDUM NO. 3

February 27, 2025

PORTER COUNTY SHERIFF'S OFFICE AND JAIL FACILITY RENOVATIONS

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 8, 2025 by DLZ. Acknowledge receipt of the Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

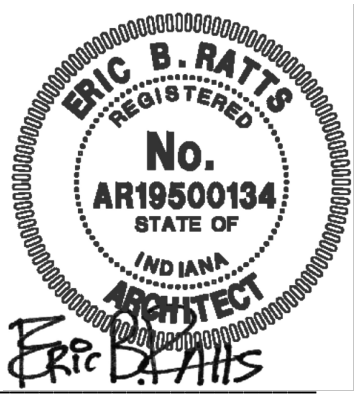
This Addendum consists of Page ADD 3-1 and attached Addendum No. 3 from DLZ dated February 26, 2025 and consisting of 3 pages, Questions and Clarifications Sheets (3), Revised Specification Sections: 23 07 13 - Duct Insulation, 23 09 23 - Direct Digital Control (DDC) System for HVAC, 23 64 23.13 - Air-Cooled Scroll Water Chillers, 23 73 13.13 - Indoor, Basic Air-Handling Units, and 6 drawings.

ADDENDUM NO. 3

PROJECT:	**PORTER COUNTY SHERIFF'S OFFICE AND JAIL FACILITY RENOVATIONS** 2755 State Road 49 Valparaiso, IN 46383
TO:	All Prospective Bidders and others to whom Plans and Specifications for the above referenced Project have been issued.
OWNER:	**PORTER COUNTY BOARD OF COMMISSIONERS** 155 Indiana Avenue Valparaiso, IN 46383
ARCHITECT	**DLZ INDIANA, LLC** 138 N. Delaware Street Indianapolis, Indiana 46204
DATE:	February 26th, 2025

The items included in this Addendum are to become a part of the original Contract Documents including Drawings and Project Manual dated January 08, 2025, as if included herein. Only these items are to be altered. The remainder of the original Drawings and Project Manual remain valid in their entirety. Bidders must acknowledge receipt of this Addendum in the space provided on the Proposal Form. Failure to do so may subject the Bidder to disqualification.

CERTIFIED BY:



Eric B. Ratts, AIA
Vice President
State of Indiana No. 19500134

PROJECT MANUAL

ITEM NO. 1. SECTION 230713 – DUCT INSULATION
- a. Part 3.10. Added Indoor Duct and Plenum Insulation Schedule
- b. Replace the entire specification section with the attached.

ITEM NO. 2. SECTION 230923 – DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC
- a. Part 2.1.A. Added '6. Reliable Controls by OJS Servicing' as acceptable manufacturer.
- b. Replace the entire specification section with the attached.

ITEM NO. 3. SECTION 236423.13 – AIR-COOLED, SCROLL WATER CHILLERS
- a. Part 1.5.C. Deleted this section, added "NOT USED".
- b. Part 2.1.A. Deleted this section, added "NOT USED".
- c. Part 2.2.A. Added '5. Dunham-Bush' as acceptable manufacturer.
- d. Part 2.12.A. Revised spring isolators to be neoprene pad for vibration isolation.
- e. Part 2.15.A. Revised requirement for chillers to be factory tested to chillers are required to have AHRI certification.
- f. Replace the entire specification section with the attached.

ITEM NO. 4. SECTION 237313.13 – INDOOR, BASIC AIR-HANDLING UNITS
- a. Part 2.3.A. Added Dunham-Bush as acceptable manufacturer.
- b. Part 2.3.B.2.d.3. Revised insulation thickness to be 2''.
- c. Part 2.3.I. Provided note requiring LED lights to be factory installed.
- d. Replace the entire specification section with the attached.

DRAWINGS

ITEM NO. 5. AD10.1 - OVERALL FIRST FLOOR REFLECTED CEILING – REMOVAL
- a. Updated sheet, see the AD10 series sheets below for complete description of changes.
- b. Replace the entire sheet with the attached.

ITEM NO. 6. AD10.1A - FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA A
- a. TOILET/SHOWER A8-S1 - Remove epoxy paint from the concrete plank ceiling.
- b. Updated sheet legend.
- c. Replace the entire sheet with the attached.

ITEM NO. 7. AD10.1B - FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA B
- a. TOILET/SHOWER A7-S1, and B2-S1 - Remove epoxy paint from the concrete plank ceiling.
- b. Updated sheet legend.
- c. TOILET B119B, no work in this room.
- d. Replace the entire sheet with the attached.

ITEM NO. 8. AD10.1C - FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA C
- a. TOILET/SHOWER B1-S1, C4-S1, C7-S1, and C8-S1 - Remove epoxy paint from the concrete plank ceiling.
- b. Updated sheet legend.
- c. TOILET C108B, no work in this room.
- d. Replace the entire sheet with the attached.

ITEM NO. 9. M6.2 – MECHANICAL EQUIPMENT SCHEDULES – II

a. Added schedule note 3 for duct mounted coils as shown.
b. Replace the entire sheet with the attached.

ITEM NO. 10. M7.3 – CONTROLS SCHEMATICS

a. Removed refrigerant detector verbiage from sequence of operation.
b. Replace the entire sheet with the attached.

ATTACHMENTS:

OTHER

1. Questions and Clarifications

PROJECT MANUAL

1. SECTION 230713 – DUCT INSULATION
2. SECTION 230923 – DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC
3. SECTION 236423.13 – AIR-COOLED, SCROLL WATER CHILLERS
4. SECTION 237313.13 – INDOOR, BASIC AIR-HANDLING UNITS

DRAWINGS

1. AD10.1 - OVERALL FIRST FLOOR REFLECTED CEILING - REMOVAL
2. AD10.1A - FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA A
3. AD10.1B - FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA B
4. AD10.1C - FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA C
5. M6.2 – MECHANICAL EQUIPMENT SCHEDULES - II
6. M7.3 – CONTROLS SCHEMATICS

END OF ADDENDUM No. 3

Questions and Clarifications

ITEM NO. 1.

Question: Section 237313.13-4, 2.3, B, 2, d, 3 – Specifies an AHU insulation thickness of 1". The previous line has an R-value of 12. I recommend changing the AHU insulation thickness to be 2" to match the R-value

Answer: AHU insulation thickness changed to 2''.

Question: AHU Schedule Note #7 requires all AHU sections be no more than 48" wide. We can provide most of the AHU shipping skids with 48" length or less, but there are shipping skids on some of the AHUs which will be longer than 48". For example, AHU-7 has the Vertical Coil (VC) section length of 58" and the Top Tier Supply Fan (SF) with a length of 50". YORK Solution AHUs can be disassembled to fit through doorways and reassembled. We have a manual specifically for that which shows contractors how to do this. I don't have any doubt that the AHU components will fit through a 48" wide door, but there may be some coordination with the contractor to disassemble and reassemble some shipping skids to get them in. Just wanted to make sure we are on the same page.

Answer: Note 7 on AHU schedule states for contractor and construction manager to coordinate means and methods of install of AHU's.

Question: Do you want the AHUs to come with factory installed LED lights? I don't see lights specified in the AHU spec. There is an AHU Electrical Schedule on M6.1 which shows a 120v-1ph-60hz electrical circuit #3 for AHU-1-8, but I don't see it specified anywhere else. I recommend adding in an Addendum that AHU-1, 2, 3, 4, 5, 6, 7, 8 shall come with factory installed LED lights.

Answer: Requirement for factory installed LED lights added to AHU specification.

ITEM NO. 2.

Question: Seismic requirements in the chiller spec which requires the chillers to operate after a seismic event. This means the chillers would have to be shaker table tested. I don't see this Seismic verbiage in the AHU and other equipment specs which I would think it would/should be if that is a requirement. I would have to see if this chiller model has been shaker table tested and can comply. Can you please clarify in Addendum #3?

Answer: Seismic requirements removed from specification.

Question: Section 236423.13-3, 1.5, C – Requires Seismic Certificates. Is Seismic certification required for the chillers and any other HVAC equipment on the project? I don't see it specified in the AHU and other equipment spec sections. If Seismic certification is required, can you please provide the required Seismic requirements for the project (Site Classification, Importance Factor, SDS, Occupancy Category, and Wind load (PSF)?

Answer: Seismic requirements removed from specification.

Question: Requires power factor correction capacitors to 0.95. Are power factor correction capacitors required for this project?
Answer: Requirement to remain.

Question: Section 236423.13-12, 2.12, A, 1 – Requires 1" spring isolators for the chillers. We recommend neoprene pad vibration isolators when chillers are sitting on the ground and spring isolators when chillers are on top of a building to prevent vibration transmission through the building. Since the chillers are located on the ground, are neoprene pad vibration isolators acceptable in lieu of springs?
Answer: Specification section revised to neoprene pad.

Question: Section 236423.13-12, 2.15, B – Requires the air cooled chillers be factory performance tested. YORK chillers are AHRI certified so that not every chiller has to be tested. Adding a factory performance test adds significant cost when the chillers have already undergone testing for AHRI certification. Is a functional test and AHRI certification acceptable in lieu of a factory performance test?
Answer: Requirement for factory performance test revised to be AHRI certified.

Question: M7.3 Chilled water system paragraph 3 below requires the chillers come with a refrigerant leak detector. YORK chillers do not come with refrigerant leak detectors. Packaged RTUs and split systems blow air into occupied spaces. If there were a leak on an air cooled chiller the chiller would eventually trip out on low suction pressure. Can the requirement for refrigerant leak detectors on the chillers be removed?
Answer: Refrigerant detector verbiage removed.

ITEM NO. 3.

Question: There is a schedule for the Duct Mounted Coils and notes on the drawings which reference a Duct Mounted Coil Box, but there doesn't seem to be a spec section which applies to these. It also doesn't clarify that the Duct Coil Boxes should be insulated, have drain pans, access doors, etc… The Coil Selections I sent were coil sections for YORK Solution AHUs so I recommend the same 2" R-13 insulation value as the AHUs to prevent sweating. Can more clarification be added to the Duct Coil Boxes to ensure contractors don't just think they can put coils in the ductwork without an insulated casing, drain pan, and access door?
Answer: Duct mounted coils to have similar construction to indoor AHU's. Note added to duct mounted coil schedule.

ITEM NO. 4.

Question: Per the schedule there is a CU for a new flush valve kit, but there are no CU listed on the plumbing drawings. Do we assume for each CVC-1 there is a CU that goes with the Controller? Or use existing flush valve in chase?
Answer: Keynotes 221103 and 221117 at existing combination fixtures state to refer to CU on plumbing fixture schedule. As part of CU schedule, new electronic flush valve kit is to be provided at each combination unit. In the plumbing equipment schedule, the notes for CVC-1 indicate that a cell valve controller is to be placed in each security chase on each floor, such that one (1) CVC-1 can serve two (2) combination units.

ITEM NO. 5.

Question: The KEC is handing over rooftop equipment for the mechanical guy to install?

Answer: Correct, the exhaust and make-up air units shall be turned over to the mechanical contractor. Refer to M6.1 and M6.2 for equipment information.

ITEM NO. 6.

Question: Please provide specifications for metal security mesh and metal panels.

Answer: Metal security mesh is specified in 092900 Gypsum Board. The metal panel in detail 25/A8.2 METAL SCREEN is specified in 055000 METAL FABRICATIONS.

ITEM NO. 7.

Question: Please provide specification for 102825 Utility Shelf with Mop and Broom Holder or confirm responsible Bid Category No. 5 Plumbing.

Answer: The mop holder is a FIAT Model 889-CC.

ITEM NO. 8.

Question: For Bid Category 2 – Metal Studs, DW, and Ceilings – What is the existing product for the security plank ceiling that we will need to reinstall?

Answer: The existing security plank ceiling is a standard interlocking system and appears to be 12-gauge metal.

ITEM NO. 9.

Question: Please ask the design team for a duct insulation/liner schedule. 23 07 13-13 Section 3.9 identifies plenums and ducts that require insulation, but type is not specified.

Answer: Duct insulation schedule has been added in 230713 Section 3.10 as part of addendum.

ITEM NO. 10.

Question: Due to the construction sequence and the associated concrete curing requirements for the installation of the Seamless Shower Coating, can a Seamless Shower Coating manufacture approved concrete additive be added directly to the concrete mix?

Answer: While this is a contractor means and methods issue, if approved by the Seamless Shower Coating manufacturer, concrete admixture may be used to accelerate the concrete cure time. Any concrete admixture shall not adversely affect any Cast-In-Place Concrete or Seamless Shower Coating warranty requirements.

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Related Requirements:

1. Section 230716 "HVAC Equipment Insulation."
2. Section 230719 "HVAC Piping Insulation."
3. Section 233113 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or craft training program, certified by the Department of Labor, Bureau of Apprenticeship and Training.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers are to be marked with the manufacturer's name, appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials are to be applied.

B. Products do not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

E. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket: Mineral or Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 450 deg F in accordance with ASTM C411. Comply with ASTM C553, Type II, and ASTM C1290, Type II with factory-applied vinyl jacket Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed; SAINT-GOBAIN.
      b. Johns Manville; a Berkshire Hathaway company.
      c. Knauf Insulation.
      d. Manson Insulation Inc.
      e. Owens Corning.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin; suitable for maximum use temperature between 35 deg F and 250 deg F for jacketed and between 35 deg F and 450 deg F for unfaced in accordance with ASTM C411. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed; SAINT-GOBAIN.
      b. Johns Manville; a Berkshire Hathaway company.
      c. Knauf Insulation.
      d. Manson Insulation Inc.
      e. Owens Corning.

2.3 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a **2**-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation; Saint-Gobain North America.

b. Johns Manville; a Berkshire Hathaway company.
c. Nelson Firestop; a brand of Emerson Industrial Automation.
d. Thermal Ceramics.
e. Unifrax Corporation.

2.4 ADHESIVES

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller.
d. Mon-Eco Industries, Inc.

C. C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller.

2.5 MASTICS AND COATINGS

A. Vapor-Retarder Mastic, Water Based, Interior Use: Suitable for indoor use on below ambient services.

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

a. Aeroflex USA.
b. Childers Brand; H. B. Fuller Construction Products.
c. Foster Brand; H. B. Fuller.
d. Knauf Insulation.
e. Vimasco Corporation.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Color: White.

B. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

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

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller.
    d. Knauf Insulation.
    e. Mon-Eco Industries, Inc.
    f. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Color: White.

2.6 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and are compatible with insulation materials, jackets, and substrates.

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

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller.
    c. Vimasco Corporation.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.7 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

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

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller.
    d. Mon-Eco Industries, Inc.

2. Materials are compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

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

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller.

2. Materials are compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.8 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested in accordance with ASTM E96/E96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

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

a. 3M Industrial Adhesives and Tapes Division.
b. Aeroflex USA.
c. Avery Dennison Corporation, Specialty Tapes Division.
d. Ideal Tape Co., Inc., an American Biltrite Company.
e. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

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

    a. 3M Industrial Adhesives and Tapes Division.
    b. Avery Dennison Corporation, Specialty Tapes Division.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10 SECUREMENTS

A. Bands:

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

    a. Johns Manville; a Berkshire Hathaway company.
    b. RPR Products, Inc.
2. Stainless Steel: ASTM A240/A240M, Type 304; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

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

        1) AGM Industries, Inc.
        2) Gemco.

3) Midwest Fasteners, Inc.
4) Nelson Stud Welding.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

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

      1) AGM Industries, Inc.
      2) CL WARD & Family Inc.
      3) Gemco.
      4) Midwest Fasteners, Inc.
      5) Nelson Stud Welding.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

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

      1) AGM Industries, Inc.
      2) Gemco.
      3) Midwest Fasteners, Inc.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel or aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

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

      1) AGM Industries, Inc.
      2) Gemco.
      3) Midwest Fasteners, Inc.
      4) Nelson Stud Welding.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy or 0.062-inch soft-annealed, galvanized steel.

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

a. C & F Wire Products.
b. Johns Manville; a Berkshire Hathaway company.
c. RPR Products, Inc.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC in accordance with ASTM D1784, Class 16354-C. White or color-coded to match adjacent surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

C. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL-WOOL INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

B. Comply with manufacturer's written installation instructions.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.

f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Comply with manufacturer's written installation instructions.

B. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

C. Insulate duct access panels and doors to achieve same fire rating as duct.

D. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless steel jackets.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed and exposed supply, return, and outdoor air.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed or exposed, round, rectangular, and flat-oval, supply-air duct insulation is the following:

1. Mineral Wool Blanket: 1-1/2 inches thick and 0.75 lb/cu. ft. nominal density.

B. Concealed or exposed, round, rectangular, and flat-oval, return-air duct insulation is the following:
   1. Mineral Wool Blanket: 1-1/2 inches thick and 0.75 lb/cu. ft. nominal density.

C. Concealed or exposed, round, rectangular, and flat-oval, outdoor-air duct insulation is the following:
   1. Mineral Wool Blanket: 1-1/2 inches thick and 0.75 lb/cu. ft. nominal density.

D. Concealed or exposed, round, rectangular, and flat-oval, exhaust-air duct insulation between isolation damper and penetration of building exterior is the following:
   1. Mineral Wool Blanket: 1-1/2 inches thick and 0.75 lb/cu. ft. nominal density.

END OF SECTION 230713

SECTION 230923 – DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.

5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

    a. Water Temperature: Plus or minus 1 deg F.
    b. Water Flow: Plus or minus 5 percent of full scale.
    c. Water Pressure: Plus or minus 2 percent of full scale.
    d. Space Temperature: Plus or minus 1 deg F.
    e. Ducted Air Temperature: Plus or minus 1 deg F.
    f. Outside Air Temperature: Plus or minus 2 deg F.
    g. Dew Point Temperature: Plus or minus 3 deg F.
    h. Temperature Differential: Plus or minus 0.25 deg F.
    i. Relative Humidity: Plus or minus 5 percent.
    j. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
    k. Airflow (Terminal): Plus or minus 10 percent of full scale.
    l. Air Pressure (Space): Plus or minus 0.01-inch wg.
    m. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
    n. Carbon Monoxide: Plus or minus 5 percent of reading.
    o. Carbon Dioxide: Plus or minus 50 ppm.
    p. Electrical: Plus or minus 5 percent of reading.

1.5 SEQUENCE OF OPERATION

A. See Construction Documents.

1.6 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

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. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:

    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.

9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:

    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

C. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

D. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

E. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

F. Qualification Data: For Installer and manufacturer.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. 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.

C. Comply with ASHRAE 135 for DDC system components.

D. Smoke control systems shall comply with Indiana Building Code Section 909 and UL864 UULK 10th Edition. This includes, but is not limited to:
1. UL864 listed controllers.
2. All smoke control wiring, regardless of voltage, shall be in conduit.
3. Positive positive proof of airflow for fans via airflow switch or DP switch (VFD status or current-sensing relays not acceptable).
4. Positive positive proof of damper position (actuator feedback not acceptable).
5. Provide damper actuators with stroke times of 60 seconds or less.
6. Furnish UL864 listed Firefighters Smoke Control Station (FSCS) per IFC section 909.16 & UL864, plus all required software to interface between FSCS and building automation system per UL864.
7. Automatically perform weekly test per IBC/IFC 909.12 & UL864.
8. Controllers shall be on standby power source.
9. Smoke Control System shall have the capability to bypass hand-off-auto or start/stop switches located on motor controllers, and bypass temperature low-limit safeties and/or return duct smoke detectors per UL864.
10. Network communications shall be installed per control system manufacturer's UL864 UUKL listing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.9 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

1.10 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. Replacement Materials: One replacement diaphragm or relay mechanism for each unique valve motor, controller, or thermostat.
2. Maintenance Materials: One thermostat adjusting key(s).

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Manufacturers:

1. Precision Controls, Inc.
2. Johnson Controls, Inc.
3. Delta Controls by Innovative Control Solutions.
4. Automated Logic Corporation by Emcor Services.
5. Tridium.
6. Reliable Controls by OJS Servicing.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

C. Applications for the Smoke Management System include, but are not limited to the following:

1. Requirements applicable to controls serving air-handling units AHU-1 and 2, associated smoke exhaust fans, variable air volume boxes, return and transfer air duct mounted dampers, and supply dampers for diffusers in hallway as indicated on plans.
2. Smoke design:

a. IBC/IFC 909.2 – General Design Requirements: Buildings, structures, or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design.

b. The control systems shall meet UL 864 listing regarding smoke control

3. Provide a dedicated server(s) to the system.

   a. The BAS contractor shall provide the server to be utilized for the BAS system. For the purposes of this specification, this server shall be referenced as the Dedicated Application and Database Server (DADS) file server.
   b. The BAS contractor shall provide all software, setup and configuration of this Dedicated Application and Database Server (DADS) file server. Provide software, setup and configuration of remote workstations for accessing the DADS file server and BAS over the local LAN and internet.
   c. The BAS contractor shall be responsible for all software and network integration for this DADS file server to be compatible with the BAS system.

4. Provide wall mounted fire fighter's smoke control unit located in the Main Control Room. All air handling unit fans (supply, return, and exhaust) and smoke control exhaust fans shall be shown on the fire-fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for each smoke control compartment, annunciated by fan and compartment.

   a. The system shall automatically open and close fire/smoke dampers, activate exhaust fans, and modify air handling unit fan operations as scheduled to maintain a differential pressure to surrounding compartments of 0.05 inches water gage to prevent smoke from leaving the compartment of origin.

   b. The fire fighter's control panel shall provide control capability of the complete smoke control system equipment. On-Auto-Off control over each smoke compartment system that can also be controlled from other sources.

   c. Smoke Control System shall interface to the BAS. Within the BAS, specific graphical interface shall be provided by floor showing the individual dampers relating to smoke control to allow Open/Close overrides for testing.

   d. Panel to show a graphical representation of floor plan with location of each of the smoke zones and indication of the fans associated with each zone.

5. Provide all rough-in wall boxes and conduits in the walls for control of fire/smoke dampers specified below, as noted on the drawings and in accordance with manufacturer.
6. Provide all line and low voltage equipment and electrical wiring systems and devices.
7. Calibrate, program, check out, and verify operation to the Engineer, a computerized Building Automation System (BAS) to control the mechanical equipment as herein specified and indicated on the contract drawings.
8. Provide all hardware and software necessary for a complete control system as required to accomplish the objectives of Indiana Building Code pressurization method 909.6 to control smoke as herein specified and indicated on the contract drawings.

9. Provide all the necessary initial programming and any revisions to the software to accomplish the desired sequence of operation, comfort levels and energy consumption as required by the Engineer. This shall include any software revisions during any of the warranty periods that may be required by the Engineer and/or the Owner.
10. Provide all modifications and updates to the database file server and workstations necessary to comply with the intent of these specifications and as required to provide the operator interface as specified.
11. Install, electrically wire, calibrate and checkout all controls associated with the installation of the Building Automation System as required by the component manufacturer and as stated in this specification.
12. All wiring for the smoke control system shall be in conduit.
13. Interface of the Building Automation System with mechanical systems.
14. Emergency power is required for all systems associated with smoke control.
15. UL555S Dampers are required to control smoke.
16. Control feedback shall be required on all devices associated with smoke control.
17. The UL 864 system will reside on its own dedicated Ethernet network. The UL 864 listed smoke control system network will make a single connection to the owner's network using a Ethernet network switch that is listed as part of the controls system for the application.
18. Prior to occupancy the smoke control system shall be undergo operational testing according to IBC/IFC 909.20.3 which shall include all equipment such as initiating devices, fans, dampers, controls, doors and windows.
19. Smoke Control systems and associated components shall meet required UL-864 ratings and requirements of Section 909 of the Indiana Building Code.

D. ASHRAE 135 Protocol:
1. ASHRAE 135 communication protocol shall be sole and native protocol used on throughout the entire DDC system.
2. DDC system shall not require use of gateways to integrate HVAC equipment and other building systems and equipment not required to use ASHRAE 135 protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write serviced indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

2.2 DDC EQUIPMENT

A. Operator Interface Via Web Browser
1. Furnish one compact Web server interface as shown on the system drawings. Operators shall be able to access all necessary operational information in the system via personal computer utilizing standard Web browser software. Computer and Web browsing software shall not be furnished under this section. The Web server shall reside on the same Peer-to-Peer network as the Building Controllers.
2. Web Server shall connect via Ethernet to a LAN and be able to serve up controller information to simultaneous operators connected via the Ethernet or telephone with

standard Web Browsers. Each standard browser connected to server shall be able to access all system information.

3. In addition to the primary operator interface, the system shall include a secondary interface compatible with a locally available commercial wireless network and viewable on a commercially available wireless device such as a Wireless Access Protocol (WAP) enabled cellular telephone or personal digital assistant (PDA). This secondary interface may be text-based and shall provide a summary of the most important data.

B. Web Server Hardware:

1. Furnish one compact Web server router with ethernet port for operator computer access. The web server shall have an integrated RS-485 port for connection to the peer to peer controller network. The web server shall not require a permanent keyboard or monitor, however shall have an integrated terminal port for connecting a terminal and keyboard during installation and configuration. The Web server shall allow file transfer of files from another system for use as graphics backgrounds or custom displays.

C. Web Browser Interaction

1. The Web server shall be capable of providing the operator, at a Web Browser, with both tabular or graphical pages of controller data. An operator with the proper password level shall be able to change setpoint and occupancy schedules or override points and remove overrides. Dynamic objects shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation by shifting image files based on the status of the object.
2. Custom Graphics: Custom graphic files may be created with the use of a graphics generation package. Graphics may be downloaded to the Web server to use as graphical backgrounds for Dynamic data sent to a Web browser.
3. Graphics Library: Furnish a library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. The library shall be furnished in a file format compatible with the graphics generation package program. Upon connection to the controls system the Web Server shall have the capability to learn the controls system and automatically present default web pages for each controller found.
4. Alarms. An operator shall be able to access a tabular listing of the systems most recent alarm messages from a standard Web browser. This listing shall allow the operator to manage the alarms and acknowledge, print, delete and hyperlink to trouble areas.
5. Display Information. An operator shall have the capability to perform setup of the Web Server from a standard Web browser. Setup shall include learning new controllers that are added to the controls system, setting the time in controllers and changing the display units of the data presented between Metric and Imperial units.

D. Performance Standards

1. System shall conform to the following minimum standards over network connections.
    a. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
    b. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 10 sec. and shall automatically refresh every 15 sec.

c. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 10 sec.
d. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
e. Alarm Response Time. An object that goes into alarm shall be annunciated at the web browser within 15 sec.

E. Operator Functions
1. Operator interface shall allow each authorized operator to execute the following functions as a minimum:
a. Log In and Log Out. System shall require user name and password to log in to operator interface.
b. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.
c. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.
d. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.
e. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.
f. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.
g. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.
h. Manage Control System Hardware. Operators shall be able to view controller status and download new control modifications to each controller.
i. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

F. System Software
1. Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems shall be Microsoft Windows (current version).
2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water

and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
d. Format. Graphics shall be saved in an industry-standard format such as JPEG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

G. System Tools

1. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.
   a. Automatic System Database Configuration. Each web server shall store on its hard disk a copy of the current system database. Stored database shall be easily updated with each system configuration or controller firmware or software change.
   b. Controller Download. Operators shall be able to download configuration from the system database to each controller.
   c. System Configuration. Operators shall be able to configure the system.
   d. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.
   e. Security. System shall require a user name and password to view, edit, add, or delete data.

      1) Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object. Authorized operators shall be able to vary and deny each operator's accessible functions based on equipment or geographic location.
      2) Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
      3) Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

2. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).
3. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Points List. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
4. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.
5. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, display messages, send e-mail, send page, and audibly annunciate.
6. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.
7. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Points List. Trends shall be BACnet trend objects.
8. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu or on graphics.
9. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
10. Standard Reports. Furnish the following standard system reports:

    a. Reports shall be filtered based upon the selected equipment
    b. Alarm Reports
        - Alarm Summary - Current alarms
        - Alarm Sources – List of equipment and associated alarm conditions
        - Alarm Actions – Configured alarm actions such as e-mail and alarm pop-up
    c. Schedule Reports
        - Effective Schedules – Displays effective schedules for each equipment
        - Schedule Instances – Displays all schedules entered
    d. Security Reports – Maintains audit of all actions taken through user interface
    e. Commissioning Reports – Provide equipment checkout status and notes
    f. Equipment Reports – Provide reports showing trended points and available network points.

11. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, then organize the data and present results in tabular or graphical format. Reports shall be launched from the operator interface.

12. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.
13. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

H. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.
    b. Discrete/digital, analog, and pulse I/O.
    c. Monitoring, controlling, or addressing data points.
    d. Software applications, scheduling, and alarm processing.
    e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

3. Standard Application Programs:

    a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.
    b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
    c. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.
    d. Remote communications.
    e. Maintenance management.
    f. Units of Measure: Inch-pound and SI (metric).

4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
5. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

I. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.
    b. Discrete/digital, analog, and pulse I/O.
    c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

J. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

K. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

L. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.3 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
4. Enclosure: Dustproof rated for operation at 32 to 120 deg F.

2.4 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F, and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

E. Receiver Controllers: Single- or multiple-input models with control-point adjustment, direct or reverse acting with mechanical set-point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.

1. Remote-control-point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 psig.
2. Proportional band shall extend from 2 to 20 percent for 5 psig.
3. Authority shall be 20 to 200 percent.

4. Air-supply pressure of 18 psig, input signal of 3 to 15 psig, and output signal of zero to supply pressure.
5. Gages: 2-1/2 inches in diameter, 2.5 percent wide-scale accuracy, and range to match transmitter input or output pressure.

2.5 TIME CLOCKS

A. Manufacturers:
1. Precision Controls, Inc.
2. Approved equal.

B. Solid-state, programmable time control with 8 separate programs each with up to 100 on-off operations; 1-second resolution; lithium battery backup; keyboard interface and manual override; individual on-off-auto switches for each program; 365-day calendar with 20 programmable holidays; choice of fail-safe operation for each program; system fault alarm; and communications package allowing networking of time controls and programming from PC.

2.6 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Manufacturers:

a. ACI
b. BEC Controls Corporation.
c. Ebtron, Inc.
d. Heat-Timer Corporation.
e. I.T.M. Instruments Inc.
f. Johnson Controls
g. MAMAC Systems, Inc.
h. RDF Corporation.
i. Trane.

2. Accuracy: Plus or minus 0.5 deg F at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft..
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. RTDs and Transmitters:

1. Manufacturers:

a. BEC Controls Corporation.
b. MAMAC Systems, Inc.
c. Johnson Controls
d. RDF Corporation.
e. Trane.

2. Accuracy: Plus or minus 0.2 percent at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft..
5. Averaging Elements in Ducts: 24 feet long, flexible; use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
6. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
8. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

D. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:

a. ACI
b. BEC Controls Corporation.
c. General Eastern Instruments.
d. Johnson Controls
e. MAMAC Systems, Inc.
f. ROTRONIC Instrument Corp.
g. TCS/Basys Controls.
h. Vaisala.
i. Trane.

2. Accuracy: 2 percent full range with linear output.
3. Room Sensor Range: 20 to 80 percent relative humidity.
4. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
5. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of minus 22 to plus 185 deg F.
6. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:

1. Manufacturers:

a. ACI
b. BEC Controls Corporation.
c. General Eastern Instruments.
d. Johnson Controls.
e. MAMAC Systems, Inc.
f. ROTRONIC Instrument Corp.
g. TCS/Basys Controls.
h. Vaisala.
i. Veris.

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
b. Output: 4 to 20 mA.
c. Building Static-Pressure Range: 0- to 0.25-inch wg.
d. Duct Static-Pressure Range: 0- to 5-inch wg.

3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

F. Room Sensor Cover Construction: Manufacturer's standard locking covers.

1. Set-Point Adjustment: Concealed.
2. Set-Point Indication: Concealed.
3. Thermometer: Concealed.
4. Color: To be selected by architect from manufacturers standard colors.
5. Orientation: Horizontal.

G. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.
2. Guards: Locking, solid metal, ventilated.
3. Adjusting Key: As required for calibration and cover screws.

2.7 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

1. Manufacturers:

a. BEC Controls Corporation.
b. I.T.M. Instruments Inc.

2.8 GAS DETECTION EQUIPMENT

A. Manufacturers:

1. B. W. Technologies.
2. CEA Instruments, Inc.
3. Ebtron, Inc.
4. Gems Sensors Inc.
5. Greystone Energy Systems Inc.
6. INTEC Controls, Inc.
7. I.T.M. Instruments Inc.
8. Johnson Controls
9. MSA Canada Inc.
10. QEL/Quatrosense Environmental Limited.
11. Sauter Controls Corporation.
12. Sensidyne, Inc.
13. TSI Incorporated.
14. Vaisala.
15. Vulcain Inc.

B. Carbon Monoxide Detectors: Single or multichannel, dual-level detectors using solid-state plug-in sensors with a 3-year minimum life; suitable over a temperature range of 32 to 104 deg F; with 2 factory-calibrated alarm levels at 35 and 200 ppm.

C. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

2.9 THERMOSTATS

A. Manufacturers:

1. Erie Controls.
2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
3. Johnson Controls
4. Sauter Controls Corporation.
5. tekmar Control Systems, Inc.
6. Theben AG - Lumilite Control Technology, Inc.
7. Trane.

B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F set-point range, and 2 deg F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

D. Lockable Thermostat Covers: Metal Thermostat Guard, probe resistant, with lockable cover for installation in security areas as indicated on the Construction Drawings.

E. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.

6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

F. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

G. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable set point in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

H. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

I. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic- reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

J. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

2.10 HUMIDISTATS

A. Manufacturers:

1. MAMAC Systems, Inc.
2. Johnson Controls
3. ROTRONIC Instrument Corp.
4. Trane.

B. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.11 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:
   a. Belimo Aircontrols (USA), Inc.
   b. Johnson Controls
   c. Or approved equal

2. Actuators associated with the Smoke Control System shall meet all required stated in Part 2.1 of this specification and all applicable codes.

3. Valves: Size for torque required for valve close off at maximum pump differential pressure.
4. Dampers: Size for running torque calculated as follows:

   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

5. Coupling: V-bolt and V-shaped, toothed cradle.
6. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
7. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
8. Power Requirements (Two-Position Spring Return): 24-V ac.
9. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
10. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
11. Temperature Rating: 40 to 104 deg F.

12. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
13. Run Time: 12 seconds open, 5 seconds closed.

2.12 CONTROL VALVES

A. Manufacturers:

1. Belimo.
2. Danfoss Inc.; Air Conditioning & Refrigeration Div.
3. Erie Controls.
4. Hayward Industrial Products, Inc.
5. Johnson Controls
6. Magnatrol Valve Corporation.
7. Neles-Jamesbury.
8. Parker Hannifin Corporation; Skinner Valve Division.
9. Sauter Controls Corporation.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.

    a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
    b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 5-psig maximum pressure drop at design flow rate or the following:

    a. Two Position: Line size.
    b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics.
6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

D. Butterfly Valves: 200-psig, 150-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.

1. Body Style: Wafer.
2. Disc Type: Nickel-plated ductile iron.
3. Sizing: 1-psig maximum pressure drop at design flow rate.

E. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
2. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head.
3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

F. Self-Contained Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
2. Thermostatic Operator: Wax-filled integral sensor with integral adjustable dial.

2.13 DAMPERS

A. Manufacturers:

1. Air Balance Inc.
2. Don Park Inc.; Autodamp Div.
3. Greenheck.
4. Johnson Controls
5. Ruskin.
6. TAMCO (T. A. Morrison & Co. Inc.).
7. United Enertech Corp.
8. Vent Products Company, Inc.

B. Dampers: AMCA-rated, opposed-blade design; 0.108-inch-minimum thick, galvanized-steel or 0.125-inch-minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch-thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.

1. Secure blades to 1/2-inch-diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.

C. Dampers associated with the smoke control system shall meet all requirements indicated in Part 2.1 of this specification and all applicable codes.

2.14 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 27 Section "Communications Copper Horizontal Cabling."

B. All control cable associated with the Smoke Control System shall be in conduit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

B. Verify that duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation indicated on drawings.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install guards on thermostats in the following locations:

1. Entrances.
2. Public areas.
3. Where indicated.

E. Install automatic dampers according to Division 23 Section "Air Duct Accessories."

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

H. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

I. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

J. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Copper Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Copper Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

F. All wiring associated with the Smoke Control System shall be in conduit.

3.4 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. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
6. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
7. Check temperature instruments and material and length of sensing elements.
8. Check control valves. Verify that they are in correct direction.
9. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

a. Check analog inputs at 0, 50, and 100 percent of span.
b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
c. Check digital inputs using jumper wire.
d. Check digital outputs using ohmmeter to test for contact making or breaking.
e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. 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 three visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

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

B. All training shall be videotaped.

END OF SECTION 230923

SECTION 236423.13 - AIR-COOLED, SCROLL WATER CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes packaged, air-cooled, electric-motor-driven, scroll water chillers.

1.3 DEFINITIONS

A. BAS: Building automation system.

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

C. DDC: Direct digital control.

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

E. GFI: Ground fault interrupt.

F. IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit for a single chiller calculated per the method defined by AHRI 550/590 and referenced to AHRI standard rating conditions.

G. I/O: Input/output.

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

I. NPLV: Nonstandard part-load value. A single number part-load efficiency figure of merit for a single chiller calculated per the method defined by AHRI 550/590 and intended for operating conditions other than the AHRI standard rating conditions.

J. SCCR: Short-circuit current rating.

K. TEAO: Totally enclosed air over.

L. TENV: Totally enclosed nonventilating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include refrigerant, rated capacities, operating characteristics, and furnished specialties and accessories.
2. Performance at AHRI standard conditions and at conditions indicated.
3. Performance at AHRI standard unloading conditions.
4. Minimum evaporator flow rate.
5. Refrigerant capacity of water chiller.
6. Oil capacity of water chiller.
7. Fluid capacity of evaporator.
8. Characteristics of safety relief valves.
9. Force and moment capacity of each piping connection.

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

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

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Structural supports.
b. Piping roughing-in requirements.
c. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
d. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

2. Coordination drawings showing plan, section and elevation views, drawn to.
3. Each view to show screened background with the following:

a. Column grids, beams, columns, and concrete housekeeping pads.
b. Layout with walls, floors, and roofs, including each room name and number.
c. Equipment and products of other trades that are located in vicinity of chillers and part of final installation, such as plumbing systems.

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

C. NOT USED.

D. Installation instructions.

E. Source quality-control reports.

F. Startup service reports.

G. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

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

B. Spare Parts List: Recommended spare parts list with quantity for each.

C. Touchup Paint Description: Detailed description of paint used in application of finish coat to allow for procurement of a matching paint.

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

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Tool kit to include the following:

1. A tool kit specially designed by chiller manufacturer for use in servicing chiller(s) furnished.
2. Special tools required to service chiller components not readily available to Owner service personnel in performing routine maintenance.
3. Lockable case with hinged cover, marked with large and permanent text to indicate the special purpose of tool kit, such as "Chiller Tool Kit." Text size shall be at least 1 inch high.
4. A list of each tool furnished. Permanently attach the list to underside of case cover. Text size shall be at least 1/2 inch high.

B. Touchup Paint: 32 oz. container of paint used for finish coat. Label outside of container with detailed description of paint to allow for procurement of a matching paint in the future.

1.8 QUALITY ASSURANCE

A. AHRI Certification: Certify chiller according to AHRI 590 certification program.

1.9 DELIVERY, STORAGE, AND HANDLING

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

B. Package water chiller for export shipping.

1.10 WARRANTY

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

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

a. Complete chiller including refrigerant and oil charge.
b. Complete compressor and drive assembly including refrigerant and oil charge.
c. Refrigerant and oil charge.

1) Loss of refrigerant charge for any reason due to manufacturer's product defect and product installation.

d. Parts and labor.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NOT USED

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

C. AHRI Rating: Rate water chiller performance according to requirements in AHRI 550/590.

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

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

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

G. Comply with NFPA 70.

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

I. Operation Following Loss of Normal Power:

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

J. Outdoor Installations:

1. Chiller shall be suitable for outdoor installation indicated. Provide adequate weather protection to ensure reliable service life over a 25-year period with minimal degradation due to exposure to outdoor ambient conditions.
2. Chillers equipped to provide safe and stable operation while achieving performance indicated when operating at extreme outdoor temperatures encountered by the installation. Review historical weather database and provide equipment that can operate at extreme outdoor temperatures recorded over past 30-year period.

2.2 MANUFACTURERS

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

1. Carrier Global Corporation.
2. Daikin Applied.
3. Trane.
4. YORK; brand of Johnson Controls International plc, Building Solutions North America.
5. Dunham-Bush.

2.3 MANUFACTURED UNITS

A. Description: Factory-assembled and run-tested water chiller complete with compressor(s), compressor motors and motor controllers, evaporator, condenser with fans, electrical power, controls, and indicated accessories.

B. Sound-reduction package shall have the following:

1. Acoustic enclosure around compressors.
2. Reduced-speed fans with acoustic treatment.

3. Designed to reduce sound level without affecting performance.

C. Security Package: Security grilles with fasteners for additional protection of compressors, evaporator, and condenser coils. Grilles shall be coated for corrosion resistance and shall be removable for service access.

2.4 CABINET

A. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.

B. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.

C. Casing: Galvanized steel.

D. Finish: Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 500-hour salt-spray test according to ASTM B117.

2.5 COMPRESSOR-DRIVE ASSEMBLIES

A. Compressors:

1. Description: Positive-displacement direct drive with hermetically sealed casing.
2. Each compressor provided with suction and discharge service valves, crankcase oil heater, and suction strainer.

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

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

    a. Digital compressor unloading is an acceptable alternative to achieve capacity control.

5. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug or removable magnet in sump, and initial oil charge.

    a. Manufacturer's other standard methods of providing positive lubrication are acceptable in lieu of an automatic pump.

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

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

B. Compressor Motors:

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

C. Compressor Motor Controllers:

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

2.6 REFRIGERATION

A. Refrigerant: Refer to drawings.

B. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.

C. Refrigerant Circuit: Each circuit shall include an electronic-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.

D. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid-line to allow the isolation and storage of the refrigerant charge in the chiller condenser.

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

E. Pressure Relief Device:

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

2.7 EVAPORATOR

A. Brazed-plate or shell-and-tube design, as indicated.

B. Brazed Plate:

1. Direct-expansion, single-pass, brazed-plate design.
2. Type 304 stainless-steel construction.
3. Code Compliance: Tested according to ASME Boiler and Pressure Vessel Code.
4. Fluid Nozzles: Terminate with mechanical-coupling end connections for connection to field piping. Furnish flange adapters to mate to flanged piping.

5. Inlet Strainer: Factory-furnished, 20-mesh strainer for field installation in supply piping to evaporator. Manufacturer has option to factory install strainer.

C. Flow Switch: Factory-furnished and -installed, thermal-type flow switch wired to chiller operating controls.

D. Heater: Factory-installed and -wired electric heater with integral controls designed to protect the evaporator to minus 20 deg F.

2.8 AIR-COOLED CONDENSER

A. Coil(s) with integral subcooling on each circuit.

B. Aluminum Microchannel Coils:

1. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
2. Single- or multiple-pass arrangement.
3. Construct fins, tubes, and header manifolds of aluminum alloy treated with a corrosion-resistant coating.

C. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

D. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades, arranged for vertical air discharge.

E. Fan Motors: TENV or TEAO enclosure, with sealed and permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.

1. Overcurrent- and thermal-overload protection not integral to motor is acceptable if provided with chiller electrical power package.

F. Fan Guards: Removable steel safety guards with corrosion-resistant coating.

2.9 INSULATION

A. Closed-cell, flexible, elastomeric thermal insulation complying with ASTM C534/C534M, Type I for tubular materials and Type II for sheet materials.

1. Thickness: 3/4 inch.

B. Adhesive: As recommended by insulation manufacturer.

C. Factory-applied insulation over all cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping.

1. Apply adhesive to 100 percent of insulation contact surface.
2. Before insulating steel surfaces, prepare surfaces for paint, and prime and paint as indicated for other painted components. Do not insulate unpainted steel surfaces.
3. Seal seams and joints to provide a vapor barrier.
4. After adhesive has fully cured, paint exposed surfaces of insulation to match other painted parts.
5. Manufacturer has option to factory or field insulate chiller components to reduce potential for damage during installation.
6. Field-Applied Insulation:

    a. Components that are not factory insulated shall be field insulated to comply with requirements indicated.
    b. Manufacturer shall be responsible for chiller insulation whether factory or field installed to ensure that manufacturer is the single point of responsibility for chillers.
    c. Manufacturer's factory-authorized service representative shall instruct and supervise installation of field-applied insulation.
    d. After field-applied insulation is complete, paint insulation to match factory-applied finish.

2.10 ELECTRICAL

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

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

C. House in a unit-mounted, NEMA 250, Type 3R enclosure with hinged access door with lock and key or padlock and key.

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

E. Factory wiring shall be located outside of an enclosure in a metal raceway. Terminal connections shall be made with not more than a 24-inch length of liquid tight or flexible metallic conduit.

F. Field power interface shall be to NEMA KS 1, heavy-duty, nonfused disconnect switch. Minimum SCCR according to UL 508 shall be as required by electrical power distribution system, but not less than 42,000 A.

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

H. Each motor shall have overcurrent protection.

I. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.

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

K. Power Factor Correction: Capacitors to correct power factor to 0.95 at full load.

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

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

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

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

2.11 CONTROLS

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

B. Standalone, microprocessor based, with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.

C. Enclosure: Share enclosure with electrical power devices or provide a separate enclosure of matching construction.

D. Operator Interface: Keypad or pressure-sensitive touch screen. Multiple-character, digital display. Display the following:

1. Date and time.
2. Operating or alarm status.
3. Operating hours.
4. Outside-air temperature if required for chilled-water reset.
5. Temperature and pressure of operating set points.
6. Chilled-water entering and leaving temperatures.
7. Refrigerant pressures in evaporator and condenser.
8. Saturation temperature in evaporator and condenser.
9. No cooling load condition.
10. Elapsed time meter (compressor run status).
11. Pump status.
12. Antirecycling timer status.
13. Percent of maximum motor amperage.
14. Current-limit set point.
15. Number of compressor starts.

16. Alarm history with retention of operational data before unit shutdown.
17. Superheat.

E. Control Functions:

1. Manual or automatic startup and shutdown time schedule.
2. Capacity control based on evaporator leaving-fluid temperature.
3. Capacity control compensated by rate of change of evaporator entering-fluid temperature.
4. Chilled-water entering and leaving temperatures, control set points, and motor load limit. Chilled-water leaving temperature shall be reset based on return-water temperature.
5. Current limit and demand limit.
6. Condenser-water temperature.
7. External water chiller emergency stop.
8. Antirecycling timer.
9. Automatic lead-lag switching.
10. Ice-building mode.

F. Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:

1. Low evaporator pressure or high condenser pressure.
2. Low chilled-water temperature.
3. Refrigerant high pressure.
4. High or low oil pressure.
5. High oil temperature.
6. Loss of chilled-water flow.
7. Loss of condenser-water flow.
8. Control device failure.

G. BAS System Interface: Factory-install hardware and software to enable system to monitor, control, and display chiller status and alarms.

1. Hardwired I/O Points:

a. Monitoring: On/off status, common trouble alarm.
b. Control: On/off operation, chilled-water discharge temperature set-point adjustment.

H. Factory-installed wiring outside of enclosures shall be in NFPA 70-complaint raceway. Make terminal connections with liquid tight or flexible metallic conduit.

2.12 ACCESSORIES

A. Factory-furnished neoprene pad for field installation.

2.13 CAPACITIES AND CHARACTERISTICS

A. Capacity: Refer to drawings for capacity.

B. Low Ambient Operation: Chiller designed for operation to 0 deg F.

C. High Ambient Operation: Chiller designed for operation to 115 deg F.

2.14 MATERIALS

A. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653/A653M.

D. Aluminum: ASTM B209.

2.15 SOURCE QUALITY CONTROL

A. Water chillers to be AHRI certified.

B. For water chillers located outdoors, rate sound power level according to AHRI 370 procedure.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

3.2 WATER CHILLER INSTALLATION

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

B. Coordinate sizes, locations, and anchoring attachments of structural-steel support structures with actual equipment provided.

C. Install water chillers on support structure indicated.

D. Equipment Mounting:

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

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

F. Maintain clearances required by governing code.

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

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

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

3.3 PIPING CONNECTIONS

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

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

C. Connect each chiller vent connection with an automatic vent, full size of vent connection.

3.4 ELECTRICAL POWER CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Provide nameplate for each electrical connection indicating electrical equipment designation and circuit number feeding connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high. Locate nameplate where easily visible.

3.5 CONTROLS CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between chillers and other equipment to interlock operation as required to provide a complete and functioning system.

C. Connect control wiring between chiller control interface and DDC system for remote monitoring and control of chillers. Comply with requirements in Section 230923 "Direct Digital Control (DDC) System for HVAC."

D. Provide nameplate on face of chiller control panel indicating control equipment designation serving chiller and the I/O point designation for each control connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

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

C. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

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

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

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

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water chillers. Video record the training sessions and provide electronic copy to Owner.

1. Instructor shall be factory trained and certified.
2. Provide not less than eight hours of training.
3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
4. Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
5. Obtain Owner sign-off that training is complete.
6. Owner training shall be held at Project site.

END OF SECTION 236423.13

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SECTION 237313.13 - INDOOR, BASIC AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Indoor, basic air-handling units.
2. Unit casings.
3. Fan, drive, and motor section.
4. Coil section.
5. Air filtration section.
6. Dampers.

1.2 ACTION SUBMITTALS

A. Product Data: For each air-handling unit.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Include unit dimensions and weight.
4. Include cabinet material, metal thickness, finishes, insulation, and accessories.
5. Fans:

    a. Include certified fan-performance curves with system operating conditions indicated.
    b. Include certified fan-sound power ratings.
    c. Include fan construction and accessories.
    d. Include motor ratings, electrical characteristics, and motor accessories.

6. Include certified coil-performance ratings with system operating conditions indicated.
7. Include filters with performance characteristics.
8. Include dampers, including housings, linkages, and operators.

B. Shop Drawings: For each type and configuration of indoor, basic, air-handling unit.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of indoor, basic air-handling units, as well as procedures and diagrams.

4. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittal: For vibration isolation, supports, and seismic restraints indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for selecting vibration isolators, supports, and for designing vibration isolation bases.

1.3 INFORMATIONAL SUBMITTALS

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

B. Source quality-control reports.

C. Startup service reports.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) for each air-handling unit.
2. Gaskets: One set(s) for each access door.
3. Fan Belts: One set(s) for each air-handling unit fan.

1.6 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of indoor, basic, air-handling units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Manufacturer's standard, but not less than one year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

"ASHRAE/IES 90.1 Compliance" Paragraph below may be required to comply with Project requirements or authorities having jurisdiction. Sustainable design may require minimum efficiency equal to requirements in ASHRAE/IES 90.1.

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

E. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design vibration isolation, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

F. Structural Performance: Casing panels are to be self-supporting and capable of withstanding positive/negative 4-inch wg of internal static pressure, without exceeding a midpoint deflection of 0.005 inches/inch of panel span.

2.2 CAPACITIES AND CHARACTERISTICS

A. Refer to Mechanical Equipment Schedules for additional information.

2.3 INDOOR, BASIC AIR-HANDLING UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. York, a Johnson Controls company.
   2. Trane.
   3. Carrier Corporation.
   4. Daikin Applied.
   5. Dunham-Bush.

B. Unit Casings:

   1. General Fabrication Requirements for Casings:

a. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
b. Joints: Sheet metal screws or pop rivets.
c. Sealing: Seal all joints with water-resistant sealant. Hermetically seal at each corner and around entire perimeter.

2. Double-Wall Construction:

a. Outside Casing Wall: Galvanized steel, minimum 18 gauge thick, with manufacturer's standard finish.
b. Inside Casing Wall: G90 galvanized steel, solid, minimum 18 gauge thick.
c. Floor Plate: G90 galvanized steel, treadplate, minimum 18 gauge (1.3 mm) thick.
d. Casing Insulation:

1) Materials: Glass-fiber blanket or board insulation, Type I or Type II ASTM C1071 or injected polyurethane foam insulation.
2) Casing Panel R-Value: Minimum 12.
3) Insulation Thickness: 2 inches.
4) Thermal Break: Provide continuity of insulation with no through-casing metal in casing walls, floors, or roofs of air-handling unit.

3. Airstream Surfaces: Surfaces in contact with airstream are to comply with requirements in ASHRAE 62.1.

4. Panels and Doors:

a. Panels:

1) Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
2) Fasteners: Two or more camlock type for panel lift-out operation. Arrangement is to allow panels to be opened against airflow.
3) Gasket: Neoprene, applied around entire perimeters of panel frames.
4) Size: Large enough to allow unobstructed access for inspection and maintenance of air-handling unit's internal components. At least 18 inches wide by full height of unit casing up to a maximum height of 72 inches.

b. Doors:

1) Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
2) Hinges: A minimum of two ball-bearing hinges or stainless steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against airflow. Provide safety latch retainers on doors so that doors do not open uncontrollably.
3) Gasket: Neoprene, applied around entire perimeters of frame.
4) Size: Large enough to allow for unobstructed access for inspection and maintenance of air-handling unit's internal components. At least 18 inches wide by full height of unit casing up to a maximum height of 60 inches

c. Locations and Applications:

1) Fan Section: Doors.
2) Coil Section: Panels.
3) Access Section: Doors.
4) Access Sections Immediately Upstream and Downstream of Coil Sections: Doors.
5) Damper Section: Doors.
6) Filter Section: Doors large enough to allow periodic removal and installation of filters.
7) Mixing Section: Doors.

5. Condensate Drain Pans:

a. Location: Each type of cooling coil.
b. Construction:

1) Single-wall, stainless steel sheet.

c. Drain Connection:

1) Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.
2) Minimum Connection Size: NPS 2.

d. Slope: Minimum 0.125 in./ft. slope, to comply with ASHRAE 62.1, in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers, and to direct water toward drain connection.
e. Length: Extend drain pan downstream from leaving face for distance to comply with ASHRAE 62.1.
f. Width: Entire width of water producing device.
g. Depth: A minimum of 2 inches deep.

C. Fan, Drive, and Motor Section:

1. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.
2. Fans: Centrifugal, galvanized steel; mounted on solid-steel shaft.

a. Shafts: With field-adjustable alignment.

1) Turned, ground, and polished hot-rolled steel with keyway.

b. Shaft Bearings:

1) Heavy-duty, self-aligning, pillow-block type with an L-50 rated life of minimum 200,000 hours in accordance with ABMA 9.

c. Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.

1) Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.

d. Housings, Plenum Fans: Steel frame and panel; fabricated without fan scroll and volute housing. Provide inlet screens for Type SWSI fans.
e. Forward-Curved, Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; steel hub swaged to backplate and fastened to shaft with setscrews.
f. Airfoil, Centrifugal Fan Wheels (Plenum Fan Wheels): Smooth-curved inlet flange, backplate, and hollow die-formed airfoil-shaped blades continuously welded at tip flange and backplate; steel hub riveted to backplate and fastened to shaft with setscrews.
g. Mounting: For internal vibration isolation. Factory-mount fans with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 1 inch.
h. Shaft Lubrication Lines: Extended to a location outside the casing.
i. Flexible Connector: Factory fabricated with a fabric strip minimum 3-1/2 inches (89 mm) wide, attached to two strips of minimum 2-3/4-inch- (70-mm-) wide by 0.028-inch- (0.7-mm-) thick, galvanized-steel sheet.

1) Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives are to comply with UL 181, Class 1.

3. Drive, Direct: Factory-mounted, direct drive.
4. Drive, Belt: Factory-mounted, V-belt drive, with adjustable alignment and belt tensioning, and with 1.25 service factor based on fan motor.

a. Pulleys: Cast iron or cast steel with split, tapered bushing, dynamically balanced at the factory.
b. Belts: Oil resistant, non-sparking and nonstatic; in matched sets for multiple-belt drives.
c. Belt Guards: Comply with requirements specified by OSHA and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards"; 0.146-inch-thick, 3/4-inch diamond-mesh wire screen, welded to steel angle frame; prime coated.

5. Motors:

a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230500 "Common Work Results for HVAC."
b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
c. Enclosure Type: Totally enclosed, fan cooled.

d. Efficiency: Premium efficient as defined in NEMA MG 1.
e. NEMA Design: MG 1.
f. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

6. Comply with Section 262923 "Variable-Frequency Motor Controllers."
7. Variable-Frequency Motor Controller: Serving all fans.

a. Manufactured Units: Pulse-width modulated; constant torque and variable torque for inverter-duty motors.
b. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
c. Unit Operating Requirements:

1) Internal Adjustability:

a) Minimum Speed: 5 to 25 percent of maximum rpm.
b) Maximum Speed: 80 to 100 percent of maximum rpm.
c) Acceleration: 0.1 to 999.9 seconds.
d) Deceleration: 0.1 to 999.9 seconds.
e) Current Limit: 30 to minimum of 150 percent of maximum rating.

2) Self-Protection and Reliability Features:

a) Surge suppression.
b) Loss of input signal protection.
c) Under- and overvoltage trips.
d) Variable-frequency motor controller and motor-overload/overtemperature protection.
e) Critical frequency rejection.
f) Loss-of-phase protection.
g) Reverse-phase protection.
h) Motor-overtemperature fault.

3) Bidirectional autospeed search.
4) Torque boost.
5) Motor temperature compensation at slow speeds.

a) Panel-mounted operator station.
b) Historical logging information and displays.
c) Digital indicating devices.

6) Control Signal Interface: Electric.
7) Proportional Integral Directive (PID) control interface.
8) DDC system for HVAC Protocols for Network Communications: ASHRAE 135.

d. Line Conditioning:

1) Input line conditioning.
2) Output filtering.
3) EMI/RFI filtering.

D. Coil Section:

1. General Requirements for Coil Section:

a. Comply with AHRI 410.
b. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
c. Coils are not to act as structural component of unit.

d. Hot-Water Coils: Continuous circuit.

1) Piping Connections: Threaded or Flanged, same end of coil.
2) Tube Material: Copper.
3) Fin Type: Plate.
4) Fin Material: Aluminum.
5) Fin and Tube Joint: Silver brazed.
6) Headers:

a) Cast iron with cleaning plugs and drain and air vent tappings extended to exterior of unit.
b) Seamless copper tube with brazed joints, prime coated.
c) Fabricated steel, with brazed joints, prime coated.
d) Provide insulated cover to conceal exposed outside casings of headers.

7) Frames: Channel frame, minimum 0.052-inch- thick galvanized steel.
8) Coil Working-Pressure Ratings: 200 psig
9) Coating: Corrosion-resistant coating.

2. Cooling Coils:

a. Chilled-Water Coils: Continuous circuit.

1) Piping Connections: Threaded or Flanged, same end of coil.
2) Tube Material: Copper.
3) Fin Type: Plate.
4) Fin Material: Aluminum.
5) Fin and Tube Joint: Silver brazed.
6) Headers:

a) Cast iron with cleaning plugs and drain and air vent tappings extended to exterior of unit.
b) Seamless copper tube with brazed joints, prime coated.
c) Fabricated steel, with brazed joints, prime coated.

d) Provide insulated cover to conceal exposed outside casings of headers.

7) Frames: Channel frame, minimum 0.052-inch- thick galvanized steel.
8) Coil Working-Pressure Ratings: 200 psig
9) Coating: Corrosion-resistant coating.

E. Air Filtration Section:

1. Particulate air filtration is specified in Section 234100 "Particulate Air Filtration."
2. Panel Filters:

a. Description: Pleated factory-fabricated, self-supported disposable air filters with holding frames.
b. Filter Unit Class: UL 900.
c. Media: Interlaced glass, synthetic, or cotton fibers coated with nonflammable adhesive and antimicrobial coating.
d. Filter-Media Frame: High wet-strength beverage board with perforated metal retainer, or metal grid, on outlet side.

3. Side-Access Filter Mounting Frames:

a. Particulate Air Filter Frames: Match inner casing and outer casing material, and insulation thickness. Galvanized steel track.

1) Sealing: Incorporate positive-sealing device to ensure seal between gasketed material on channels to seal top and bottom of filter cartridge frames to prevent bypass of unfiltered air.

F. Dampers:

1. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals in opposed-blade arrangement with zinc-plated steel operating rods rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate is not to exceed 4 cfm/sq. ft. at 1-inch wg and 8 cfm/sq. ft. at 4-inch wg, tested, rated, and labeled in accordance with AMCA 511.
2. Electronic Damper Operators:

a. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
b. Electronic damper position indicator is to have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
c. Operator Motors:

1) Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230500 "Common Work Results for HVAC."
2) Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

3) Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

d. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).
e. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).
f. Size dampers for running torque calculated as follows:

1) Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. (86.8 kg-cm/sq. m) of damper.
2) Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. (62 kg-cm/sq. m) of damper.
3) Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. (49.6 kg-cm/sq. m) of damper.
4) Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. (37.2 kg-cm/sq. m) of damper.
5) Dampers with 2- to 3-Inch wg (500 to 750 Pa) of Pressure Drop or Face Velocities of 1000 to 2500 fpm (5 to 13 m/s): Increase running torque by 1.5.
6) Dampers with 3- to 4-Inch wg (750 to 1000 Pa) of Pressure Drop or Face Velocities of 2500 to 3000 fpm (13 to 15 m/s): Increase running torque by 2.0.

g. Coupling: V-bolt and V-shaped, toothed cradle.
h. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
i. Fail-Safe Operation: Mechanical, spring-return mechanism with external, manual gear release on nonspring-return actuators.
j. Power Requirements (Two-Position Spring Return): 24 V dc.
k. Power Requirements (Modulating): Maximum 10 VA at 24 V ac or 8 W at 24 V dc.
l. Proportional Signal: 2 to 10 V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
m. Temperature Rating: Minus 22 to plus 122 deg F
n. Run Time: 12 seconds open, 5 seconds closed.

3. Mixing Section: Multiple-blade, air-mixer assembly located immediately downstream of mixing section.
4. Combination Filter and Mixing Section:

a. Cabinet support members are to hold 2-inch- thick, pleated, flat, permanent or throwaway filters.

G. Air Blenders:

1. Multiple-blade, air-mixer assembly is to mix air to prevent stratification, located immediately downstream of mixing box.

H. Materials:

1. Steel:

a. ASTM A36/A36M for carbon structural steel.
b. ASTM A568/A568M for steel sheet.

2. Stainless Steel:

a. Manufacturer's standard grade for casing.
b. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.

3. Galvanized Steel: ASTM A653/A653M.
4. Aluminum: ASTM B209.

a. Standards:

1) ASTM B117 for salt spray.
2) ASTM D2794 for minimum impact resistance of 100 in-lb (11.3 N-m).
3) ASTM B3359 for cross hatch adhesion of 5B.

b. Application: Immersion.
c. Thickness: 1 mil.
d. Gloss: Minimum gloss of 60 on a 60-degree meter.

I. Factory installed LED lights.

2.4 SOURCE QUALITY CONTROL

A. AHRI 430 Certification: Test, rate, and label air-handling units and their components in accordance with AHRI 430.

B. AHRI 260 or AMCA 311 Sound Performance Rating Certification: Test, rate, and label in accordance with AHRI 260 or AMCA 311.

C. Fan Aerodynamic Performance Rating: Factory test and rate fan performance for airflow, pressure, power, air density, rotation speed, and efficiency in accordance with AMCA 210.

D. Fan Energy Index (FEI): Test in accordance with AMCA 210 and rate in accordance with AMCA 99, AMCA 207, and AMCA 208.

E. Fan Operating Limits: Classify fans in accordance with AMCA 99, Section 14.

F. Water Coils: Factory tested to 300 psig (2070 kPa) in accordance with AHRI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Replace with new insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

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

3.2 INSTALLATION OF INDOOR, BASIC AIR-HANDLING UNITS

A. Equipment Mounting:

1. Install air-handling units on cast-in-place concrete equipment bases. Coordinate sizes and locations of concrete bases with actual equipment provided. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.

D. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

3.3 PIPING CONNECTIONS

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

B. Where installing piping adjacent to air-handling unit, allow for service and maintenance.

C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4, ASTM B88, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Hot- and Chilled-Water Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

3.4 ELECTRICAL CONNECTIONS

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

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

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
   1. Nameplate is to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

E. Where indicated, provide circuit for factory installed LED lights and outlets.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

   1. Complete installation and startup checks in accordance with manufacturer's written instructions.
   2. Verify that shipping, blocking, and bracing are removed.
   3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
   4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.

5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
7. Comb coil fins for parallel orientation.
8. Verify that proper thermal-overload protection is installed for electric coils.
9. Install new, clean filters.
10. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.7 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

C. Occupancy Adjustments: When requested within 12 months from 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.

3.8 CLEANING

A. After completing system installation and testing, adjusting, and balancing of air-handling unit and air-distribution systems, and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
2. Charge refrigerant coils with refrigerant and test for leaks.
3. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Air-handling unit and components will be considered defective if unit or components do not pass tests and inspections.
5. Prepare test and inspection reports.

3.10 DEMONSTRATION

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

END OF SECTION 237313.13

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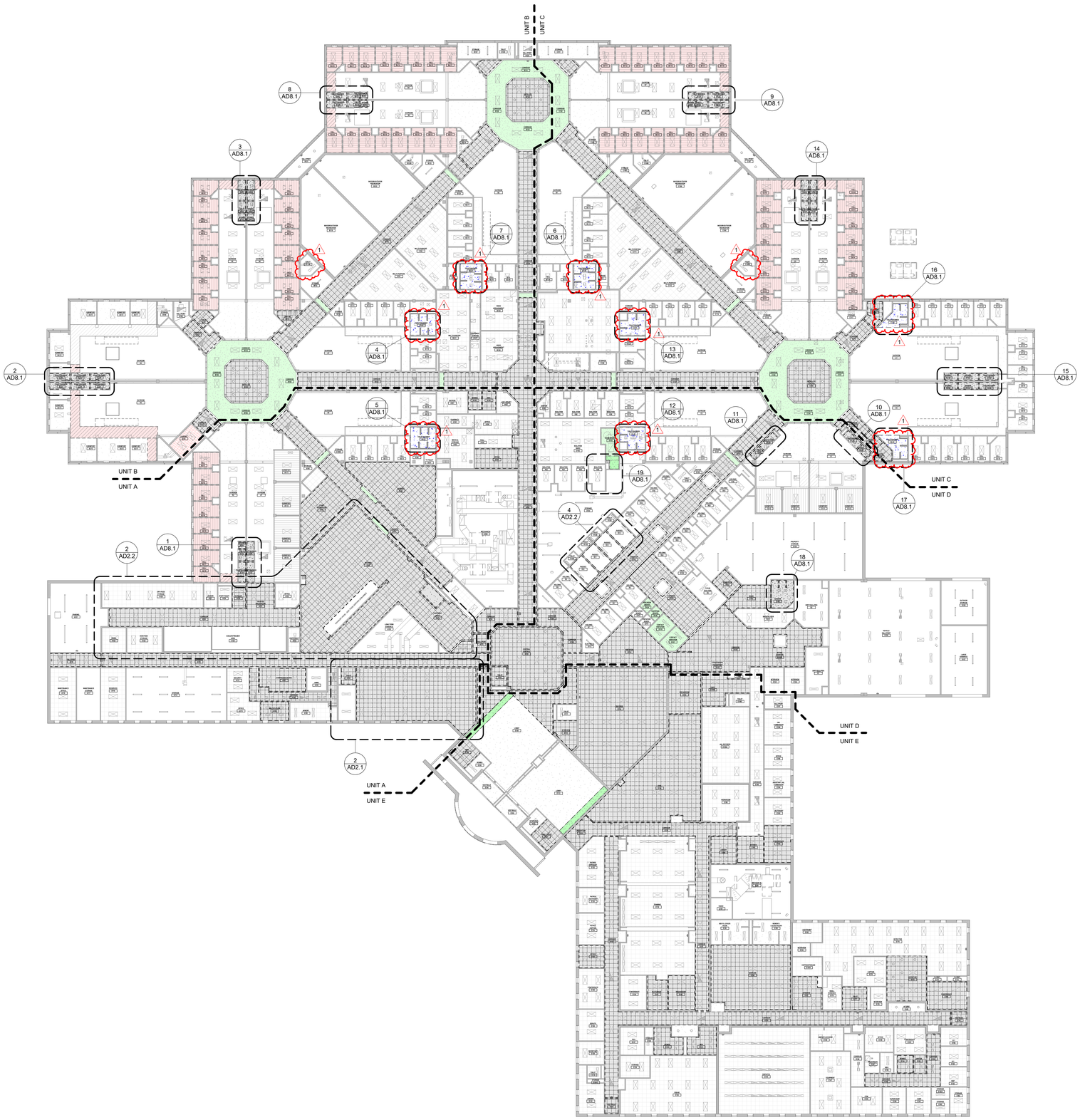


1 OVERALL FIRST FLOOR REFLECTED CEILING PLAN - REMOVAL
SCALE: 1" = 20'-0"

NORTH

CEILING REMOVAL NOTES:

A. REFER TO G1.1 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.

B. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO SELECTIVE DEMOLITION ACTIVITIES.

C. CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING AND PATCHING REQUIRED, INCLUDING ASSOCIATED REPAIR AND FINISHING TO MATCH ADJACENT SURFACES.

D. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY ENVIRONMENTAL CONTROL MEASURES INCLUDING APPLICABLE AIR QUALITY CONTROL MEASURES, DUST CONTROL, EROSION CONTROL, AND OTHER MEASURES REQUIRED FOR PROTECTION OF OCCUPANTS AND PROPERTY DURING SELECTIVE DEMOLITION AND CONSTRUCTION ACTIVITIES.
Z

E. CONTRACTOR IS SOLELY RESPONSIBLE FOR COORDINATING CONTRACT DOCUMENTS WITH FIELD CONDITIONS AND WITH WORK REQUIRED FOR EACH TRADE PRIOR TO BEGINNING WORK.

F. EXISTING TO REMAIN AND/OR SALVAGED ITEMS FOR REINSTALLATION SHALL BE PROTECTED THROUGHOUT THE DURATION OF THE PROJECT. IF ANY EXISTING ITEM IS DAMAGED DURING CONSTRUCTION, IT SHALL BE REPLACED OR RESTORED TO ITS ORIGINAL CONDITION.

G. BUILDING TO REMAIN OCCUPIED DURING CONSTRUCTION. SEQUENCE ALL DEMOLITION ACTIVITIES ACCORDINGLY TO MINIMIZE DISRUPTION OF BUILDING OCCUPANTS.

H. CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL TEMPORARY SHORING AND BRACING REQUIRED TO COMPLETE THE WORK.

I. REMOVE ALL ABANDONED EQUIPMENT, DUCTWORK, PLUMBING, ELECTRICAL, DATA, AND COMMUNICATIONS LINES, DEVICES, AND EQUIPMENT. EXPOSED UTILITIES SHALL BE IDENTIFIED, CAPPED, AND LABELED.

J. CONTRACTOR SHALL TEMPORARILY SUPPORT EXISTING CEILING SYSTEM AND CEILING MOUNTED COMPONENTS TO REMAIN - INCLUDING, BUT NOT LIMITED TO, LIGHTS, DIFFUSERS, SPEAKERS, ETC.

K. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHIC REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.

L. REMOVE PLATE METAL BULKHEADS AS INDICATED AND STORE FOR REFINISHING AND REINSTALLATION.

M. IN ALL DAYROOM TOILET, AND TOILET/SHOWER ROOMS REMOVE EXISTING STAINLESS STEEL COVERS AND BULKHEADS AND STORE FOR REFINISHING AND REINSTALLATION. SEE PHOTOGRAPH 2/A10.1.

DEMOLITION PLAN LEGEND

EXISTING TO BE REMOVED

- 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM - REMOVE COMPLETELY
- GYPSUM BOARD CEILING SYSTEM - REMOVE STUD FRAMING COMPLETELY
- GYPSUM BOARD CEILING SYSTEM - REMOVE AS REQUIRED FOR NEW CONSTRUCTION
- GYPSUM BOARD CEILING SYSTEM W/ SECURITY MESH - REMOVE AS REQUIRED FOR NEW CONSTRUCTION
- EPOXY PAINT ON CONCRETE PLANKING
- PLATE METAL BULKHEAD - REMOVE AS REQUIRED FOR NEW CONSTRUCTION. SALVAGE FOR REINSTALLATION.
- SECURITY PLANK CEILING - REMOVE AS REQUIRED FOR NEW CONSTRUCTION. SALVAGE FOR REINSTALLATION.
- EXISTING WALL TO BE REMOVED
- EXISTING FLOORING MATERIAL TO BE REMOVED - SEE KEYNOTES

EXISTING TO REMAIN

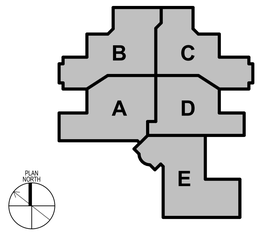
- 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM
- SUSPENDED GYPSUM BOARD CEILING
- PLATE METAL BULKHEAD
- SECURITY PLANK CEILING
- EXP. EXPOSED
- ACCESS PANEL
- EXISTING WALL TO REMAIN

MECHANICAL & ELECTRICAL

- RETURN AIR GRILLE, SEE MECHANICAL
- SUPPLY AIR DIFFUSER, SEE MECHANICAL
- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL

NOTE:
ELEMENTS ON THIS DRAWING ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS DRAWING IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEYPLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

2025 FEBRUARY 25

ERIC B. PATTS
REGISTERED
ARCHITECT
STATE OF INDIANA

NO.	REVISION	DATE
1	Addendum #3	02/26/2025

DRAWN: CAG
DESIGNED: CAG
APPRVD: ESR
DATE: JANUARY 8, 2025
CHK'D: SAC

PROJECT NUMBER 2363-1104-90

PORTER COUNTY BOARD OF COMMISSIONERS
PORTER COUNTY SHERIFF'S OFFICE & JAIL
FACILITY RENOVATIONS
2755 STATE ROAD 49

OVERALL FIRST FLOOR REFLECTED CEILING - REMOVAL

SHEET NUMBER
AD10.1

ARCHITECTURE

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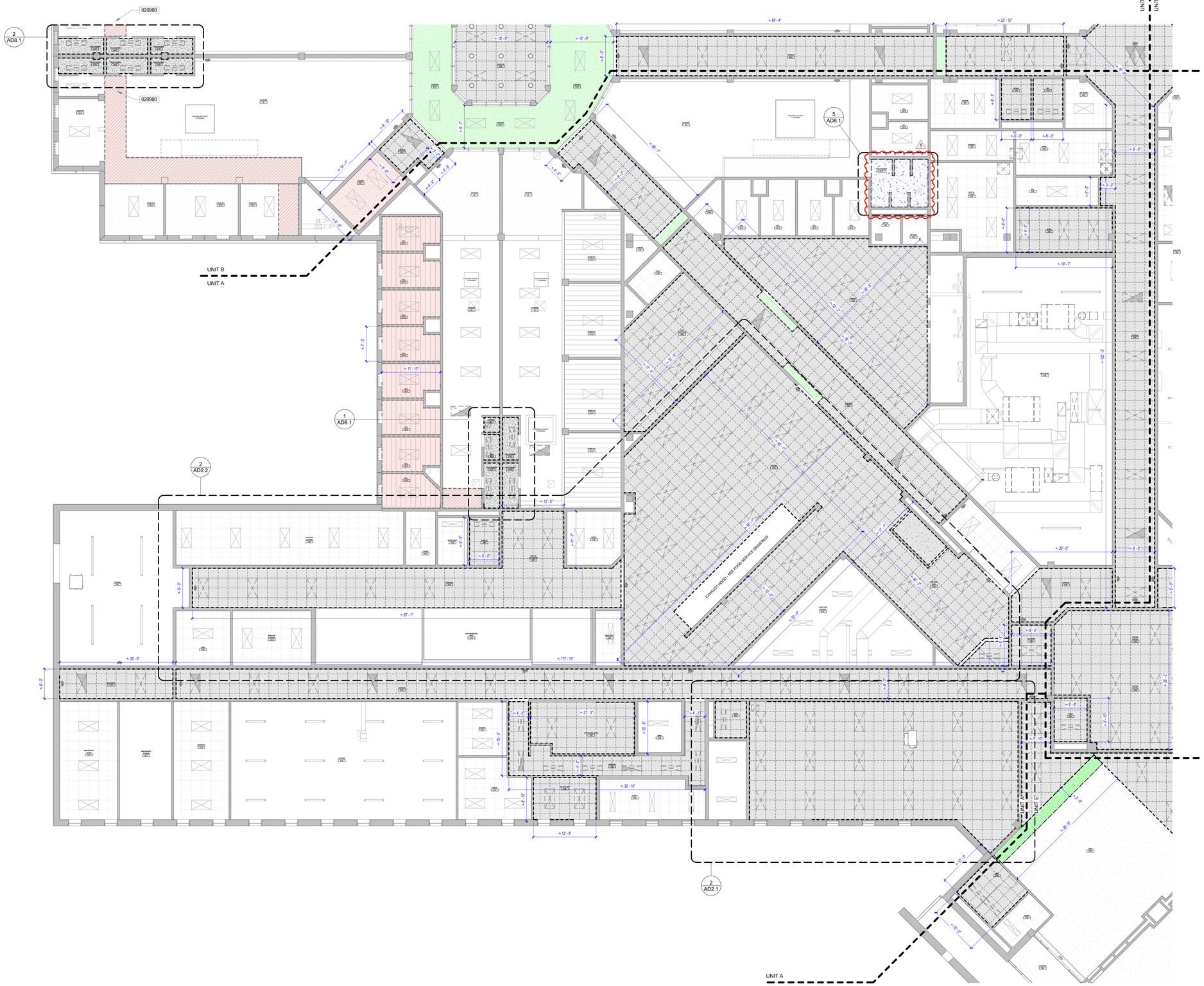

1 FIRST FLOOR REFLECTED CEILING PLAN - REMOVAL - AREA A
SCALE: 1/8" = 1'-0"

NORTH

CEILING REMOVAL NOTES:

A. REFER TO G1.1 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.

B. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO SELECTIVE DEMOLITION ACTIVITIES.

C. CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING AND PATCHING REQUIRED, INCLUDING ASSOCIATED REPAIR AND FINISHING TO MATCH ADJACENT SURFACES.

D. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY ENVIRONMENTAL CONTROL MEASURES INCLUDING APPLICABLE AIR QUALITY CONTROL MEASURES, DUST CONTROL, EROSION CONTROL, AND OTHER MEASURES REQUIRED FOR PROTECTION OF OCCUPANTS AND PROPERTY DURING SELECTIVE DEMOLITION AND CONSTRUCTION ACTIVITIES.

E. CONTRACTOR IS SOLELY RESPONSIBLE FOR COORDINATING CONTRACT DOCUMENTS WITH FIELD CONDITIONS AND WITH WORK REQUIRED FOR EACH TRADE PRIOR TO BEGINNING WORK.

F. EXISTING TO REMAIN AND/OR SALVAGED ITEMS FOR REINSTALLATION SHALL BE PROTECTED THROUGHOUT THE DURATION OF THE PROJECT. IF ANY EXISTING ITEM IS DAMAGED DURING CONSTRUCTION, IT SHALL BE REPLACED OR RESTORED TO ITS ORIGINAL CONDITION.

G. BUILDING TO REMAIN OCCUPIED DURING CONSTRUCTION. SEQUENCE ALL DEMOLITION ACTIVITIES ACCORDINGLY TO MINIMIZE DISRUPTION OF BUILDING OCCUPANTS.

H. CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL TEMPORARY SHORING AND BRACING REQUIRED TO COMPLETE THE WORK.

I. REMOVE ALL ABANDONED EQUIPMENT, DUCTWORK, PLUMBING, ELECTRICAL, DATA, AND COMMUNICATIONS LINES, DEVICES, AND EQUIPMENT. EXPOSED UTILITIES SHALL BE IDENTIFIED, CAPPED, AND LABELED.

J. CONTRACTOR SHALL TEMPORARILY SUPPORT EXISTING CEILING SYSTEM AND CEILING MOUNTED COMPONENTS TO REMAIN - INCLUDING, BUT NOT LIMITED TO, LIGHTS, DIFFUSERS, SPEAKERS, ETC.

K. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHIC REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.

L. REMOVE PLATE METAL BULKHEADS AS INDICATED AND STORE FOR REFINISHING AND REINSTALLATION.

M. IN ALL DAYROOM TOILET, AND TOILET/SHOWER ROOMS REMOVE EXISTING STAINLESS STEEL COVERS AND BULKHEADS AND STORE FOR REFINISHING AND REINSTALLATION. SEE PHOTOGRAPH 2/A10.1.

DEMOLITION PLAN LEGEND

EXISTING TO BE REMOVED

- 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM - REMOVE COMPLETELY
- GYPSUM BOARD CEILING SYSTEM - REMOVE STUD FRAMING COMPLETELY
- GYPSUM BOARD CEILING SYSTEM - REMOVE AS REQUIRED FOR NEW CONSTRUCTION
- GYPSUM BOARD CEILING SYSTEM W/ SECURITY MESH - REMOVE AS REQUIRED FOR NEW CONSTRUCTION
- EPOXY PAINT ON CONCRETE PLANKING 1
- PLATE METAL BULKHEAD REMOVE AS REQUIRED FOR NEW CONSTRUCTION. SALVAGE FOR REINSTALLATION.
- SECURITY PLANK CEILING - REMOVE AS REQUIRED FOR NEW CONSTRUCTION. SALVAGE FOR REINSTALLATION.
- EXISTING WALL TO BE REMOVED
- EXISTING FLOORING MATERIAL TO BE REMOVED - SEE KEYNOTES

EXISTING TO REMAIN

- 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM
- SUSPENDED GYPSUM BOARD CEILING
- PLATE METAL BULKHEAD
- SECURITY PLANK CEILING
- EXP. EXPOSED
- ACCESS PANEL
- EXISTING WALL TO REMAIN

MECHANICAL & ELECTRICAL

- RETURN AIR GRILLE, SEE MECHANICAL
- SUPPLY AIR DIFFUSER, SEE MECHANICAL
- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
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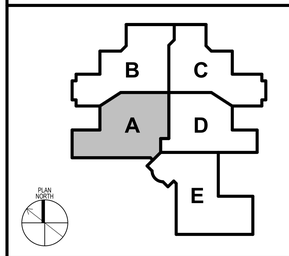

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ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

2025 FEBRUARY 25

NO.	REVISION	DATE
1	Addendum #3	02/26/2025

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PROJECT NUMBER
2363-1104-90

PORTER COUNTY BOARD OF COMMISSIONERS
PORTER COUNTY SHERIFF'S OFFICE & JAIL
FACILITY RENOVATIONS
2755 STATE ROAD 49

FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA A

SHEET NUMBER
AD10.1A

ARCHITECTURE

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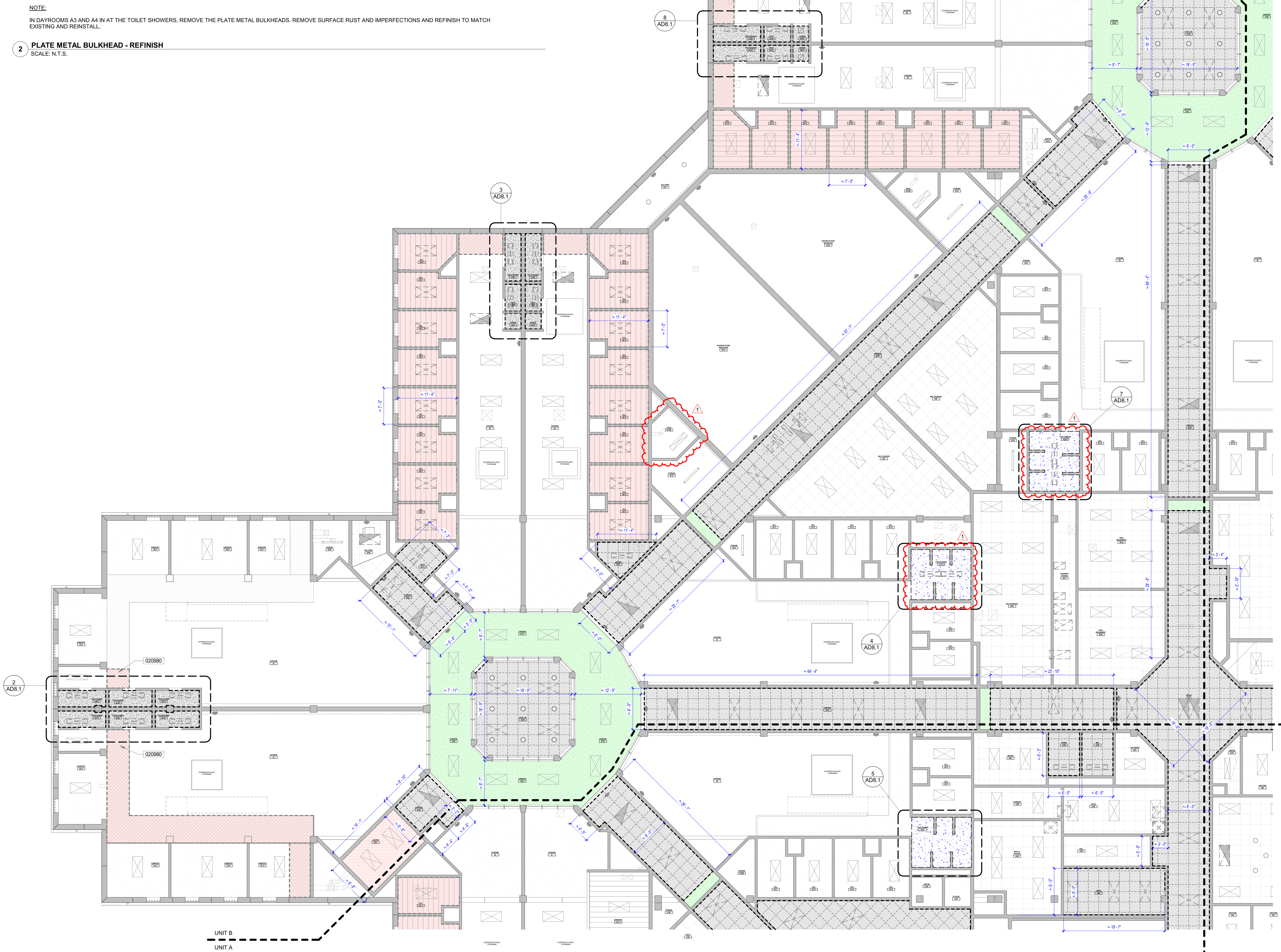
NOTE:

IN DAYROOMS A3 AND A4 IN AT THE TOILET SHOWERS, REMOVE THE PLATE METAL BULKHEADS. REMOVE SURFACE RUST AND IMPERFECTIONS AND REFINISH TO MATCH EXISTING AND REINSTALL.

2 PLATE METAL BULKHEAD - REFINISH
SCALE: N.T.S.



1 FIRST FLOOR REFLECTED CEILING PLAN - REMOVAL - AREA B
SCALE: 1/8" = 1'-0"

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CEILING REMOVAL NOTES:

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Z

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DEMOLITION PLAN LEGEND

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MECHANICAL & ELECTRICAL

- RETURN AIR GRILLE, SEE MECHANICAL
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- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
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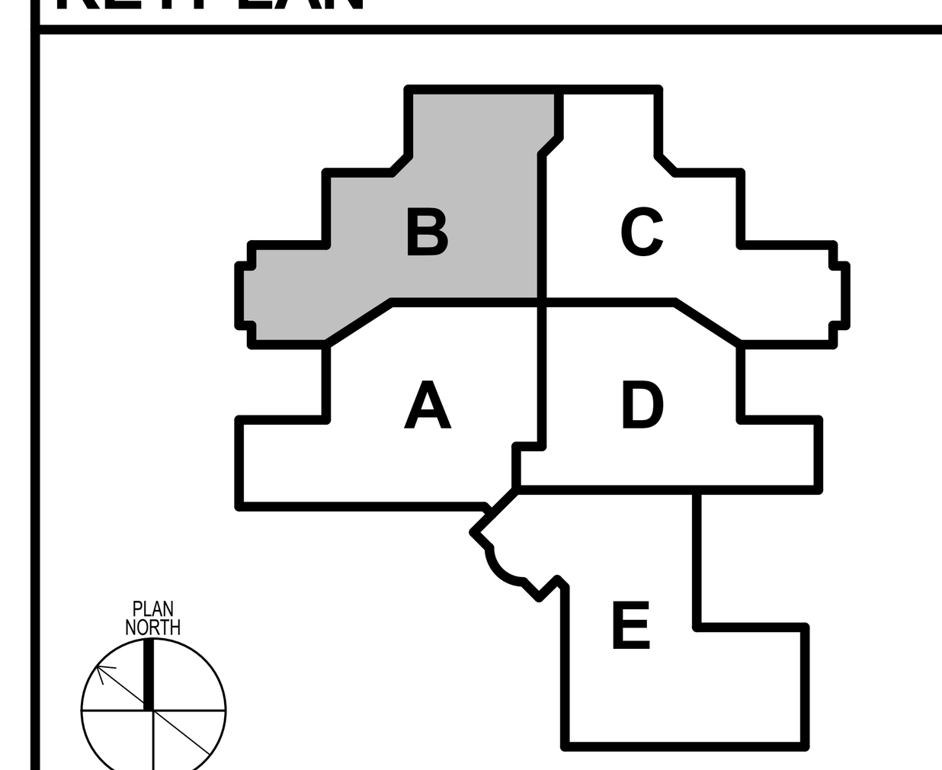

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ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

2025 FEBRUARY 25

ERIC B. RATTS REGISTERED No. AR19500134 STATE OF INDIANA ARCHITECT

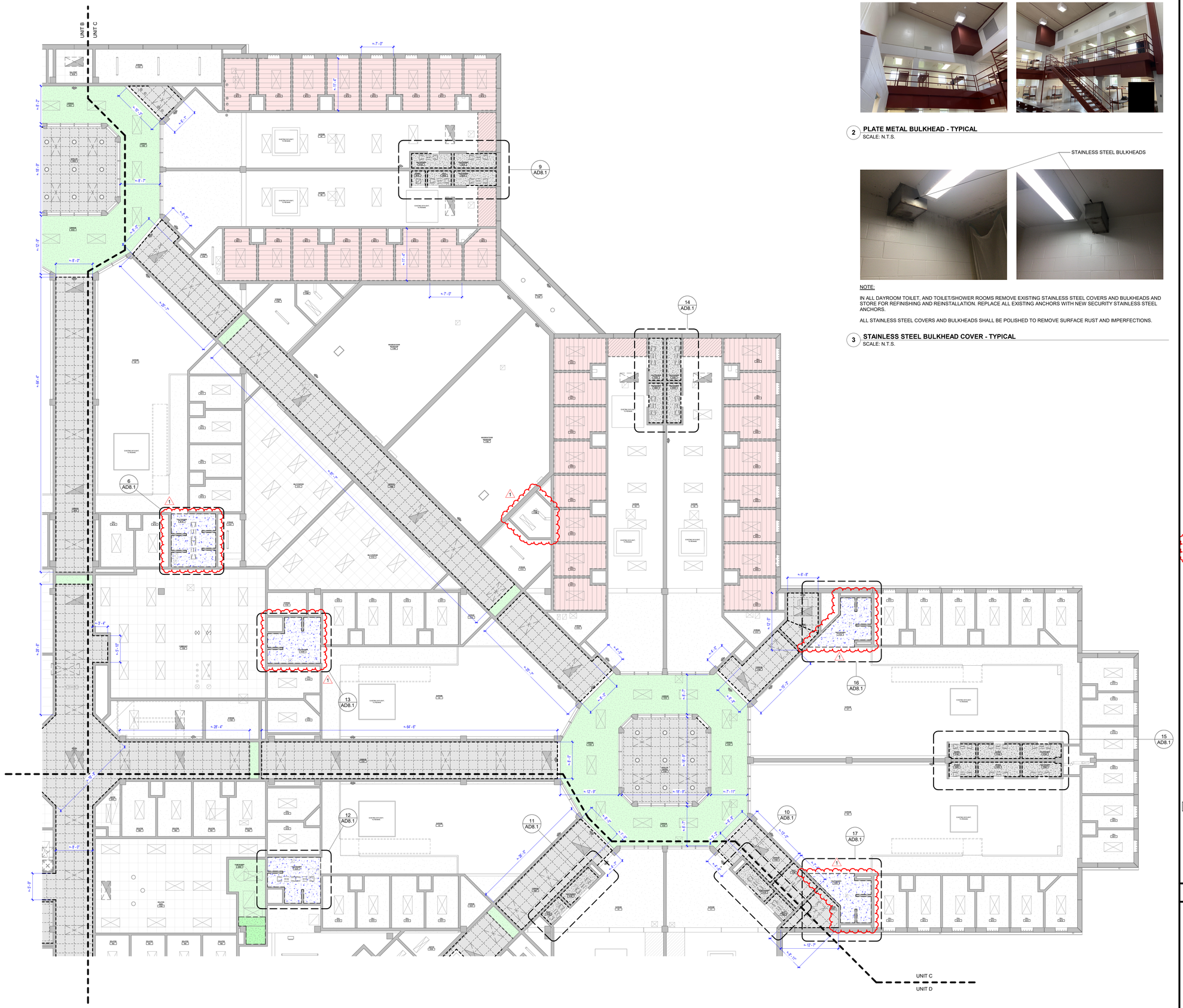
NO.	REVISION	DATE
1	Addendum #3	02/26/2025

DRAWN: CAG CHK'D: SAC
DESIGNED: CAG
APPR'D: EBR
DATE: JANUARY 8, 2025
PROJECT NUMBER
2363-1104-90

PORTER COUNTY BOARD OF COMMISSIONERS
PORTER COUNTY SHERIFF'S OFFICE & JAIL FACILITY RENOVATIONS
2755 STATE ROAD 49

FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA B

SHEET NUMBER
AD10.1B
ARCHITECTURE



1 **FIRST FLOOR REFLECTED CEILING PLAN - REMOVAL - AREA C**
SCALE: 1/8" = 1'-0"

NORTH

2 **PLATE METAL BULKHEAD - TYPICAL**
SCALE: N.T.S.

NOTE:

IN ALL DAYROOM TOILET, AND TOILET/SHOWER ROOMS REMOVE EXISTING STAINLESS STEEL COVERS AND BULKHEADS AND STORE FOR REFINISHING AND REINSTALLATION. REPLACE ALL EXISTING ANCHORS WITH NEW SECURITY STAINLESS STEEL ANCHORS.

ALL STAINLESS STEEL COVERS AND BULKHEADS SHALL BE POLISHED TO REMOVE SURFACE RUST AND IMPERFECTIONS.

3 **STAINLESS STEEL BULKHEAD COVER - TYPICAL**
SCALE: N.T.S.

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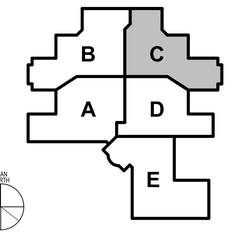

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2025 FEBRUARY 25

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FIRST FLOOR REFLECTED CEILING - REMOVAL - AREA C

SHEET NUMBER

AD10.1C

ARCHITECTURE

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AIR COOLED CHILLER SCHEDULE

TAG		MANUFACTURER	MODEL	NOMINAL TONS	EER	IPLV	FLUID TYPE	FLOW RATE (GPM)		WATER PD (FT H2O)		WATER TEMPERATURE (°F)		REFRIGERANT TYPE	NUMBER OF REFRIGERANT CIRCUITS	NO. OF COMPRESSORS	ELECTRICAL DATA						DIMENSIONS (IN)			WEIGHT (LBS)	NOTES
								MINIMUM	DESIGN	TOTAL PD	EVAPORATOR PD	ENTERING	LEAVING				VOLTAGE	PHASE	FREQUENCY (HZ)	STARTER TYPE	MCA	MOCP	LENGTH	WIDTH	HEIGHT		
CH	1	YORK	YLAA0136SJ46XFB	122.6	9.815	17.68	30% PROPYLENE GLYCOL	115	305.1	23.3	15.1	55	45	R454B	2	6	460	3	60	ACROSS THE LINE	290	300	187	88	94	7165	1,2,3,4,5,6,7,8,9,10
CH	2	YORK	YLAA0136SJ46XFB	122.6	9.815	17.68	30% PROPYLENE GLYCOL	115	305.1	23.3	15.1	55	45	R454B	2	6	460	3	60	ACROSS THE LINE	290	300	187	88	94	7165	1,2,3,4,5,6,7,8,9,10
CH	3	YORK	YLAA0136SJ46XFB	122.6	9.815	17.68	30% PROPYLENE GLYCOL	115	305.1	23.3	15.1	55	45	R454B	2	6	460	3	60	ACROSS THE LINE	290	300	187	88	94	7165	1,2,3,4,5,6,7,8,9,10

NOTES:

1. PROVIDE STARTER/DISCONNECT PER DIVISION 26 SPECIFICATIONS AND MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON ELECTRICAL DRAWINGS.
2. PROVIDE DISCONNECT IN NEMA 3R RATED ENCLOSURE AS PER DIVISION 26 SPECIFICATIONS.
3. UNIT SHALL BE RATED FOR 30% PROPYLENE GLYCOL.
4. PROVIDE ACCESSORIES AS NEEDED FOR LOW AMBIENT OPERATION. UNITS SHALL BE PROVIDED WITH HIGH EFFICIENCY FANS TO ALLOW FOR UNITS TO OPERATE VIA SOUND REDUCTION MODE. PROVIDE FACTORY INSTALLED ACOUSTICAL BLANKETS ON EACH COMPRESSOR FOR SOUND REDUCTION.
5. UNIT SHALL HAVE A SINGLE POWER POINT ELECTRICAL CONNECTION. PROVIDE 10A, 115 V GFCI OUTLET IN CONTROL PANEL FOR SERVICING THE UNIT. OUTLET SHALL BE POWERED VIA SINGLE POWER POINT CONNECTION.
6. PROVIDE EVAPORATOR HEATER AND INSULATION FOR PROTECTION OF EVAPORATOR COIL. EVAPORATOR HEATER CIRCUIT SHALL BE FACTORY WIRED TO 115 V CIRCUIT IN CONTROL BOX.
7. PROVIDE FACTORY INSTALLED WATER FLOW SWITCH TO PREVENT EVAPORATOR FREEZEUP DURING LOW OR NO FLOW CONDITIONS.
8. UNIT SHALL BE PROVIDED WITH LOUVERS TO PROTECT AGAINST HAIL GUARD.
9. REFER TO DETAIL 1/M5.2 AND 16/M5.1 FOR ADDITIONAL INFORMATION.
10. REFER TO M7.3 FOR CONTROLS.

FAN POWERED VAV SCHEDULE

TAG		MANUFACTURER	MODEL	SIZE	INLET DIAMETER (IN)	AIR FLOW (CFM)			DOWNSTREAM SP (IN WG)	COIL CAPACITY (MBH)	MAX COIL APD (IN WG)	WATER PRESSURE DROP (FT WG)	WATER FLOW (GPM)	WATER TEMPERATURE (°F)		FAN			NOTES
						FAN FLOW	MAX PRIMARY	MIN PRIMARY						ENTERING	LEAVING	HP	VOLTAGE	PHASE	
FPV	4-2	PRICE	FDC	30	8	1100	1100	90	0.5	41.6	0.32	1.54	2.26	180	150	1/2	277	1	1,2,3,4
FPV	4-5	PRICE	FDC	20	8	690	690	60	0.55	26.1	0.14	0.41	1.07	180	150	1/3	277	1	1,2,3,4
FPV	4-7	PRICE	FDC	10	8	590	590	270	0.5	22.3	0.34	0.27	1.09	180	150	1/3	277	1	1,2,3,4
FPV	6-5	PRICE	FDC	60	14	2180	2180	1080	0.6	45.6	0.24	0.27	1.11	180	150	2@3/4	277	1	1,2,3,4
FPV	8-19	PRICE	FDC	50	12	1625	1625	150	0.7	61.4	0.33	1.27	3.17	180	150	1	277	1	1,2,3,4
FPV	8-25	PRICE	FDC	10	4	160	160	15	0.5	6	0.04	0.01	0.2	180	150	1/3	277	1	1,2,3,4
FPV	8-28	PRICE	FDC	10	5	370	370	180	0.5	14	0.15	0.07	0.51	180	150	1/3	277	1	1,2,3,4

NOTES:

1. PROVIDE STARTER/DISCONNECT PER DIVISION 26 SPECIFICATIONS AND MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON ELECTRICAL DRAWINGS.
2. REFER TO DETAIL 11/M5.1.
3. REFER TO 2/M7.1 FOR CONTROLS.
4. PROVIDE 2-WAY VALVE FOR HEATING COIL.

GLYCOL FEED TANK SCHEDULE

TAG		MANUFACTURER	MODEL	SYSTEM SERVED	DIAMETER (IN)	HEIGHT (IN)	TANK VOLUME (GAL)	HORSE POWER (HP)	NOTES
GFT	1	WESSELS	GMP-15050	CW	34	45	50	1/2	1,2,3,4,5

NOTES:

1. EQUIPMENT SHALL BE RATED FOR PROPYLENE GLYCOL.
2. PROVIDE LOW WATER CUT-OFF ALARM, HIGH LEVEL ALARM, HOA CONTROLS, MAGNETIC STARTER, PRESSURE GAUGE AND SYSTEM ISOLATION VALVE.
3. PROVIDE 120V CIRCUIT FOR GLYCOL PUMP. UNIT SHALL BE ACCOMPANIED WITH A REMOTE ALARM (LIGHT AND HORN). UNIT SHALL HAVE A SINGLE POWER POINT CONNECTION. REMOTE ALARMS SHALL BE POWERED THROUGH THE SAME ELECTRICAL CONNECTION. COORDINATE LOCATION OF REMOTE ALARM WITH THE OWNER.
4. REFER TO DETAIL 12/M5.1 FOR ADDITIONAL INFORMATION.
5. REFER TO DETAIL 1/M5.2 FOR ADDITIONAL INFORMATION.

DUCTLESS SPLIT INDOOR UNIT SCHEDULE

TAG		MANUFACTURER	MODEL	AIRFLOW (CFM)	RATED COOLING CAPACITY (MBH)	RATED HEATING CAPACITY (MBH)	ELECTRICAL DATA				WEIGHT (LBS)	NOTES
							VOLTAGE	PHASE	MCA	MOCP		
DS	1	TRANE	PLA-AE12NL	530	12	10.1	208	1	1.0	15	225	1,2,3,4
DS	2	TRANE	PLA-AE12NL	530	12	10.1	208	1	1.0	15	225	1,2,3,4
DS	3	TRANE	PLA-AE12NL	530	12	10.1	208	1	1.0	15	225	1,2,3,4
DS	4	TRANE	PLA-AE24NL	810	24	13	208	1	1.0	25	225	1,2,3,4

NOTES:

1. REFER TO DETAIL 8/M5.1.
2. PROVIDE CONDENSATE PUMP WITH BUILT-IN CHECK VALVE.
3. INDOOR UNIT IS POWERED BY OUTDOOR UNIT.
4. UNIT IS INTENDED TO BACK-UP FOR EXISTING SYSTEM. REFER TO M7.7 AND M7.8 FOR CONTROLS. PROVIDE CONTROLS FOR UNITS TO TURN ON WHEN PRIMARY VAV SYSTEM TURNS OFF.

AIR COOLED CONDENSING UNIT SCHEDULE

TAG		MANUFACTURER	MODEL	EQUIPMENT SERVED	NOMINAL TONS	DESIGN AMBIENT TEMP. (°F)	SEER	REF. TYPE	ELECTRICAL DATA					WEIGHT (LBS)	NOTES
									VOLTAGE	PHASE	FREQUENCY (HZ)	MCA	MOCP		
ACC	1	TRANE	PUZ-AK12NL	DS-1	1	95	27.0	R-454B	208	1	60	11.0	28	104	1,2,3,4,5
ACC	2	TRANE	PUZ-AK12NL	DS-2	1	95	27.0	R-454B	208	1	60	11.0	28	104	1,2,3,4,5
ACC	3	TRANE	PUZ-AK12NL	DS-3	1	95	27.0	R-454B	208	1	60	11.0	28	104	1,2,3,4,5
ACC	4	TRANE	PUZ-AK24NL	DS-4	2	95	24.2	R-454B	208	1	60	19.0	26	179	1,2,3,4,5
ACC	9	YORK	KC120C00A4GLB1	AHU-9	10	95	15.5	R-454B	460	3	60	20.5	30	435	1,2,3,4,6

NOTES:

1. PROVIDE STARTER/DISCONNECT AS PER DIVISION 26 SPECIFICATIONS AND MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON ELECTRICAL DRAWINGS.
2. PROVIDE CRANKCASE HEATER, HAIL GUARD, LOW-AMBIENT KIT, WINTER START KIT AND WIND BAFFLE.
3. SIZE AND INSTALL REFRIGERANT PIPING AS PER MANUFACTURER'S RECOMMENDATIONS.
4. REFER TO DETAIL 8/M5.1 FOR ADDITIONAL INFORMATION.
5. UNIT IS INTENDED TO BACK-UP FOR EXISTING SYSTEM. REFER TO M7.7 AND M7.8 FOR CONTROLS.
6. ALTERNATE BID ITEM.

DUCT MOUNTED COIL SCHEDULE

TAG		MANUFACTURER	MODEL	CFM	COOLING COIL											HEATING COIL										WIDTH	LENGTH	HEIGHT	WEIGHT (LBS)	AREA SERVED	NOTES
					TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	MAX AIR PD (IN H20)	WATER PD (IN H20)	FLOW (GPM)	ROWS	EWT (°F)	LWT (°F)	EAT DB/WB (°F)	LAT DB/WB (°F)	CONTROL VALVE	TOTAL CAPACITY (MBH)	MAX AIR PD (IN H20)	WATER PD (IN H20)	FLOW (GPM)	ROWS	EWT (°F)	LWT (°F)	EAT DB (°F)	LAT DB (°F)	CONTROL VALVE						
DC	1-1	YORK	XTI-33X39	1985	46	45	0.65	6.4	12.0	8	45	55	75/60.4	53.3/52.0	2-WAY	102	0.11	0.4	7.0	2	180	150	55.0	102.6	2-WAY	48	33	39	706	BLOCK A7	1,2,3
DC	1-2	YORK	XTI-33X39	2065	46	46	0.68	6.4	12.0	8	45	55	75/60.4	53.6/52.1	2-WAY	104	104	0.4	7.0	2	180	150	55.0	101.7	2-WAY	48	33	39	706	BLOCK A8	1,2,3
DC	1-3	YORK	XTI-33X39	1775	37	37	0.34	4.7	10.0	8	45	55	75/60.4	55.0/52.8	2-WAY	93	0.09	0.3	6.0	2	180	150	55.0	103.5	2-WAY	48	33	39	680	BLOCK A6	1,2,3
DC	1-4	YORK	XTI-33X39	1720	31	31	0.24	3.0	9.0	6	45	55	75/60.4	57.6/53.8	2-WAY	92	0.09	0.3	6.0	2	180	150	55.0	104.4	2-WAY	46	33	39	615	BLOCK A5	1,2,3
DC	1-5	YORK	XTI-33X39	1755	37	37	0.33	4.7	10.0	8	45	55	75.0/60.4	54.9/52.7	2-WAY	93	0.09	0.3	6.0	2	180	150	55.0	103.8	2-WAY	48	33	39	680	BLOCK A1	1,2,3
DC	1-6	YORK	XTI-33X36	1580	33	33	0.32	3.8	9.0	8	45	55	75.0/60.4	55.0/52.7	2-WAY	77	0.12	0.1	5.0	2	180	150	55.0	100.3	2-WAY	48	33	36	644	BLOCK A2	1,2,3
DC	1-7	YORK	XTI-36X39	2465	52	52	0.4	3.8	16.0	8	45	55	75.0/60.4	55.0/52.7	3-WAY	120	0.12	0.2	8.0	2	180	150	55.0	100.1	3-WAY	48	36	39	747	BLOCK A4	1,2,3
DC	1-8	YORK	XTI-36X42	2800	58	58	0.41	4.4	17.0	8	45	55	75.0/60.4	55.2/52.8	3-WAY	137	0.12	0.3	9.0	2	180	150	55.0	100.3	3-WAY	48	36	42	785	BLOCK A3	1,2,3
DC	2-1	YORK	XTI-33X39	2075	41	39	0.45	4.9	12.0	6	45	55	75.0/62.7	57.4/55.9	2-WAY	103	0.13	0.2	7.0	2	180	150	55.0	100.8	2-WAY	46	33	39	627	BLOCK B2	1,2,3
DC	2-2	YORK	XTI-33X39	2055	42	39	0.5	4.9	12.0	6	45	55	75.0/62.7	57.0/55.6	2-WAY	102	0.13	0.2	7.0	2	180	150	55.0	101.1	2-WAY	46	33	39	630	BLOCK B1	1,2,3
DC	2-3	YORK	XTI-33X39	1725	36	33	0.34	3.6	10.0	6	45	55	75.0/62.7	56.8/55.6	2-WAY	85	0.09	0.1	6.0	2	180	150	55.0	100.4	2-WAY	46	33	39	626	BLOCK B3	1,2,3
DC	2-4	YORK	XTI-33X36	1535	31	29	0.34	2.9	9.0	6	45	55	75.0/62.7	56.9/55.7	3-WAY	75	0.11	0.1	5.0	2	180	150	55.0	100.0	3-WAY	46	33	36	593	BLOCK B4	1,2,3
DC	2-5	YORK	XTI-33X39	1725	36	33	0.34	3.6	10.0	6	45	55	75.0/62.7	56.8/55.6	2-WAY	85	0.09	0.1	6.0	2	180	150	55.0	100.4	2-WAY	46	33	39	626	BLOCK B8	1,2,3
DC	2-6	YORK	XTI-33X36	1545	31	29	0.34	2.9	9.0	6	45	55	75.0/62.7	57.0/55.7	3-WAY	75	0.11	0.1	5.0	2	180	150	55.0	99.8	2-WAY	46	33	36	593	BLOCK B7	1,2,3
DC	3-1	YORK	XTI-33X39	2085	42	40	0.49	4.9	12.0	6	45	55	75.0/62.3	56.8/55.3	2-WAY	103	0.13	0.2	7.0	2	180	150	55.0	100.7	2-WAY	46	33	39	630	BLOCK C3	1,2,3
DC	3-2	YORK	XTI-33X39	1985	40	38	0.41	4.9	12.0	6	45	55	75.0/62.3	56.8/55.2	2-WAY	101	0.12	0.2	7.0	2	180	150	55.0	102.0	2-WAY	46	33	39	627	BLOCK C4	1,2,3
DC	3-3	YORK	XTI-33X39	1800	36	34	0.35	3.6	10.0	6	45	55	75.0/62.3	56.9/55.3	2-WAY	90	0.1	0.1	6.0	2	180	150	55.0	101.1	2-WAY	46	33	39	627	BLOCK C5	1,2,3
DC	3-4	YORK	XTI-30X36	1590	34	32	0.6	4.9	11.0	6	45	55	75.0/62.3	56.0/54.8	2-WAY	78	0.11	0.3	5.0	2	180	150	55.0	100.3	2-WAY	46	30	36	565	BLOCK C6	1,2,3
DC	3-5	YORK	XTI-33X36	1480	32	30	0.41	2.9	9.0	6	45	55	75.0/62.3	55.7/54.7	2-WAY	71	0.09	0.1	5.0	2	180	150	55.0	99.6	2-WAY	46	33	36	606	BLOCK C2	1,2,3
DC	3-6	YORK	XTI-27X30	960	26	22	0.52	4.1	10.0	6	45	55	75.0/62.3	53.4/52.5	2-WAY	48	0.16	0.1	3.5	2	180	150	55.0	101.2	2-WAY	46	27	30	476	BLOCK C1	1,2,3
DC	3-7	YORK	XTI-39X42	2850	68	60	0.56	6.0	17.0	6	45	55	75.0/62.3	55.2/53.9	2-WAY	141	0.18	0.3	10.0	2	180	150	55.0	100.8	3-WAY	46	39	42	767	BLOCK C7	1,2,3
DC	3-8	YORK	XTI-42X42	3120	75	66	0.53	5.8	18.0	6	45	55	75.0/62.3	55.1/53.8	3-WAY	158	0.17	0.6	10.0	2	180	150	55.0	101.9	3-WAY	46	42	42	813	BLOCK C8	1,2,3

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NOTES:

1. REFER TO 5/M7.2 FOR CONTROLS.
2. COOLING COILS RATED FOR 30% PROPYLENE GLYCOL.
3. DUCT MOUNTED COILS TO HAVE SIMILAR CONSTRUCTION REGARDING INSULATION, DRAIN PANS, ACCESS DOORS, ETC. AS AHU'S. REFER TO SPEC SECTION 237313.13 FOR ADDITIONAL INFORMATION.

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AIR TERMINAL SCHEDULE

TAG	MANUFACTURER	MODEL	CFM RANGE	PANEL SIZE (IN)	NECK SIZE (IN)	STYLE	INSTALLATION	FINISH	PRESSURE (IN.)	NC	THROW	NOTES
EA-1	PRICE	MSRRP	0-150	8x8	-	MAXIMUM SECURITY	CEILING	BRUSHED ALUMINUM	0.124	25	-	3
EA-2	PRICE	80 SERIES	0-720	12X12	-	EGGCRATE	DUCT	WHITE POWDER COAT	0.085	20	-	-
EA-3	PRICE	80 SERIES	0-720	12X12	-	EGGCRATE	CEILING	BRUSHED ALUMINUM	0.085	20	-	-
EA-4	PRICE	80 SERIES	0-2625	24X24	-	EGGCRATE	CEILING	BRUSHED ALUMINUM	0.085	20	-	-
EA-5	PRICE	MSRRP	0-250	14X14	-	MAXIMUM SECURITY	CEILING	BRUSHED ALUMINUM	0.124	25	-	2,3
EG-1	PRICE	80 SERIES	0-720	12X12	-	EGGCRATE	CEILING	BRUSHED ALUMINUM	0.085	20	-	3
RA-1	PRICE	80 SERIES	0-2500	24X24	-	EGGCRATE	CEILING	BRUSHED ALUMINUM	0.085	20	-	-
SA-1	PRICE	RCD	0-550	12 Ø	8	ROUND CONE	DUCT	WHITE POWDER COAT	0.085	23	7	-
SA-2	PRICE	SCD	0-175	24X24	6	SQUARE CONE	CEILING	WHITE POWDER COAT	0.076	19	7	-
SA-3	PRICE	SCD	0-620	24X24	12	SQUARE CONE	CEILING	BRUSHED ALUMINUM	0.091	24	8	-
SA-4	PRICE	SCD	0-275	24X24	8	SQUARE CONE	CEILING	WHITE POWDER COAT	0.065	19	9	-
EG-1	PRICE	80 SERIES	0-720	12X12	-	EGGCRATE	CEILING	WHITE POWDER COAT	0.085	20	-	1
EG-2	PRICE	80 SERIES	0-2625	24X24	-	EGGCRATE	CEILING	BRUSHED ALUMINUM	0.085	20	-	1
EG-4	PRICE	MSRRP	0-250	14X14	-	MAXIMUM SECURITY	CEILING	BRUSHED ALUMINUM	0.124	25	-	1
EG-5	PRICE	MSRRP	0-250	12X12	-	EGGCRATE	CEILING	WHITE POWDER COAT	0.124	25	-	1
RG-2	PRICE	80 SERIES	0-2500	24X24	-	EGGCRATE	CEILING	WHITE POWDER COAT	0.085	20	-	1
RG-6	PRICE	MSRRP	0-250	14X14	-	MAXIMUM SECURITY	CEILING	WHITE POWDER COAT	0.124	25	-	1
SD-1	PRICE	SCD	0-150	24X24	6	SQUARE CONE	CEILING	WHITE POWDER COAT	0.076	19	7	1
SD-2	PRICE	SCD	0-225	24X24	8	SQUARE CONE	CEILING	WHITE POWDER COAT	0.065	19	7	1
SD-3	PRICE	SCD	0-380	24X24	10	SQUARE CONE	CEILING	WHITE POWDER COAT	0.091	24	8	1
SD-9	PRICE	MSRRCD	0-195	16X16	8	MAXIMUM SECURITY	CEILING	WHITE POWDER COAT	0.022	-	11	1,2
SD-16	PRICE	SCD	0-575	24X24	12	SQUARE CONE	CEILING	WHITE POWDER COAT	0.091	24	9	1

NOTES:

1. AIR TERMINAL REPLACEMENT PART OF ALTERNATE BID.
2. PROVIDE WITH SECURITY BARS.
3. PROVIDE FRONT OPERATED DAMPER.

EXPANSION TANK SCHEDULE

TAG		MANUFACTURER	MODEL	SYSTEM SERVED	TANK FILL TEMPERATURE (°F)	TANK MAX TEMPERATURE (°F)	TANK FILL PRESSURE (PSI)	TANK MAX PRESSURE (PSI)	REQUIRED TANK VOLUME (GAL)	REQUIRED ACCEPTANCE VOLUME (GAL)	TANK ORIENTATION	TANK TYPE	NOTES
ET	1	BELL & GOSSETT	D280	CW	40	100	60	80	190	40	VERTICAL	DIAPHRAGM	1,2,3

NOTES:

1. TANK TO BE ASME RATED.
2. EQUIPMENT SHALL BE RATED FOR 30% PROPYLENE GLYCOL.
3. REFER TO DETAIL 1/M5.2 FOR ADDITIONAL INFORMATION

EXHAUST FAN SCHEDULE

TAG		MANUFACTURER	MODEL	ROOM SERVED	DRIVE TYPE	AIRFLOW (CFM)	EXTERNAL SP (IN WG)	MOTOR (RPM)	MOTOR (HP)	ELECTRICAL DATA			WEIGHT (LBS)	NOTES
										VOLTAGE	PHASE	FLA		
EF	1	GREENHECK	G-090-VG	KITCHEN TOILETS	DIRECT	585	0.46	1680	1/10	115	1	1.5	41	1,2,3,4
EF	2	GREENHECK	GB-160	BOOKING CELLS	BELT	1535	0.45	828	1/3	115	1	7.2	90	1,2,3,4
EF	3	GREENHECK	G-095-VG	AMMO	DIRECT	685	0.52	1640	1/6	115	1	2.8	43	1,2,3,4
EF	4	GREENHECK	G-090-VG	LOBBY TOILETS	DIRECT	460	0.41	1459	1/10	115	1	1.5	41	1,2,3,4
EF	5	GREENHECK	G-120-VG	BOOKING BULLPENS	DIRECT	1015	0.44	1127	1/4	115	1	3.8	67	1,2,3,4
EF	6	GREENHECK	GB-160	SALLYPORT	BELT	2000	0.34	868	1/3	115	1	7.2	90	1,2,3,4
EF	7	GREENHECK	GB-160	SALLYPORT	BELT	2000	0.34	969	1/3	115	1	7.2	90	1,2,3,4
EF	8	GREENHECK	G-095-VG	EXERCISE TOILETS	DIRECT	660	0.5	1600	1/6	115	1	2.8	43	1,2,3,4
EF	9	GREENHECK	GB-200	KITCHEN CART WASH	BELT	2625	0.41	680	1/2	115	1	9.8	120	1,2,3,4
EF	10	GREENHECK	G-095-VG	DISPATCH TOILETS	DIRECT	575	0.45	1474	1/6	115	1	2.8	43	1,2,3,4
EF	11	GREENHECK	G-095-VG	ADMIN TOILETS	DIRECT	475	0.41	1347	1/6	115	1	2.8	43	1,2,3,4
EF	12	GREENHECK	GB-160	REC	BELT	2000	0.34	868	1/3	115	1	7.2	90	1,2,3,4
EF	13	GREENHECK	GB-160	REC	BELT	2000	0.34	868	1/3	115	1	7.2	90	1,2,3,4
EF	14	GREENHECK	GB-160	REC	BELT	2000	0.34	868	1/3	115	1	7.2	90	1,2,3,4
EF	15	GREENHECK	GB-160	REC	BELT	2000	0.34	868	1/3	115	1	7.2	90	1,2,3,4
EF	16	GREENHECK	G-095-VG	LAUNDRY TOILETS	DIRECT	700	0.53	1664	1/6	115	1	2.8	43	1,2,3,4
EF	17	GREENHECK	GB-130	ISOLATION CELLS	BELT	1335	0.53	1225	1/4	115	1	5.8	70	1,2,3,4
EF	18	GREENHECK	G-140-B	EVIDENCE	DIRECT	1400	0.62	1140	1/3	115	1	7.2	83	1,2,3,4
EF	19	GREENHECK	G-140-B	SMALL EVIDENCE	DIRECT	1400	0.62	1140	1/3	115	1	7.2	83	1,2,3,4
EF	20	GREENHECK	GB-160	MECHANICAL	BELT	1980	0.58	988	1/2	115	1	9.8	87	1,2,3,4
EF	21	GREENHECK	G-080-VG	RADIO/TRANS	DIRECT	200	0.31	1262	1/10	115	1	1.5	40	1,2,3,4
EF	22	GREENHECK	G-095-VG	MAINT OFFICE	DIRECT	300	0.48	1326	1/6	115	1	2.8	43	1,2,3,4
EF	23	GREENHECK	G-160-VG	LONG TERM EVIDENCE STORAGE	DIRECT	1600	0.59	911	1	480	3	3.2	90	1,2,3,4
EF	24	CAPTIVEAIRE	DU180HFA	KITCHEN HOOD	DIRECT	2708	1.5	1268	2	480	3	3.3	215	4,5,6,7
EF	25	CAPTIVEAIRE	DU180HFA	KITCHEN HOOD	DIRECT	2708	1.5	1268	2	480	3	3.3	215	4,5,6,7
EF	26	CAPTIVEAIRE	DU180HFA	KITCHEN HOOD	DIRECT	2708	1.5	1268	2	480	3	3.3	215	4,5,6,7
EF	27	GREENHECK	CUBE-200-VGD	DISHWASHER EXHAUST	DIRECT	750	0.5	1032	0.25	115	1	3.8	71	1,2,3,4

NOTES:

1. PROVIDE STARTER AND DISCONNECT AS PER DIVISION 26 SPECIFICATIONS AND MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE.
2. REFER TO DETAIL 9/M5.1 FOR ADDITIONAL INFORMATION.
3. REFER TO CONTROLS ON DRAWING M7.1.
4. REUSE EXISTING ROOF CURB.
5. PROVIDE GREASE CUP WITH DRAIN.
6. PROVIDE VFD/DISCONNECT AS PER DIVISION 26 SPECIFCATIONS AND MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE.
7. UNIT SHALL BE PROVIDED WITH MANUFACTURER CONTROLS VIA A PROGRAMMABLE CONTROLLER. UNIT AND CONTROLS SHALL BE BACNET COMPATIBLE.

SMOKE EXHAUST FAN SCHEDULE

TAG		MANUFACTURER	MODEL	AREA SERVED	AIRFLOW (CFM)	EXTERNAL SP (IN WG)	MOTOR (RPM)	MOTOR (HP)	ELECTRICAL DATA			WEIGHT (LBS)	NOTES
									VOLTAGE	PHASE	FLA		
SEF	1	GREENHECK	CUBE-130	CELLBLOCK A1	1295	0.125	1022	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	2	GREENHECK	CUBE-130	CELLBLOCK A2	1200	0.125	957	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	3	GREENHECK	QEI-27	CELLBLOCK A3	10130	0.875	887	3	460	3	4.8	674	1, 2, 3, 4
SEF	4	GREENHECK	QEI-27	CELLBLOCK A4	10315	0.875	897	3	460	3	4.8	674	1, 2, 3, 4
SEF	5	GREENHECK	CUBE-130	CELLBLOCK A5	1180	0.125	944	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	6	GREENHECK	CUBE-130	CELLBLOCK A6	965	0.125	802	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	7	GREENHECK	QEID-18-95	CELLBLOCK B1	3805	0.875	1170	1	460	3	2.1	244	1, 2, 3, 4
SEF	8	GREENHECK	QEID-18-95	CELLBLOCK B2	3805	0.875	1170	1	460	3	2.1	244	1, 2, 3, 4
SEF	9	GREENHECK	CUBE-130	CELLBLOCK B3	1070	0.125	871	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	10	GREENHECK	CUBE-130	CELLBLOCK B4	1300	0.125	1025	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	11	GREENHECK	CUBE-130	CELLBLOCK B7	1180	0.125	944	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	12	GREENHECK	CUBE-130	CELLBLOCK B8	955	0.125	796	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	13	GREENHECK	CUBE-130	CELLBLOCK C1	890	0.125	755	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	14	GREENHECK	GB-099	CELLBLOCK C2	370	0.125	692	0.25	115	1	5.8	69	1, 2, 3, 4
SEF	15	GREENHECK	QEI-27	CELLBLOCKS C3/C8	10545	0.875	910	3	460	3	4.8	674	1, 2, 3, 4
SEF	16	GREENHECK	QEI-27	CELLBLOCKS C4/C7	10470	0.875	906	3	460	3	4.8	674	1, 2, 3, 4
SEF	17	GREENHECK	CUBE-130	CELLBLOCK C5	830	0.125	717	0.25	115	1	5.8	75	1, 2, 3, 4
SEF	18	GREENHECK	CUBE-130	CELLBLOCK C6	1135	0.125	914	0.25	115	1	5.8	75	1, 2, 3, 4

NOTES:

1. PROVIDE STARTER/DISCONNECT AS PER DIVISION 26 SPECIFICATIONS AND REFER TO MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON ELECTRICAL DRAWINGS.
2. REFER TO CONTROLS ON DRAWINGS M7.7 AND M7.8.
3. REFER TO DETAIL 10/M5.1 FOR ADDITIONAL INFORMATION.
4. FANS SHALL BE UL LISTED FOR SMOKE CONTROL.

NOTE:
ELEMENTS ON THIS DRAWING ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS DRAWING IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

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DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

2/25/2025
JOSHUA R. APLING
PE 10910274

NO.	REVISION	DATE
1	ADDENDUM #01	02-05-2025
2	ADDENDUM #02	02-19-2025
3	ADDENDUM #03	02-26-2025

DRAWN: CSH CHK'D: SJS
DESIGNED: CSH
APPRV'D: JRA
DATE: JANUARY 8, 2025

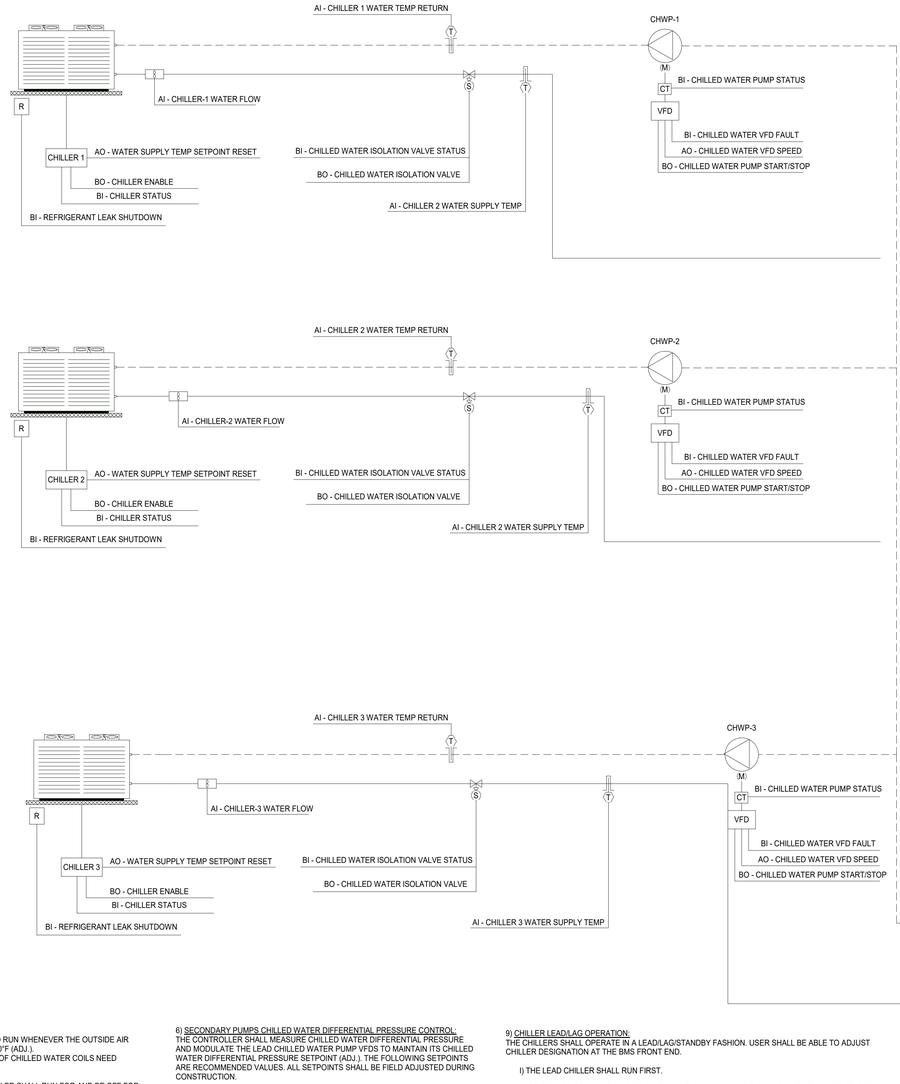
PROJECT NUMBER
2363-1104-90

PORTER COUNTY BOARD OF COMMISSIONERS
PORTER COUNTY SHERIFF'S OFFICE & JAIL
FACILITY IMPROVEMENTS
2755 STATE ROAD 49

MECHANICAL EQUIPMENT SCHEDULES - II

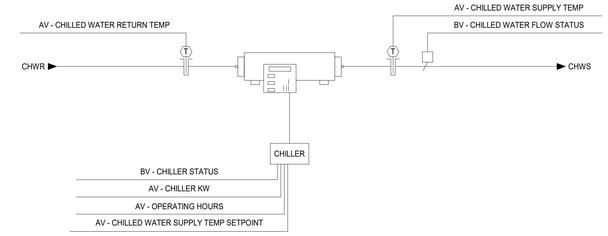
DRAWING NUMBER
M6.2

MECHANICAL



NOTES:

1. CONTROLS CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ZONE HUMIDITY SETPOINTS FOR EXISTING CHILLER SYSTEM TEMPERATURE SETPOINT RESET. ADJUST CONTROLS TO MATCH EXISTING SETPOINTS.



1) CHILLER INTERFACE MONITORING:

CURRENT CHILLER STATUS AND OPERATING CONDITIONS SHALL BE MONITORED THROUGH ITS COMMUNICATION INTERFACE PORT. THE INTERFACE SHALL MONITOR AND TREND THE POINTS SHOWN.

NOTE:
THIS CHILLER INTERFACE SCHEMATIC MAY NOT REFLECT THE ACTUAL SENSORS AND POINTS AS SUPPLIED BY THE CHILLER MANUFACTURER. ALL INTERFACE POINTS SHALL BE COORDINATED WITH THE CHILLER SUPPLIER.

2 CHILLER MONITORING CONTROL SEQUENCE
SCALE: N.T.S.

1) CHILLER - RUN CONDITIONS:
- THE CHILLER SHALL BE ENABLED TO RUN WHENEVER THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).
- A USER DEFINABLE (ADJ.). NUMBER OF CHILLED WATER COILS NEED COOLING.

TO PREVENT SHORT CYCLING, THE CHILLER SHALL RUN FOR AND BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINABLE), UNLESS SHUTDOWN ON SAFETIES OR OUTSIDE AIR CONDITIONS.

THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

2) EMERGENCY SHUTDOWN:

THE CHILLER SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

1

3) CHILLED WATER ISOLATION VALVE:
THE ISOLATION VALVE SHALL OPEN ANYTIME THE ASSOCIATED CHILLER IS CALLED TO RUN.

A) THE VALVE SHALL OPEN PRIOR TO THE CHILLER BEING ENABLED AND SHALL CLOSE ONLY AFTER THE CHILLER IS DISABLED.

B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

4) PRIMARY CHILLED WATER PUMP OPERATION:

EACH CHILLER SHALL HAVE A DEDICATED PUMP AS FOLLOWS
- CHILLER - 1 = CHWP-1
- CHILLER - 2 = CHWP-2
- CHILLER - 3 = CHWP-3

PRIMARY PUMP SHALL TURN ON A USER DEFINED TIME (ADJ.). AFTER ASSOCIATED CHILLER IS PROVEN TO BE ON. WHENEVER ASSOCIATED CHILLER TURNS OFF, THE PUMP SHALL TURN OFF 5 MINS (ADJ.). AFTER THE CHILLER IS DISABLED.

5) SECONDARY CHILLED WATER PUMP LEAD/LAG OPERATION:
THE TWO CHILLED WATER PUMPS SHALL OPERATE IN A LEAD LAG FASHION.

A) THE LEAD PUMP SHALL START PRIOR TO THE LEAD CHILLER BEING ENABLED AND SHALL STOP ONLY AFTER THE CHILLER IS DISABLED.

B) THE DELAY TIMES SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

C) THE TWO PUMPS SHALL OPERATE IN A LEAD/LAG FASHION.
I) THE LEAD PUMP SHALL RUN FIRST.
II) ON FAILURE OF THE LEAD PUMP, THE LAG PUMP SHALL RUN AND THE LEAD PUMP SHALL TURN OFF.

LAG PUMP SHALL NOT TURN ON UNLESS LEAD PUMP IS OPERATING AT ITS FULL CAPACITY

D) THE DESIGNATED LEAD PUMP SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS (USER SELECTABLE):
I) MANUALLY THROUGH A SOFTWARE SWITCH
II) DAILY
III) WEEKLY
IV) MONTHLY

E) CHILLED WATER PUMP ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
III) VFD FAULT

6) SECONDARY PUMPS CHILLED WATER DIFFERENTIAL PRESSURE CONTROL:
THE CONTROLLER SHALL MEASURE CHILLED WATER DIFFERENTIAL PRESSURE AND MODULATE THE LEAD CHILLED WATER PUMP VFDS TO MAINTAIN ITS CHILLED WATER DIFFERENTIAL PRESSURE SETPOINT (ADJ.). THE FOLLOWING SETPOINTS ARE RECOMMENDED VALUES. ALL SETPOINTS SHALL BE FIELD ADJUSTED DURING CONSTRUCTION.

THE CONTROLLER SHALL MODULATE CHILLED WATER PUMP SPEED TO MAINTAIN A CHILLED WATER DIFFERENTIAL PRESSURE OF 12 LBF/IN2 (ADJ.). THE VFD MINIMUM SPEED SHALL NOT DROP BELOW MINIMUM FLOW REQUIRED FOR THE SYSTEM (ADJ.).

A) ON DROPPING CHILLED WATER DIFFERENTIAL PRESSURE, THE VFDS SHALL STAGE ON AND RUN TO MAINTAIN SETPOINT AS FOLLOWS:
I) THE CONTROLLER SHALL MODULATE THE LEAD VFD TO MAINTAIN SETPOINT.

B) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) GREATER THAN SETPOINT.
II) LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF 25% (ADJ.) LESS THAN SETPOINT.

7) CHILLER:
THE CHILLER SHALL BE ENABLED A USER ADJUSTABLE TIME AFTER PUMP STATUSES ARE PROVEN ON. THE CHILLER SHALL THEREFORE HAVE A USER ADJUSTABLE DELAY ON START.

A) THE DELAY TIME SHALL BE SET APPROPRIATELY TO ALLOW FOR ORDERLY CHILLED WATER SYSTEM START-UP, SHUTDOWN AND SEQUENCING.

B) THE CHILLER SHALL RUN SUBJECT TO ITS OWN INTERNAL SAFETIES AND CONTROLS.

C) ALARMS SHALL BE PROVIDED AS FOLLOWS:

I) CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) CHILLER RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

8) CHILLED WATER SUPPLY TEMPERATURE SETPOINT:
THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL RESET USING A TRIM AND RESPOND ALGORITHM BASED ON COOLING REQUIREMENTS.

IF ANY ZONE HUMIDITY SENSOR EXCEEDS USER DEFINED SETPOINT (ADJ.). THE CHILLED WATER SUPPLY TEMPERATURE SHALL BE RESET TO 45 F (ADJ.). ONCE THE ZONE HUMIDITY SENSORS FALL BELOW USER DEFINED SETPOINT (ADJ.) THE CHILLED WATER SUPPLY TEMPERATURE SHALL GRADUALLY RISE OVER TIME TO REDUCE COOLING ENERGY USE.

9) CHILLER LEAD/LAG OPERATION:
THE CHILLERS SHALL OPERATE IN A LEAD/LAG/STANDBY FASHION. USER SHALL BE ABLE TO ADJUST CHILLER DESIGNATION AT THE BMS FRONT END.

I) THE LEAD CHILLER SHALL RUN FIRST.

II) ON FAILURE OF THE LEAD CHILLER, THE LAG CHILLER SHALL RUN AND THE LEAD CHILLER SHALL TURN OFF.

III) IF LEAD CHILLER IS OPERATING AT ITS FULL CAPACITY AND CANNOT MAINTAIN LEAVING WATER TEMPERATURE SETPOINT AFTER 30 MINS (ADJ.). THE LAG CHILLER SHALL TURN ON AND CONTINUE TO OPERATE WITH LEAD CHILLER TO MAINTAIN ITS SETPOINT. LAG CHILLER SHALL NOT STAGE ON UNLESS LEAD CHILLER IS OPERATING AT ITS FULL CAPACITY.

IV) IF LEAD AND LAG CHILLERS ARE OPERATING AT THEIR FULL CAPACITY AND CANNOT MAINTAIN LEAVING WATER TEMPERATURE SETPOINT AFTER 30 MINS (ADJ.). THE STANDBY CHILLER SHALL TURN ON AND CONTINUE TO OPERATE WITH LEAD AND LAG CHILLER TO MAINTAIN ITS SETPOINT. STANDBY CHILLER SHALL NOT STAGE ON UNLESS LEAD AND LAG CHILLER ARE OPERATING AT ITS FULL CAPACITY.

V) UNITS SHALL TURN DOWN IN THE SAME SEQUENCE AS ABOVE WHENEVER CHILLED WATER LEAVING TEMPERATURE FALLS BELOW ITS LEAVING WATER TEMPERATURE SETPOINT (ADJ.).

A) THE DESIGNATED LEAD CHILLER SHALL ROTATE UPON ONE OF THE FOLLOWING CONDITIONS: (USER SELECTABLE):
I) MANUALLY THROUGH A SOFTWARE SWITCH
II) IF CHILLER RUNTIME (ADJ.) IS EXCEEDED
III) DAILY
IV) WEEKLY
V) MONTHLY

B) CHILLER ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
II) RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
III) RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

10) TEMPERATURE MONITORING:
THE FOLLOWING TEMPERATURES SHALL BE MONITORED:

I) CHILLER #1 WATER SUPPLY.
II) CHILLER #1 WATER RETURN.
III) CHILLER #2 WATER SUPPLY.
IV) CHILLER #2 WATER RETURN.
V) CHILLER #3 WATER SUPPLY.
VI) CHILLER #3 WATER RETURN.
VII) PRIMARY CHILLED WATER SUPPLY TEMPERATURE
VIII)PRIMARY CHILLED WATER RETURN TEMPERATURE
IX) SECONDARY CHILLED WATER SUPPLY TEMPERATURE
X) SECONDARY CHILLED WATER RETURN TEMPERATURE

A) ALARMS SHALL BE PROVIDED AS FOLLOWS:
I) HIGH SUPPLY TEMP: IF THE SUPPLY TEMPERATURE IS GREATER THAN 55°F (ADJ.).
II) LOW SUPPLY TEMP: IF THE CHILLED WATER SUPPLY TEMPERATURE IS LESS THAN 38°F (ADJ.).

11) FLOW MONITORING:
FOLLOWING FLOWS SHALL BE MONITORED THROUGH THE CHILLED WATER SYSTEM

I) CHILLER #1 WATER FLOW.
II) CHILLER #2 WATER FLOW.
III) CHILLER #3 WATER FLOW.
IV) PRIMARY CHILLED WATER FLOW.
V) SECONDARY CHILLED WATER FLOW.

ALARMS SHALL BE PROVIDED WHEN CHILLED WATER FLOW FALLS BELOW MINIMUM FLOW REQUIRED BY THE SYSTEM (ADJ.).

1 CHILLED WATER SYSTEM CONTROLS SCHEMATIC
SCALE: N.T.S.

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DLZ INDIANA, LLC

2/25/2025

JOSHUA R. APLING
REGISTERED
STATE OF INDIANA
PE 10009679
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	ADDENDUM #03	02-26-2025

DRAWN: CSH | CHK'D: SJS
DESIGNED: CSH
APPRVD: JRA
DATE: JANUARY 9, 2025

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PORTER COUNTY BOARD OF COMMISSIONERS
PORTER COUNTY SHERIFF'S OFFICE & JAIL
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2755 STATE ROAD 49

CONTROL SCHEMATICS

DRAWING NUMBER
M7.3

MECHANICAL