TECHNICAL SPECIFICATIONS

VOLUME 3 OF 3

100% CONSTRUCTION DOCUMENTS

May 9, 2025

Griffin Middle School

PHASE 2 – Gymnasium

Leon County Schools

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SECTION 102113
SOLID PLASTIC TOILET/SHOWER COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments including the following: (Hiny Hiders)
   1. Floor mounted overhead-braced toilet compartments.
   2. Privacy screens.
   3. Shower and dressing compartments.

1.02 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2013.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.03 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications.

B. Section 06 10 00 - Rough Carpentry.

1.04 REFERENCES

A. ASTM A666 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

E. Sustainable Design Submittals:
   1. Recycled Content: Certify percentages of post-consumer and pre-consumer recycled content.
   2. Regional Materials: Certify distance between manufacturer and Project.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar

service conditions for not less than 5 years.

B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

C. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.

D. Performance Requirements:
   1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with ASTM E84, Class B:
      a. Tested to Meet ASTM E84, Class B flame spread/smoke developed rating.
   2. Material Fire Ratings:
      a. National Fire Protection Association (NFPA) 286: Pass.
      b. International Code Council (ICC): Class B.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.08 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. Labor not included in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18505; Toll Free Tel: 800-445-5148; Fax: 855-376-6161; Email:request info (info@scrantonproducts.com); Web:http://www.scrantonproducts.com
   1. Fabricator: Santana Toilet Partitions.
   2. Fabricator: Comtec Toilet Partitions.
   3. Fabricator: Capitol Toilet Partitions.

B. Substitutions: permitted

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 MATERIAL

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.
   1. Recycled Content; Post Industrial: 25 percent.
   2. Recycled Content; Post Industrial: 100 percent.
   3. Recycled Content; Post Consumer: 100 percent.

B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B86.

C. Stainless Steel Castings: ASTM A167, Type 304.

D. Aluminum: ASTM 6463-T5 alloy.

2.03 SOLID PLASTIC TOILET COMPARTMENTS

A. Basis of Design: Hiny Hiders Toilet Partitions as manufactured by and supplied by Scranton Products.
   1. Style: Floor mounted overhead-braced toilet compartments.

B. Doors, Panels, and Pilasters: 1 inch thick with all edges rounded to a radius. Mount doors and dividing panels based on height of specified system.
   1. Door and Panel Height: 55 inches.
   2. Panel Edge: Standard.
   3. Pilasters: Floor-to-ceiling

C. Panel Color: Grip Ex texture, color to be selected from manufacturer's full range of options.

D. Headrail: Heavy-duty extruded 6463-T5 alloy aluminum with anti-grip design. Finish to be clear anodized. Fastened to headrail brackets with stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
   1. Headrail Brackets: 20 gauge stainless steel with satin finish. Secured to the wall with stainless steel tamper resistant Torx head screws.

E. Wall Brackets:
   1. Aluminum Brackets: Heavy-duty aluminum 6463-T5 alloy.
   2. PVC Brackets: Extruded PVC plastic.
   3. Stainless Steel Brackets: Stainless steel type 201.

F. Door Hardware:
   1. Continuous Stainless Steel Helix Hinge:
      a. Length: 54 inches.
   2. Door Strike/Keeper: Heavy-duty extruded aluminum 6436-T5 alloy with a clear anodized finish. Secured to pilasters with stainless steel tamper resistant Torx head sex bolts. Bumper shall be made of extruded black vinyl.
   3. Latch Mechanism: Stainless Steel Slide Bolt Latch and Housing: Heavy-duty stainless steel type 304. The latch and housing to have a bright finish. The slide bolt and button to have a black anodized finish.
   4. Equip outswing handicapped doors with second door pull and door stop.

2.04 SOLID PLASTIC PRIVACY SCREENS

A. Provide plastic privacy screens in urinal and entry toilet room applications as indicated or scheduled.

B. Panels, and pilasters, if required, 1 inch thick with edges rounded to a radius. Screens to be mounted at 14 inches above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.
   1. Recycled Content: Minimum 25 percent.

C. Screen Type: Wall mounted.

D. Screen Type: Pilaster supported.

E. Wall Brackets: Extruded PVC plastic. Fastened to the panel/pilaster with stainless steel tamper resistant torx head screws and fastened to wall with stainless steel tamper resistant torx head sex bolts.

F. Aluminum Slide Bolt Latch and Housing: Heavy-duty extruded 6463-T5 alloy aluminum. Latch and housing to have a clear anodized finish. Slide bolt and button to have a black anodized finish.

2.05 SOLID PLASTIC SHOWER AND DRESSING COMPARTMENTS

A. Plastic privacy screens in shower room applications as indicated or scheduled.

B. Panels and Pilasters: 1 inch thick with edges rounded to a radius. Mount screens at 14 inches above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.
   1. Recycled content: Minimum 25 percent.

C. Type: Floor mounted pilaster supported screen.
   1. Panel Screens: 76 inches high.
   2. Pilaster Screens: 82 inches high.
   3. Headrail: Heavy-duty extruded 6463-T5 alloy aluminum with anti-grip design and integrated curtain track. Clear anodized finish. Fastened to the headrail bracket with a stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
   4. Headrail Brackets: 20 gauge stainless steel with a satin finish. Secured to the wall with stainless steel tamper resistant Torx head screws.
   5. Pilaster Sleeves: 20 gauge stainless steel. 3 inches high. Secured to pilaster with stainless steel tamper resistant Torx head sex bolt.
   6. Wall Brackets: Continuous, heavy-duty 6463-T5 alloy aluminum. Clear anodized finish. Fastened to panel/pilaster with stainless steel tamper resistant Torx head sex bolts.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install partitions rigid, straight, plumb, and level manor, with plastic laid out as shown on shop drawings.

C. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch.

D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

E. Finished surfaces shall be cleaned after installation and be left free of imperfections.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 102113

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Accessories for toilet rooms and showers.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.

F. ASTM C1036 - Standard Specification for Flat Glass; 2011.

G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Bradley Corporation; _____: www.bradleycorp.com.
   2. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
   3. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

E. Adhesive: Two component epoxy type, waterproof.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

B. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.

C. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of Ivory color.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
   1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
   2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
   3. Color: White.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated. See drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

SECTION 104300
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Field paint finish.

1.03 DEFINITIONS

1.04 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test schedules and recertification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automated External Defibrillators (AEDs):
   1. Philips Medical Systems; _____: www.usa.philips.com/#sle.
   2. Stryker Corporation; HeartSine samaritan PAD 350P Defibrillator - PAD 350p: www.stryker.com/#sle.
   3. ZOLL Medical Corporation; _____: www.zoll.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.
   1. Provide automated external defibrillators (AEDs) as indicated.

2.03 ACCESSORIES

A. Theft Alarm: Battery operated audible and strobe light alarm, 10 second delay for disarming, activated by opening cabinet door. Alarm deactivated when door is closed.

B. Cabinet Door Signage: 'AED" decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

C. Plastic Wall Signage: Flat style.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place AEDs in cabinets.

C. Wall Signs:
   1. Location: Where shown.

D. Cabinet Lettering:
   1. Location: Face of door framing.

3.03 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of AED to Owner's designated representative.

END OF SECTION 104300

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

B. FM (AG) - FM Approval Guide; current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
   2. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
   3. Pyro-Chem, a Tyco Business: www.pyrochem.com.
   4. Strike First Corporation of America; ABC-Seamless Steel Fire Extinguisher: www.strikefirstusa.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Ansul, a Tyco Business: www.ansul.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Pyro-Chem, a Tyco Business: www.pyrochem.com.
   4. Strike First Corporation of America; EL-Elite Architectural Series Fire Extinguisher Cabinet, Non-Fire-Rated: www.strikefirstusa.com/#sle.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 5 pound.
   3. Finish: Baked polyester powder coat, ____ color.

2.03 FIRE EXTINGUISHER CABINETS - INTERIOR

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

C. Fire Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall with 5/8 inch thick fire barrier material.

D. Cabinet Configuration: 1 1-2" square trim, Semi-recessed type.

E. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

F. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

G. Door style: Vertical Duo

H. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

I. Weld, fill, and grind components smooth.

J. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

K. Applied Graphics: Provide applied vinyl lettering as follows: FIRE EXTINGUISHER. Color - black, orientation - vertical.

L. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers in cabinets.

END OF SECTION 104400

SECTION 107316.13
METAL CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Freestanding metal canopies.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete footings.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

E. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

I. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

J. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010.

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

L. ASTM E2950 - Standard Specification for Metal Canopy Systems; 2014.

M. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2013a.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Florida.
   1. Comply with applicable code for submission of design calculations as required for acquiring permits.

B. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than ____ years of documented experience.

C. Erector Qualifications: Company specializing in performing the work of this section.
   1. Not less than five years of documented experience and approved by canopy manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 METAL CANOPIES

A. Shop Fabricated Aluminum Canopy

B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
   1. Installation: As indicated on drawings..
   2. Column Anchorage: Column baseplates installed with anchor bolts or expansion anchors into concrete footing, slab, or pier.
   3. Structural Framing System: Aluminum.
   4. Covering Material: Aluminum.
   5. Drainage Concept: Water collected in decking conducted into perimeter drain beams and discharged through columns.

C. Performance Requirements:
   1. Design and fabricate metal canopy system to resist wind loads without failure, damage, or permanent deflection in accordance with ASCE 7:
      a. Loads: As indicated on drawings.
   2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.02 COMPONENTS

A. Structural Aluminum Framing: Alloy and temper 6063-T5, 6063-T6, or 6061-T6.
   1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
   2. Rolled or Extruded Structural Shapes: ASTM B308/B308M.
   3. Extruded Structural Pipe and Tube: ASTM B429/B429M.
   4. Sheet and Plate: Alloy 5052, 5005, or 6061-T651, ASTM B209/B209M.

B. Covering:

1. Aluminum Decking:
    a. Interlocking extruded aluminum decking modules.
        1) Extruded Decking: ASTM B221 (ASTM B221M), Alloy and temper 6005-T5, 6061-T6, or 6063-T6.

C. Fascia: Manufacturer's standard flat profile.
    1. Material: Aluminum Composite Material (ACM) panel.

D. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
    1. Minimum exposed thread of 7 inches above footing and 23 inch minimum embedment.
    2. Provide nuts and washers as required for column leveling and plumbing.

E. Concrete Footings: Refer to Section 033000 for additional requirements.

2.03 SHOP FABRICATION

A. Provide a complete system ready for erection at project site.

B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

C. Weld steel members in accordance with AWS D1.1/D1.1M.

D. Fabricate connections for bolt, nut, and washer connectors.

2.04 FINISHES

A. Aluminum Framing and Decking:
    1. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41, clear anodic coating not less than 0.7 mils thick.

2.05 ACCESSORIES

A. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.

B. Grout: ASTM C1107/C1107M; non-shrinking; premixed compound consisting of non-metallic aggregate, cement, water-reducing and plasticizing agents.

C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that foundation, electrical utilities, and placed anchors are in correct position.

C. Verify that bearing surfaces are ready to receive this work.

D. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING

A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.

B. Set column base plates with non-shrink grout to achieve full plate bearing.

C. Fasten columns to anchor bolts.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 TOLERANCES

A. Maximum Variation from Level: Plus/Minus 1/8 inch.

3.05 CLEANING

A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.06 PROTECTION

A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION 107316.13

SECTION 116623
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor sleeves for net and goal posts.

C. Wall mounted protection pads.

D. Volleyball nets and posts.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.

B. Section 051200 - Structural Steel Framing: Structural members supporting basketball systems.

C. Section 096466 - Wood Athletic Flooring: Gymnasium flooring.

D. Section 260583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Operating and maintenance data for each operating equipment item.

E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. Performance Sports Systems; _____: www.perfsports.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
   1. National Federation of State High School Associations (NFHS) sports rules.

C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL

A. Basketball System: Backstop assembly, backboard, and goal.
   1. Manufacturers:
      a. Performance Sports Systems.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
   1. Framing: Center strut; forward folding & backward folding framing.
   2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
   3. Framing Color: As selected from manufacturer's standard selection.
   4. Manufacturers:
      a. Performance Sports Systems; Model No. 3103 & Model No. 3105.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Backboards: Tempered glass, rectangular shaped.
   1. Frame: Brushed aluminum edge, steel mounting.
   2. Markings: Painted.
   3. Color: Manufacturer's standard.

D. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
   1. Net Attachment Device: Tube-tie.
   2. Finish: Powder coat orange.

2.04 FLOOR-MOUNTED EQUIPMENT

A. Volley Ball Nets and Posts: Two court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
   1. Posts: 3-1/2 inch O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
   2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
      a. Size: Regulation size.
   3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
   4. Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.

B. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
   1. Latch Cover: Brass, round; tamper resistant lock with key.
   2. Sleeve: Aluminum.
   3. Depth of Sleeve: 11 inches from floor surface to bottom, including latch cover.

2.05 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Covering: Vinyl-coated polyester fabric, mildew and rot resistant.
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Custom Graphics: To be supplied by Architect.
      d. Fabric Weight: 14 oz/sq yd, minimum.
   2. Foam: Soft, Polyethylene, with __ pcf nominal density.
   3. Foam Thickness: 2 inches.
   4. Backing Board: Wood Board.
      a. Thickness: 7/16 inch, minimum.
   5. Mounting: Removable; Z-clips fixed to wall and to padding.
   6. Manufacturers:
      a. Porter.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
   1. Wall corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION 116623

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. PS 1 - Structural Plywood; 2009.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 3/4 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. NSF approved for food contact.
      c. Finish on Exposed Surfaces: Polished, gloss rating of 55 to 80.
      d. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 1/2 inch, minimum.
   4. Exposed Edge Treatment: Built up to minimum 1-1/2 inch thick; eased edge; use marine edge at sinks.
   5. Back and End Splashes: Same sheet material, square top; minimum ____ inches high.
   6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

A. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.
   2. Provide sustainably harvested wood, certified or labeled; see Section 016000 - Product Requirements.
   3. Provide wood harvested within a 500 mile radius of the project site.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Grommets: Provide 2" diamter round grommet with plastic cover.
   1. Provide one at the following locations: Print Lounge 107, Print Lounge 211

2. Provide two each at the following locations: Admin. 104, Conference Room 101

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 CLEANING

A. Clean countertops surfaces thoroughly.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 123600

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SECTION 126613
TELESCOPING BLEACHERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Telescoping bleachers.

B. Electric motor operators, controls, and internal wiring.

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Connection of electric motors and controls.

1.03 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

B. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2008.

C. NFPA 102 - Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures; 2021.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage handling and requirements.
   3. Installation methods.

C. Shop Drawings: Complete layout with dimensions, seat heights, row spacing and rise, aisle widths and locations, points of connection to substrate, assembly dimensions, and material types and finishes.
   1. Provide drawings customized to this project.
   2. Include Professional Engineer certification.
   3. Wiring Diagrams: Show locations of motors, electrical wiring, and rough-in connections.

D. Operation and Maintenance Data: Manufacturer's operation and maintenance instructions, including annual inspection and maintenance and bi-annual inspection by a Professional Engineer or manufacturer factory service personnel.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Manufacturer's installation crew.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store, in original packaging, under cover and elevated above grade.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion. Replace parts that fail under normal use at no extra charge to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Telescoping Bleachers:
   1. Hussey Seating Company; _____: www.husseyseating.com/#sle.

2.02 TELESCOPING BLEACHERS

A. Telescoping Bleachers: Factory assembled tiered benches that retract horizontally into depth approximately the same as a single row depth, with fixed seats mounted on leading edge of platforms.
   1. Provide a design certified by a licensed Professional Engineer licensed in Florida.
   2. Design to comply with applicable requirements of NFPA 102 and requirements of code authorities having jurisdiction; where conflicts between requirements occur, comply with whichever is more stringent.
   3. Design with solid fascia (riser) or seat fronts that conceal interior mechanisms when fully retracted, fitting tightly enough to prevent climbing up face; at front row provide key locked, hinged fascia (skirt) to cover gap between seat riser/fascia and floor.
   4. Operation: Motor operated.

B. Design Loads: Design to withstand the following loading conditions:
   1. Live Load on Structural Supports: 100 psf, minimum, of gross horizontal projection.
   2. Live Load on Seats and Walking Surfaces: 120 pounds per linear foot.
   3. Lateral Sway Stress on Structural Supports: 24 pounds per linear foot of seat plank.
   4. Perpendicular Sway Stress on Structural Supports: 10 pounds per linear foot of seat plank.

C. Dimensions:
   1. Rows: __.
   2. Rise Per Row: 10 inches.
   3. Row Depth: 22 inches.
   4. Seat Height Above Tread: 6 inches.

D. Structural Supports: Steel or aluminum; manufacturer's standard wheeled carriages supporting each tier separately, with moving parts permanently lubricated and metal parts cushioned to prevent metal-to-metal contact during operation.
   1. Design so that each row carriage so that it will individually support the design loads and is self supporting when fully assembled without dependence on platform panels or boards, seats, or fascia.
   2. Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M.
   3. Bolting: Use lock-washers or locknuts.
   4. Wheels: Minimum 5 inch diameter by 1-1/8 inch wide, with non-marring rubber tires; ball, roller, or oil-impregnated metal bearings; minimum of 2 wheels at each floor support.
   5. Finish: Manufacturer's standard enamel or powder coating.
   6. Row Locking: Automatically mechanically lock each carriage to adjacent carriages when fully extended.
   7. Unlocking: Automatically unlock all rows before engaging retraction mechanism.

E. Motor Operation: Manufacturer's standard drive mechanism, using motor adequately sized for the purpose.
   1. Provide UL listed electrical components and wiring.
   2. Controls: Start, Stop, Forward, and Reverse in a single control unit.
   3. Control Station: Removable plug-in low-voltage pendant station, with first-row plug-in location for each motor.
   4. Limit Switches: Automatically stop operation when unit has reached fully open or fully closed position.
   5. Provide all wiring internal to bleacher units, to junction box located where indicated; ensure that wiring is not energized except during operation.
   6. Electrical Characteristics: 120V, single phase, 60 Hz.
   7. Provide access to motor from front side of bleachers; a hinged front skirt or hinged section at least 30 inches wide is acceptable.

END OF SECTION 126613

SECTION 21 11 00 - FIRE PROTECTION PIPING AND ACCESSORIES

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Provisions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Installation of a Fire Pump, including piping inside of the building.

Installation of a Fire Department Connection including piping both inside of the building and underground exterior.

Replacement of an existing two-way FDC with a four-way FDC.

Installation of tamper switches on new and existing valves, at locations shown on the drawings.

All equipment, devices and anchors, cutting & patching as necessary for a complete and operable fire standpipe system including restoration of site to original conditions.

RELATED WORK

Fire alarm wiring, demolition, and connections are by others.

QUALITY ASSURANCE:

Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a State of Florida certified fire protection installer having a minimum of 5 previous projects similar in size and scope to this project, familiar with all precautions required, and having complied with all the requirements of the authority having jurisdiction.

Codes and Standards:

Comply with current editions of all codes as listed on the Drawings including but not limited to:

NFPA 13 - Standard for Installation of Sprinkler Systems.

NFPA 24 - Standard for Installation of Private Fire Service Mains and Appurtenances.

UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

PERMITS AND APPROVALS:

Contractor shall obtain all permits and approvals required for execution of his work.

WORKING PLANS:

Work Plans: Have been prepared for the Contractor's submittal to the local authority having jurisdiction. Signed and sealed sets will be provided to the Contractor as needed.

SHOP DRAWINGS:

Shop Drawings: The Contractor shall produce a set of installation plans including, pipe cut based upon field measurements, proposed pipe support and miscellaneous Contractor information required by NFPA standards 13, 14 & 24.

SUBMITTALS:

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings, and as many additional copies as required for Contractor use:

Shop Drawings: Submit drawings which indicate pipe cut, support detail and other installation data.

Product Data: Submit manufacturer's technical product data for all fire protection valves, devices, piping, and fittings.

Proposed fire proofing systems at penetrations of rated walls

Proposed water proofing systems at penetrations of exterior walls

PRODUCT DELIVERY, STORAGE, AND HANDLING:

Handle components carefully to prevent damage. Do not install damaged components; replace with new.

Store components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

GUARANTEE AND WARRANTY:

Installer shall guarantee in writing, his responsibility for defective materials and workmanship for a period of one (1) year from date of Final Acceptance issued by the Engineer and correct any deficiencies, labor and material, without additional cost to Owner.

CONTRACTOR'S CERTIFICATES:

Installer shall complete all system acceptance tests and provide copies of material and test certificates as required by referenced NFPA codes, and/or manufacturer's installation instructions.

PART 2 - PRODUCTS

GENERAL REQUIREMENTS:

All products and materials shall comply with referenced Codes and Standards.

PIPING:

Interior Piping: Black steel pipe: ASTM A53, A795 or A135. All threaded piping shall be schedule 40. All roll-grooved piping shall be schedule 10.

Grooved fitting specifically listed for fire main service approved by NFPA 13, 14 & 24 for the pipe specified will be acceptable.

Below Grade Piping: Ductile iron pipe: AWWA C151, working pressure 250 psig, exterior and interior bituminous coating. Provide flanged and anchored connection to interior piping.

VALVES:

All valves shall be specifically listed or approved for fire protection service by UL or Factory Mutual. Provide for supervision of valves as indicated on drawings.

Gate: OS&Y, 250 psig WWP.

Butterfly: Gear operated, indicating type, 250 psig WWP.

Underground Check: Ductile Iron swing type, 250 psig WWP.

Test and Drain Valves: Threaded bronze angle or globe with composition disc, 250 psig WWP.

Provide identification sign (enamel on metal) to all valves.

AUTOMATIC BALL DRIPS:

UL or Factory Mutual approved, 3/4-inch cast brass in-line automatic ball drip. Pipe drain to spill through building wall, over floor drain, over mop sink or as approved.

FIRE DEPARTMENT INLET CONNECTION

Free Standing Inlet Connection: Chrome plated brass clappered FDC: 6" x 4 @ 2.5" F NST snoots & plugs. Provide chrome plated brass identification plate, with words " Standpipe & Auto Spkr" in raised letters.

MATERIALS WHICH PENETRATE FIRE WALLS

Where bare-metal piping systems penetrate fire walls, provide a permanent sleeve which is grouted or rocked into wall. Provide a UL listed fire caulk for the annular space.

PART 3 - EXECUTION

PIPING INSTALLATIONS:

Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated.

> Deviations from approved "Working Plans" for piping, requires written approval of the authority having jurisdiction. Written approval shall be on file with the Architect/Engineer prior to deviating form the approved "Working Plans."

Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

Hangers and Supports: Comply with the applicable requirements of NFPA 14 or 24. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems.

Make connections between underground and above-ground piping using an approved transition piece fastened to prevent separation.

Install mechanical sleeve seal at pipe penetrations in basement and foundation walls.

PIPE JOINTS:

Welded Joints: AWS D10.9, Level AR-3. Welding shall not be performed on site unless the building and contents are noncombustible.

Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

> Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Align threads at point of assembly. Apply appropriate tape or thread compound to the external pipe threads. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
>
> Damaged Threads: Do not use pipe with threads which are stripped, chipped, corroded, or otherwise damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

Mechanical Grooved Joints: Cut or roll grooves on pipe ends dimensionally compatible with the couplings.

End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

VALVE INSTALLATIONS:

General: Install fire protection valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 14 and 24, and the authority having jurisdiction.

FIRE DEPARTMENT CONNECTION INSTALLATIONS:

General: Install FDC valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 14 and 24, and the authority having jurisdiction.

Install automatic drip valves and check valve on the fire department connection to the mains. Install mechanical sleeve seal at pipe penetration in outside walls.

DRAINS, TEST PIPES AND ACCESSORIES:

Provide drains on valved sections and at other locations as necessary for complete drainage of system. Drains shall be valved and plugged or drained to the pump room drain.

FIELD QUALITY CONTROL:

Test and inspect piping systems in accordance with NFPA 13, 14 & 24

Provide all testing as recommended by the Manufacturer

Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

Hydrostatically test entire system to 50 psi over normal operating pressure or 150 psi whichever is more.

Required tests to be witnessed by Fire Marshal.

END OF SECTION

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SECTION 21 13 00 - FIRE PROTECTION SPRINKLERS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Provisions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings.

In general, the work consists of, but is not limited to, the following:

Installation of wet pipe sprinkler system including all piping, equipment, devices and hangers as necessary for a complete and operable fire protection sprinkler system.

QUALITY ASSURANCE:

Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a State of Florida certified fire protection installer having a minimum of 5 previous projects similar in size and scope to this project, familiar with all precautions required, and having complied with all the requirements of the authority having jurisdiction.

Codes and Standards:

NFPA 13 - Comply with 2016 Edition of NFPA 13, Standard for Installation of Sprinkler Systems.

UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

PERMITS AND APPROVALS:

Contractor shall obtain all permits and approvals required for execution of his work.

DESIGN CRITERIA PLANS & SHOP DRAWINGS:

Design Criteria Plans: Design Criteria plans have been prepared for the Contractor's bid and submittal to the local authority having jurisdiction.

Shop Drawings: The Contractor shall produce a set of installation plans including hydraulic calculations, pipe cut based upon field measurements, proposed pipe support and miscellaneous Contractor information required by NFPA 13.

SUBMITTALS:

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings, and as many additional copies as required for Contractor use:

Shop Drawings: Submit drawings which indicate pipe cut, support detail and other installation data.

Product Data: Submit manufacturer's technical product data, include each type sprinkler head, valve, piping specialty, fire protection specialty, and fire department connection.

INSTRUCTION AND MAINTENANCE MANUALS:

Installer shall instruct Owner's designated employee in the proper operation and maintenance all fire protection systems and equipment. Installer will also furnish Owner with typed operating instructions, for inclusion in operating and maintenance manual specified in Division 1 and Division 15.

Maintenance Data: For each type sprinkler head, valve, piping specialty, fire protection specialty, and fire department connection, for inclusion in operating and maintenance manual specified in Division 1 and Division 15.

PRODUCT DELIVERY, STORAGE, AND HANDLING:

Handle components carefully to prevent damage. Do not install damaged components; replace with new.

Store components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

GUARANTEE AND WARRANTY:

Installer shall guarantee in writing, his responsibility for defective materials and workmanship for a period of one (1) year from date of Final Acceptance issued by the Architect and correct any deficiencies, labor and material, without additional cost to Owner.

CONTRACTOR'S CERTIFICATES:

Installer shall complete all system acceptance test and provide copies of material and test certificates as required by referenced NFPA codes.

AUTHORITY APPROVAL:

Provide final approval letter from local authority.

PART 2 - PRODUCTS

GENERAL REQUIREMENTS:

All products and materials shall comply with referenced Codes and Standards.

PIPING:

Interior Piping: Black steel pipe: ASTM A53, A795 or A135. Where a specific joining method is not indicated on the Drawings, any fittings approved by NFPA 13 for the pipe specified will be acceptable.

All threaded piping shall be schedule 40. All roll-grooved piping shall be schedule 10. Individual sprinkler run-puts shall be 1" schedule 40 or flexible sprinkler drops.

Exterior Corrosion Protection: All exposed piping shall be cleaned, primed, and painted.

VALVES:

All valves shall be specifically listed or approved for fire protection service by UL or Factory Mutual.

Test and Drain Valves: Threaded bronze angle or globe with composition disc, 175 psig WWP.

Provide identification sign (enamel on metal) to all valves in accordance with NFPA No. 13.

SPRINKLERS:

UL approved, automatic, quick-response with 1/2-inch orifice discharge, having temperature ratings suitable for installation. See Drawing Notes for additional information. Provide the following type of sprinkler heads:

LOCATION	TYPE
Unfinished ceiling areas	Standard, upright, brass
Finished ceilings	Flush with two-piece escutcheon

Finished ceiling pendant sprinklers shall be a flush type, chrome plated with push-on escutcheon.

SPRINKLER CABINET:

Complete with sprinklers and special wrenches in accordance with NFPA No. 13.

PART 3 - EXECUTION

PIPING INSTALLATIONS:

Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated.

Deviations from approved "Design Criteria Plans" for sprinkler piping, requires written approval of the authority having jurisdiction. Written approval shall be on file with the Architect/Engineer prior to deviating from the approved “Design Criteria Plans."

Install sprinkler piping to provide for system drainage in accordance with NFPA 13.

Use approved fittings to make all changes in direction, branch takeoff from mains, and reductions in pipe sizes.

Install unions in pipes 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

Hangers and Supports: Comply with the applicable requirements of NFPA 13. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems.

PIPE JOINTS:

Welded Joints: AWS D10.9, Level AR-3. Welding shall not be performed on site unless the building and contents are noncombustible.

Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Align threads at point of assembly. Apply appropriate tape or thread compound to the external pipe threads. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.

Damaged Threads: Do not use pipe with threads which are stripped, chipped, corroded, or otherwise damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

Mechanical Grooved Joints: Cut or roll grooves on pipe ends dimensionally compatible with the couplings.

VALVE INSTALLATIONS:

General: Install fire protection valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13, and the authority having jurisdiction.

SPRINKLER HEAD INSTALLATIONS:

Use proper tools to prevent damage during installations.

DRAINS, TEST PIPES AND ACCESSORIES:

Provide drains at base of risers, on valved sections and at other locations as necessary for complete drainage of system. Drains shall be valved and plugged or connected to the central drain riser system to discharge outside over splash block or as indicated.

Provide test pipes in accordance with NFPA No. 13. Test pipes shall be valved and piped to discharge through proper orifice. Provide approved required accessories such as sight glasses, etc. Test connections may also serve as drain pipes.

FIELD QUALITY CONTROL:

Flush, test and inspect sprinkler piping systems in accordance with NFPA 13.

Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

END OF SECTION

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SECTION 22 05 00 - PLUMBING

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Plumbing demolition and new plumbing fixture and piping installation.

RELATED WORK

Insulation is specified in Section 23 07 10.

Pipe hangers and supports are specified in Section 23 05 29.

QUALITY ASSURANCE

All materials and installations are to comply with the following. If conflicts occur between plumbing codes and the specifications, the most restrictive requirements shall govern.

National Electric Code
Florida Building Code
Florida Plumbing Code
Florida Energy Efficiency Code For Building Construction
Florida Administrative Code, 10D-10, Sanitary Facilities for Buildings Serving the Public and Places of Employment.
Accessibility Requirements Manual, Florida Board of Building Codes & Standards

Furnish and install equipment having the characteristics and accessories indicated on the drawings or in these specifications. The manufacturer's specifications for the models shown on the drawings or given as basis for design, plus all features, options, and accessories indicated on the drawings or in these specifications, shall constitute the minimum requirements for equipment furnished under this section.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Piping and Fittings

Plumbing fixtures

Valves, cleanouts, and floor drains

Proposed fire proofing systems at penetrations of rated walls.

Pipe hangers and supports.

CHANGES

The Drawings indicate generally the locations of plumbing fixtures, apparatus, piping, etc., and while these are to be followed as closely as possible, if before installation, it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner and as directed by the Architect/Engineer.

PART 2 - PRODUCTS

MATERIALS WHICH PENETRATE FIRE WALLS

Where insulated piping or plastic materials penetrate fire walls, provide a UL listed systems for maintaining the rating.

Where bare-metal piping systems penetrate fire walls, provide a permanent sleeve which is grouted or rocked into wall. Provide a UL listed fire caulk for the annular space.

PLUMBING FIXTURES, TRIM AND FITTINGS

Furnish and install all plumbing fixtures and trim, floor drains and cleanouts as shown on the Drawings. Fixtures shall be as specified or equivalent quality fixtures by American Standard, Kohler, Universal Rundle or Eljer.

Provide all items of brass and chrome plated finish except where otherwise noted.

Brackets, Anchors, and Cleats: Furnish and install where required for support, conceal behind finished wall.

PIPING

Where more than one material is specified for a particular application, comply with Drawing Notes. Where interfacing with an existing system supply materials to match the existing. Where not tying to existing and where not specified on the Drawings, then the Contractor may select from the options listed.

All materials shall comply with latest ASTM specifications in each instance that ASTM has specifications and standards relating to such materials.

Sanitary Waste and Vent

Cast Iron Soil Pipe, service weight bell and spigot; ASTM A 74, with neoprene single service compression gaskets.

PVC Sewer Pipe, schedule 40, ASTM D2665

Cast Iron Soil Pipe, service weight no-hub, ASTM A 74, with neoprene gasket and stainless-steel band and screw assemblies conforming to CISPI Standard 301. May be used for vent piping. May be used for drain piping only where space prohibits use of bell's spigot piping. For below slab underground connections of new piping to existing piping, provide underground adjustable repair coupling with T-bolt Surgical Grade 316 stainless steel nut and bolt sealing clamps.

Copper tubing, Type L, conforming to ASTM B88, with brazed or solder-joint copper, brass or bronze fittings conforming to ANSI B16.18 or B16.22.

Copper tubing, DWV grade, hard temper conforming to ASTM B306, with solder joint, cast bronze fittings conforming to ANSI B16.23. Tubing larger than 2 inches shall use wrought copper fittings conforming to ANSI B16.29.

Domestic Water Pipe:

Above grade domestic water pipe shall be type L hard copper, conforming to ASTM B88. ProPress cast or wrought fittings per ASME B16.18 or B16.22. Where required solder fittings are acceptable

Piping below grade shall be annealed soft copper per ASTM B88. Limit fittings where possible.

Below Grade & Below Slab Piping & Fittings: Ductile iron pipe: AWWA C151, working pressure 150 psig, exterior and interior bituminous coating. Provide flanged and anchored connection to interior piping.

Below Grade Piping Alternative: PVC pipe: ASTM D2241, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring-Tite or approved equal.

Below Piping Alternative 4” and Above: PVC pipe: AWWA C900, Class 150, working pressure 150 psig, fittings to be AWWA C151. J-M Ring Tite or approved equal.

Exposed Pipe in Toilet Areas:

Exposed pipe shall be chrome plated brass, American Brass Co., or equivalent. Furnish and install chrome plated brass wall plates.

Lavatory and Similar Waste Arms:

Type M or L copper water tube, Mueller or equivalent.

Urinal Waste Arms:

PVC.

Roof Drain Piping:

Cast Iron Soil Pipe, service weight bell and spigot; ASTM A 74, with neoprene single service compression gaskets.

Cast Iron Soil Pipe, service weight no-hub, ASTM A 74, with neoprene gasket and stainless-steel band and screw assemblies conforming to CISPI Standard 301.

Below grade and below slab piping may be PVC pipe and fittings: schedule 40, conforming to ASTM D2665 or D2661 respectively.

PIPE ACCESSORIES:

Pipe sleeves: metal sized to allow minimum clearance between pipe and sleeves or insulation and sleeves.

Provide chrome-plated brass escutcheon plates where exposed pipe passes through walls, floors, or ceiling in finished areas.

Furnish and install dielectric or isolation fittings at all points where copper pipe connects to steel pipe.

Adjustable wrought clevis type hanger and rods: Anvil Company or equivalent. Provide copper hangers for copper piping.

Install water hammer arrestors as shown on the Drawings and where required by codes.

VALVES

Ball Valves: 125 lb., brass ball valve.

TRAPS

For Lavatories and Sinks: Fully Cast Brass, 17ga., chrome plated.

TRAP PRIMERS

1/2 automatic trap primers: all bronze body with integral vacuum breaker and gasketed service cover.

PART 3- EXECUTION

INSTALLATION OF PIPING

Condensate piping shall be sloped same as sanitary waste and vent.

On vertical sanitary drain lines, connect all soil and waste inlets through sanitary tees, wyes, or wyes and eighth bends. Short radius fittings may be used for vent piping. On horizontal lines connect all waste and soil connections through wyes or wyes and eighth bends. Double branch

fittings may be used on vertical lines and horizontal runs, providing proper grades can be maintained.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Lay horizontal drain pipes to uniform grade; riser pipes, vertical. Make changes in directions of drain pipes with long bends. No screwed joints permitted in drain pipes, except as described herein.

Lay all sewers and branches, where practicable, on undisturbed earth cut at proper grade. Where laid on fill, provide adequate supports to maintain pitch of the line.

Sizes of risers and mains of water system piping shall be as designated on the Drawings. Verify any omitted sizes before installation.

Cover pipe openings at all times that the work is not in progress at that point.

Cut brass and copper pipe by means of hacksaw. Remove all burrs and metal chips, dirt, etc., before joining pipe. Chrome plated pipe shall show no wrench marks after installation; no threads shall show.

Adequately support all piping above floors inside the building from or on the building structure. Support piping suspended from the building structure by means of the specified pipe hangers and rods. Support interval shall be per FBC Plumbing Table 308.5.

Sanitary and storm drain piping shall be supported by at least one hanger on each full length of pipe close to hub where possible and at least one within 24 inches of each fitting, and wherever else required to prevent tendency toward deflection due to load. Provide a hanger at upper angle at each drop. Locate hangers adjacent to hubs on multiple fittings not more than four feet on centers.

For support spacing of all other horizontal piping refer to MSS-SP-69 and provide additional supports at valves, strainers, in line pumps and other heavy components. Provide a support within one foot of each elbow.

Vertical Pipe Supports: Up to 6 inch 60 feet long or not over 12-inch pipe up to 30 feet long, Riser clamps bolted to pipe below couplings, or welded to pipe and resting securely on the building structure. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure. Vertical runs less than 15 feet long may be supported by the hangers on the connecting horizontal runs.

Bases of drain stacks: If not buried in earth support on concrete, brick in cement mortar, or metal brackets permanently attached to building structure.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Yard supply main piping: Piping shall be installed in strict accordance with the manufacturer’s recommendations. Provide 6” clean sand fill for pipe bedding. Insure minimum 18” of cover.

Provide concrete thrust blocks at all changes of direction. Hand dig thrust block area just behind fittings. Bevel ends of PVC piping. Test piping in accordance with manufactures instruction.

INSTALLATION OF VALVES

Isolate all major piping assemblies as shown on the Drawings and as required for proper operation and maintenance. All valves shall be accessible. Provide valve boxes and access panels where required for accessibility.

Install service valve for hot and cold water at each plumbing fixture.

INSTALLATION OF TRAPS

Trap each fixture by water sealing trap placed as near the fixture as possible.

Vent all traps and place within 5 feet of the fixture which it serves unless otherwise noted.

INSTALLATION OF PIPE SLEEVES

Install pipe sleeves at all locations where pipe passes through walls, floors, or ceilings above or below grade. Sleeves shall extend above floor a minimum of 1". Seal floor sleeves in concrete floors with mortar. Coordinate sleeve size with piping and firestopping requirements in advance.

Where subject to moisture or weather, seal sleeves with watertight sealant.

INSTALLATION OF FIXTURES, TRIM, AND FITTINGS

Install the fixtures, trim and fittings specified, taking care to properly anchor each fixture.

Installation of carriers shall comply with manufacturers' maximum recommendations. Carriers shall be bolted to floor slab using all bolt holes or slots provided on carrier. Bolt size shall match hole or slot. Provide lock washer on each bolt. Use "Red Head" self-drilling anchors as manufactured by Phillips Drill Co. or approved equal product to set bolts.

When the use of a wrench is necessary on chrome plated piping, protect the pipe from marring by use of felt or cloth wrapping beneath wrench jaws.

INSULATION

Insulate all domestic hot water lines.

Insulate all interior condensate piping with ¾" thick elastomeric closed cell foam insulation. Insulation shall have a flame spread of less than 25 and a smoke developed rating of 50 or less as tested by ASTM C534, E84, UL-723 and NFPA 255.

Hot water pipe insulation shall be rigid glass fiber insulation with a nominal density of 3 pounds per cubic foot with a thermal conductivity of not more than 0.23 at 75 deg F mean temperature. Insulation cover shall be an all-service jacket with double self-sealing laps, with self-sealing butt

strips. Insulation thickness shall be per FBC Energy Conservation Table C403.2.10 and as follows:

1" thick for pipe sizes 1-1/4" and smaller.
1-1/2" thick for pipe sizes 1-1/2" and larger.

Insulate all domestic cold-water lines subject to ambient conditions. Use closed-cell elastomeric thermal insulation, minimum density of 5.5 pounds per cubic foot with a thermal conductivity of not more than 0.27 at 75 deg F mean temperature. The material shall have a flame spread of 25 or less and a smoke-developed rating of 50 or less as tested by ASTM C534, E84 (25/50) UL-723 (25-50) and NFPA 255 (25-50). Seal all joints, seams, etc. air tight. Insulation thickness shall be per FBC Energy Conservation Table C403.2.10 and as follows:

1/2" thick for pipe sizes 1-1/4" and smaller.
1" thick for pipe sizes 1-1/2" and larger.

Pipe insulation is not required in crawl spaces where located more than 10' from a ventilation opening.

Install insulation in accordance with manufacturer's recommendations.

TESTS AND INSPECTIONS

Make all water and air tests of the piping systems in the presence of and to the satisfaction of the Architect/Engineer or his designated representative. Conduct these tests at such places and with timing to permit work to proceed with as little interruption as possible. Make tests before work is concealed.

Test water piping to hydrostatic pressure at 125 psi and hold for 4 hours.

After the installation of sanitary piping and before the pipe is concealed or the fixtures are installed, cap or plug the ends of the system and fill all lines with water to top of vents above roof and allow to stand until a thorough inspection has been made. Should leaks appear, repeat the tests until the system is tight.

Do not use resin, candle wax or any other substance for stopping leaks in cast iron soil, waste or vent lines or in storm drain lines. Caulking of screw joints to stop leaks will not be permitted.

STERILIZATION

The sterilization process shall comply with all governing regulations and with the sterilization procedures recommended by the American Water Works Association. The chlorination process may be simplified by first flushing the system thoroughly clean, then charging with water containing a minimum of 50 parts per million of chlorine, allowing this to stand for 24 hours, then thoroughly flushing. After sterilization and final flushing, the local health authority is to be notified and their approval obtained in writing. Provide copies to the Construction Manager, engineer and Owner. Include a copy in the close out manual.

END OF SECTION

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SECTION 22 08 00 - COMMISSIONING OF SERVICE WATER HEATING SYSTEMS

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

Section includes commissioning process requirements for Service Water Heating Systems, assemblies, and equipment.

Related Sections:

> Section 019113 "General Commissioning Requirements" for general commissioning process requirements.

DEFINITIONS

BAS: Building Automation System as specified in Section 230900 “Building Automation and Temperature Control System.”

Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

CxA: Commissioning Authority.

Service Water Heating Systems: Service Water Heating Equipment, Pressure Regulating Devices, Mixing Valves, Piping, Insulation, Pumps, Variable Speed Drives, Controls, Interlocks, Interfaces, Safeties, Accessories and Appurtenances.

Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

TAB: Testing, Adjusting and Balancing work as specified in Section 230593 “Testing and Balancing for HVAC.”

INFORMATIONAL SUBMITTALS

Certificates of readiness, refer to Section 019113 “General Commissioning Requirements.”

Pre-Functional Test Checklists and Equipment Start-up Reports

CONTRACTOR’S RESPONSIBILITIES

Attend construction phase commissioning kick-off meeting.

Attend commissioning team meetings held on a variable basis.

Attend TAB review and coordination meeting, if applicable to Service Hot Water Systems.

Notify CxA when manufacturer will be onsite to startup service water heating equipment. Provide sufficient notice (14 days minimum) so that the CxA can plan to be onsite to witness.

Complete pre-functional test checklists provided by the CxA. Contractor may use the manufacturer's factory startup checklists to avoid duplication of data entry.

Perform commissioning tests at the direction of the CxA. Include an additional site visit from the equipment manufacturer if necessary to demonstrate the operation of the system and perform the requirements of functional testing.

Provide owner training as required by the Contract Documents and provide documentation of the training to the CxA. CxA may witness owner training.

Provide information requested by the CxA for final commissioning documentation.

Participate in warranty walk-through of building and system operation 10 months after completion.

CxA'S RESPONSIBILITIES

Organize and lead the commissioning team and convene commissioning team meetings.

Provide project specific construction checklists and functional performance test procedures for actual Service Water Heating Systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

Conduct commissioning site visits and distribute field observation reports.

Prepare and maintain the commissioning Issues Log.

Witness major equipment or system start-ups.

Direct commissioning functional performance testing.

Compile commissioning related documentation and include it in the final commissioning process report and systems manual.

Verify owner training is complete.

Review of building and system operation 8-10 months after completion.

COMMISSIONING DOCUMENTATION

Provide the following information to the CxA for inclusion in the commissioning plan:

Plan for delivery and review of submittals, operation and maintenance manuals, and other

documents and reports.

Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.

Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for Service Water Heating Systems, assemblies, equipment, and components to be verified and tested.

Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.

Test and inspection reports and certificates.

Corrective action documentation for commissioning related issues.

Testing, adjusting, and balancing (TAB) reports.

Certificate of readiness certifying that Service Water Heating Systems, subsystems, equipment, and associated controls are ready for testing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

TESTING PREPARATION

Provide a fully executed Certificate of Readiness signed by Contractor, Subcontractors, TAB Agent and BAS provider certifying that Service Water Heating Systems, instrumentation and control systems have been completed and calibrated, pre-tested and inspected and that they are operating according to the Contract Documents, and that pretest set points have been recorded.

Provide completed Certificate of Readiness to CxA no less than 7 days prior to the scheduled beginning of on-site CxA functional performance testing.

Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

Inspect and verify the position of each device and interlock.

Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

GENERAL TESTING REQUIREMENTS

Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

Scope of Service Water Systems testing shall include entire Service Water Heating Systems installation, from central equipment for heat generation through distribution systems to each water outlet and device.

Testing of systems and equipment shall include measuring capacities and effectiveness of operational and control functions, in addition to, or in conjunction with any statutory and regulatory testing required by Authorities Having Jurisdiction over the project and testing required in other Sections of this Project Manual.

Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

The CxA along with the Service Water Heating Systems Subcontractor shall prepare detailed testing plans, procedures, and checklists for Service Water Heating Systems, subsystems, and equipment.

Tests will be performed using design conditions whenever possible.

Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions.

Before simulating conditions, calibrate testing instruments.

Provide equipment to simulate loads.

Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation.

After tests, return settings to normal operating conditions.

The CxA may direct that set points be altered when simulating conditions is not practical.

The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

If tests cannot be completed because of a deficiency outside the scope of the Service Water Heating Systems system, document the deficiency and report it to the Owner.

After deficiencies are resolved, reschedule tests.

If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

END OF SECTION

SECTION 23 01 00 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the General Contractor in preparing his bid and in no way relieves the General Contractor of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

PLANS AND SPECIFICATIONS

Drawings and Specifications are intended to clearly set forth all work, and the detailed description is added to assist in establishing the scope and the location of the several parts of the work. Collectively, they shall govern and control the scope, character, and design of the Work, and any item called for in any one of the documents shall be as though mentioned in all.

Failure to make reference in the Specifications to any items of the work shown on the Drawings, but necessary to the completion of the Work shall not relieve the Contractor of the full responsibility to furnish the materials and perform the work of such items, in a manner comparable to other items of similar nature for which detailed Specifications are included.

PROJECT FAMILIARIZATION

The bidder is expected to visit the site and familiarize himself with conditions at the site before submitting his bid. He shall familiarize himself with the work required throughout the entire project and shall make allowances for contingencies which may occur in the interconnection of the various systems.

ALTERNATES AND ADDENDA

The Contractor shall investigate all Alternates, Addenda and Allowances as they relate to the Work of this Section.

TESTING

The Work shall include complete testing of all equipment and piping at the completion of the Work and making any connection changes or adjustments necessary for the proper functioning of the system and equipment.

WORK INCLUDED

Work covered under this Section consists of furnishing all labor, materials, tools, equipment, transportation, scaffolding, services, supervision, and performing of all operations required to properly complete all mechanical work in accordance with this Division of the Specifications and as indicated on the applicable Drawings, subject to terms and conditions of the Contract.

SUPERVISION OF WORK

The Mechanical Contractor shall have a qualified and experienced superintendent on the job when any related work is in progress.

RELATED WORK SPECIFIED ELSEWHERE

The Contractor is cautioned to note carefully other Sections of the project Specifications with their cross references to other specific standard specifications, standard detail, etc., describing work to be furnished under these Specifications as well as any mechanical work that may be shown on electrical, structural, architectural, or other drawings, in order that he may fully understand the requirements and work to be provided under this Section of the Specifications.

ORDINANCES AND REGULATIONS

All work shall conform with all local and State ordinances or regulations governing the installation of such equipment. If work as laid out, indicated or specified is recognized to be contrary to or conflicting with local ordinances or regulations, the Subcontractor shall report same to the Architect/Engineer before submitting a bid. The Architect/Engineer will then issue instructions as to procedure.

CODES AND STANDARDS

The currently adopted standards of the following organizations, and individual standards named, shall be followed the same as if they were fully written herein and constitute a part of the Specification requirements except where otherwise specified:

National Fire Protection Associations - Standards
- NFPA 70, National Electric Code
- NFPA 101, Life Safety Code
- NFPA 90-A, Installation of Air Conditioning and Ventilating Systems.

FL Building Code
FL Mechanical Code
FL Gas Code
FL Plumbing Code
Florida Fire Prevention Code
National Board of Fire Underwriters
SMACNA HVAC Duct Construction Standard
ANSI/ASME B31.1, Power Piping
ANSI/ASME B31.9, Building Services Piping

The foregoing rules, standards, regulations, specifications, recommendations, and requirements shall be followed by the Contractor as minimum requirements. They shall not relieve the Contract from furnishing and installing higher grades of materials and workmanship which are specified herein or indicated on the Drawings.

Any material, equipment or workmanship specified by reference to the number, symbol or title of Specification or detail, or other standard rules, codes, regulations, etc., shall comply with the latest edition amendments and revisions thereto in effect on the date of these Specifications.

The Contractor shall submit proof, if requested by the Engineer or his representative, that the materials, appliances, equipment or devices that he furnishes and installs under this Contract meet the requirements of the Underwriters' Laboratories, Inc., or Factory Mutual, as regards fire and casualty hazards.

PERMITS, INSPECTIONS AND UTILITY FEES

Coordinate costs of taps with the Owners Representative & the CM.

The Contractor shall obtain necessary permits and inspections required for work and pay all charges incidental thereto. Contractor shall coordinate all utility taps and shall pay all associated fees, impact charges, etc. Upon completion of the work the Contractor shall deliver to the Engineer a certificate of inspection and approval from the local inspection department, if required.

MINOR DEVIATIONS

The Contractor shall note that the Mechanical Drawings are intended to indicate only the extent diagrammatically, general character and location of the work included. Work intended, but having minor details obviously omitted or not shown, shall be furnished and installed complete to perform the functions intended.

Arrangements of piping, ductwork, and equipment that differ materially from the obvious intent of the Drawings will not be permitted except where necessary to avoid interferences, and only where specifically approved by the Architect/Engineer. Drawings shall be furnished showing all changes. Any change resulting in a saving in labor and materials shall be made in accordance with a Contract change order.

BASIC MATERIALS AND METHODS

The materials and methods specified in this article are to be used for work specified throughout this Section of the Specifications.

All materials and workmanship shall be of the highest quality.

Any materials on the job rejected by the Architect/Engineer shall be removed from the premises.

The installation shall be made in a workmanlike manner in accordance with acceptable industry standards except where specific procedures are called for in these Specifications, in which case they shall be followed.

All materials shall be new, free of defects and of the manufacturers latest standard design.

Reference to a particular material or specific equipment by name, make or catalog number is to describe equipment which will meet the requirements of the project and is not intended to restrict bidding.

It is the intent that all of the equipment of a similar type shall be the products of the same (one) manufacturer when practicable, providing unit responsibility for each group.

REVIEW OF MATERIALS

Submittals shall be made in compliance with the General Conditions of the Contract for Construction and the following:

Submittals shall be identified by items numbers as listed in the pertinent section of the specifications and shall be accompanied by a letter of transmittal.

Certificates shall be in triplicate and where required in conjunction with other submittals shall accompany such submittals.

Materials and other items subject to approval shall not be purchased or incorporated in the work before receipt of written approval.

Submittals shall be rendered all at one time for the entire project. Partial submittals will not be accepted or acknowledged. Exception: If a few items have long shop drawing preparation time, then these items will be accepted later to avoid delaying the shop drawing procedure.

SHOP DRAWINGS

Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor and which illustrates some portion of the Work.

All shop drawings submitted shall bear the stamps of approval of the Contractor as evidence that the drawings have been checked by the Contractor. If the shop drawings show variances from the other requirements of the contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment. Otherwise, the Contractor will not be relieved of the responsibility for executing the work even though such shop drawings have been approved.

Submit electronic copies of the shop drawings to be retained and additional copies as required by the Contractor, all items required under appropriate sections of the Specifications.

All materials are to be submitted in a hard cover, three ring binder. All materials are to be labeled with the pertinent Specification Section and are to be separated with dividers for each section of the Mechanical Specifications.

All materials submitted late or re-submitted shall be 3-ring punched and marked with the appropriate Specification Section Numbers.

PROJECT CLOSEOUT

The Contractor shall remove all temporary work and temporary facilities prior to final pay request.

The Contractor shall clean spaces that were occupied by temporary work and temporary facilities. Remove debris, rubbish and excess materials from the sites. Burning or burying is not permitted on the sites.

Repair damages caused by installation or use of temporary facilities. Restore to original condition.

Restore grass, landscaping, hardscaping to original condition.

GUARANTEES, BONDS AND AFFIDAVITS

Warranties:

The Contractor shall submit to the Owner all manufacturer's warranties on equipment furnished and installed under this Contract.

In addition, to the guarantee of equipment by the manufacturer of each piece specified herein, the Contractor shall also guarantee such equipment and shall be held for a period of one year from final acceptance test to make good any defects of the materials or workmanship occurring during this period, without expense to the Owner.

Affidavits:

The Contractor shall provide affidavits as required in the non-technical portion of these Specifications.

Provide Warranty Labels:

All warrantied mechanical equipment see Mechanical Identification requirements.

OPERATION AND MAINTENANCE DATA

Manuals and Instructions:

The Contractor shall deliver to the Engineer, upon substantial completion of the Work, two copies of descriptive literature related to the equipment installed under this Contract, including parts lists, wiring diagrams, maintenance and operation manuals and warranties customarily supplied by manufacturers for equipment incorporated in this work. The literature shall be neatly bound in a 3-ring binder and delivered to the

Engineer prior to final acceptances. Each manual shall include a copy of the Control Diagrams and a complete description of the operation of the control systems.

The Contractor shall give physical demonstration and verbal instructions for proper operation and maintenance of equipment to the Owner or his designated representative. Schedule these demonstrations and instructions at the Owner's convenience.

Provide four (4) hours of tour and demonstration of all equipment installed under this project.

AS-BUILT DRAWINGS

As-Built Drawings are required. Maintain a current and legible record set (full size set) on the job. Final record prints will be drafted by the Engineer and signed off by the contractor. The Contractor is solely responsible for providing accurate as-builts.

QUALITY ASSURANCE

Products Criteria:

Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least two (2) years prior to bid opening. Provide list of users upon request.

Equipment having less than a two-year use record, which in the opinion of the Engineer, provided significant benefits to the Owner such as improved energy efficiency, will be acceptable if it is a product of a manufacturer who has been regularly engaged in the manufacture of that specific type of product which has been used in similar applications for a period of two years. The Engineer reserves the right to require the Contractor to submit evidence to this effect for his approval.

Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located, in the opinion of the Engineer, reasonably close to the site.

Manufacturer's Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

Welding: Before any welding is performed submit a copy of the Welding Procedure Specification (WPS) together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code.

Before any welder performs any welding, submit a copy of the Manufacturer's Record of Welder or Welding Operator Qualification Tests as required by Section IX of the ASME Boiler and Pressure Code. The letter or symbol (as shown on the qualification test form)

shall be used to identify the work of that welder and shall be affixed, in accordance with appropriate construction code, to each completed weld.

The types and extent of non-destructive examinations required for pipe welds are shown in Table 136.4 of the Code for Pressure Piping, ANSI/ASME B 31.1.

Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

FIRESTOPPING

Provide for firestopping of all mechanical systems. UL listed methods conforming to the situations present shall be utilized. Submit shop drawings of intended methods, including installation instructions and proof of UL Listing.

WALL, FLOOR AND CEILING PLATES

Material and Type: Chrome plated brass or chrome plated steel. Use plates that fit tight around pipes, cover openings around pipes, and cover the entire pipe sleeve projection.

Thickness: Not less than 3/32 inch for floor plates. For wall and ceiling plates, not less than 0.025 for up to 3 inch pipe, 0.035 for larger pipe.

Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, except mechanical rooms or chases. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

INSTALLATION

Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

Protection and Cleaning:

Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Engineer. Damaged or defective items, in the opinion of the Engineer, shall be replaced.

Protect all finished parts of equipment, such as shafts and bearings, where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures

and equipment against dirt, water, chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

Concrete and Grout: Use concrete and shrink-compensating grout, 3000 psi minimum.

Install gauges, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gauges to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

PAINTING

Paint all bare steel pipe, supports, hangers, fabricated parts, etc. with two coats of enamel paint. Prepare surfaces in accordance with the manufacturer's recommendations. Coordinate colors with existing like components or per the Owner.

Paint all cut or heat affected galvanized steel components with two coats of cold galvanizing spray paint, ZRC Cold Galvanizing compound or equal. Prepare surfaces per the manufacturer's recommendations.

PIPE AND EQUIPMENT SUPPORTS

Generally, support in accordance with industry standards and as described in Section 23 15 00.

Use of chain, wire or strap hangers, wood for blocking, stays and bracing, nor hangers suspended from piping above will not be permitted.

Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 1" clearance between pipe or pipe covering and adjacent work.

LUBRICATION

Field check and lubricate equipment requiring lubrication prior to initial operation.

END OF SECTION

SECTION 23 05 29 – SUPPORTS AND ANCHORS

PART 1 - GENERAL

DESCRIPTION OF WORK

Drawings and general provisions of Contract, including General Supplementary Conditions and Division 1 Specification section, apply to work of this section.

This section is a Division 23 Basic Materials and Methods section, and is part of each Division 22 & 23 section making reference to or requiring supports, anchors, and seals specified herein.

Extent of supports, anchors and seals required by this section is indicated on drawings and/or specified in other Division 23 sections.

Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors and seals.

MSS Standard Compliance:

Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.

Select and apply pipe hangers and support, complying with MSS SP-69.

Fabricate and install pipe hangers and supports, complying with MSS SP-89.

Terminology used in this section is defined in MSS SP-90.

UL Compliance: Provide products which are Underwriters Laboratories listed.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide supports and hangers by Grinnell, Michigan Hanger Company, B-Line Systems, or approved equal.

HORIZONTAL PIPING HANGERS AND SUPPORTS

Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and support to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulating piping. Provide copper plated hangers and support for copper piping systems.

Adjustable Steel Clevises: MSS Type 1.

Steel Double Bolt Pipe Clamps: MSS Type 3.

Adjustable Steel Band Hangers: MSS Type 7.

Steel Pipe Clamps: MSS Type 4.

Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast

iron floor flange.

Vertical Piping Clamps: Except as otherwise indicated, provide factory fabricated vertical piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper plated clamps for copper ping systems.

Two-Bolt Riser Clamps: MSS Type 8.

Four-Bolt Riser Clamps: MSS Type 42.

HANGER-ROD ATTACHMENTS

Except as otherwise indicated, provide factory fabricated hanger-rod attachments complying with ANDI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping hangers and building attachments, in accordance with MSS-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provider copper plated hanger-rod attachments for copper piping systems.

Steel Turnbuckles: MSS Type 13.

Malleable Iron Sockets: MSS Type 16.

BUILDING ATTACHMENTS

Except as otherwise indicated, provide factory fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

Center Beam Clamps: MSS Type 21.

C-Clamps: MSS Type 23.

Malleable Beam Clamps: MSS Type 30.

Side Beam Brackets: MSS Type 34.

Concrete Inserts: MSS Type 18.

SADDLES AND SHIELDS

Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.

Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation adjoining insulation.

MISCELLANEOUS MATERIALS

Metal Framing: Provide products complying with NEMA STD ML 1.

Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.

Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ATM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

Heavy Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance wit AWS standards.

PART 3 - EXECUTION

PREPARATION

Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selection and procedures to followed in performing the work in compliance with requirements specified.

INSTALLATION OF BUILDING ATTACHMENTS

Install building attachments as required locations within concrete or structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is places; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

In areas of work requiring attachments to existing concrete, use self-drilling rod inserts, Phillips Drill Co., “Red-Head” or equal.

INSTALLATION OF HANGERS AND SUPPORTS

General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do no use wire of perforated metal to support piping, and do not support piping from other piping.

Horizontal steel pipe and copper tube 1-½” diameter and smaller: support on 6-foot centers.

Horizontal steel pipe and copper tube over 1-½" diameter: support on 10-foot centers.

Locate pipe hangers/supports within 1' of elbow when pipe turns up or down, e.g. for suppy/return piping to AHU coils/headers.

Support piping to not bear on coil headers or on flexible piping connections.

Vertical steel pipe and copper: support at each floor.

Plastic pipe: support in accordance with manufacturer's recommendations.

Fire protection piping: support in accordance with NFPA 13.

Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

Paint all black steel hangers with black enamel. Galvanized steel and copper clad hanger do not require paint.

Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

Provision for Movement:

Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

Insulated Piping: Comply with the following installation requirements.

Shields: Where low compressive strength insulation or vapor barriers are indicated, install noncompressible insert and use a coated protective insulation shield.

Clamps: Attach clamps, including spacers (if any) to piping projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

Support fire protection piping independently of other piping.

INSTALLATION OF ANCHORS:

Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and elbows. Make provisions for present of anchors as required to accommodate both expansion and contraction of piping.

Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

EQUIPMENT BASES

Where specified, provide concrete housekeeping bases for all floor-mounted equipment furnished as part of the work of Division 23. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation unless otherwise specified. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top edge or corners ¾" on all sides.

Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe fittings. Provide factory fabricated tank saddles for tanks mounted on steel stands. Prime and paint with black enamel.

END OF SECTION

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SECTION 23 05 53 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of contract, including General and Supplementary Conditions and Division-23 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Provide identification of the following:

Mechanical Equipment (air handlers, condensing units, terminals, VFDs, etc.)
Mechanical Controls (panels, equipment, devices, sensors, etc.)
Mechanical Piping (chilled water, hot water, etc.)

Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division 23 sections.

Types of identification devices specified in this section include the following:

Laminated Self-adhesive Identification Materials.
Self-Adhering Pipe Identification Materials

QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Codes and Standards:

ANSI Standards: Comply with ANSI A13.1 for lettering size, colors, and viewing angles of identification devices.

SUBMITTALS

Product Data: Submit electronic copies of manufacturer's technical product data and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURES:

Manufacturer: Subject to compliance with requirements, provide mechanical identification materials of one of the following:

Allen Systems, Inc.

Brady (W. H.) Co.; Signmark Div.
Industrial Safety Supply Co., Inc.
Seton Name Plate Corp.

MECHANICAL IDENTIFICATION MATERIALS:

General: Provide manufacturer's standard products of categories and types required for each application. Where more than one type is specified for application, selection is Installer's option, but provide single selection for each product category. Labels and lettering shall be neat and machine made.

EQUIPMENT IDENTIFICATION MATERIALS:

Plastic or phenolic self-adhesive labels with 3/8” high stenciled letters. Label shall be black color with white stenciling.

PAINTED IDENTIFICATION MATERIALS:

Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendation of ANSI A13.1

Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.

Identification Paint: Standard identification enamel to match existing systems elsewhere in the building.

PLASTIC PIPE MARKERS:

Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1 and matching existing.

Pressure-Sensitive Type: Provide manufacturer’s standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1 and matching existing.

Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location.

Large Pipes: For external diameters 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height.

Lettering: Comply with piping system nomenclature to match existing systems elsewhere in the building.

Arrows: Apply printed pipe markers with arrows indicating direction of flow.

PART 3 - EXECUTION

EQUIPMENT IDENTIFICATION:

General: Coordinate names, abbreviations with the schedules on the plans.

Install equipment labels on all new and affected panels, and equipment. Place labels in conspicuous location. Ensure label does not interfere with access.

PIPING SYSTEM IDENTIFICATION:

General: Coordinate names, abbreviations, pipe colors and other designations used in mechanical identification work, with existing corresponding designations with plans and existing equipment. Consult with the engineer regarding conflicts with existing equipment names.

Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

Plastic pipe markers, with application system as indicated under "Materials" in this section.

Stenciled marker, black or white for best contrast.

Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine room, accessible maintenance spaces and exterior non-concealed locations.

Near each valve and control device.

Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

Near locations where pipes pass through walls or floors/ceiling, or enter non-accessible enclosures.

At access doors, manholes and similar access points which permit view of concealed piping.

Near major equipment items and other points of origination and termination.

Spaced intermediately at maximum spacing of 25' along each piping run, except reduce spacing to 15' in congested areas of piping and equipment.

On piping above removable acoustical ceilings, except omit intermediately spaced markers.

END OF SECTION

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SECTION 23 05 94 - TEST AND BALANCE COORDINATION

PART 1 - GENERAL

GENERAL CONDITIONS

This work is to be completed by the TAB Vendor in accordance with a separate contract with Leon County Schools. Construction Manager shall provide coordination & assistance for implementation.

a. Coordinating the activities of the Test and Balance Firm.

b. Notifying the Owner when systems are ready for test and balance. The Contractor shall bear the cost of any retesting or return visits required of the Test and Balance firm because systems are not ready.

c. Providing the Test and Balance Firm with all drawings, submittals, specifications and manufacturer's performance data needed.

d. Maintaining systems in operation during test and balance.

e. Making such alterations and corrections (within the scope of the plans and specifications) to systems and equipment as necessary for correct test and balance.

f. Making changes to pulleys, belts, or dampers, or adding dampers, as required by the Test and Balance Firm.

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

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SECTION 23 07 10 - MECHANICAL INSULATION

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

DESCRIPTION OF WORK:

Extent of the mechanical insulation required by this section is indicated on the Drawings and schedules, and by the requirements of this section.

Types of mechanical insulation specified in this section include the following:

Ductwork Systems Insulation:
- Fiberglass duct wrap
- Semi-rigid board
- Closed-cell elastomeric

Piping System Insulation:
- Cellular glass
- Closed-cell elastomeric
- Preformed fiberglass
- Calcium Silicate

RELATED WORK

Refer to Division 7 for fire caulking; not work of this section.

QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in the manufacture of mechanical insulation products, of types required, whose products have been in satisfactory use in similar service for not less than three (3) years.

Installer's Qualifications: Installer shall be an insulation specialty sub-contractor. A professional insulator with adequate experience and ability shall install all insulation. Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) having flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) methods.

Comply with the manufacturer’s recommendations for installation of insulation materials.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Each type of insulation material, performance data, etc.

Mastics, tapes, mechanical fasteners, etc.

Jacketing materials

Schedule of insulation systems that includes materials, insulation thickness, mastics, tapes, etc. for each type of system included in the project.

DELIVERY, STORAGE, AND HANDLING:

Deliver insulation, coverings, cements, adhesives and coatings to the site in containers with manufacturer's stamp or label, affixed and showing fire hazard indexes of products.

Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

DUCTWORK INSULATION MATERIALS:

Fiberglass Duct Wrap: Federal Specification HH-1-558B, 1 pcf density, k=0.24, 2.2" thick (out of package), 1-5/8" thick (installed), R-value = 6.0 (installed), rated to 450 degrees F operating temperature. FSK reinforced foil vapor retarder. Owens / Corning SoftR or an approved equivalent.

Fiberglass Duct Board: Federal Specification HH-1-558B, 3.8 pcf density, k=0.23, 1-1/2" thick, R-value = 6.50, rated to 450 degrees F operating temperature. FSK reinforced foil vapor retarder. Owens / Corning Quiet R, Manville Type 814 or an approved equivalent.

PIPING INSULATION MATERIALS:

Cellular Glass Piping Insulation (limited to above-grade installations): ASTM C 552, 8 pcf density, k=0.38, rated to 900 degrees F operating temperature. Pittsburgh Corning Foamglass or an approved equivalent.

Cellular glass bedding mastic: Benjamin Foster 30-45

Indoor Insulation Jacket: All service kraft reinforced foil jacket with an elastomeric polymer barrier reinforced with glass fabric. Vapor permeance

less than 0.02 grains/hr.sf.in.Hg. Owens/Corning ASJ/SSL-II, Lamtec 30J or equal.

Indoor Insulation Fittings: Finish with glass fabric and vapor barrier mastic. Childers CP-30 or Pittcote 300.

Exterior Insulation Jacket: Aluminum jacketing 0.016" thickness with bands and seal of same product. Childers Products or equal.

Fiberglass Pipe Insulation: ASTM C 547, 3 pcf density, k=0.26, rated to 650 degrees F operating temperature. Owens/Corning, Fiberglass

Calcium Silicate Pipe Insulation: ASTM C533 molded, asbestos free, 14 pcf. Johns Manville Thermo-12 or equal. Abrasion resistant canvas jacketing.

Fiberglass insulation jacket: All service kraft reinforced foil jacket. Owens/Corning, ASJ/SSL-II or an approved equivalent.

Closed Cell Elastomeric Insulation: ASTM C 534, k=0.27, rated to 200 degrees F operating temperature, maximum permeability = 0.20 perm-in. Armaflex AP or an approved equivalent.

INSULATION JACKETING

Aluminum roll jacketing conforming to ASTM B209, 3003 alloy, H-14 temper, 0.016” thick, with preformed aluminum elbows.

PART 3 - EXECUTION

INSULATION SYSTEMS:

General Duct Systems: Insulate concealed supply, return, outside air, and transfer air ductwork with fiber glass duct wrap unless otherwise specified herein. Duct that is in exposed ceilings and beyond the reach normal wear-and-tear, can be insulated with duct wrap.

Air Handler Duct Systems: Insulate new supply, return, and outside air ducts in mechanical rooms with rigid fiberglass board up to a height of 7 feet and then transition to flexible duct wrap. If all duct is below 7 feet, extend rigid insulation to 6” beyond the mechanical room walls.

Interior Refrigerant Piping: Insulate with 3/4" closed-cell elastomeric insulation.

Exterior Refrigerant Piping: Insulate with 3/4" elastomeric foam. Cover hard piping with aluminum jacketing and soft piping with 13-ply Venture Tape (or equal) with aluminum foil cover.

Exterior, and Under Roof Hot Water Piping (above grade): Insulate with 2” thick foam glass finish with vapor-barrier and cover with aluminum jacketing.

Exterior Heating Hot Water Piping (below grade): Insulate with 2” thick foam glass, provide finish vapor barrier coat, and cover with polyguard jacketing.

Interior Chilled Water Piping: Insulate with 2” thick foam glass with ASJ cover for pipes 4” and above, and 1-1/2” thick for all others sizes. Finish with vapor barrier coat.

Interior Heating Hot Water Piping & Hot Condensate: Insulate with 1.5” thick fiberglass insulation, cover with ASJ.

Interior Steam Piping: Insulate with 1.5” thick calcium silicate insulation, cover with canvas wrap.

Miscellaneous Cold Drain Piping: Interior: Insulate with 3/4" closed cell elastomeric insulation. Seal all seams joints, etc. Exterior: No insulation is required.

GENERAL INSTALLATION REQUIREMENTS:

Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

Surfaces shall be clean and dry before attempting to apply insulation. Mechanical systems shall be turned off and the system shall be at room temperature before insulating. A professional insulator with adequate experience and ability shall install insulation.

Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose. Seal all joints, seams, etc. air and water tight.

Rated floors and partitions shall be penetrated only with insulation materials and techniques UL listed to maintain rated assembly. Consult with firestopping product vendors and technicians in advance. Any questions shall be referred to the Architect/Engineer.

Exposed/exterior piping shall be finished with an aluminum jacketing.

INSTALLATION OF DUCT WRAP

Application: The insulation shall be applied over 4" wide brushed strips of Foster's 85-20 adhesive spaced 12" on center. The insulation shall be overlapped approximately 2” and stapled in place. All ducts 24" or larger in width shall have the insulation additionally secured with mechanical fasteners spaced approximately 18" on center. Mechanical fasteners shall be bonded to the duct with the appropriate mastic/adhesive. Self-stick type pins are prohibited.

Insulation shall be cut and applied to the ductwork with not less than 2" overlap of backing on each edge and on the linear seams. Insulation shall be removed from all overlapping tabs.

On rectangular ducts install so insulation is not excessively compressed at corners.

Seams shall be stapled approximately 6" on center with outward clinching staples.

Seal all seams, tears, punctures, penetrations for hanger straps, or any other breaches of duct wrap facing with tape or mastic to provide a vapor tight system.

INSTALLATION OF FIBERGLASS DUCT BOARD INSULATION

Application: The insulation joints shall be lapped, butted, or mitered and taped in place. All ducts 24" or larger in width shall have the insulation additionally secured with mechanical fasteners spaced approximately 18" on center. Tape all joints and staple with outward clinching staples. Final tape over staples.

Seal all seams, joints, tears, punctures, penetrations or any other breaches of insulation facing with tape to provide a vapor-tight permanent system.

Use mastic over final taped joints for the connections to air handlers, fan coil units, etc.

INSTALLATION OF FIBERGLASS AND ELASTOMERIC PIPING INSULATION:

Insulation is not to be installed until the piping systems have been checked and found free of all leaks, and piping is dry (achieved room temperature) and free of debris.

Provide hanger type and support shields of 18-gauge galvanized steel over or embedded in the insulation. Shield shall extend halfway up the pipe insulation cover and at least 6" on each side of the hanger. Insulation shield edges shall be hemmed. Use incompressible inserts at each hanger/support to prevent compressing insulation due to weight of pipe.

Provide standoffs and clamps for wall/floor mounted piping to accommodate insulation thickness. Insulate over clamp and seal all joints, gaps, etc. air and water tight. Use incompressible inserts at each hanger/support to prevent compressing insulation due to weight of pipe.

Securely fasten shield with straps at each end. Insulate anchors adequately to prevent moisture condensation problems.

Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use pieces or scraps abutting each other.

Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

Maintain integrity of vapor-barrier jackets, and protect to prevent puncture or other damage. Gaps and openings in chilled water insulation vapor barrier will not be tolerated.

Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation applied to adjoining pipe. Optional: install factory molded, precut or job fabricated units.

Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

Exposed/outdoor piping with elastomeric insulation shall be protected by aluminum jacketing.

INSTALLATION OF CELLULAR GLASS PIPE INSULATION:

Install continuous coat of insulation adhesive/bedding on piping and on insulation butt and longitudinal ends. Install insulation sections and stagger joints. Butt ends tight, wipe excess bedding, and secure insulation with aluminum bands and wrap with vapor barrier jacket along entire length and butted ends. Apply additional vapor-barrier tape where needed. Seal ends air and water tight with approved mastic.

Apply vapor-barrier jacket in accordance with the manufacturer's instructions. Ensure integrity of the vapor barrier with properly applied butt strips. Repair all punctures, penetrations, and holes with tape approved by the manufacturer.

INSTALLATION OF ALUMINUM JACKETING:

Install aluminum jacketing only after insulation installation is completed. Install full-length sections and overlap joints 2" minimum. Orient longitudinal seams at bottom of piping. Install aluminum or stainless-steel bands to secure insulation on 2' maximum centers. Install prefabricated aluminum fittings at elbows/offsets. Seal all seams joints, openings, etc. water tight with clear/gray silicone sealant.

PROTECTION AND REPLACEMENT:

Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

SEALING WALL & FLOOR PENETRATIONS

Seal rated wall/floor penetrations to maintain fire rating. Coordinate firestopping in advance of installation.

Seal all wall/floor penetrations water tight.

END OF SECTION

SECTION 23 08 00 - COMMISSIONING OF HVAC

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment; the Test, Adjusting and Balancing (TAB) process, and the Building Automation System (BAS).

Related Sections:

> Section 019113 "General Commissioning Requirements" for general commissioning process requirements.

DEFINITIONS

BAS: Building Automation System as specified in Section 230900 “Building Automation and Temperature Control System.”

Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

CxA: Commissioning Authority.

HVAC&R: Heating, Ventilation, Air Conditioning, and Refrigeration.

Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

TAB: Testing, Adjusting and Balancing work as specified in Section 230593 “Testing and Balancing for HVAC.”

INFORMATIONAL SUBMITTALS

Certificates of readiness, refer to Section 019113 “General Commissioning Requirements.”

Pre-Functional Test Checklists and Equipment Startup Reports

CONTRACTOR’S RESPONSIBILITIES

Attend construction phase commissioning kick-off meeting.

Attend commissioning team meetings held on a variable basis.

Attend TAB review and coordination meeting.

Notify CxA when major equipment start-ups by the Contractor or the manufacturer are scheduled to occur. Provide sufficient notice (14 days minimum) so that the CxA can plan to be onsite to witness.

Notify CxA when TAB work is scheduled to occur. Provide sufficient notice (14 days minimum) so that the CxA can plan to be onsite to witness.

Complete pre-functional test checklists provided by the CxA. Contractor may use the manufacturer's factory startup checklists to avoid duplication of data entry.

Perform commissioning functional performance tests at the direction of the CxA. A representative from the Mechanical Contractor and Controls Contractor will be required to be onsite for the entire duration of functional performance testing. Include additional site visits from equipment manufacturers if necessary to demonstrate the operation of the equipment and/or systems, their integration with the BAS, and perform the requirements of the functional performance tests.

Notify CxA when TAB work is complete and provide a copy of the Final TAB Report for the CxA records.

Provide owner training and orientation as required by the Contract Documents and provide documentation of the training to the CxA. CxA may witness owner training.

Provide information requested by the CxA for final commissioning documentation.

Participate in a warranty walk-through of building and system operation 10 months after completion.

CxA'S RESPONSIBILITIES

Organize and lead the commissioning team and convene commissioning team meetings.

Provide project specific construction checklists and functional performance test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

Conduct commissioning site visits and distribute field observation reports.

Prepare and maintain the commissioning Issues Log.

Witness major equipment or system start-ups.

Direct commissioning functional performance testing.

Compile commissioning related documentation and include it in the final commissioning process report and systems manual.

Verify owner training is complete.

Review of building and system operation 10 months after completion.

COMMISSIONING DOCUMENTATION

Provide the following information to the CxA for inclusion in the commissioning plan:

Plan for delivery and review of submittals, operation and maintenance manuals, and other documents and reports.

Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.

Process and schedule for completing pre-functional test checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.

Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.

Test and inspection reports and certificates.

Corrective action documentation for commissioning related issues.

TAB reports.

Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

TESTING PREPARATION

Provide a fully executed Certificate of Readiness signed by Contractor, Subcontractors, TAB Agent and BAS provider certifying that HVAC&R Systems, instrumentation and control systems have been completed and calibrated, pre-tested and inspected and that they are operating according to the Contract Documents, and that pretest set points have been recorded.

Provide completed Certificate of Readiness to CxA no less than 7 days prior to the scheduled beginning of on-site CxA functional performance testing.

Certify that TAB procedures have been completed and that reports have been submitted, discrepancies corrected, and corrective work approved.

Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

Inspect and verify the position of each device and interlock.

Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

GENERAL TESTING REQUIREMENTS

Provide technicians, instrumentation, and tools to perform commissioning tests at the direction of the CxA.

Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation, cooling and refrigeration through distribution systems to each conditioned space.

Cx Testing of systems and equipment shall include measuring capacities and effectiveness of operational and control functions in addition to or in conjunction with any statutory and regulatory testing required by Authorities Having Jurisdiction over the project and testing required in other Sections of this Project Manual.

Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

The CxA along with the HVAC&R Subcontractor, TAB Agent, and Controls Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

Tests will be performed using design conditions whenever possible.

Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions.

Before simulating conditions, calibrate testing instruments.

Provide equipment to simulate loads.

Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation.

After tests, return settings to normal operating conditions.

The CxA may direct that set points be altered when simulating conditions is not practical.

The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

END OF SECTION

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SECTION 23 09 10 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials equipment and incidentals required and install variable frequency drives as shown on the Drawings and as specified here.

These specifications are intended to give a general description of what is required but do not cover all details that will vary in accordance with the requirements of the equipment furnished. They are, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing of all materials equipment and appurtenances for the variable frequency drives specified here.

DESCRIPTION OF SYSTEM

The variable frequency drives specified here will become part of a complete mechanical control system as specified in Division 23. The intention of these specifications is that the mechanical system Supplier shall furnish and coordinate the supply of the Variable Speed Drives with the balance of the equipment and controls installation so as to provide unit responsibility.

The variable frequency drives shall operate standard induction motors. Remote or automatic control of the variable frequency drive shall be as specified. The drives furnished herein shall be totally compatible with the motors to be controlled and the controls supplied.

The intent of these specifications is to provide a completely self-contained and fully featured unit with rectifier, inverter, controls, bypass feature, disconnect and circuit protection features in a single unit. Drives that are composed of modular, but integrated components are acceptable. Branch circuit protection may be fuses or circuit breakers. The approved equipment will commonly be referred to as a drive package or drive pack.

REFERENCES

Comply with the latest applicable standards: UL-508, National Electric Code, NFPA 70, and IEEE.

QUALIFICATIONS

Variable speed drives shall be of sufficient size for the duty to be performed and shall not exceed their full rated capacity when the driven equipment is operating as specified.

All equipment furnished under these Specifications shall be new and unused and shall be the standard catalog product of the manufacturer.

The drives covered by these specifications are intended to be equipment of proven ability as manufactured by reputable manufacturers having 10 years' experience in the production of similar units. The equipment furnished shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed.

For the equipment specified herein, the manufacturer shall be ISO 9001 certified.

The variable frequency drive manufacturer shall maintain and staff engineering service and repair shops throughout the United States with personnel trained to do start-up service, emergency service calls, repair work, service contracts and training of customer personnel. In addition, the drive manufacturer shall maintain such a service and repair facility within 200 miles of the project site.

SUBMITTALS

Copies of all materials required to establish compliance with the Specifications shall be submitted electronically. Submittals shall include at least the following:

1. Shop Drawings showing all important details of construction, dimensions and anchor bolt locations.

2. Descriptive literature, bulletins, and catalog product sheets of the equipment.

3. Data on the characteristics and performance of the variable frequency drives. Data shall include certification that the variable frequency drives are warranted for use with the motors furnished and the equipment specified in Division 23 and is to be compatible with the instrumentation and control devices installed.

4. Complete Drawings shall be furnished for approval and shall consist of power and control connection diagrams, elementary or control schematics, including coordination with other electrical control devices operating in conjunction with the Variable Frequency Drive, and suitable outline drawings with sufficient details for locating conduit locations and field wiring.

OPERATING INSTRUCTIONS

Three copies of the operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

TOOLS AND SPARE PARTS

One (1) set of all special tools required for normal operation and maintenance shall be provided.

The manufacturer shall provide two spares per drive of all Owner-replaceable items such as fuses, pilot lamps, etc.

PRODUCT HANDLING

All parts shall be properly protected so that no damage or deterioration will occur from the time of shipment until installation is completed and the units and equipment are ready for operation.

Factory assembled parts and components shall not be dismantled for shipment or installation unless explicitly stated in manufacturer's installation instructions.

START-UP COMMISSIONING

The manufacturer shall provide start-up commissioning of each VFD supplied by a factory certified service technician who is experienced in start-up and repair services.

Start-up services shall include checking for verification of proper operation and installation of the VFD, its options and all interface wiring to the building automation system. All parameters of the VFD shall be checked and adjusted to within manufacturer's recommended operating ranges.

WARRANTY AND SERVICE AGREEMENT

All equipment supplied under this section shall be covered by a warranty and service agreement. This warranty and service agreement shall be for three (3) years from the date of Owner acceptance. The warranty shall be provided by the drive manufacturer (factory warranty).

The manufacturer's warranty shall be unconditional.

A maintenance and repair service agreement shall be included as part of the drive manufacturer's submittal. Drive manufacturers who cannot provide factory trained service and maintenance are not acceptable.

PART 2 - PRODUCTS

GENERAL

The Contractor shall furnish and install complete Variable Frequency Drives as described in this specification and as detailed on the applicable Drawings.

The Contractor shall be responsible for the installation and startup of the equipment covered by this specification.

The motor(s) to be controlled are rated for 208 volt, 3-phase.

CONSTRUCTION

Each Variable Frequency Drive shall consist of a 460-volt rated, three-phase rectifier and variable-frequency inverter with features, functions and options as specified.

The Variable Frequency Drives shall be rated for the specified horsepower, NEC full load current, and motor speed at 104 deg F. The variable frequency drives shall be designed to provide continuous speed adjustment of three phase motors. The variable frequency output voltage shall provide constant volts-per-Hertz excitation to the motor terminals up to 60 hertz. Two or more selectable V/Hz patterns shall be available and shall be controlled through software or adjustable hardware.

Controllers shall be rated for an ambient temperature of 0 degrees Celsius to 40 degrees Celsius, an altitude of up to 3,000 feet above sea level and humidity of 0 to 95% non-condensing.

Controller enclosures shall be NEMA Type 1 or Type 12, wall mounted, ventilated if required by equipment manufacturer and as approved by the Engineer. The inverters shall have complete front accessibility with easily removable assemblies.

The following standard basic control features shall be provided on the inverter:

1. Start, Stop, Power On indicating lights and speed control potentiometer. Terminations for remote mounted operator control devices shall be furnished.
2. Unidirectional operation, coast to rest upon stop.
3. Variable linear independent timed acceleration.
4. Variable torque performance from 4 to 60 Hertz.
5. Dual speed stepover, to prevent operation at two discrete speeds, adjustable.
6. The installation shall meet IEEE 519 Standards for five per cent distortion.
7. Frequency stability of 0.5% for 24 hours with voltage regulation of +-2% of maximum rated output voltage.
8. 115V AC isolated control power supply for operator devices.
9. Phase insensitive to input power.
10. Automatic restart upon return of power following a utility outage.
11. A HAND-OFF-AUTO switch (H-O-A) shall be provided and interface with the control sequence specified.
12. Each VFD shall have a non-resettable 0 to 99999.9 hour elapsed run time meter.
13. Each VFD shall have an optically isolated 4-20 mA input for remotely setting motor speed.
14. Each VFD shall have an optically isolated 4-20 mA output signal proportional to the motor speed. Accuracy of the signal shall be verified by comparing the signal to actual motor speed as measured in the field and set to match if required.

The following protective features shall be provided on the drive:
1. Input short circuit protection. The drive shall be protected against short circuits up 50,000 amperes symmetrical.
2. Input phase loss and phase reversal protection.
3. Electronic overcurrent trip for instantaneous overload protection.
4. Undervoltage protection of output.
5. Over frequency protection.
6. Overtemperature protection.
7. Integral transient protection from input AC line transients meeting ANSI/IEEE Standard C62.41.
8. Electrical isolation between the power and logic circuits, as well as between the 115V AC control power and the static digital sequencing.
9. Drive shall be capable of withstanding output terminal line short or open circuits without component damage.
10. di/dt and dv/dt protection for converter semiconductors.
11. Units shall have an alpha-numeric or light emitting diodes for diagnostic display of over frequency, instantaneous overcurrent, DC overvoltage, AC undervoltage/loss of phase, emergency stop, overload, overtemperature, inverter pole trip and standby modes; unit mounted.
12. A protective coating shall be applied to both sides of all printed circuit boards.
13. All potentiometers, including pots on printed circuit boards, shall be sealed.

14. Input disconnect switch with overcurrent and short circuit protection.

The following standard independent adjustments shall be provided on the inverter:
1. Minimum speed (as required).
2. Maximum speed (as required).
3. Acceleration time 2 to 60 seconds (minimum).
4. Deceleration time 2 to 60 seconds (minimum).
5. Critical frequency avoidance.
6. Volts per Hertz profile.

The following shall be furnished with the controller:
1. Run indicating relay contacts (closes when VFD is supplying power to the motor) to be wired to Distributed Control Unit.
2. Delayed motor failure indicating relay contact (opens on failure) to be wired to Distributed control Unit.
3. Door mounted output load ammeter, voltmeter, and speed output indicating meters.
4. Built-in self-diagnostics.

BYPASS

Where scheduled, provide a manual or automatic (selectable by keypad input) bypass controller, microprocessor based. Controller shall consist of a a built-in motor starter and a three position DRIVE/OFF/BYPASS switch controlling two contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the BYPASS position, the motor is operated at full speed from the AC power line and power is disconnected from the drive so that service can be performed. Provide a normally closed dry contact interlocked with the drive safety trip circuitry to stop the motor whether in drive or bypass mode in case of an external safety fault. Start/Stop control shall shall function in both DRIVE and BYPASS MODE.

PERFORMANCE

Drives shall have an efficiency at full load and speed that exceeds 95%. The efficiency shall exceed 90% at 50% speed and load.

Drives shall maintain the line side displacement power factor at not less than 0.95, regardless of motor speed and load.

Drives shall be capable of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the drive.

Drives shall be capable of starting into a spinning motor without any adverse effect on the motor and without exceeding normal operating parameters of the drive.

Drives shall meet or exceed IEEE 519 for reflected harmonic distortion.

APPROVED MANUFACTURERS

Furnish units by ABB, Siemens, Cutler-Hammer, Danfoss, Square D, or Allen Bradley.

PART 3 - EXECUTION

INSTALLATION

Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the location shown on the Drawings. Field wiring shall be in accordance with the manufacturer's recommendations.

TESTING

Tests and checks: Variable frequency drives shall be tested with a motor load of full horsepower rating prior to shipment.

All printed circuit boards shall be functionally tested prior to unit installation.

After all operational tests have been performed, each drive shall undergo a burn-in test. The drive shall be burned in at 100% inductive or motor load without an unscheduled shutdown.

A copy of all tests and checks performed in the field, complete with meter readings and recordings, where applicable, shall be submitted to the Owner.

After the drives have been completely installed, and working under the direction of the manufacturer, conduct in the presence of the Engineer, such tests as necessary to indicate that operation conforms to the Specifications.

END OF SECTION

SECTION 23 09 24 - DIGITAL HVAC CONTROLS COORDINATION

PART 1 - GENERAL

GENERAL CONDITIONS

This work is to be completed by the Controls Vendor in accordance with a separate contract with Leon County Schools. Construction Manager shall provide coordination & assistance for implementation.

Equipment Installation Subcontractors shall be responsible for the following tasks:

a. Coordinate activities with the Control Subcontractor.

b. Provide Control Subcontractor with all drawings, submittals, specifications, and manufacturer's performance data needed.

c. Maintaining systems in operation during test and balance.

d. Installation of all control devices in piping and ductwork systems.

END OF SECTION

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SECTION 23 1123 - NATURAL GAS PIPING

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 0100.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings.

In general, the work consists of, but is not limited to, the following:

Arrange with supplier to provide gas service.

Installation of a system of gas piping and all valves, fittings, regulators, etc.

Final connection of gas fixtures/equipment furnished by others.

QUALITY ASSURANCE

Codes: Install systems in accordance with NFPA-54, NFPA-58, and Florida Fuel Gas Code 6th Edition

Licensed Personnel: Installation of the entire system shall be executed by persons licensed and bonded by the construction industry licensing board.

Permits: The contractor shall obtain applicable permits for the work via the local/jurisdictional agencies.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Valves and pressure regulators

Piping materials

Anodeless Risers

CHANGES

The Drawings indicate generally the locations of gas fired equipment, piping, etc., and while these are to be followed as closely as possible, if before installation, it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made as directed by the Architect/Engineer.

PART 2 - PRODUCTS

PIPING/FITTINGS

Steel pipe complying ASTM A 53 with malleable iron threaded fittings.

Threaded fittings shall be threaded Class 150 malleable iron, conforming to ANSI B16-3. The fittings shall be black or galvanized to match the pipe with which they are to be used and shall be suitable for a working pressure of 250 psig.

Medium density polyethylene (MDPE) yellow gas pipe, conforming to ASTM D2513 with a maximum SDR of 11.0 may be used outdoors for underground installation. Pipe shall be marked “Gas” and “ASTM D 2513”.

GAS VALVES

Gas cocks shall comply with ANSI Standard Z21.15 and/or CSA Requirement 3.88 depending upon application/pressure. Two inches or smaller: 150 psi non-shock WOG, bronze straightway cock with threaded ends. Manufacturers: Nibco, Powell, Rockwell, or approved equivalent.

REGULATORS

Provide diaphragm-type line pressure regulator that is listed as complying with ANSI Z21.80. Regulator capacity shall be based upon the lowest supply pressure, i.e., incorporate distribution piping pressure drop, to ensure meter will function during peak demands.

PIPE ACCESSORIES

Pipe sleeves: preformed plastic sized to allow minimum clearance between pipe and sleeves.

Pipe Hangers: Provide pipe hangers and supports conforming to MSS SP-58 and SP-69; Grinnell Company, B-Line, or equivalent.

Provide insulated 18 AWG copper tracer wire for underground plastic piping. Wire insulation shall be suitable for direct burial. Terminate ends above grade.

Provide detectable underground warning tape in trench above underground piping.

Provide chrome-plated escutcheon plates where exposed pipe passes through walls, floors, or ceiling in finished areas.

Provide manufacturer’s standard anodeless riser, transition from plastic to steel pipe with 7 to 12 mil thick epoxy coating. Use swaged gas-tight construction with O-ring seals, metal insert, and protective sleeve. Provide either bolt-on bracket or wall mounted riser supports.

PART 3 - EXECUTION

PIPING

Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

Use screw pipe up to 2” NPS and weld pipe 2-1/2” NPS and over.

Use sealants on gas piping threads which are chemically resistant to either natural or LP gas.

Remove cutting and threading burrs before assembling piping.

Nesting of bushings to be prohibited. Utilize properly sized reducing fittings.

Install valves with stems upright or horizontal.

Install "Tee" fitting with bottom outlet plugged or capped to provide a minimum 6" drip leg where noted on the Drawings.

Install tee fitting and plug/cap upstream and downstream of pressure regulator to allow connection of a pressure-measuring instrument.

Install gas piping with a minimum 1" drop in 30' pipe run, preferably in direction of flow.

Install dirt legs at all risers.

Aboveground piping shall be rigid metallic pipe and fittings.

Underground metallic piping shall be protected against corrosion as required by the local authority.

Underground plastic piping shall include a copper tracer wire that terminates above ground and a detectable underground warning tape placed approximately 12” above the piping or below the soil, whichever is shallower.

Adequately support all piping above floors inside the building from or on the building structure. Support piping suspended from the building structure by means of the specified pipe hangers and rods. Make maximum spacing between pipe supports as follows:

Nominal Pipe Size	Maximum Span
3/4" and under	6'
1"	8'
1-1/4" or larger	10'

PIPE SLEEVES

Install pipe sleeves at all locations where pipe passes through walls, floors, or ceilings. Holes in exterior masonry walls shall be cored for installation of galvanized metal sleeve. Seal sleeve within wall and seal piping in sleeve with safing and silicone or butyl sealant.

DIELECTRIC UNIONS

Provide dielectric unions where steel pipe connects to copper.

PERMITS AND INSPECTIONS

Gas work shall be permitted. Also see Mechanical General Provisions, Section 15010.

IDENTIFICATION

Identify new piping systems in accordance with ANSI and NFPA standards.

Above ground piping to be primed and painted yellow along its entire length.

TESTS AND INSPECTIONS

Shall conform to NFPA-54 and/or NFPA 58.

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING & SPECIALTIES

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Provisions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Heating hot water system

Chilled water systems

Valves

Instrumentation

Hydronic specialties

QUALITY ASSURANCE AND CODES/STANDARDS:

Construct and install piping for highest pressures and temperature in respective systems in accordance with the latest revision of the ASME Code for Pressure Piping, ANSI/ASME B31.1 and Building Services Piping, ANSI/ASME B31.9.

Qualifications for Welding Processes and Operators: ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification."

Regulatory Requirements:

ASME Compliance: fabricate and stamp air separators and compression tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Quality Control Submittals:

Welders' certificates certifying that welders comply meet the quality requirements specified herein.

Certification of compliance with ASTM and ANSI manufacturing requirements for pipe, fittings, and specialties.

Submit reports/certifications specified in part 3 of this Section.

SUBMITTALS:

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings and as many additional copies as required for Contractor use.

Valve Product Data: Provide data from manufacturers, for each hydronic specialty and special duty valve specified. Include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions. Submit manufacturer's installation instructions.

Pipe Product Data: Submit data from manufacturer regarding material properties, test data, properties data.

Pipe Fitting Data: Submit manufacturer’s product data including certifications, material properties, test data, etc.

Submit copies of the Welders’ qualifications, certificates, etc.

MAINTENANCE DATA:

Maintenance Data: for hydronic specialties and special duty valves, for inclusion in operating and maintenance manual specified in Division 1 and Division 23 Section "Basic Mechanical Requirements."

PART 2 - PRODUCTS

PIPE AND TUBING MATERIALS:

General: Refer to Part 3 Article "PIPE APPLICATION" for identification of systems where the below specified pipe and fitting materials are used.

Steel Pipe: ASTM A53B or A106B, Schedule 40, seamless or ERW, black steel pipe, beveled ends for weld pipe.

CPVC Plastic Pipe: ASTM D2846.

FITTINGS:

Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.

Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.

Steel Fittings: ASTM A234B, seamless or welded, for welded joints.

Cast-Iron Threaded Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.

Steel Flanges and Flanged Fittings: ANSI B16.5.

Gasket Material: thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.

CPVC Plastic Fittings: ASTM D 2846 solvent cemented joints.

SPECIAL DUTY VALVES:

Two-Way Control Valves: Pressure-independent, characterized control valves, forged brass body, nickel plated; chrome plated brass ball and stem, fiberglass reinforced Teflon PTFE seat, Viton O-rings, stainless steel spring, 200 psi close-off rating, 0 to 212 deg F temperature range, 5 to 50 psid maximum differential pressure across valve, 400 psi minimum pressure rating with 24 volt multi-function operator, 2 to 10 VDC, 4-20 mA operating range, spring return, 45 in-lb torque (minimum), 95 deg max rotation, and 100 second running time.

Three-Way Control Valves: Same as two-way but not pressure independent and A-port equal percentage and B-port modified for common port flow.

Automatic Flow Control Valves: Spring type constructed with stainless steel wear surfaces and spring, variable side porting and single orifice end hole with minimum flow restriction capable of controlling flowrates to +/- 5% of design, and two integral pressure/temperature ports.

Calibrated Plug Valves (Circuit Setter): 125 psig water working pressure, 250 deg F maximum operating temperature, bronze body, plug valve with calibrated orifice. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening. Valves 2 inch and smaller shall have threaded connections and 2-1/2-inch valves shall have flanged connections.

Pressure Reducing Valves: Diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment.

Safety Relief Valves: Unless specified otherwise, one hundred twenty-five (125) psig working pressure and 250 deg F maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber. Select valve to suit actual system pressure and Btu capacity.

BUTTERFLY VALVES:

Comply with MSS SP-67, Butterfly Valves. Provide butterfly valves designed for tight shut-off. Provide gear operators on all butterfly valves 6” and larger. Provide lever operators for valves under 6 inches.

Wafer type valves are prohibited.

Types of Butterfly (BF) Valves: Lug Type 3” and Larger (BF1): 200 CWP, cast iron body, cadmium plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-712. Nibco LD 2110-3. Nibco WD 2110-5. Crane 44-FXB-TL. Milwaukee ML123B-8416.

Lug Type 3" and Larger (BF2): 150/200 CWP, cast iron body, cadmium plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-722 and LG-721. Nibco LD 2110-5. Crane 44-FXB-G. Milwaukee ML 123B-8115.

Lug Type 4" and Larger (BF3): 175 WWP, cast iron body, nickel-plated ductile or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-72U. Nibco LD 3510-8.

Grooved Type 4" and Larger (BF4): 175 WWP, cast iron body, nickel plated ductile iron or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-82U. Nibco GD 1765-2.

BALL VALVES:

General: Select valve size equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blowout proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome plated ball and reinforced Teflon seats. Valves 1" and smaller shall be full port design. Valves 1 ¼" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½" thickness.

Comply with the following standards:

MSS SP-72. Ball Valves with Flanged or Butt-Welding Ends for General Service.

MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

Types of Ball Valves:

Threaded Ends 3" and Smaller: Bronze two-piece full port body with adjustable stem packing. Nibco T-585-70. Stockham S216-BR-R-T. Milwaukee BA 125. Apollo 77-100.

Soldered Ends 3" and Smaller: Bronze three-piece full port body with adjustable stem packing. Nibco S-595-Y-66. Milwaukee BA350. Apollo 82-200.

Threaded Ends 3" and Smaller: Bronze two-piece full port body, UL listed (UL842) for use with flammable liquids and LP gas. Nibco T-585-70-UL.

Threaded Ends 2" and Smaller: 175 WWP, bronze two-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.

Threaded Ends 2" and Smaller: 400 WWP, bronze two-piece body, for fire protection service. Nibco KT-580.

Threaded Ends 2 ½“ and Smaller: 300 WWP, bronze three-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.

Flanged Ends 2 ½” and Larger: Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.

Manual Air Vent: Bronze body and nonferrous internal parts; 150 psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew: and having 1/8-inch discharge connection and 1/2-inch inlet connection.

Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240-degree F operating temperature; and having 1/4-inch discharge connection and 1/2 inch inlet connection.

Y-Pattern Strainers: Cast-iron body (ASTM A 126, Class B), flanged ends for 2-1/2 inch and larger, threaded connections for 2 inch and smaller, bolted cover, perforated Type 304 stainless steel basket, bottom drain connection; 125 psig working pressure.

Flexible Pipe Connections: Rubber-bellows type for chilled water service and stainless steel reinforced for heating hot water systems. Working pressure rating shall be 150 psig (minimum) at 200 deg F. Rubber bellows shall include multi-layered Kevlar tire cord fabric and solid steel retention ring for higher ratings. Flexible pipe connectors shall be same size as the connecting pipe and either screwed or ANSI flanged.

INSTRUMENTATION:

ASME and ISA Compliance: Comply with applicable portions of ASME and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

Pressure Gauges: ASME B40.1, Grade A, phosphor bronze bourdon-tube type, bottom connection. Drawn steel or brass case, glass lens, 4-1/2 inches diameter. White coated aluminum scale with permanently etched markings. Accuracy of 1% of range span. Range of 2 times operating pressure.

Gauge Syphon: 1/4-inch NPS straight coil constructed of brass tubing with threads on each end.

Gauge Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.

Mercury-in-glass Thermometers: Die cast case, aluminum finished in baked epoxy enamel, glass front, spring secured, 9 inches long. Adjustable joint finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device. Tube shall be red reading, mercury filled, magnifying lens. Scale shall be satin-faced, nonreflective aluminum, with permanently etched markings. Stem shall be copper-plated steel, aluminum or brass, for separable socket, length to suit installation. Accuracy shall be plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span. Temperature ranges for services listed as follows:

Chilled Water	0 to 100
Hot Water	30 to 240

Thermometer Wells: Brass or stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap.

Test/Pete's Plugs: Shall be nickel-plated brass body, with 1/2-inch NPS fitting and 2 self-sealing valve-type core inserts suitable for inserting a 1/8-inch OD probe assembly from a dial-type thermometer or pressure gauge. Core material shall be EPDM or neoprene. Test plug shall have gasketed and threaded cap with retention chain and body of length to extend beyond insulation.

PART 3 - EXECUTION

PIPE APPLICATIONS:

Heating Hot Water: Use steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

Chilled Water: Use steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

PIPING INSTALLATIONS:

Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

Install piping generally parallel to walls and column center-lines, unless shown otherwise on the Drawings. Space piping, including insulation, to provide one (1) inch minimum clearance between adjacent piping or other surface.

Slope water supply and return piping at a uniform grade of 1 inch in 40 feet upward in the direction of flow.

Install branch connections to mains using Tee fittings in main with take-off out the bottom of the main, except for up-feed risers which shall have take-off out the top of the main line.

Install unions in pipes 2 inch and smaller, adjacent to each valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

Install flexible connectors at inlet and discharge connections to pumps (except inline pumps) and other vibration producing equipment. Support piping so no weight bears on connector. Use retention rods and/or rings when recommended by the manufacturer.

Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, inline pump, and elsewhere as indicated. Install nipple and ball valve in blow down connection of strainers 2 inch and larger.

Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally, locate valve stems in overhead piping in horizontal position.

Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the Drawings.

Install butterfly valves with the valve open as recommended by the manufacturer to prevent binding of the disc in the seat.

Offset equipment connections to allow valving off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line take-offs with 3-elbow swing joints where noted on the Drawings.

Thermometer Wells: In pipes 2-1/2 inch and smaller increase the pipe size to provide free area equal to the upstream pipe area.

Threaded Joints: Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Align threads at point of assembly. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified). Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

PIPE WELDING:

All welding shall be performed by qualified and certified welders. Welders' qualifications/certification shall be current, i.e., not more than 12 months since issuance, and fully completed by a reputable source. Welders shall submit copy of certificate and driver's license to contractor for review, submit for review/approval to the engineer. Maintain copies of certificates/licenses onsite. Welders shall be qualified on the size pipe utilized for this project.

Unless otherwise specified, welding shall be performed using Shielded Metal Arc Welding (SMAW), otherwise referred to as "stick" welding.

Welds require preparation of surfaces, beveling, and multiple passes.

All welds shall be inspected. The engineer reserves the right to utilize any examination procedure listed in Chapter VI of ANSI/ASME B31.1 to verify integrity of any welds in question. If welds are found to be in compliance, then testing costs shall be paid by the project. Otherwise, the contractor shall bear all related testing costs, weld/pipe replacement costs, additional engineering inspection or reporting costs, etc.

VALVE APPLICATIONS:

General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:

Shut-off duty: use gate, ball, and butterfly valves.

Throttling duty: use globe and ball valves.

Install shut-off duty valves at supply connection to each piece of equipment, and elsewhere as indicated.

Install throttling duty valves as indicated.

Install calibrated plug valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.

Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.

Install check valves on each pump discharge and elsewhere as required to control flow direction.

Install safety relief valves on hot water generators, boilers, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation requirements.

Install pressure reducing valves on make-up water system, and elsewhere as required to regulate system pressure.

VALVE FEATURES

General: Provide valves with features indicated and where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.

Valve features specified or required shall comply with the following:

Flanged: Provide valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).

Threaded: Provide valve ends complying with ANSI B2.1.

Solder-Joint: Provide valve ends complying with ANSI B16.18.

Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.

Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.

Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.

Extended Stem: Increase stem length by 2: minimum, to accommodate insulation applied over valve.

Mechanical Actuator: Provide factory fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve for all valves 4" and larger that are mounted more than 7' 0" above the floor, or are otherwise difficult to operate regardless of height.

HYDRONIC SPECIALTIES INSTALLATION:

Install manual air vents at high points in the system, at heat transfer coils, and elsewhere as required for system air venting. Pipe air vent drains using ¼" soft copper and terminate at nearest safe waste. Support piping on 2' centers.

Install automatic air vents at high points in the system, heat transfer coils, and elsewhere as required for system air venting.

Install pressure/temperature ports across cooling and heating coils, control valves that do not include these fittings, and as needed for proper testing, adjusting, and balancing.

Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.

Use dielectric unions or flanges to isolate dissimilar materials.

FIELD QUALITY CONTROL

Preparation for testing: Coordinate tests with the engineer three days in advance and prepare hydronic piping in accordance with ASME B 31.9 and as follows:

Leave joints including welds uninsulated and exposed for examination during the test.

Flush system with clean water. Clean strainers.

Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing.

Examine system to see the equipment and parts that cannot withstand test pressures are properly isolated.

Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test.

After the hydrostatic test pressure has been applied for at least 15 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks. Document all tests by recording test area, setup, participants names, test pressure, duration, and final results.

FLUSHING AND CLEANING:

Water treatment will be provided by the owner's water treatment contractor. Coordinate flushing and cleaning operation with owner's representative.

Flush entire water piping system. Remove, clean, and replace strainer screens.

Circulate cleaning solution for 4 hours if recommended by the water treatment contractor.

Final flush entire water piping system if cleaning operations were carried out. Remove, clean and replace strainer screens.

Close and fill system as soon as possible after final flushing to minimize corrosion.

END OF SECTION

SECTION 23 21 23 - HVAC PUMPS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Close-Coupled End Suction Pumps
Frame Mounted End Suction Pumps
Inline Circulators

QUALITY ASSURANCE

Manufacturer's Qualifications: Firms regularly engaged in manufacture of general-use centrifugal pumps with characteristics, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Compliance with the following codes and standards is required:

UL Compliance: Design, manufacture, and install HVAC pumps in accordance with UL 778 "Motor Operated Water Pumps."

UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

Certification, Pump Performance: Provide pumps whose performances, under specified operating conditions, are certified by manufacturer.

SUBMITTALS

Product Data: Identify pumps as referenced in the construction documents; submit manufacturer's pump capacities/ratings, installation and start-up instructions, current/accurate pump characteristic performance curves with selection points clearly indicated. Include motor data, seal and sleeve types, materials of construction, dimensions and weights, and any other pertinent data to ensure comprehensive review/approval by the engineer.

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and shop drawings of the above information.

MAINTENANCE DATA

Submit maintenance data and parts lists for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

PRODUCT DELIVERY, STORAGE, AND HANDLING

Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

Store HVAC pumps and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

Comply with Manufacturer's rigging and installation instructions for unloading HVAC pumps, and moving them to final location.

PART 2 – PRODUCTS

GENERAL REQUIREMENTS

Furnish pumps complete with motors, impellers, drive assemblies, bearings, coupling guards, where required, lubrication ports/fittings/extensions to ensure access even when insulated, and accessories as hereinafter specified.

Select motor with sufficient horsepower rating for non-overloading operation over entire pump curve.

Pumps shall meet or exceed operating efficiencies specified on the plans/schedules.

Where pump is indicated for parallel operation, scheduled conditions are for that pump with two pumps in operating; i.e. total system flow rate is twice that scheduled for single pump. When only one of the two pumps is operating, operating point of that pump must fall within manufacturer’s recommended operating range.

Furnish each pump and motor with nameplate giving manufacturer’s name, serial number of pump, model number, impeller size, horsepower, voltage, frequency, speed and full load current.

Pumps shall operate without objectionable noise or vibration.

After testing, each pump shall be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment and preserved/protected for shipping/storage.

Pumps shall be of same manufacturer for each project unless otherwise approved in advance by the engineer.

Unless otherwise specified, pump and motor bearings shall be permanently lubricated, sealed for life, meeting all industry standards for a minimum L 10 life of 60,000 hours.

CLOSE-COUPLED END SUCTION PUMPS

General: Provide close-coupled end suction pumps where indicated, and of capacities and having characteristics as scheduled.

Type: Horizontal mount, single stage, designed for 175 psi working pressure. Pump volute or casing shall be center-line discharge for positive air venting constructed of class 30 cast iron with integrally cast mounting feet. The pump shall have a self-flushing seal design or a positive external seal flushing line. Pump may be furnished with a seal flush line and a Purocell # 900 replaceable cartridge filter with shut-off isolation valve installed in the seal flushing line. The filter shall have the ability to remove particles down to five microns in size.

Casing: Cast iron, 125 psi ANSI flanges, tappings for gage and drain connections. The pumps shall have case wear rings. Mounting feet shall be integrally cast into the casing to allow servicing without disturbing piping connections.

Shaft: Steel with bronze or stainless-steel replaceable shaft sleeve.

Seal: Shall be mechanical with carbon seal ring and ceramic seat rated at 250 deg F.

Motor: Motor shall meet EPAC/NEMA specifications and shall be the size, voltage and enclosure (ODP/TEFC) called for on the plans and as specified in related Division 15 sections. Motors shall be premium efficiency and rated for inverter duty (where scheduled) with 1.15 minimum service factor.

Impeller: The impeller shall be bronze and hydraulically balanced by either back vanes or balancing holes. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key.

FRAME MOUNTED END SUCTION PUMPS

Same as above with the following exceptions. The base shall be made of structural steel and include an integral drain pan. A flexible coupler suitable for both across-the-line starting applications as well as variable-torque loads associated with variable-frequency drives shall connect the pump to the motor and shall be covered by an OSHA-approved coupler guard. Frame mounted pumps shall be aligned by a millwright after installation per the manufacturer's recommendations and tolerances.

IN-LINE PUMPS (CIRCULATORS)

General: Provide inline pumps with capacities as shown on plans. Pumps shall be in-line type for installation in vertical or horizontal piping. Pump must be capable of being serviced without disturbing piping connections.

Pump body shall be of cast iron, rated 175 psi working pressure, with gauge ports at nozzles, and with vent and drain ports. Impeller shall be cast bronze s material, enclosed type, dynamically and hydraulically balanced, keyed to the shaft and secured by a locking cap screw or nut.

An internally-flushed mechanical seal with ceramic seal seat, and carbon seal ring shall seal off the liquid cavity at the motor shaft, suitable for continuous operation at 225^{o} deg. F. A cupro-nickel shaft sleeve shall completely cover the wetted area under the seal.

Pump bearing bracket shall have oil lubricated bronze sleeve bearings or regreaseable or permanently lubricated ball bearings. Bracket shaft shall be alloy steel having ground and hardened thrust bearing faces. A flexible coupling to dampen starting torque and torsional vibrations shall be employed.

Motors shall be EPAC/NEMA rated, premium efficiency, and shall be of the size, voltage, and enclosure (ODP/TEFC) as outlined in the plans and specifications. In general, pumps specified for use with a variable frequency drive shall be inverter duty rated with Class F insulation per the Motors section.

PART 3 - EXECUTION

INSPECTION

Examine areas and conditions under which HVAC pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

EQUIPMENT SUPPORTS/PADS

All pumps in mechanical rooms shall be supported on concrete housekeeping pads. In-line pumps shall be supported by 3” NPS, schedule 40, steel pipe support on concrete pad.

INSTALLATION / START-UP OF PUMPS

General: Install HVAC pumps where indicated, in strict accordance with manufacturer's published installation instructions to avoid stress, minimize noise, maximize life, and ensure alignment; complying with recognized industry practices to ensure that HVAC pumps comply with requirements and serve intended purposes over the expected service life.

Access: Provide access space around HVAC pumps for service as indicated, but in no case less than that recommended by manufacturer. Provide access to all lubrication fittings, including extensions to accommodate depth of insulation, where applicable.

Piping Connections: Refer to the Hydronic Specialties section for piping-related work. Provide piping, valves, accessories, gages, supports, and flexible connections as indicated. Provide concentric (for vertical piping) and eccentric (for horizontal piping) reducers, increasers where pump connection sizes are not identical to connecting piping.

Support/Alignment: Install base-mounted and foot-mounted pumps on minimum of 4" high concrete base, secure with anchor bolts. Vertical inline pumps shall be supported in accordance with the manufacturer’s recommendations. Set and level pump, grout under pump base with non-shrink grout. Align all flexible coupled pumps after grouting is complete/set in accordance with the manufacturer’s recommendations. Record and submit written report/results of alignment to engineer for review/approval. After alignment is complete, pin pump and motor to base.

Verify piping system has been flushed, cleaned, and filled prior to startup. Prime pump, vent air from system/casing, and verify pump rotation. Do not start pumps in a dry condition as this will damage the seals. Remove start-up strainers once the system has been circulated and verified “clean”.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

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SECTION 23 31 13 - METAL AND FLEXIBLE DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

DESCRIPTION OF WORK:

Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section. In general, the work consists of, but is not limited to, the following:

A system of heating and air-conditioning supply and return air ductwork.

Smoke/fire dampers, air diffusers, and miscellaneous accessories.

Miscellaneous volume/control dampers.

Ventilation air ductwork.

Exhaust air ductwork.

RELATED WORK

Insulation is specified under Section 23 07 10.

QUALITY ASSURANCE:

Manufacture's Qualifications: Firms regularly engaged in manufacture of metal ductwork products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer's qualifications: Firm with at least three (3) years of successful installation experience on projects with metal ductwork systems similar to that required for project.

Codes and Standards:

SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.

NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilation Systems".

NFPA Compliance: Comply with NFPA 96 "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment".

SUBMITTALS:

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Ductwork and materials

Mastics

Grilles & accessories

Smoke and fire dampers, miscellaneous dampers and installation instructions

DELIVERY, STORAGE AND HANDLING:

Handle ductwork and equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.

Store ductwork and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

PART 2 - PRODUCTS

DUCTWORK MATERIALS:

Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock forming quality; with G-90 zinc coating in accordance with ASTM A 525.

Single-Wall Spiral Round Duct: Round duct with mechanical fastening, spiral flat seams, complying with ASTM A527, with G-90 zinc coating in accordance with ASTM A 525.

MISCELLANEOUS MATERIALS:

General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connections of ductwork and equipment.

Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

Flexible Ducts: Insulated spiral-wound spring steel with flame proof vinyl sheathing complying with UL 181, Class I air duct (duct connectors will not be accepted).

Smoke Dampers: Dampers shall meet the requirements listed in NFPA 90A, 92A and 92B and shall be classified as leakage rated dampers for use in smoke control systems in accordance with the UL555S. Provide factory installed electric actuators qualified under UL555S. For each damper provide an access door 4" smaller than sheet metal size in width (up to 18") and 18" in length.

Fire Dampers: Dampers shall meet UL 555 for dynamic systems and shall be provided with angles, hardware, etc. Dampers shall be airfoil blade type or Style “B” out of the airstream type. Damper procurement and installation shall accommodate existing conditions. Provide damper access either via the duct or grille.

Smoke Damper Actuators: Actuators to be normally closed (powered open), spring return (selectable), 120 VAC with end position indication (two built in auxiliary switches), overload protection with disconnect switch. It will meet UL555 and UL555S requirements and be factory mounted to the smoke damper.

Grilles & Registers: Provide as scheduled on the drawings or an approved equivalent.

FABRICATION:

Duct sizes are internal free area unless otherwise noted.

Shop fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

Construct supply duct for 2” static pressure.

Construct return ducts for 2” negative static pressure.

Construct exhaust ducts for 1” negative static pressure and outside air ducts for 1” positive static pressure.

Construct rectangular taps with mitered fittings.

Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

PART 3 - EXECUTION

INSTALLATION OF METAL DUCTWORK

Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

Install metal ductwork in accordance with SMACNA HVAC "Duct Construction Standards". Assemble and install ductwork in accordance with recognized industry practices, which will achieve airtight and noiseless systems, capable of performing each indicated service. Install

each run with minimum number of joints. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

Use single-wall spiral seam round duct where specified and/or as needed to accommodate existing conditions.

Duct sizes shown are internal dimensions. Maintain free area equivalence when making transitions or when transforming between round and/or rectangular duct.

Seal all transverse and longitudinal joints, seams, etc. regardless of pressure class with approved duct mastic.

Routing: Field verify duct route prior to any fabrication. Coordinate layout with existing structure, suspended ceiling and lighting layouts and similar finished work.
Hangers for steel ducts shall be fabricated from sheet metal. Ducts shall be supported from the structure.

Penetrations: Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct insulation with sheet metal flanges/collars two gauges heavier than duct. Minimum width of flanges/collars shall be 1-1/2” or as required to completely seal opening. Overlap opening on rectangular openings by at least 1-1/2". Fasten to duct and substrata. Where ducts pass through fire-rated floors, walls, or partitions, provide in accordance with approved UL listed details and accepted industry practice.

Hard Ceiling or Sidewall Connections: Provide insulated sheet metal boots sized to fit the grille size as indicated. Secure boot to ceiling structure. Boot insulation shall be semi-rigid foil faced where exposed to the air stream and sealed with tape.

INSTALLATION OF SMOKE/FIRE DAMPERS:

General: Install dampers in accordance with the manufacturers’ installation instructions in order to maintain the UL listing. Fire dampers shall be out of the air stream as specified on the plans.

INSTALLATION OF FLEXIBLE DUCTS:

Maximum Length: For any duct run using flexible ductwork, do not exceed ten (10) feet extended length – use round spiral seam steel duct for longer runs. Install shortest possible length.

Installation: Install in accordance with Section III of SMACNA “HVAC Duct Construction Standards, Metal and Flexible". No bends shall be made with center-line radius of less than one duct diameter.

Flexible duct hangers shall be constructed from hanger wire and 3” wide sheet metal saddles. Wire gauge shall be per SMACNA and saddles shall have hemmed edges and corners. Support as needed to avoid kinks and flow obstructions.

END OF SECTION

SECTION 23 34 10 - FANS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

In-line Direct-Drive Cabinet Fans

RELATED WORK

Electrical wiring is specified in the Electrical Sections.

Control wiring is specified under other sections, provide any control devices as described on the schedule.

QUALITY ASSURANCE

Rate fans according to appropriate Air Moving and Conditioning Association, Inc. (AMCA) approved test codes and procedures. Supply fans with sound ratings below the maximums permitted by AMCA standards. All fans provided must be licensed to bear the Certified Ratings Seal.

WARRANTY

Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Fans

Fan accessories/options, etc.

MAINTENANCE DATA:

Submit operation and maintenance data. Include manufacturer's descriptive literature, start-up instructions, and maintenance procedures.

DELIVERY, STORAGE AND HANDLING:

Handle equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.

Store equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

Comply with manufacturer's rigging and moving instructions for equipment unloading and moving to final location.

PART 2 - PRODUCTS

FAN SCHEDULE

Provide fan type, arrangement, rotation, capacity, size, motor horsepower, and motor voltage accessories as scheduled on the Drawings or specified hereafter.

Provide fan accessories as scheduled on the Drawings or required in these specifications.

IN-LINE DIRECT-DRIVE CABINET FANS

Provide in-line direct-drive cabinet centrifugal fans with forward curved dynamically balanced fan wheel and square galvanized steel housing with venturi throat inlet. The housing interior shall be lined with ½" thick acoustical insulation. The outlet duct collar shall include an aluminum backdraft damper and be adaptable to horizontal or vertical discharge. The access for wiring shall be external. The motor disconnect shall be internal and of the plug type. The motor shall be mounted on vibration isolators.

FAN ACCESSORIES

Provide fan accessories as scheduled on the Drawings or required in these specifications.

Wall caps shall include insect screens and backdraft dampers.

PART 3 - EXECUTION

Install fans in accordance with manufacturer's installation instructions.

Verify existing roof construction prior to compiling shop drawings for curbs and/or adapters.

Coordinate the installation with the controls' contractor.

Locate inline fans directly above a single lay-in tile for motor/fan access/replacement. Support fan from structure. Install flexible duct connectors to ductwork. Install axial restraints across flexible connector on fans with over ½ hp motors.

Ensure that fans are wired properly, with correct motor rotation, and includes electrical motor grounding.

Verify motor amperage and voltage.

Verify proper operation of backdraft dampers.

Verify control functions of fan.

END OF SECTION

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SECTION 23 52 00 - HYDRONIC HEATING BOILERS

PART 1 - GENERAL

RELATED DOCUMENTS:

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in manufacture of hydronic boilers, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Guarantee: Guarantee all parts and workmanship for a period of one year.

Codes and Standards:

NFPA Compliance: Install gas-fired boilers in accordance with NFPA code 54 "National Fuel Gas Code".

ASME Compliance: Construct boilers in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".

UL and NEMA Compliance: Provide boiler ancillary electrical components which have been listed and labeled by UL, and comply with NEMA standards.

Furnish and install equipment having the characteristics and accessories indicated on the drawings or in these specifications. The manufacturer's specifications for the models shown on the drawings or given as basis for design, plus all features, options, and accessories indicated on the drawings or in these specifications, whether or not standard for the model scheduled or offered as a substitute, shall constitute the minimum requirements for equipment furnished under this section.

SUBMITTALS:

Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), furnished specialties and accessories; and installation and start-up instructions.

Wiring Diagrams: Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of boilers and controls.

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Boilers

MAINTENANCE DATA:

Submit maintenance data and parts list for each boiler, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, and wiring diagrams in maintenance manual.

DELIVERY, STORAGE, AND HANDLING:

Handle boiler equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.

Store boiler and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

Comply with manufacturer's rigging and moving instructions for unloading boilers, and moving them to final location.

PART 2 - PRODUCTS

PACKAGED GAS-FIRED HYDRONIC HEATING BOILERS:

Warranty: The boiler to be shock proof for a period of ten years.

The entire boiler shall be factory assembled and fire-tested, requiring only connection to the water circulating system, fuel and electric utilities and the flue gas vent.

The boiler shall be AGA design-certified and shall not release any condensate during operation.

The boiler shall be constructed and stamped in accordance with Section IV of the ASME Code for low pressure heating boilers with a maximum water working pressure if 160 PSI.

Tubes shall be 7/8" I.D. finned copper, rolled into top and bottom collectors. Tubes shall be straight without bends.

The gas burner shall be the radial-fired, power type and be constructed of steel. The burner shall utilize a screen-type diffuser to produce a full 360-degree flame pattern.

The trim shall include a combination temperature/pressure gauge and an ASME-rated pressure relief valve set at 125 PSI.

The control system shall be supplied for 120 Volts, single phase, 60 Hertz. The limit circuit shall include separate operating and high-limit temperature controllers (with field adjustable ranges of 100 degrees to 240 degrees F), water flow switch, differential pressure switch to sense air flow to the burner and a manual reset low gas pressure switch. Boiler shall be equipped with a control panel which will give visual indication of each stage of the firing control sequence as well as any safety lockouts in the limit circuits. The boiler will include an interrupted-type pilot system with electric spark ignition.

Control system shall conform to the requirements of ASME CDS-1.

The combustion chamber shall be constructed of corrosion-resistant aluminum.

The outer cabinet shall be 16-gauge steel finished, both inside and outside, with a baked epoxy finish and be equipped with a heat-resistant glass port for observation of the burner operation.

Main gas manifold shall consist of AGA approved, lubricated manual plug cock, pressure regulator, low gas pressure switch and two separate, solenoid operated, diaphragm valves. Pilot gas manifold shall consist of AGA-approved pilot cock, pressure regulator, gas filter and solenoid valve.

PART 3 - EXECUTION

INSTALLATION OF BOILER:

General: Install boiler in accordance with manufacturer's installation instructions, in accordance with State and local code requirements, and in accordance with requirements of local Utility Company. Install units plumb and level, to tolerance of 1/8 inch in 10'-0" in both directions. Maintain manufacturer's recommended clearances around and over boilers.

Erection: Assemble boiler trim shipped loose, or unassembled for shipment purposes. Follow manufacturer's installation instructions.

Verify that electrical work: installation is in accordance with manufacturer's submittal and installation requirements of Division 26 Sections. Do not proceed with equipment start-up until electrical work is acceptable to equipment Installer.

Gas Piping: Connect gas piping to boiler, full size of boiler gas train inlet, provide union with sufficient clearance for burner removal and service.

Hot Water Piping: Refer to Division 23 section "Hydronic Piping and Specialties". Connect supply and return boiler tappings as indicated, with shutoff valve and union or flange at each connection.

Gas Vent Lines: Individually vent the gas pressure regulator and the low gas pressure switch.

Relief Valve: Pipe relief valve to floor drain.

FIELD QUALITY CONTROL:

Flush and clean boilers upon completion of installation, in accordance with manufacturer's start-up instructions.

Hydrostatically test assembled boiler and piping in accordance with applicable sections of ASME Boiler and Pressure Vessel Code.

Start-up boilers, in accordance with manufacturer's start-up instructions, and in the presence of boiler manufacturer's representative. Test controls and demonstrate compliance with

requirements. Adjust burner for maximum burning efficiency. Replace damaged or malfunctioning controls and equipment.

CLOSEOUT PROCEDURES:

Owner's Instructions: Provide services of a technical representative to instruct Owner's personnel in operation and maintenance of boilers.

Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

END OF SECTION

SECTION 23 64 23
Air-Cooled Scroll Water Chillers

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled rotary screw packaged chillers.

1.02 REFERENCES

A. AHRI 550/590 - Standard for Water Chilling Packages using the Vapor Compression Cycle
B. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
C. ASHRAE 15 - Safety Code for Mechanical Refrigeration
D. ASHRAE 90.1 - Energy Efficient Design of New Buildings
E. UL 1995 - Central Cooling Air Conditioners
F. ASTM B117 - Standard Method of Salt Spray (Fog) Testing
G. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
H. ASTM A525 - Zinc (Hot-Dip Galvanized) Coatings on Sheet Steel Products
I. ASTM D1654 - Evaluation of Painted or Coated Specimens, Subjected to Corrosive Environments
J. ANSI/AFBMA 9-1978 - Load Ratings and Fatigue Life for Ball Bearings.
K. ISO 9001

1.03 SUBMITTALS

A. Submit dimensional plan and elevation view drawings, weights and loadings, required clearances, location and size of all field connections, electrical requirements and wiring diagrams.
B. Submit product data indicating rated capacities, accessories and any special data.
C. Submit manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Comply with codes and standards specified.
B. Factory Tested: Packaged chiller shall be pressure tested, evacuated, and fully charged with refrigerant and oil, and be functionally run-tested at the factory.
C. Chiller must be built in an ISO 9001 classified facility.
D. Factory trained and authorized service personnel shall perform pre-startup checks and startup procedures.

1.05 VERIFICATION OF CAPACITY AND EFFICIENCY

A. All proposals for chiller performance must include an AHRI approved selection method.

1.06 DELIVERY, HANDLING AND STORAGE

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting chillers.
B. Chillers shall be delivered to the job site completely assembled and charged with refrigerant and oil by the manufacturer.

1.07 WARRANTY

A. Provide a complete manufacturer 10-year parts, labor, and refrigerant warranty.

1.08 MANUFACTURER STANDARD CONSTRUCTION

A. Exception to these specifications: It is not the intent that any supplier is locked out based on the specifics of that manufacturer's standard construction. Bids will be considered that do not materially differ from the specification so long as construction items differing from this specification are highlighted in the bid submittal and the units will fit into the space without adversely affecting duct layout, maintenance space requirements, and original design intent. The engineer reserves the right to determine which units are acceptable.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Trane, Daikin, Carrier, York

2.02 CHILLER DESCRIPTION

A. The contractor shall furnish and install air-cooled water chiller with scroll compressors as shown as scheduled on the contract documents. The chillers shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

2.03 CHILLER OPERATION

A. Low ambient operation; Chiller shall be able to start and operate in ambient conditions down to 0ºF and up to 125ºF. Wide ambient operation is accomplished with factory installed and tested protection.
B. Chiller shall be capable of operating with a leaving solution temperature range 40ºF to 65ºF without glycol.
C. Chiller shall be capable of starting up with 95ºF (35ºC) entering fluid temperature to the evaporator. Maximum water temperature that can be circulated with the Chiller not operating is 125ºF (52ºC)
D. Chiller shall provide evaporator freeze protection and low limit control to avoid low evaporator refrigerant temperature trip-outs during critical periods of chiller operation. Whenever this control is in effect, the controller shall indicate that the chiller is in adaptive mode. If the condition exists for more than 30 seconds, a limit warning alarm relay shall energize.

2.04 COMPRESSORS

A. Construct chiller using fully hermetic scroll type compressors with R454B (or equal) optimized and dedicated scroll profile. Refrigerant shall have a GWP of less than 600.
B. Provide direct drive motor cooled by suction gas with only three major moving parts and a completely enclosed compression chamber that leads to increased efficiency.
C. Each compressor shall have overload protection internal to the compressor.
D. Each compressor shall include: centrifugal oil pump, oil level sight glass and oil charging valve.
E. Each compressor will have crankcase heaters installed and properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles.

2.05 EVAPORATOR

A. The evaporator shall be a high efficiency, brazed plate-to-plate type heat exchanger consisting of parallel plates. Braze plates shall be stainless steel with copper braze material.
B. The water side working pressure shall be rated at 150 psig (10.3 bar) and tested at 1.5 times maximum allowable water side working pressure.
C. The refrigerant side working pressure shall be rated at 460 psig (29.6 bars) and tested at 1.1 maximum allowable refrigerant side working pressure.
D. Insulate the evaporator with a minimum of 1.25 inch (K=0.28) UV rated insulation. If the insulation is field installed, the additional money to cover material and installation costs in the field should be included in the bid.
E. Evaporator heaters shall be factory installed and shall protect chiller down to -20ºF (-29ºC). Contractor shall wire separate power to energize heat tape and protect evaporator while chiller is disconnected from the main power.
F. Provide water drain connection, vent and fittings. Factory installed leaving water temperature control and low temperature cutout sensors.
G. Water connections shall be grooved pipe.
H. Proof of flow shall be provided by the equipment manufacturer, mechanically installed and electrically wired, at the factory of origin.
I. Factory installed cleanable strainer.

2.06 FANS

A. Low sound fans shall by dynamically balanced and direct driven.
B. All condenser fan TEAO motors have permanently lubricated ball bearings and external overload protection.

2.07 CONDENSER

A. Construct condenser coils of aluminum fins mechanically bonded to internally finned copper tube. The condenser coils shall have an integral subcooling circuit and shall be designed for 650 psig or higher working pressure. Leak tested at 650 psig

2.08 ENCLOSURES/CHILLER CONSTRUCTION

A. Unit panels, structural elements and control boxes are constructed of galvanized steel and mounted on a bolted galvanized steel base. Unit panels, control boxes and the structural base are finished with a baked-on powder paint.
B. Control panel doors shall have door stays.
C. Mount starters and Terminal Blocks in a UL 1995 rated weatherproof panel provided with full opening access doors. The circuit shall be a lockable, through-the-door type with an operating handle and clearly visible from outside of chiller indicating if power is on or off.
D. The coating or paint system shall withstand 500 hours in a salt-spray fog test in accordance with ASTM B117.

2.09 CHILLER MOUNTED STARTER

A. The starter shall be across-the-line configuration, factory-mounted and fully pre-wired to the compressor motor(s) and control panel.
B. Unit shall have a single point power connection.

C. A control power transformer shall be factory-installed and factory-wired to provide unit control power.
D. Control panel shall be dead front construction for enhanced service technician safety
E. Unit wiring shall run in liquid-tight conduit.
F. A molded case standard interrupting capacity circuit breaker shall be factory pre-wired with terminal block power connections and equipped with a lockable external operator handle, making it available to disconnect the chiller from main power.
G. High short circuit current rating (SCCR) of 65kA chillers with selection of high fault protection device.

2.10 REFRIGERANT CIRCUIT

A. All chillers shall have 1 or 2 refrigeration circuits, each with two or three (manifolded) compressor on each circuit.
B. Provide for refrigerant circuit:
   1. Liquid line shutoff valve
   2. Discharge service valve
   3. Filter
   4. Liquid line sight glass.
   5. Electronic expansion valve sized for maximum operating pressure
   6. Charging valve
C. Full operating charge of R454B (or equivalent) and oil.

2.11 CONTROLS

A. Factory-mounted to the control panel door, the operator interface has an LCD touch-screen display
B. Display shall consist of a menu driven interface with easy touch screen navigation to organized sub-system reports for compressor, evaporator, and motor information as well as associated diagnostics.
C. The chiller control panel shall provide password protection of all set-points
D. Chilled water temperature control shall be microprocessor-based, proportional and integral controller to show water and refrigerant temperature, refrigerant pressure, and diagnostics. This microprocessor-based controller is to be supplied with each chiller by the chiller manufacturer.
E. The front of the chiller control panel shall display the following in clear language, without the use of codes, look-up tables, or gauges:
   1. Run time.
   2. Number of starts.
   3. Current chiller operating mode.
   4. Chilled water set point and set point source.
   5. Electrical current limit set point and set point source.
   6. Entering and leaving evaporator water temperatures.
   7. Saturated evaporator and condenser refrigerant temperatures.
   8. Evaporator and condenser refrigerant pressure.
   9. Differential oil pressure.
   10. Phase reversal/unbalance/single phasing and over/under voltage protection.
   11. Low chilled water temperature protection.
   12. High and low refrigerant pressure protection.
   13. Load limit thermostat to limit compressor loading on high return water temperature.

14. Condenser fan sequencing to automatically cycle fans in response to load, expansion valve pressure, condenser pressure, and differential pressure to optimize chiller efficiency.
15. Display diagnostics.
16. Compressors: Status (on/off), %RLA, anti-short cycle timer, and automatic compressor lead-lag.

F. On chiller, mount weatherproof control panel, containing starters, power and control wiring, factory wired with terminal block power connection. Provide primary and secondary fused control power transformer.

G. The chiller controller shall utilize a microprocessor that will automatically take action to prevent chiller shutdown due to abnormal operating conditions associated with: evaporator refrigerant temperature, high condensing pressure and motor current overload.

H. Provide the following safety controls with indicating lights or diagnostic readouts.
1. Low chilled water temperature protection.
2. High refrigerant pressure.
3. Loss of chilled water flow.
4. Contact for remote emergency shutdown.
5. Motor current overload.
6. Phase reversal/unbalance/single phasing.
7. Over/under voltage.
8. Failure of water temperature sensor used by controller.
9. Compressor status (on or off).

I. Provide the following operating controls:
1. A variable method to control capacity in order to maintain leaving chilled water temperature based on PI algorithms. Five minute solid state anti-recycle timer to prevent compressor from short cycling. Compressor minimum stop-to-start time limit shall be 2 minutes. If a greater than 5 minute start-to-start, or greater than 2 minute stop-to-start timer is included, hot gas bypass shall be provided to insure accurate chilled water temperature control in light load applications.
2. Chilled water pump output relay that closes when the chiller is given a signal to start.
3. Load limit thermostat to limit compressor loading on high return water temperature to prevent nuisance trip outs.
4. High ambient unloader pressure controller that unloads compressors to keep head pressure under control and help prevent high pressure nuisance trip outs on days when outside ambient is above design.
5. Compressor current sensing unloader chiller that unloads compressors to help prevent current overload nuisance trip outs.
6. Low ambient lockout control with adjustable setpoint.
7. Condenser fan sequencing which adjusts the speed of all fans automatically in response to ambient, condensing pressure and expansion valve pressure differential thereby optimizing chiller efficiency.

J. Provide user interface on the front of the panel. If display is on the inside of the panel, then a control display access door shall be provided to allow access to the display without removal of panels. Provide user interface with a minimum of the following features:
1. Leaving chilled water setpoint adjustment from LCD input
2. Entering and leaving chilled water temperature output
3. Pressure output of condenser
4. Pressure output of evaporator
5. Ambient temperature output

6. Voltage output
7. Current limit setpoint adjustment from LCD input.

K. The chiller control panel shall provide leaving chilled water temperature reset based upon return water temperature.

L. Digital Communications to BAS system shall consist of a BACnet MS/TP interface via a single twisted pair wiring.

M. The chiller control panel shall provide an alarm relay output that shall energize whenever a fault requiring manual reset is detected by the panel.

2.12 SOUND

A. Acoustics: Manufacturer must provide both sound power and sound pressure data in decibels. Sound pressure data per AHRI 370 must be provided at full load.

B. If manufacturer cannot meet the noise levels, sound attenuation devices and/or barrier walls must be installed to meet this performance level.

C. Provide acoustical treatment for compressor.

2.13 ACCESSORIES

A. Chiller shall have full architectural louvers panels.

B. Chiller shall ship with elastomeric isolators

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's requirements.

1. Level the chiller using the base rail as a reference. The chiller must be level within 1/2" in over the entire length and width. Use shims as necessary to level the chiller.

3.02 SERVICE AND START-UP

A. Startup - Provide all labor and materials to perform startup. Startup shall be performed by a factory-trained technician. Technician shall confirm that equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. This shall be done in strict accordance with manufacturer's specifications and requirements.

B. A start-up log shall be furnished by the factory approved start-up technician to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.

END OF SECTION

SECTION 23 72 00
AIR-TO-AIR ENERGY RECOVERY VENTILATOR

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Provisions," Section 23 01 00.

DESCRIPTION OF THE WORK

This section includes Air-to-Air Energy Recovery Ventilators for indoor installation. Within this document, these units may be referred to as Energy Recovery Ventilator (ERV) for brevity.

RELATED WORK

All utility connections, including power, control, drains, chilled water, heating hot water; are described elsewhere.

QUALITY ASSURANCE

Source Limitations: Obtain Air-to-Air Energy Recovery Ventilator with all appurtenant components or accessories from a single manufacturer.

For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.

The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten (10) years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two (2) years from the date of installation.

Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

Certifications:

> The energy recovery cores used in these products shall be third party Certified by AHRI under its Standard 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacturer’s published performance for airflow, static pressure, temperature and total effectiveness, purge air (OACF) and exhaust air leakage (EATR). Products that are not currently AHRI certified will not be accepted. OACF shall be no more than 1.02 and EATR shall be at 0% against balanced airflow.

MANUFACTURER’S STANDARD CONSTRUCTION

Exception to these specifications: It is not the intent that any supplier is locked out based on the specifics of that manufacturer’s standard construction. Bids will be considered that do not materially differ from the

specification so long as construction items differing from this specification are highlighted in the bid submittal and the units will fit into the space without adversely affecting duct layout, maintenance space requirements, and original design intent. The engineer reserves the right to determine which units are acceptable.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic of brochures, technical data and/or shop drawings and as many additional copies as required for Contractor use.

Product data: For each type or model of Energy Recovery Ventilator, include the following:

Unit performance data for both Supply Air and Exhaust Air, with system operating conditions indicated.
Enthalpy plate performance data for both summer and winter operation.
Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
Estimated gross weight of each installed unit.
Filter types, quantities, and sizes
Installation, Operating and Maintenance manual (IOM) for each model.

Shop Drawings: For air-to-air energy recovery ventilators, include plans, elevations, sections, details, and attachments to other work.

Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Operation and maintenance data for air-to-air energy recovery ventilator

PART 2 - PRODUCTS

GENERAL

Air-to-Air Energy Recovery Ventilators shall be fully assembled at the factory and consist of a fixed-plate cross-flow heat exchanger with no moving parts, an insulated [single][double] wall G90 galvanized 20-gauge steel cabinet, filter assemblies for both intake and exhaust air, enthalpy core, with all specified components and internal accessories factory installed and tested. Entire unit with the exception of field-installed components shall be assembled and test operated at the factory.

CABINET

Materials: Formed double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.

Outside casing: 20 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.

Access doors shall be hinged with airtight closed cell foam gaskets. Door pressure taps, with captive plugs, shall be provided for cross-core pressure measurement allowing for accurate airflow measurement.

Unit shall have factory-installed duct flanges on all duct openings.

Cabinet Insulation: Unit walls and doors shall be insulated with 1 inch, 4-pound density, foil/scrim faced, high density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers, and with a minimum R-value of 4.3 (hr-ft^2-°F/BTU).

Enthalpy core: Energy recovery core shall be of the total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be allowed. The energy recovery core shall be designed and constructed to permit cleaning and removal for servicing. The energy recovery core shall have a ten-year warranty. Performance criteria are to be as specified in AHRI Standard 1060.

Passive Frost Control: The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10ºF and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.

FILTER SECTION

ERV shall have 2" thick MERV 11 disposable pleated filters located in the outdoor air and exhaust airstreams. All filters shall be accessible from the exterior of the unit.

PART 3 EXECUTION

EXAMINATION

Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

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

INSTALLATION

Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer’s installation instructions as documented in manufacturer’s IOM, Best Practices and all applicable building codes.

Install unit with clearances for service and maintenance.

CONNECTIONS

In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

Duct installation and connection requirements are specified in Division 23 of this document.

FIELD QUALITY CONTROL

Contractor to inspect field assembled components and equipment installation. Report results to Architect/Engineer in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer’s IOM. Insert any other requirements here.

START-UP SERVICE

Contractor to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Refer to Division 23 “Testing, Adjusting and Balancing” and comply with provisions therein.

DEMONSTRATION AND TRAINING

Contractor to train owner’s maintenance personnel to adjust, operate and maintain the entire Make-Up Air unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

END OF SECTION

SECTION 23 73 10
VARIABLE AIR VOLUME AIR HANDLING UNITS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Provisions," Section 23 01 00.

DESCRIPTION OF THE WORK

In general, the work consists of, but is not limited to, the following:

Provide and install air handling units including factory start-up and warranties per schedule and plans.

RELATED WORK

Electrical power wiring is specified in the Electrical Sections.

All utility connections, including power, control, drains, chilled water, heating hot water; are described elsewhere.

QUALITY ASSURANCE

Air Handling Units: Certify capacity, static pressure, fan speed, horsepower and selection procedures in accordance with ARI 430.

Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410.

Air-handling Unit Assembly: Shall have UL certification for safety, including use with electric heat. Units requiring electric connection shall be listed and classified by ETL and CSA as suitable for the purpose specified and indicated.

Air-handling Unit Assembly: Shall meet NFPA 90A requirements.

MANUFACTURER'S STANDARD CONSTRUCTION

Exception to these specifications: It is not the intent that any supplier is locked out based on the specifics of that manufacturer's standard construction. Bids will be considered that do not materially differ from the specification so long as construction items differing from this specification are highlighted in the bid submittal and the units will fit into the space without adversely affecting duct layout, maintenance space requirements, and original design intent. The engineer reserves the right to determine which units are acceptable.

SUBMITTALS

Submit to the Architect/Engineer for approval electronic of brochures, technical data and/or shop drawings and as many additional copies as required for Contractor use.

Performance data indicating nominal capacity, sound data in accordance with AMCA 300, performance curves per ARI, fan power required, entering & leaving water temperatures, flow rates, and pressure drops.

Submit product data: materials of construction and corrosion protection, required clearances, field

connections, weight, motor data, specialties and accessories.

Submit installation instructions, including field-wiring diagrams, required utility connections and manufacturer's recommendations. Provide a list of components which will be shipped loose for field assembly. Identify any special handling and storage procedure necessary to protect the equipment prior to operation.

Provide O&M manuals: Include manufacturer's descriptive literature, wiring diagrams, start-up instructions, and maintenance procedures. Provide a schedule of recommended periodic inspection and preventive maintenance procedures. Provide a list of any spare parts recommended for start-up or on-site storage.

WARRANTY

Provide manufacturer's extended five-year full parts and labor warranty.

PART 2 - PRODUCTS

GENERAL

Provide double-walled air handling unit specifically designed for the intended service. The unit shall be factory fabricated, assembled and tested. Units shall ship fully assembled unless directed otherwise. The unit shall perform as indicated in the Schedule and shall be configured to include all components/sections indicated on the Drawings.

CASING

Unit shall be constructed of galvanized steel casing panels with 2" thick polyurethane foam filled insulation. Coils shall be removable without cutting any panels.

Top or side lugs shall be provided for supporting the unit.

Base rails of 6" height shall be provided to support the cabinet.

Construct unit casing exterior panels of G60 galvanized steel.

The unit shall have a complete double wall internal liner of G60 galvanized steel.

Side panels shall be easily removable from both sides of unit for access to unit and shall seal against a full perimeter automotive style neoprene gasket to ensure a tight seal.

The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.

Accessibility options shall be as follows:

a. Hinged double-wall access door with quarter-turn latch on fan side with removable access panel(s) on the other side.
b. Hinged double-wall access doors on access sides.
c. Removable double-wall access panels on opposite side of hinged door.
d. Hinged double-wall access door to filter with quarter-turn latch.

Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.

All sections shall be double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 6.

Access Doors: Access doors shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 6.

Cooling Coil Drain Pans: Drain pans for cooling coils shall be stainless steel construction. The pan shall be sloped in four (4) directions toward the drain fitting. Drain pan shall have recessed bottom drain connections on both sides of the unit. Drain pan shall allow no standing water and comply with ASHRAE Standard 62.

Heating Coil Drain Pans: Provide anti-microbial galvanized steel double-sloped drain pan with drain fitting.

Finish: Galvanized G60 steel.

FANS

Provide direct-drive plenum fan. Fan assemblies including fan, motor and sheaves shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Manufacturer must ensure maximum fan RPM is below the first critical speed.

Fan and motor assembly shall be mounted on vibration isolators inside cabinetry.

Units shall be certified in accordance with the central station air handling unit's certification program, which is based on AHRI Standard 430.

BEARINGS AND DRIVES

Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards, L-50 life at 200,000 hours heavy-duty pillow block type, self-aligning, grease lubricated ball bearings, with lubrication fittings. Provide extended grease lines to drive/access side of unit casing, for all fan bearings, rigidly attached for easy service access.

Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

V-Belt drives shall be adjustable cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed.

Fixed and adjustable pitch motor sheaves shall be provided.

Final RPM is obtained with sheaves set at mid-position and rated motor horsepower.

Contractor to furnish fixed sheaves at final RPM as determined by balancing contractor.

MOTORS AND DRIVES

Units shall have internal motor and drives and shall be provided with a full-size removable service door on the drive side of the fan(s).

All three-phase motors shall have a ± 10% voltage utilization range and a 1.15 minimum service factor. Motor shall be compliant with EPACT where applicable.

Fan motors shall be heavy duty, premium efficiency, open drip proof (ODP) with Class F insulation. Motor

shall be rated for VFD inverter duty and labeled accordingly.

V-Belt drive shall be rated at 1.3 times the motor nameplate.

COILS

All coil sections shall be provided with drain pans for condensate removal and cleaning operations. The drain pan shall extend under the complete coil and coil-access section.

Water Coils

All coils shall be enclosed in an insulated coil section. Coil headers and U-bends shall not be exposed.

Coil connections shall be MPT and constructed of bronze or suitable dielectric fitting/coupling.

Coils shall be counter flow design, constructed of copper tubes, aluminum plate fins, copper header and nozzles, stainless steel tube sheet and coil casing.

Coils shall be leak tested to 320-psig air pressure under water.

Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit either through the side or top. Capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410.

FILTERS

Provide factory fabricated filter section of the same construction and finish as unit casing with filter guides and hinged, removable double-wall access doors.

Provide flat pre-filter section to accommodate two-inch thick 30% efficient filters. Provide a final filter section to accommodate four-inch thick MERV 11 filters. Filters shall be removable from one side of the filter section.

Provide two sets of pleated media equal to FARR 30-30.

ACCESS SECTIONS

Access shall be supplied as shown on the plans. Access doors shall be provided on one side of each section.

PART 3 EXECUTION

AIR HANDLING UNIT DELIVERY AND SETTING

Protect units on site from physical damage and internal access. Handle carefully to avoid damage to components, enclosures, and finish. Protect coils.

Entire installation shall be in accordance with the applicable requirements of the manufacturer.

Support unit on ½" thick neoprene isolation pads located below base rails on 2' centers or as required by manufacturer. Locate units in space to facilitate maintenance, duct and piping layouts, and to comply with the manufacturer's access requirements.

PIPING

Install coil piping, valves, flexible pipe connections, etc. Support piping so no weight bears on coil headers. See plans.

Install condensate piping and terminate in the nearest hub drain, see plans.

DUCTWORK

Install ductwork per plans. Space ducts to allow for insulation. Route ductwork as high as possible to optimize ceiling heights. Coordinate installation with other trades.

CONTROLS

Install controls per plans.

START-UP

Vacuum and wet wipe interior or unit.

Remove shipping restraints at fan assembly.

Install new air filters, lubricate bearings, verify condensate is properly trapped, piping configuration is correct, belts aligned and tensioned, all shipping braces have been removed, and fan has been test-run under observation.

Test controls, motor rotation, zone dampers, safeties, etc. prior to startup.

Perform startup per the manufacturer’s recommendations.

END OF SECTION

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SECTION 23 81 26 - SPLIT-SYSTEM HEAT PUMPS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 23 01 00.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings.

In general, the work consists of, but is not limited to, the following:

Ducted Heat Pump units consisting of separate evaporator/fan and compressor/condenser components

SUBMITTALS

Submit product data indicating rated capacities, required clearances, field connections weight, specialties and accessories, electrical nameplate data, and wiring diagrams.

Submit manufacturer's installation instructions.

Submit operation and maintenance data. Include manufacturer's descriptive literature, start-up instructions, installation instructions, and maintenance procedures.

Submit to the Architect/Engineer for approval electronic copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Split-System Air Conditioning

COORDINATION

Coordinate sizes and locations of equipment, equipment supports, penetrations, and accessories with actual equipment supplied.

DELIVERY, STORAGE, AND HANDLING:

Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

Protect units on site from physical damage. Protect coils.

WARRANTY:

Manufacturer's standard form in which manufacturer agrees to repair or

replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

Warranty Period:

- For Compressor: Five year(s) from date of Substantial Completion.
- For Parts: One year(s) from date of Substantial Completion.
- For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

INDOOR UNIT

General:

Air handling units shall be draw through type with 1" thick, standard size, disposable type filters and shall have DX cooling coils and electric heating coils as scheduled on drawings with minimum unit capacities as indicated.

Fan:

Fan capacities shall be as scheduled on drawings. Fans shall be direct drive with variable speed motors as scheduled. Fans and motors shall be mounted on vibration isolators.

Casing:

Casing shall be constructed of heavy duty, factory painted, galvanized sheet steel adequately reinforced with structural members. Removable panels in front of unit shall provide access to all internal parts. Units shall have filter access panel and filter rack. All unit panels shall be internally insulated to meet requirements of the Florida Energy Code. All insulating materials shall meet the requirements of NFPA 90-A. Units shall be equipped with duct collars on intake and discharge of unit and single point power connection.

Refrigerant Coils:

The coils shall have aluminum plate fins mechanically bonded to seamless copper tubes internally enhanced (grooved) with all joints brazed.

Electric Coils:

Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.

Filter:

One-piece cleanable type that filters supply air. Thickness and efficiency per schedule.

OUTDOOR UNIT:

General:

Unit shall have all operating components assembled on one common base, including: compressor, condenser coil, condenser fan and motor, charging valves, all controls, and a holding charge of refrigerant. Units shall be designed for outdoor installation with all exterior surfaces factory painted with primer and enamel for weather protection. Drain holes shall be provided for elimination of rain. Provide removable panels for access to components.

Compressor:

The scroll compressor shall be 2-speed, hermetically sealed, with internal and external vibration isolation.

Condenser Coil:

Condenser coil shall be of the continuous aluminum plate fin and copper tube type and shall be circuited for integral sub-cooler. The coil shall be tested with refrigerant and sealed with a holding charge of refrigerant.

Refrigerant Components:

Refrigeration circuit components shall include liquid line service valve, suction line service valve, and full charge of compressor oil.

Controls and Safeties:

Controls shall consist of low-voltage thermostat to control compressor and evaporator fan, with OFF/FAN/HEAT/COOL selector, adjustable thermostat with upper and lower limits, VENT OPEN/CLOSE and FAN CYCLE switches. Thermostat to be 7-day programmable with LCD display; wifi connectivity for access from smartphone, tablet, or computer.

Safeties shall consist of automatic reset overtemperature and overcurrent protection for compressor; inherent, automatic reset overtemperature protection for fan motor; 2 overtemperature protectors for heater.

Electrical Requirements:

208/230 VAC, 1 phase or 3 phase: shall be prewired with one plug to use with appropriate wall receptacle as specified on unit nameplate.

PART 3 - EXECUTION

INSTALLATION

Entire installation shall be in accordance with the Drawings, Specifications and applicable requirements of the manufacturers of the equipment and shall perform satisfactorily at the completion of the work.

NOISE AND VIBRATION

Equipment shall operate quietly and the design of the base shall be such that the operation of the equipment shall cause no perceptible vibration in the structure adjacent to the equipment, nor cause, directly or indirectly, vibration or objectionable noise in any other portion of the building and/or in the building structure itself.

SUPPORTS

Furnish all supports for equipment covered in this Specification, as a part of this Section, unless otherwise indicated on the Drawings.

PAINTING

Equipment with a factory applied finish shall have scratches, chips, etc., primed and touched up with materials which will protect the surface and match the adjacent areas.

CLEANING AND ADJUSTMENTS

Upon completion of work, clean, oil, and grease all fans, motors, other running equipment, and apparatus and make certain that all such apparatus and mechanisms are in proper working order.

END

SECTION 26 00 00 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

APPLICATION

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

These provisions apply to all sections of Division 26 of this project except as specified otherwise in each individual section. Codes, standards, policies and requirements contained in this Section are applicable to all contract documentation.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the Contractor in preparing his bid and in no way relieves the Contractor of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

DESCRIPTION OF WORK

Furnish all labor, materials, equipment and incidentals required to complete all electrical work as specified in this Division and as shown on the Contract Drawings. Division 26 work shall include the installation of a complete and properly operating electrical system.

Refer to other Divisions of this specification for electrical requirements of factory installed motors, controllers, power supplies, etc. Electrical connections to equipment furnished as specified in other sections of these Specifications or shown on other than the Electrical Drawings shall be governed by this Division of the Specifications.

The bidder shall inspect the present jobsite conditions before preparing his bid. The submission of a bid will be considered evidence that such a visit and inspection was performed by the bidder and that he takes full responsibility for all factors governing his work.

The electrical work shall be complete, fully operational, and suitable in every way for the service required. Drawings are generally diagrammatic in nature and do not show all details, devices and incidental materials necessary to accomplish their intent. Therefore, it shall be understood that such devices and incidental materials required shall be furnished at no cost to the Owner.

RELATED WORK

Drawings and general provisions of Contract, including General Conditions, Supplementary General Conditions, and Special Conditions sections apply to work specified in Division 26.

The Contractor shall be aware that other divisions of these Specifications may apply to related work required to perform Division 26 requirements. All related work shall be performed in accordance with those divisions.

CONFORMANCE

If the Contractor takes no exceptions to these Specifications in the Submitted Bid, the Contractor will be held totally responsible for failure to comply.

Any exception to the Specification shall reference the affected paragraph(s), subject(s), and list benefit to the Owner.

The Owner reserves the right to have the Contractor replace installed material or equipment which does not comply with these Specifications at the Contractor's expense.

SUBMITTALS

Obtain approval before procurement, fabrication, or delivery of items to the job site. Submit manufacturers' data on the equipment listed below and as directed in other Sections of Division 26. Follow the procedures required in Division 1 of this specification. Data shall be in the form of manufacturer's descriptive data sheets and engineering drawings and will be reviewed by the Engineer before materials and equipment are delivered to the work site. Review of the submittal by the Engineer is to check for general conformance to the design intent and will not relieve the Contractor of the responsibility for the correctness of all dimensions, conformance and the proper fitting of all parts of the work.

Panelboards and Circuit Breakers
Disconnect Switches
Enclosed Circuit Breakers
Fuses
Grounding
Surge Protection Devices
Plugs and Receptacles
Transformers
Lighting Fixtures
Lighting Controls and Installation Drawings*
Fire Alarm System and Devices and Installation Drawings*
Sound System*

* prepared by Manufacturer or System Supplier

Submit manufacturers' names and catalog numbers for the following materials:

Conduit, Fittings, and Couplings
Boxes and Fittings
600 Volt Wire and Cables
Grounding Equipment

The Contractor shall thoroughly check the submittal for accuracy and compliance with the contract requirements. Shop drawings and data sheets shall bear the date checked and shall be accompanied by the Contractor's statement that they have been checked for conformity to the Specifications and Drawings. Submittals not so checked and noted will be returned without review.

Deliver the entire electrical submittal to the Engineer complete and in one package. An incomplete submittal will be returned to the Contractor without review.

EQUIPMENT SUBSTITUTIONS

Substitutions that do not increase installation value will not be accepted.

Contractor proposed substitutions may result in necessary changes to the construction documents. Coordination effort due to Contractor proposed substitutions shall be the complete responsibility of the Contractor. All potential conflicts are to be addressed. The Contractor shall also be responsible for any work of any other trades made necessary by the substitution. All potential conflicts with other trades are to be addressed.

The Engineer's review of the proposed substitutions and coordination documents is for the benefit of the Owner and not the Contractor and does not relieve the Contractor of responsibility for making any corrections necessary to insure the Owner receives full benefit of the original design intent.

Detailed coordination documents shall be provided for any equipment that, in the opinion of the Engineer, materially differs from the design documents. This difference includes but is not limited to any equipment having:

- access requirements that differ from the design / specification
- operating characteristics that differ from the design / specification
- footprints or elevations that differ from the design / specification
- connection requirements or locations that differ from the design / specification
- venting or combustion air requirements that differ from the design / specification
- electrical characteristics that differ from the design / specification
- control requirements that differ from the design / specification
- hydronic characteristics that differ from the design / specification
- plumbing requirements that differ from the design / specification

Documentation shall include a detailed listing of all differences from the design / specification. Also included will be a detailed explanation as to why these differences should be considered equal or an improvement.

Any physical differences shall be coordinated with drawings. All Coordination Drawings shall be produced by a competent drafts person and shall be equivalent in quality, detail, and scope to the Construction Drawings.

Acceptance of the substitution as an equal will be the sole descretion of the Engineer. Items of necessary coordination or review omitted from the documentation shall be grounds for rejection of the substitution.

No cost increase to the Owner for any changes due to coordination will be considered. The Engineer shall be compensated for any and all efforts associated with review and coordination of non-conforming equipment

CODES, INSPECTION AND FEES

Comply with the indicated edition of the following codes and ordinances. Where specific edition is not indicated, comply with the latest published edition.

American National Standards Institute - ANSI
- C2 – The National Electrical Safety Code
- ANSI/IEEE C37.90.1 Surge Withstand Capability (Swc) Tests For Relays And Relay Systems Associated With Electric Power Apparatus
- C62.41 - Transient Voltage Surge Suppressors

American Society for Testing and Materials - ASTM

National Fire Protection Association - NFPA
- NFPA 70; The National Electrical Code
- NFPA 72; The National Fire Alarm Code
- NFPA 90A; Standard for the Installation of Air Conditioning and Ventilating Systems
- NFPA 101; The Life Safety Code

Florida Building Code
- FBC-B 2023; The Florida Building Code 8th Edition
- FPC 2023; The Florida Fire Prevention Code 8th Edition
- FBC-M 2023; The Florida Mechanical Code 8th Edition
- FBC-P 2023; The Florida Plumbing Code 8th Edition
- FBC-A 2023; The Florida Accessibility Code 8th Edition
- State Requirements for Educational Facilities 2014

Electronic Industries Association/Telecommunications Industries Association - EIA/TIA
- 568C - Commercial Buildings Telecommunications Cabling Standards
- 569 - Commercial Buildings Standard for Telecommunications Pathways and Spaces
- 606 - Administrative Standard for Telecommunications Infrastructure of Commercial Buildings
- 607B - Commercial Building Grounding and Bonding Requirements for Telecommunications

Federal Communications Commission - FCC

Insulated Cable Engineers Association - ICEA

Institute of Electrical and Electronic Engineers – IEEE (latest edition)
- 383 Vertical Flame Test
- 587 Transient Voltage Surge Suppressors
- 802 Specifications for Local Area Networks
- 1547 Interconnecting Distributed Resources with Electric Power Systems
- 1547.1 Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

National Electrical Manufacturers Association
- NEMA ICS 1 – 2000; Industrial Control and Systems General Requirements
- NEMA ICS 2 – 2000; Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
- NEMA AB3 - 2013 “Molded Case Circuit Breakers”.

Serving Utility Company Policies

City of Tallahassee Municipal Codes and Requirements

Underwriters Laboratories - UL
- 5 Surface Raceway
- 467 Electrical Grounding and Bonding Equipment
- 506 Enclosures 514A Outlet Boxes and Fittings
- 514C Non-metallic Outlet Boxes and Fittings
- 1449 Transient Voltage Surge Suppressors

Obtain all permits required. Contractor shall pay all fees for permits and inspections.

COMPLIANCE AND REVIEW

Within two weeks of the awarding of the contract, and before any work is commenced, the Contractor shall meet with all legal authorities having jurisdiction, review all materials and details of this project, and agree on any required revisions. A letter shall be forwarded to the Engineer listing the names, dates and place of such review and the revisions required. A copy of the letter shall also be sent to the reviewing authority.

The Contractor shall also meet with each serving utility and repeat the above procedure. A letter certifying each meeting shall also be written with the information as described above.

TEMPORARY LIGHTING AND POWER

Provide temporary lighting and power during construction. The Contractor may utilize existing building distribution power for temporary and construction power. Temporary power shall be 120/208 volt, single phase.

Temporary wiring shall be done in a safe and neat manner. See Article 590 of the NEC.

Provide a minimum of one (1) 100 watt incandescent lamp for every 300 square feet of interior space being constructed.

Provide 30 amp, 120/240 volt single phase power points throughout the construction area such that a power point will be within fifty feet of where any saws, drills, or other electrical tool is being used. Each power point shall have a disconnecting safety switch.

Provide 20 amp receptacles with ground fault interrupting circuitry. Outdoor or otherwise exposed receptacles shall have weatherproof covers. Provide any necessary special outlets required.

Size temporary power conductors so that voltage drop is kept below 5% at maximum designed load at the delivery point.

RECORD DOCUMENTS

Prepare record documents in accordance with Division 1 requirements. Record documents shall be complete and accurate and clearly show deviations to the Contract Drawings. Additionally, indicate major raceway sizes and routings, locations of all control devices, all equipment and locations to scale, and fuse and circuit breaker ratings and arrangements.

Record documents shall reflect the complete contract record, including all changes, supplements and addenda as issued. All drawings, sketches and notations describing the work and as issued by the Engineer shall be incorporated.

Prepare bound sets of equipment Operation and Maintenance Instructions. These instructions shall include the name and location of the system, the name and telephone number of the Contractor, and all subcontractors installing the system or equipment, and the name and telephone number of each local manufacturer’s representative for the system or equipment. Routine maintenance actions shall be clearly identified and include a listing of approved disposable materials necessary.

Furnish bound copies of all test results required in other sections of this division.

GUARANTEES

Equipment: one (1) year from final acceptance by the Owner. Materials and labor: one (1) year from final acceptance by the Owner.

All equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

In addition to the guarantee of equipment by the manufacturer the Contractor shall also guarantee such equipment for a period of one (1) year from final acceptance by the Owner. The Contractor's one (1) year guarantee shall be for equipment, materials, and labor.

The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision will be allowed.

Additional guarantee requirements specific to certain parts or assemblies or installations may be in the General and Special Conditions, or other Sections of these Specifications.

PART 2 - PRODUCTS

EQUIPMENT AND MATERIALS

Furnish materials or equipment specified by manufacturers named.

Materials furnished shall be new, undamaged and packed in the original manufacturer's packing.

All equipment and apparatus shall bear the seal of approval of the Underwriter’s Laboratory where testing and listing performance criteria has been established for like items.

Protect equipment and materials from mechanical and water damage during construction. Suitable storage facilities shall be provided. Equipment shall not be stored out-of-doors except as follows:

> Concrete items, plastic conduit if protected from sunlight, rigid metal conduit if protected from water and debris, padmounted equipment for outdoor installation if maintained in a normal weathertight condition, ground rods, and large spools of cables with ends properly sealed. In no case will materials be stored directly on the ground. Provide suitable timbers or billets on which items will be stored out of direct contact with the earth.

All items to be installed shall be free of rust and dirt. Damaged materials and equipment shall be replaced by the Contractor at no cost to the Owner.

All electrical panels, enclosures, raceways, conduit, and boxes shall be fabricated of metal unless indicated otherwise.

EQUIPMENT AND MATERIALS STANDARDS

Design and fabrication of electrical equipment and materials:

The American National Standards Institute (ANSI)
The American Society of Mechanical Engineers (ASME)
The American Society for Testing and Materials (ASTM)
The Institute of Electrical and Electronic Engineers (IEEE)
The National Electrical Manufacturers Association (NEMA)
The Occupational Safety and Health Administration (OSHA)
The Underwriters Laboratories (UL)
The National Fire Protection Association (NFPA)

Comply with the latest edition and revisions of these codes and standards.

EQUIPMENT RATINGS

Horsepower and wattages of equipment shown on the Drawings are estimated and comply with a certain basis of design. It is the Contractor's responsibility to coordinate with, and furnish proper connections to equipment substituted and accepted as equivalent to the basis of design.

Conduit, wire, disconnects, fuses, and circuit breakers shall be sized to suit the horsepower and wattage of equipment actually furnished. However, conduit, boxes, wire or disconnects shall not be sized smaller than shown on the Drawings.

PART 3 - EXECUTION

QUALITY ASSURANCE

Installer's Qualifications: At least three years of successful installation experience on projects with electrical work similar to that required for this project.

Manufacturer's Qualifications: Manufacturers regularly engaged in the manufacture of electrical components and equipment of the types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Electrical work shall be performed by experienced persons skilled in the trade.

Work shall be supervised by a licensed journeyman or master electrician who shall be on the job site at all times while work is in progress.

Work shall be done neatly and in keeping with good practice and conventions of the trade. The electrical installation shall be of high quality, and of the performance level associated with top level commercial electrical installations as determined by the Engineer and the National Electrical Code.

IDENTIFICATION

Provide laminated plastic nameplates for each panelboard, automatic transfer switch, safety disconnect, equipment enclosure and all other major pieces of equipment installed or modified as part of this contract.

Furnish all starters, disconnect switches and control panels with engraved name plates identifying the equipment served. Attach nameplates to equipment, aligned with structural features of equipment, with two pressure pins or #4 stainless steel screws, nuts, and lockwashers.

Identification of flush mounted panelboards and other cabinets shall be on the inside of the cabinet only.

Panelboards shall have typewritten directories with all loads thoroughly described for each circuit. Update existing panelboards and their directories to reflect new work.

CLEANING AND PAINTING

Clean all equipment and boxes thoroughly inside and outside at the completion of installation. Do not leave dirt and debris inside panelboard and equipment cabinets, device and junction boxes, etc.

All painting shall be done according to the Finishes Section of these specifications.

Paint all exposed conduit and wiremold installed on painted surfaces to match surrounding surface. Paint exposed threads on conduits and touch up all scratches in galvanized pipe and fittings with a high quality cold galvanizing compound.

Touchup scratched or marred surfaces of lighting fixtures, panelboards, motor control centers, switchboards, etc. with paint furnished by the equipment manufacturer specifically for the purpose.

Plywood backboards shall be of fire retardant plywood, painted with two coats of fire-resistive finish.

EXCAVATION, TRENCHING AND BACKFILLING

Perform all excavation and trenching to install raceways indicated on the drawings.

No tunneling shall be allowed unless written permission is received by the Engineer.

Excavated material not suitable for backfill shall be removed from the job site.

Insure that the bottom of trenches are uniform, without large rocks or lumps of dirt which could damage the raceway or conductors.

Backfill with material that will compact readily. Compact backfill material from bottom of excavation up, to within 2” of surrounding undisturbed material.

Cover shall not be less than surrounding grade and no greater than 2" above surrounding grade.

All trenching in and around rooted areas shall be by hand. Contractor shall take all steps necessary to protect existing root growth from damage by trenching or digging. Trenching in proximity to trees and other growth shall be directed radially away from the main trunk so as not to cut across major roots.

All trenching routing shall be coordinated with and approved by the Engineer before digging. Contractor shall contact the Engineer twenty four hours before work is scheduled to begin. Conduit routing shall be clearly laid out with paint or staking before inspection takes place. The Engineer reserves the right to specify final routing before digging begins, or at any point during the operation.

TESTS

Contractor shall test all wiring for shorts and all equipment for proper grounding before energizing. Equipment shall be thoroughly checked and adjusted for proper operation. Check motors for proper rotation before energizing and adjust if necessary.

END OF SECTION

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SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and incidentals required to construct and install the complete electrical systems as indicated on the Drawings and as specified in this Section.

STANDARD OF MATERIALS

All materials, equipment and apparatus covered by this specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories.

All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory.

All conduits and raceways, wire, devices, panelboards, switches, etc. of a given type shall be the product of one manufacturer.

SUBMITTALS

Manufacturer's data and shop drawings for all components, fixtures, assemblies and accessories indicated in this Division. Submit in accordance with Division 1.

PART 2 - PRODUCTS

HOUSEKEEPING PADS

Housekeeping pads shall be provided for all floor-mounted equipment such as switchgear, motor control centers, transformers, etc. Pads shall be made of concrete extending 3 to 4 inches vertically above finished floor and extending 6 inches horizontally around equipment.

CONDUCTORS

Compliance: Provide wires, cables and connectors that comply with the following standards as applicable:

UL Standard 83	Thermoplastic Insulated Wires and Cables
UL Standard 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL Standard 854	Service Entrance Cable
NEMA/ICEA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA/ICEA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
IEEE Standard 82	Test procedures for Impulse Voltage Tests on Insulated Conductors

Wire and cable manufactured more than twelve months before delivery to the jobsite shall not be used.

All conductors shall be soft-drawn copper of not less than ninety-eight percent (98%) conductivity, with NEC Type THW, THHN, or THWN for No. 4 and smaller, and Type RHW, THW, or THWN for No. 2 and larger, 600 volt insulation.

Jackets: Factory applied nylon or PVC external jacketed wires and cables for installation in raceways and where indicated.

Color coding of all ungrounded service, feeder, and branch circuits conductors shall be required according to the following convention:

120/208 Volt, 3 phase: black, red, and blue
277/480 Volt, 3 phase: brown, orange, and yellow

Ground wires shall be green and neutrals shall be white or gray or other combination per NEC. Isolated grounding conductors shall be green with yellow stripe or green with applied yellow tape to indicate isolated ground. Ground and grounded wire colors shall be used for these purposes only. Where grounded conductors of different systems are installed in the same raceway, box, auxiliary gutter, or other type of enclosure, each grounded conductor shall be individually identified by system. Additional grounded conductors shall be white with a readily distinguishable colored stripe, other than green, running along the insulation.

Conductors No. 12 AWG through No. 10 AWG shall be solid and No. 8 AWG and larger shall be stranded. No conductors smaller than No. 12 AWG shall be used except as otherwise noted.

Acceptable manufacturers: Anaconda Wire and Cable Co., General Electric Co., Okonite Co., Southwire Co., or Rome Cable Co.

CABLES AND CABLE ASSEMBLIES

Cables and cable assemblies for variable frequency drive (VFD) application shall conform to the following: 4-conductor, (3) stranded tinned copper ungrounded conductors plus (1) grounding conductor with cross linked polyethylene XLP insulation. Overall metal foil shielding plus tinned copper braided shielding not less than 85 per cent coverage. Tinned copper drain wire, polyvinyl chloride PVC jacket.
Grounding wire shall be not less than #10AWG.

Acceptable manufacturer: Belden Type 2950x, rating as noted on plans.

CABLE AND WIRE SPLICES

General: the materials shall be compatible with the conductors, insulations and protective jackets of the respective cables and wires. Use connectors with ampacity and temperature ratings equal to or greater than those of the wires upon which used.

In manholes and other locations where moisture might be present, the splice shall be watertight and submersible.

Connectors: UL 486A. Aluminum and aluminum alloy fittings will not be accepted. Connectors shall be plated with tin or tin alloy.

Conductor Sizes No. 6 AWG and Larger: Splices in conductors shall be made with indenter, crimp connectors and compression tools or with bolted clamp type connectors to insure a satisfactory mechanical and electrical joint.

WIRE AND CABLE MARKERS

Wire and cable markers shall be "Omni-Grip" as manufactured by Brady Worldwide, Inc., or equal.

Wire and cables with diameters exceeding the capacity of the “Omni-Grip” shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by Brady Worldwide, Inc., 3M Co., or equal.

RECEPTACLES

Receptacles shall be furnished and installed where shown on the drawings and shall conform to the following requirements:

Grounding type duplex receptacle: rated 20 amperes, 125 volt, 2 wire, 3 pole with grounded shunt (yoke permanently grounded to third clip), NEMA Configuration No. 5-20R, and conforming to Federal Specification W-C-596F (submit proof of compliance).

All receptacles listed on the drawings shall be specification grade receptacles.

Tamper resistant receptacles shall be in compliance with the intent of the NEC. The design of the tamper resistant receptacle shall not incorporate any switching mechanism.

All exterior devices shall be designed for the application and shall be installed in a waterproof enclosure with proper cover.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

SWITCHES

Flush, enclosed type, specification grade, rated at 20 amperes, 120/277 volts, alternating current only, quiet operation, and shall comply with Federal Specification W-S-896F (submit proof of compliance). Switch housing shall be color coded for current rating.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

Motor switches with inherent thermal overload protection shall be Square D, Type F for flush or surface mounting as required by the location of the unit. Units shall be furnished with pilot lights as indicated.

DEVICE PLATES

All plates for switch, receptacles and telephone outlets located on finished walls shall be UL listed with the number of gangs required for the application. Nylon or plastic plates shall match device color. All plates for outlets located on unfinished walls or on condulet type fittings shall be zinc coated sheet metal with rounded or beveled edges.

Weatherproof receptacle covers shall be of impact resistant plastic, gasketed, in-use type. Switch covers shall be gasketed metal.

Device plates shall be factory engraved where indicated on the drawings. Letters shall be black filled.

RELAYS

Relays shall be electrically held and operated. Relays shall be mounted in a NEMA-1 enclosure. The contactors shall be capable of switching inductive and resistive loads.

GROUNDING AND BONDING

Conductors: type THW, THHN/THWN, or RHW to match power supply wiring.

Bonding Jumper Braid: copper braided tape, constructed of 30 gage bare copper wires and properly sized for application.

Flexible Jumper Strap: flexible flat conductor, 48,250 circular mils, with copper bolt hole ends sized for 3/8” diameter bolts.

Grounding Electrodes: solid steel core with a heavy uniform covering of electrolytic copper, 5/8" X 10'. Provide sectional rods if required. Threads, on sectional rods, shall be rolled (not cut) into the composite metal after the copper covering has been applied. Sectional rod couplings shall be of a corrosion resistant alloy.

Plate Electrodes: plate electrodes are not permitted. If sufficiently low resistance cannot be obtained with driven rods, the Architect shall be notified and will provide written instruction on grounding methodology.

NAMEPLATES

Nameplates: 0.125 inch thick laminated plastic; white and black finish; rectangular shaped; minimum of 1.0 X 2.5 inches with 0.25 inch high block style engraved lettering.

PART 3 - EXECUTION

WIRING

All conductors shall be carefully handled to avoid kinks or damage to insulation.

All wires, cables and each conductor of multi-conductor cables shall be uniquely identified at each end by color or with wire and cable markers. Lighting and receptacle wiring shall be distinctly differentiated and junction boxes marked.

Lubrications shall be used, if required, to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

Neutral wires shall be pigtailed to receptacles so that a receptacle can be removed for replacement without the neutral connection to other receptacles on the circuit being disconnected.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

All 600 Volt wire insulation shall be tested with a "megger" after installation. Tests shall be made at not less than 500 Volts.

DEVICES

Unless indicated otherwise on the drawings all light switches shall be mounted with the centerline of the device 48" above the finished floor.

Unless indicated otherwise on the drawings or in the specifications all receptacles shall be mounted with the centerline of the device 18" above the finished floor.

Receptacles shall be installed with the grounding contact at the top. Where receptacles are required to be mounted horizontally they shall be installed with the neutral contact at the top.

Receptacles above counters shall have major axis horizontal to counter surface and device centerline 6" above counter surface or backsplash (if present).

Mount all devices so that the cover plate edges are in contact with the wall and are parallel to building features.

GROUNDING

Ground all non-current carrying metal parts of the electrical system to provide a low impedance path for ground fault current. Route ground connections and conductors to ground and protective devices in shortest and straightest paths as possible.

Insulated grounding bushings shall be required for all raceways, service entrance panels, distribution panels, all raceways one inch and larger and any raceway entering a concentric knock-out.

In general a ground wire shall be installed in every conduit. The conduit installation itself shall serve as an additional grounding means.

Where there are parallel feeders installed in more than one raceway, each raceway shall have a ground conductor.

Where conduits terminate without mechanical connection (i.e., locknuts and bushings) to panelboards, and for all terminations of conduit sizes one inch and larger; and for all sizes of metallic conduit (rigid or flexible) terminating in concentric knockouts, the following procedure shall be followed: Each conduit shall be provided with an insulated grounding bushing and each bushing connected with a bare copper conductor to the ground bus in the electrical equipment. The ground conductor shall be in accordance with Article 250 of the NEC.

Install ground rods as necessary to provide an earth ground having a test resistance of no more than 25 ohms.

Test ground rods for ground resistance value before any wire is connected. A portable ground testing megger shall be used to test each ground rod or group of rods. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the electrode tested. Where tests show resistance to ground is over 25 ohms, reduce resistance to 25 ohms, or less, by driving additional ground rods; then retest.

Grounding connections shall be made by exothermal weld or by using a compatible mechanical connector and brazing completely over. Exothermal welds shall be made strictly in accordance with the weld manufacturer's written recommendations. Welds that have puffed up or which show convex surfaces, indicating improper cleaning, are not acceptable. No mechanical connector is required at exothermal welds.

Connect together system neutral, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing system.

The neutral conductor(s) of the incoming electrical service shall be grounded to the ground rod system, metal cold water piping system, and structural steel using Table 250-66 of the NEC for conductor sizing. Grounding conductors shall be run in rigid non-metallic conduit.

Ground the neutral of all dry type transformers to effectively grounded building steel and metal cold water piping system as near as practicable using Table 250-66 of the NEC to size conductor.

Grounding conductors shall be attached to equipment with a bolt-on lug or approved tapered screw used for no other purpose. Use crimp-on spade lugs for stranded conductors.

IDENTIFICATION

Equipment

Equipment identification shall be made using engraved laminated plastic plates (indented tape labels will not be permitted). Characters shall be white on a black background and 1/4" high minimum. Plates shall be secured to the panels by means of screws or metal pressure pins. Cement, by itself, will not be acceptable. All nameplates shall be mounted on the outside surface of the piece of equipment.

Individually enclosed safety switches, circuit breakers, and motor starters, pull boxes, control cabinets and other such items shall be identified indicating load, electrical characteristics, and

source. For example, a disconnect switch for a 7-1/2 horsepower, 208 volt, 3 phase air handling unit, Number 8 feed from Panel "MDP", Circuit Number 2 shall be labeled as follows:

AHU-8
7-1/2 HP, 208V, 3Ø
Cir: MDP-2

Service entrance panel, distribution panels, panelboards, and transformers shall be identified indicating panel designation from the drawings, electrical characteristics and source. For example, a 277/480 volt 3 phase panel "LPA" feed from "MDP" Circuit No. 3 shall be labeled as follows:

LP-A
277/480V, 3Ø
(Feeder: MDP-3)

Service entrance panel and distribution panels shall also have each circuit identified as to circuit number, load, and electrical characteristics of load. For example, a 5 HP, 208 volt, 3 phase hot water pump Number 6 feed from panel MDP, Circuit No. 4 would be labeled as follows with the plate attached adjacent to the circuit:

MDP-4
HWP-6
5 HP, 208V, 3Ø

All enclosures containing energized components shall be marked with mylar labels identifying hazards. Such warning messages as "WARNING-HAZARDOUS VOLTAGE", “480 VOLTS", "240 VOLTS", etc. are acceptable. Labels shall be EZ-Code by Thomas & Betts or similar product.

Junction Box Identification: Each junction box cover shall be labeled with a permanent "magic" marker or other means to identify the circuits within. For example, a junction box containing lighting circuits 21, 23, 25 from Panel L2A would be labeled "L2A-21,23,25". Telephone junction boxes shall be labeled "T". Fire alarm system junction boxes shall be labeled “FA”. Public address, nurse call, and other system junction boxes shall be labeled accordingly.

Conductor Identification: All cables and wires shall be color coded as to phase per convention. See color coding above.

Raceway Identification: All raceways leaving the service entrance panel and distribution panels shall be clearly marked as to their circuit number. For example, a conduit containing conductors for Panel MDP, Circuit No. 5 would be marked MDP-5. Empty conduits shall be marked "empty".

Device Identification: When it is not clear what a wall switch or what a receptacle is dedicated for then the device plate shall be engraved appropriately. Blank plates for future devices shall be engraved "FUTURE". All plates shall be factory-engraved.

Ungrounded Conductor Identification within Panelboards: All panelboards shall have a label indicating the ungrounded conductors color schedule as noted below. Labels shall be at least 2” x 4”, laminated in plastic, and affixed to the inside of the equipment door.

For 120/208 Volt, 3 phase panels:
AØ Conductors – Black
BØ Conductors – Red
CØ Conductors – Blue

For 277/480 Volt, 3 phase panels:
AØ Conductors – Brown
BØ Conductors – Orange
CØ Conductors – Yellow

Warranty Signage Identification: Provide equipment tags to identify equipment and warranty information on all electrical equipment including panelboards, motor control centers, transformers, starters, etc. See sample format below. Labels shall be at least 2” x 4”, laminated in plastic, and affixed to equipment in conspicuous location.

Equipment Information Tag
Unit ID: PANEL ‘N1A’
Manufacturer: Siemens
Model No. : CDP-7
Serial No. : 56742 OG1
Warranty Period Ends: December 12, 2013
Warranty Contact: Short Circuit, Inc. 123.456.7890

FIREPROOFING

All conduit and boxes passing through or installed within fire walls and smoke walls shall be installed so as to maintain the integrity and rating of the wall through which it passes. Boxes shall be installed within 1/8" of wall surface. Conduits penetrating rated floors shall be installed to maintain the fire rating of the floor using UL approved sealing materials.

END OF SECTION

SECTION 26 05 05 ELECTRICAL SELECTIVE DEMOLITION

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes all labor, material, equipment and services necessary and incidental to complete all the demolition and removal of electrical work as shown on the Drawings or as required.

The demolition drawings do not necessarily indicate all the conditions, details, or work required. The Contractor shall examine the building to determine the actual conditions and extent of the work. Any details not clear to this Contractor shall be referred to the Engineer for clarification prior to bidding.

The Contractor shall be responsible for demolition and removal of all existing electrical systems where shown for demolition. No portion of electrical systems shown for demolition may be abandoned in place.

SUBMITTALS

Shop Drawings: Indicate demolition and removal sequence and location of salvageable items.

Schedules: Submit schedule showing time and detailed sequence of demolition, removal of materials and arranged coordination of anticipated electrical interruptions.

1. Schedule demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

Project Record Documents: Submit in accordance with Section 16010.

1. Accurately record actual locations of abandoned or dead ended utilities.

QUALITY ASSURANCE

Contractor shall verify the extent of the demolition work. Any questions as to which systems are to be removed versus which systems are to remain shall be referred to the Engineer for clarification prior to commencing demolition work.

The demolition work shall be a phased operation and shall comply with the construction sequence schedule.

Do not close or obstruct egress width of fire exits or access.

Do not disable or disrupt building fire or life safety systems without written permission from the Owner. In all cases, permission shall have been granted not less than ten (10) working days prior to the intended interruption.

PROJECT CONDITIONS

Owner will vacate demolition area prior to start of demolition work.

Owner will continuously occupy areas of building immediately adjacent to selective demolition areas.

Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations.

Provide minimum of ten (10) working days advanced notice to Owner of demolition activities which will severely impact Owner's normal operations.

Maintain free and safe passage to and from Owner occupied areas.

Condition of Structures: Owner assumes no responsibility for actual condition of areas to be demolished.

Traffic and Passageways: Maintain accessibility for fire fighting apparatus.

1. Conduct demolition operations and debris removal to avoid interference with adjacent occupied facilities.

2. Obtain written permission from authorities having jurisdiction prior to closing or obstructing adjacent occupied facilities.

3. Provide alternate routes when closing or obstructing traffic ways when required by governing authorities.

4. Ensure safe passage of persons around area of demolition. Provide and maintain temporary covered passageways; comply with requirements of governing authorities.

Protection: Perform work in manner to eliminate hazards to persons or property and avoid interference with adjacent areas.

1. Maintain existing utilities that are to remain in service and protect from damage during demolition operations.

2. Do not interrupt existing utilities serving occupied facilities, except when authorized by Owner in writing. Provide temporary services during interruptions.

3. Coordinate in advance with Owner electrical interruptions.

4. Protect existing floors with suitable coverings when necessary.

COORDINATION

The Contractor shall be responsible for coordinating demolition of all affected electrical systems to prevent disruption to the Owner and minimize downtime.

The Contractor shall be responsible for coordinating demolition by other Divisions of the Specifications to prevent disruption to the Owner and minimize downtime.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

EXAMINATION

Beginning alterations to existing building systems means the installer accepts existing conditions.

PREPARATION

Provide, erect, and maintain temporary barriers, warning notifications (signs) and other security devices as may be required for personnel safety.

Inventory each panelboard where circuits are indicated to be reused. Sequentially consolidate existing circuits within each panelboard with regard to area served. Maximize capacity for service to the project area by including existing spares with the group of circuits breakers to be disconnected as a result of this selective demolition. Prepare a current directory, post demolition, for each panelboard as the base upon which the final directories will be compiled.

Temporarily tag every circuit breaker serving systems outside the demolition area. The tag shall be an OSHA compliant, commercially preprinted, 3¼ inch by 5-5/8 inch, accident prevention card with write on matte finish plastic surface, ¼ inch reinforced grommet and attachment string loop. The message on the card front shall read: “DANGER, DO NOT OPEN” and the message on the reverse side shall read: “DANGER, DO NOT REMOVE THIS TAG. NECESSARY DISCIPLINARY ACTION WILL BE TAKEN IF THESE ORDERS ARE DISREGARDED. SEE OTHER SIDE.” The tags shall remain in place until the demolition and renovation are complete.

TEMPORARY CONDITIONS

The Contractor shall include all temporary connections necessary to permit the Owner to occupy areas of the building during the various construction phases.

SALVAGEABLE MATERIAL AND EQUIPMENT

Carefully remove, store and protect the salvage materials and equipment shown on the Drawings for Owner's use. Deliver to location directed by Owner.

Carefully salvage, remove and store, and protect for re-installation the materials and equipment shown on the Drawings.

Materials Retained by Contractor:

1. Items of salvageable value not indicated as Owner salvaged or scheduled for reinstallation may be removed as work progresses.

2. Salvaged items must be removed from site as they are removed. Storage or sale of salvaged items on site will not be permitted.

REMOVAL OF DEMOLITION MATERIAL

Contractor shall remove existing systems, shown or specified, necessary or reasonably inferred, for completion of his/her work. Owner will have the option of retaining any item of material removed under this contract. Item or materials not retained by Owner will become the property of the Contractor, removed from the premises and legally disposed off-site.

Contractor shall dispose of fluorescent lamps, ballasts, and other hazardous materials in accordance with all Local, State and Federal regulations.

Contractor shall remove all wiring determined to be disconnected and abandoned, and remove all conduit and junction boxes determined to be empty and not intended to be used during the reconstruction phase.

Remove abandoned wiring to source of supply.

Remove all exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Remove all junction boxes and conduit supports associated with conduit being removed.

Repair adjacent construction and finishes damaged during demolition and extension work.

Maintain continuity of circuits, which remain in service.

Remove all existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings floors, and other surfaces scheduled for demolition unless specifically shown as retain or relocate on drawings.

Remove auxiliary and signal systems (IE: fire alarm, security, telephone, data, sound/paging and the like) not scheduled for reuse or relocation. Remove associated devices, appliances and cabling complete.

Remove electrical systems associated with equipment (IE: Elevators, motorized doors/shades/gates/ dampers, mechanical HVAC and plumbing equipment, landscape, civil, kitchen and other equipment served by the electrical systems) not scheduled for reuse or relocation on the drawings. Remove switchboards, motor control centers, panelboards, busway, electrical junctions boxes, pull boxes, conduit, raceway systems (IE: bus gutter, cable tray, plugmold), wiring, safety switches, enclosed circuit breakers, control panels, Energy management systems, relays and contactors associated with equipment scheduled for removal.

PERFORMANCE

Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Engineer.

CLEANING

Broom clean demolition areas of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

Remove temporary work and protection when no longer needed.

Unless noted otherwise, existing fixtures that are to remain shall be cleaned and lamps and ballasts replaced with new lamps and ballasts.

END OF SECTION

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SECTION 26 05 30 - RACEWAY SYSTEMS

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and incidentals required to construct and install the complete electrical systems as indicated on the Drawings and as specified in this Section.

STANDARD OF MATERIALS

All materials, equipment and apparatus covered by this specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories.

All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory.

All conduits and raceways, wire, devices, panelboards, switches, etc. of a given type shall be the product of one manufacturer.

SUBMITTALS

Manufacturer's data and shop drawings for all components, fixtures, assemblies and accessories indicated in this Division. Submit in accordance with Division 1.

PART 2 - PRODUCTS

RIGID CONDUIT, TUBING AND FITTINGS

Rigid steel conduit: zinc coated, threaded type conforming to the requirements of UL 6 and ANSI C80.1 standards. Zinc coating shall be applied to both inner and outer surfaces.

Intermediate metal conduit: hot-dipped galvanized, threaded type conforming to the requirements of UL 1242 and ANSI C80.6 standards.

A fitted thread protector shall protect threaded ends from damage during shipment and handling.

Fittings for rigid steel and IMC conduit: zinc coated, threaded type, conforming to Federal Specification W-F-408.

Electrical Metallic Tubing (EMT): UL 797 and ANSI C80.3 standards.

Fittings for electrical metallic tubing: Federal Specification W-F-408. Steel compression or set-screw type, galvanized or cadmium plated, and suitable for location of installation. Conduit bushings shall be metallic with insulated throats. Insulating grounding type bushings shall be provided where required under "Grounding". EMT connectors shall be similar to T&B "Insuline" with completely insulated throats. Field applied insulated throats are not acceptable.

Plastic conduit for direct burial: UL labeled Schedule 40 PVC manufactured to NEMA TC-2 specifications, and UL 651 specifications. Plastic conduit concrete encased may be Type EB.

Plastic interduct for installation in PVC conduits: UL labeled and listed for installation of inside/outside communication cable.

Couplings, fittings, pipe straps and spacers used with rigid plastic conduit shall be fabricated of plastic.

Fittings for plastic conduit: manufactured to NEMA TC-3 specifications.

Acceptable Metal Conduit and Tubing Manufacturers:

EMT: Allied Tube & Conduit Co.
Wheatland Tube Co.
Triangle PWC, Inc.

Fittings: Steel City
Thomas & Betts (T&B)
Raco Inc.

FLEXIBLE METAL CONDUIT, COUPLINGS AND FITTINGS

Flexible metal conduit for dry interior applications: Federal Specification WW-C-566 and UL 1, continuous, spiral wound galvanized steel type.

Fittings (connectors) for flexible metal conduit: UL E 23018. Squeeze Type of galvanized steel or malleable iron zinc plated.

Flexible metal conduit for damp or exterior applications: liquid tight, UL listed, spiral wound galvanized steel with PVC outer jacket.

Fittings for liquid tight conduit: Federal Specification W-F-406. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and gasket sealing rings and insulated throats.

Acceptable Metal Conduit and Fittings Manufacturers:

FMC: Alflex Corp.
American Flexible Conduit Co.
Anaconda Metal Hose, ANAMET Inc.

FMC Fittings: Steel City
Thomas & Betts (T&B)
Raco Inc.

CONDUIT MOUNTING EQUIPMENT

Hangers, rods, backplates, beam clamps etc. shall be hot-dipped galvanized iron or steel. They shall be as manufactured by the Appleton Electric Co., Thomas and Betts Co., Unistrut Corp., or approved equal.

JUNCTION BOXES

Sheet Steel Outlet Boxes: conform to UL 514A, “Metallic Outlet Boxes, Electrical”, UL 514B, “Fittings for Conduit and Outlet Boxes, Covers, and Box Supports”, and NEMA OS1, “Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”.

Sheet Steel: Flat-rolled, code gauge galvanized steel.

Acceptable Manufacturers: Sheet-steel boxes shall be manufactured by RACO, Steel City or equal.

All junction boxes and pull boxes shall be sized per NEC requirements and be of the proper NEMA classification for the locations where they are installed. Where boxes occur above other than lift-out ceilings, access panels must be provided.

Wet location covers shall meet NEC wet location requirements (shall comply with NEC). Covers shall be “in-use” type and shall mount vertically or horizontally and be of gasketed heavy-duty polycarbonate construction with clear cover with lockable hasp for 1/8" shank lock.

OUTLET BOXES

Switch, receptacle and wall or ceiling mounted junction boxes shall be the 4" X 2 1/8" square type. Tile, dry wall, or flat cover plates for one or two devices shall be furnished for each box as required.

TELEPHONE AND DATA SYSTEM OUTLETS

Wall outlets shall in general consist of four inch (4") square boxes with single gang switch ring. Conduits shall be supplied turned out of wall above ceiling assembly. Conduits shall be 1” or larger, with insulated bushing installed on all bare ends.

Install finished blank plates on all unused openings.

OUTDOOR BOXES

Cast Aluminum Boxes: exposed, exterior locations; copper free aluminum, threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices, and closure plugs.

Boxes shall have a rear opening in addition to necessary top and bottom openings. Boxes shall be provided complete with a minimum of two closure plugs and self-threading ground screw. Boxes shall have a thermoset, baked enamel silver gray finish. Weatherproof cover plates for one or two devices shall be furnished for each box as required.

Covers shall be of heavy duty die-cast construction. Mounting screws shall be stainless steel. Covers shall have a thermoset, baked enamel silver gray finish and be equipped with a sealing gasket. Covers shall be equipped with a hasp-type locking tab.

Nonmetallic boxes shall be thermoplastic or polyester fiberglass types as manufactured by Carlon or Pass & Seymour.

LOCATION OF OUTLETS

The approximate locations of outlets, etc. are shown on the drawings. The exact locations shall be determined at the building.

It is the responsibility of the Contractor to note the locations and heights of cabinets, counters, shelving units, etc. before the installation of outlets.

WIREWAY

16 gauge galvanized steel with polyester powder coat finish over a phosphate preparation. UL listed as steel enclosed wireway and auxiliary gutter. Conform to NEMA 3R for outdoor locations.

Size: nominal 8” by 8” square cross section.

Fittings and Accessories: Male and female lengths shall be factory constructed. L’s, T’s, sweeps and other connectors as required. Junction boxes shall be standard and furnished where required or directed.

CONDUIT BODIES

Conduit bodies shall be constructed of galvanized or cadmium plated malleable iron or copper-free aluminum. Galvanized steel or aluminum covers and gaskets shall be supplied.

LB’s 3” and greater shall be mogul type with domed covers.

PART 3 - EXECUTION

RACEWAY INSTALLATION

All interior and above grade exterior wiring shall be installed in a metal conduit and all embedded in concrete or below grade wiring shall be in PVC conduit unless indicated otherwise on the drawings.

Exterior low voltage (less than 50 volts) wiring may be installed in liquid tight, non-metallic flexible conduit (“Sealtite”) where installation is above grade and not subject to damage.

No conduit smaller than 3/4 inch electrical trade size shall be used, nor shall any have more than three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.

No wire shall be pulled until the conduit system is complete in all details.

The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

Conduit support shall be spaced at intervals of 8 ft. or less, as required to obtain rigid construction.

Single conduits shall be supported by means of two-hole pipe clamps. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8 inch diameter. The channel shall be not less than 1 1/2" nominal size.

Conduit hangers shall be attached to structural steel by means of beam or channel clamps.

All conduits on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run straight and true.

Conduit terminating in sheet steel boxes shall have double locknuts and insulated bushings.

Flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present. Flexible conduit length shall not exceed 1'-6" in length for this application.

Provide expansion coupling every 100 feet for long runs of conduit and at concrete expansion joints. Provide ground bonding jumpers around expansion couplings, used on metallic conduit, sized according to Table 250-122 of the NEC.

Transitions from below grade to above grade shall be with rigid galvanized steel long sweep nineties with a bituminous coating where in contact with earth or concrete. Area of transition shall not be subject to standing puddles of water.

Seal all wall penetrations to watertight condition. Finish as applicable to location.

Steel conduit, when buried in soil, shall be treated with a protective coating of bitumastic or asphalt-base paint, or wrapped with plastic tape.

Approval by the Architect shall be required to install conduit in structural members.

In general, the conduit installation shall follow the layout shown on the plans. This layout is, however, diagrammatic only, and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without additional cost to the Owner. It is recognized that branch circuit routing shown on the drawings may not always be the most economical or the most feasible method. Routing may be changed by the Contractor subject to the following provisions:

Conduits shown routed overhead may not be installed in or below slabs or in walls.

Not more than three circuits may be installed in any one conduit. Care must be taken to provide the appropriate number of neutrals where two or three circuits are on the same phase.

All conduit shall be concealed unless otherwise noted on the drawings.

Exposed conduit will be permitted only as shown on the drawings. Exposed conduit shall be run parallel with or at right angles to the building walls.

All empty conduits shall be provided with a plastic pull wire rated for a minimum of 200 lbs.

Conduit stub-ups at panels shall be secured in place by use of Unistrut and clamps.

Conduit and tubing shall be kept at least twelve (12) inches from parallel runs of flues, steam pipes or hot water lines.

Telephone and data raceways shall be 1” minimum. This includes conduits stubbed up into ceiling cavity.

Where exposed connections to motors and equipment from overhead conduits are made without benefit of a wall for conduit mounting, the connection shall consist of vertical conduit (minimum size 1") from Type "LL", "LR" or “TT” Unilet to floor flange. Connection to equipment shall be with flexible liquid-tight from Type FDT boxes located in the vertical conduit.

Flexible conduit in all areas subject to moisture shall be liquid-tight flexible conduit.

All electrical connections to vibration isolated equipment shall be made with flexible conduit.

Connections to indoor dry type transformers shall be made with weatherproof flexible conduit.

All conduit entering the building shall be suitably sealed to prevent the entrance of moisture.

All conduit passing through a structural expansion joint shall be provided with a UL approved expansion joint fitting and bonded as required by the National Electrical Code.

Conduit in hazardous locations (as defined and classified by the National Electrical Code) shall be sealed with sealing fittings. Where hazardous locations exist, all conduit, fittings and installation shall comply with Article 500 of the NEC.

Any wiring in a finished area which cannot be concealed in conduit shall be installed in a surface metal raceway system as manufactured by Wiremold or equal. Utilization of surface metal raceway, if not indicated as such on the plans, will be accomplished only with the written approval of the Architect.

Conduit run in areas with hung ceilings shall be installed in the space above the hung ceiling as close to the structure as possible. Conduits shall be supported from the structure.

Where flex conduit is used from junction box to light fixture it shall be supported such that it does not touch ceiling tiles or interfere with their placement.

Flexible metal conduit connections to light fixtures shall be at least 4 feet but not more than 6 feet in length per NEC 410-117(c).

Conduit installed in walk-in freezers or walk-in coolers shall be rigid PVC. Provide suitable conduit sealing fittings to contain cooled air transfer.

Where raceways are indicated installed under slabs, they shall be placed not less than 2” below surface of prepared fill. Under no circumstances shall raceways be laid directly on vapor barrier or in or on reinforcing. Raceways concealed in ground outside building shall be a minimum of 2 feet below grade and topped with a two inch concrete cap before backfilling. Install plastic warning tape 12 inches above raceway, buried in backfill.

RACEWAY INSTALLATION - CONDITIONS

Conduit raceways shall be installed as indicated herein. Where more than one type of raceway is listed under one condition, the Contractor may exercise his option of the raceway used. Conditions of raceway installation are as follows:

Exposed Raceway Below 8'-0" from Finish Floor and in Areas Subject to Moisture: Rigid galvanized steel conduit.

Raceway Concealed Overhead, or in Walls: Rigid galvanized steel conduit, intermediate metallic conduit or electrical metallic tubing (EMT).

Raceway Concealed in Ground Outside Building: Schedule 40 PVC or rigid steel. Rigid steel conduits installed below slab-on-grade or in the earth shall have a factory-applied PVC coating, two coats of a coal-tar system, or shall be field-wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50-percent overlay.

Final Raceway Connection to Recessed Fixtures in Accessible Locations: Flexible steel conduit maximum of 6'-0" long.

Final Raceway Connection to Pumps, Motors, Transformers, Etc.: Liquid-tight flexible steel conduit maximum of 1'-6" long.

Raceway That Extend Through the Slab or Above Finish Grade: 90° elbows, nipples and couplings of rigid galvanized steel or IMC shall be used where any raceway extends through the slab or above finished grade. In general PVC conduit shall not be allowed above finished slab inside the building or within 1 1/2' of finished grade outside the building.

OUTLET BOXES

Outlet boxes for flush mounted lighting fixtures shall be accessible. If lighting fixture is in a non-accessible ceiling the box shall be accessible when the fixture is removed.

Set boxes plumb and such that their device mounting plane is within 1/8" of the finished wall.

Surface mounted boxes and wiremold boxes, both new or existing, shall be painted to match surrounding surfaces.

The location of boxes on the electrical plans is approximate. Review architectural drawings for specific location or if not shown center and align within architectural detail. The Architect shall reserve the right to move boxes during rough in.

END OF SECTION

SECTION 26 27 13 - SERVICE AND DISTRIBUTION

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and incidentals required to construct and install the complete electrical systems as indicated on the Drawings and as specified in this Section.

STANDARD OF MATERIALS

All materials, equipment and apparatus covered by this specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories.

All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory.

All conduits and raceways, wire, devices, panelboards, switches, etc. of a given type shall be the product of one manufacturer.

SUBMITTALS

Manufacturer's data and shop drawings for all components, fixtures, assemblies and accessories indicated in this Division. Submit in accordance with Division 1.

PART 2 - PRODUCTS

PANELBOARDS

Compliance: NFPA 70 National Electrical Code, UL 67, “Electric Panelboards”, NEMA Publication PB1, “Panelboards”, Federal W-P-115a Type 1, Class 1 specifications and NEMA PB 1.1, “Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less”.

Provide factory assembled panelboards in sizes and rating as indicated. Panelboards shall be UL listed and labeled.

Acceptable manufacturers: panelboards shown on the drawings shall be manufactured by Cutler-Hammer, Eaton, Square D, or Siemens.

POWER DISTRIBUTION PANELBOARDS

Provide dead front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors. Select unit with feeders connecting at the top of the panel. Equip with copper bus bars with not less than 98 percent conductivity, and with full size neutral bus; provide suitable

lugs on neutral bus for outgoing feeders requiring neutral connections. Provide molded case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple pole breakers are indicated, provide with common trip so overload on any pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

LIGHTING AND APPLIANCE PANELS

Provide dead front safety type lighting and appliance panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors.

Refer to the drawings to determine each panelboards pertinent characteristics such as bus rating, main circuit breaker or lugs only, voltage rating, number of phases, number of positions required, etc.

Select unit with feeders connecting at the top of the panel. Equip with copper bus bars with not less than 98 percent conductivity, and with full size neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections.

Interrupting ratings shall be coordinated with the available short circuit current. Provide molded case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple pole breakers are indicated, provide with common trip so overload on any pole will trip all poles simultaneously.

All panels shall be provided with an equipment grounding bus similar to, but isolated from the solid-neutral bus. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures.

Panels shall be carefully aligned and rigidly secured in place with the top of the cabinets located 78 inches above the finished floor.

Each panel shall be furnished with an identification plate as specified in the "Equipment Identification" section of this specification.

Distribution panels which are flush mounted must have door on front of panel.

Circuit Breakers:

Panelboards shall be equipped with thermal-magnetic molded case circuit breakers with trip ratings as shown on the drawings.

Circuit breakers shall be quick-make and quick-break units with positive trip indicating mechanism and common trip on all multi-pole breakers.

Single pole 15 and 20 amp circuit breakers shall be UL listed as "Switching Breakers" and be marked SWD.

Circuit breakers shall be the bolt-on type.

Bus Assembly:

Bus bar connections to the branch circuit breakers shall be the "phase sequence" type.

Bus bars shall be of copper construction. All current carrying parts of the bus shall be plated.

Buses shall be full length with constant cross sectional area, designed for the bus current indicated.

Cable lugs shall be furnished in the quantity and size required for the size and number of conductors indicated.

Mains ratings: as shown on the drawings.

Short circuit current rating: as shown on the drawings. Panelboards, as a complete unit, shall have a short circuit current rating equal to or greater than that indicated. It shall be understood that the minimum rating for 240 and 480 volt rated panelboards shall be 10,000 and 14,000 RMS symmetrical amperes respectively.

Cabinet construction:

Panel enclosures: UL 50. Enclosures shall be furnished without knockouts. All knockouts shall be field cut.

The panelboard bus assembly shall be enclosed in a dead front safety constructed steel cabinet.

The size of the wiring gutters and gauge of steel shall be in accordance with NEMA and UL standards; except that the thickness of steel shall not be less than 16 gauge.

The box shall be fabricated from galvanized steel. Boxes intended for outdoor duty, or where indicated, shall be rated NEMA 3R.

Select enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

Construction shall be such that circuit breaker mounting hardware is not required when circuit breakers are added in the future.

The panelboard front cover shall be hinged 1-piece with integral door. The integral door shall have completely concealed hinges and door swings, flush lock and key mechanism, and steel door pull.

A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Typed directory cards shall be furnished in each panel.

All panelboards throughout project shall be keyed alike.

Special Provisions:

Where lighting and appliance panelboards are flush mounted, provide spare conduits stubbed up and capped as specified elsewhere in this section – see note on plans. Where surge protection is required, provide as specified in this section - **SURGE PROTECTION DEVICES (SPD)**. Surge protection device system shall be incorporated into the panelboard assembly as described in **SURGE PROTECTION DEVICES (SPD).**

CIRCUIT BREAKERS INSTALLED IN EXISTING PANELS

Circuit breakers installed in existing panels shall have an A.I.C. rating equal to that of the panel in which they are installed.

SAFETY DISCONNECT SWITCHES

Compliance: NFPA 70 National Electrical Code, UL 98, “Enclosed and Dead Front Switches”, NEMA Publication KS1, “Enclosed Switches”, and NEMA KS 250, “Enclosures for Electrical Equipment (1000 Volts Maximum)”.

Safety switches shall be provided for all motors and equipment indicated or required by the National Electrical Code.

Safety switches shall be Type "HD" (heavy duty) unless noted otherwise, fused or non-fusible as indicated with number of poles as shown or required. Safety switches for equipment may be non-fused only if equipment is UL tested with circuit breaker protection.

Fuses: general use, dual element time-delay, current limiting. Manufactured by Bussman, Littlefuse, Edison, or equivalent.

Safety switches for indoor general purpose application shall be NEMA 1 and for exterior application shall be NEMA 3R.

Acceptable manufacturer: provide safety switches manufactured by Cutler-Hammer, Square D, or Siemens.

Construction: Gray baked enamel finish. NEMA 3R enclosures shall be manufactured from galvanized steel. NEMA 4X enclosures shall be manufactured from 304 stainless steel. Corners shall be ground smooth and polished to overall finish quality. NEMA 4X enclosures shall be fitted with a condensate drain at the bottom and a vent at the top that is rated for NEMA 4X service.

Ratings: Fusible disconnects shall be 240 or 600 volt rated depending on the service voltage.

Fusible disconnects shall be furnished with Class R fuses of the indicated ampere rating (up to 600 amps) and be equipped with rejection clips.

Fusible disconnects shall be UL listed for 200,000 RMS symmetrical ampere short circuit current when equipped with Class R or Class L fuses.

Lugs shall be front removable and be UL listed for aluminum or copper conductors at 60 degrees C or 75 degrees C.

Disconnect switches shall be horsepower rated.

DRY-TYPE TRANSFORMERS

Shall have a 480 volt primary and a 208/120 volt secondary with a minimum of 4 full rated primary taps, two 2-1/2% below and two 2-1/2% above nominal voltage. Transformers shall be furnished with primary and secondary lugs sized to accommodate the conductors shown on the Drawings.

Transformers shall have an insulation system rated for continuous operation at 220^{o}C, but they shall be rated for continuous operation at full load with a maximum temperature rise of 115^{o}C above a 40^{o}C ambient temperature.

Transformers shall be capable of carrying a 15% overload continuously without exceeding a 150^{o}C rise above a 40^{o}C ambient temperature.

Enclosures shall be a ventilated type with feet for floor mounting.

Core and coil assemblies shall be grounded to the frame and shall be mounted on rubber isolation pads to reduce sound transmission.

The maximum sound level shall be:

0-50 KVA	45 dB
51-150 KVA	50 dB
151-300 KVA	55 dB
301-500 KVA	60 dB

DESIGN OBJECTIVES

The design of the electrical distribution system, including the specification of harmonic mitigating transformers (HMTs) as identified in the accompanying construction drawings, provides for the control of the harmonic currents that are generated by nonlinear electronic loads. These design objectives and the various standards that apply are detailed herein as follows:

To reduce the ‘penalty losses’ that are produced by harmonic currents, which would otherwise result in an increase in the cost-of-power, apparatus heating and the cost of air conditioning, within economic limits.

To limit harmonic current injection into the Point of Common Coupling (PCC), as recommended in (ANSI) IEEE Std. 519-1992, Section 10.4, Table 10.3.

To limit positive, negative and zero sequence harmonic currents in the distribution system so that the Individual Harmonic Distortion of Voltage (IHDv) levels do not exceed 3% at the loads and the Total Harmonic Distortion of Voltage (THDv) levels do not exceed 5% at the loads.

To limit zero sequence harmonic currents in the neutral conductors so that their ratings are not exceeded and Common Mode Noise (CMN) [neutral-ground voltage] levels do not exceed 5 volts at the loads, as recommended by CBEMA (Computer Business Equipment Manufacturers Association).

Where so required, the cancellation of positive and negative sequence harmonic currents, which are generated by single-phase and three-phase nonlinear loads, has been accomplished by phase shifting nonlinear load groups so that they are approximately 180° out-of-phase at the targeted harmonic frequencies.

Where so required, the reduction of zero sequence harmonic currents, which are generated by single-phase nonlinear loads that are connected phase to neutral in a three-phase, four-wire system, has been accomplished by providing an ultra-low impedance parallel path that is as close-as-practical to the nonlinear loads. The method of reduction will guarantee an acceptable level of Common Mode Noise (CMN) [neutral-ground voltage] at the loads, as recommended by CBEMA.

DESIGN EXECUTION

In order to achieve the 'Design Objectives', a harmonic mitigation plan which will meet all of the requirements elaborated on above. This engineered solution includes the application of various harmonic filtering transformers, all of which have been included in this specification and detailed in the accompanying construction drawings.

In the event the contractor wishes to propose an alternative to the specified Harmonic Filtering Transformers, the contractor shall provide the engineer with a detailed alternate Harmonic Mitigation Plan, which includes a schedule of proposed replacement devices that will meet all of the requirements elaborated on above.

DISTRIBUTION (HARMONIC MITIGATING) TRANSFORMERS

Harmonic Mitigating, Isolation Transformers for Medium K-Factor Loads:

Basis-of-Design: Subject to compliance with requirements, Power Quality International, Type DV (ZS).

Configuration:

Primary winding configurations shall be "Delta" in order to ensure the required zero-sequence reactance and impedance. ("Wye" connected primary windings shall NOT be used.)

Secondary winding configurations shall be "Zig-Zag" (two windings per secondary core leg) for 0 degree phase shift HMTs and "Modified Zig-Zag" (three windings per secondary core leg) for all other phase shift HMTs in order to ensure that zero-sequence flux is completely cancelled under balanced zero-sequence loading.

Primary to Secondary Phase Shift: Refer to Riser for Phase Shifts. (combination of 0, -15, -20, -30, -40, and/or -45 degrees)

Positive- and Negative-sequence impedance at 60 Hz shall be 3 to 6 percent.

Zero-sequence reactance at 60 Hz shall be less than 0.2 percent.

Zero-sequence impedance at 60 Hz shall be less than 0.9 percent.

Neutral connection shall be rated at two times the ampacity of the secondary phase current.

Capability to deliver full nameplate kVA with a load K-factor up to K30.

Harmonic cancellation shall be by electromagnetic means only. No capacitors or electronics shall be used.

Specifically designed to provide an ultra-low zero-sequence impedance (less than 0.9 percent) path for all zero-sequence currents (i.e. I3, I9, I15, I21,) in their three-phase, four-wire secondary windings regardless of phase shift.

Enclosure: Ventilated, NEMA 250, Type 3R, Indoor (Standard) unless otherwise indicated on Drawings.

The front and back covers of the enclosure shall be securely fastened using zinc plated, hexavalent chromium free, captive stainless-steel inserts and hex-head bolts. The use of self-tapping screws to secure the front and back covers is not permitted.

WARRANTY

Manufacturer's Warranty: Harmonic Mitigating – High Efficiency Transformers: Twenty (20) years pro-rated.

SURGE PROTECTION DEVICES

The SPD shall be Listed in accordance with UL 1449, Fourth Edition. The product and ratings shall be included in the database of the UL.com website.

The surge protective device (SPD) shall be designated a location Type 1 or Type 2 device intended for installation on the load side of the service equipment overcurrent device, including SPDs located at the branch panel.

The SPD shall be connected in parallel with the facility’s electrical system.

The SPD shall be made up of metal oxide varistors (MOV's), or a combination of MOV’s with selenium cells or silicon avalanche diodes, ensuring that all of the performance requirements are met. Gas tubes shall not be used.

The entire SPD shall be enclosed in a metal or ABS enclosure, NEMA rated for the location. SPDs at main service equipment shall be mounted outside the switchboard or panelboard, not integral to, or installed within the switchboard or panelboard. SPDs for branch panelboard (2nd tier) locations may be mounted outside of, or integral to, the branch panelboard. SPDs installed internal to the distribution equipment shall be of the same manufacturer as the equipment.

The SPD shall have a maximum continuous operating voltage (MCOV) rating not less than 115% of nominal voltage of the system it is protecting.

Protection Modes:

The SPD shall have line to neutral (L-N), line to ground (L-G), line to line (L-L) and neutral to ground (N-G) protection modes for three-phase grounded wye configured systems. For a three-phase delta configured system, the device shall have line to line (L-L) and line to ground (L-G) protection modes.

Voltage Protection Rating (VPR):

The UL 1449 Voltage Protection Rating (VPR) for the device shall not exceed the following:

208Y/120 volt applications: 800V L-N, L-G, N-G; 1200V L-L
480Y/277 volt applications: 1200V L-N, L-G, N-G; 2000V L-L

Nominal Discharge Current (In):

The UL 1449 Nominal Discharge Current Rating (In) shall not be less than the following:

20kA for service entrance, switchboard, and main distribution panel locations
10kA for branch panelboard (2nd tier) locations

Short Circuit Current Rating (SCCR):

The SPD shall have a UL 1449 Short Circuit Current Rating (SCCR) of not less than 200kA.

Surge Current Rating:

The single-pulse (8 X 20 microsecond waveform as specified in ANSI/IEEE Standard C62.41) surge current capacity shall not be less than the following:

100kA per mode (200kA per phase) for service entrance, switchboard, and main distribution panel locations
50kA per mode (100kA per phase) for branch panelboard (2nd tier) locations

Each SPD shall include externally-mounted LED visual status indicators that indicate the on-line status of the unit, for each phase.

At service entrance, switchboard, and main distribution panel locations each SPD shall include the following features:

- audible diagnostic monitoring by way of an audible alarm function
- one set of NO/NC dry contracts for alarm conditions

The manufacturer shall provide a minimum 5 year warranty from the date of shipment of the SPD.

PART 3 - EXECUTION

PANELBOARDS

Mount panelboards such that top most circuit breaker handles shall not be more than 6'-6" above finished floor.

Power circuits to fire alarm system control panel, auxiliary power supplies, command center console and any other fire alarm system component requiring line voltage power shall be dedicated branch circuits. Circuit disconnecting means shall be identified as follows: branch circuit breakers shall have an engraved phenolic nameplate permanently attached adjacent to the circuit breaker, reading “FIRE ALARM CONTROL PANEL”, “FIRE ALARM AUXILIARY

POWER SUPPLY", or other suitable wording. Provide circuit breakers with lockable ON-OFF clips.

Where panelboards are to be installed on masonry unit walls, including poured reinforced concrete or brick veneer type, install two vertical sections of galvanized steel channel between enclosure and mounting surface. Channel shall be lagged to wall in three places (each length) and the enclosure bolted to the secured channel using stainless steel or galvanized steel hardware. Galvanized channel shall run the entire length of the enclosure, but shall not be exposed at either the top or bottom of the enclosure.

Only one conductor shall be allowed under each terminal of circuit breakers. No splices are permitted in panelboards. Tighten connectors and terminals in accordance with equipment manufacturer's published torque tightening values for equipment connectors.

Complete and install a typewritten directory for each panelboard that accurately indicates all loads being served by each breaker.

DISCONNECTS

Motor circuit disconnects shall be mounted within fifty feet and in sight of the load being served.

Disconnects shall be labeled in accordance with Section 26 00 00.

SURGE PROTECTION DEVICES

Install SPD units in accordance with manufacturer's written instructions, applicable requirements of NEC and NEMA standards, and recognized industry practices.

The SPD units shall be installed at the locations shown on the drawings, or as indicated in the one-line diagram. They shall be parallel-connected to, and located adjacent to the switchboard or panelboard being protected. Locate as close as practical to the bus, keeping lead length as short as possible (less than 3 feet preferred to ensure optimum performance).

SPDs shall be connected through a multi-pole circuit breaker or fused disconnect switch, not into main lugs. Circuit breaker or fused disconnect switch shall be 60A for main service device, 30A for branch panelboard device or as recommended by the manufacturer.

Use schedule 40 PVC conduit or metallic conduit between the SPD and the switchboard or panelboard as recommended by the manufacturer. Avoid sharp bends, excess length, and splices in the wires. Where possible, use a close-nippled connection with wires going directly to a circuit breaker within the switchboard or panelboard.

Setup and test per the manufacturer's recommendations.

END OF SECTION

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SECTION 26 41 00 - LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

SCOPE OF WORK

This section describes the furnishing, installation and testing of a complete new building Lightning Protection System including cables, air terminals, ground rods, and appurtenances as shown on the Drawings and as specified here.

STANDARDS

The following specifications, codes and standards form a part of this specification:

NFPA 70 - National Electrical Code
NFPA 780 – Standard for the Installation of Lightning Protection Systems
UL 96 - Standards for Lightning Protection Components
UL 96A – Standard for Installation Requirements for Lightning Protection Systems
LPI–175 – Standard of Practice for the Design, Installation, and Inspection of Lightning Protection Systems

All components shall be the product of a nationally reputable manufacturer regularly engaged in the production of lightning protection equipment. Each unit shall be made to specifications and known by tests to be capable of accomplishing its intended purpose.

SUBMITTALS

Shop drawings: prepared by the installer, showing the proposed system for installation and the exact location of each item of lightning protection equipment, shall be submitted to the Engineer for approval. A complete list of materials, catalog data, and shop drawings shall be submitted to the Engineer for approval in accordance with Section 260000.

Dimensioned drawings in plan view (and riser) showing accurately scaled air terminal layouts, main and branch conductor routing, down conductor location, ground electrode and inspection pit locations, counterpoise routing and all bodies of conductance and inductance connected to the system. Show connections to the required metal surfaces and the methods of mounting the system to the adjacent construction. Show lightning protection system main conductor routing and install methods.

Qualifications: submit proof of suitable and adequate experience installing lightning protection systems, and capability of installing the system as recommended by the manufacturer of the equipment. Minimum 10 years experience installing such systems.

Certification: two weeks prior to final inspection, deliver to the Engineer the certification that the installed lightning protection system has been inspected by a UL representative and has been approved by UL without variation.

GUARANTEE

Guarantee for one year after acceptance all equipment, materials and workmanship to be free from defect.

Provide replacement parts for components found defective at no extra cost to the Owner.

PART 2 - PRODUCTS

MATERIALS

The materials used in the installation of this system shall be approved and labeled for Lightning Protection systems by Underwriter's Laboratories, Inc. In addition to conformance to UL 96, the component material requirements are as follows:

Conductors (Class I): main conductors shall be cable and shall be electrical grade copper or aluminum, of cross sectional area not less than 57,400 CM (Cu) or 98,600 CM (Al). The size of any strand in the conductor shall not be less than number 17AWG (Cu) or 14AWG (Al). Bonding conductors shall be cable and shall be electrical grade copper or aluminum, of cross sectional area not less than 26,240 CM (Cu) or 41,100 CM (Al). The size of any strand in the conductor shall not be less than number 17AWG (Cu) or 14AWG (Al). Each main conductor shall be connected to at least 2 down conductors. Down conductors shall be spaced at intervals averaging not more than 100 feet around the protected perimeter of the structure. Concealed conductors shall be installed in Schedule 40, 1” PVC conduit.

Joints: joints or splices in conductors shall be as few as practicable and of such construction as to provide a tensile strength of not less than fifty percent of that of the conductor. Splice shall be of material compatible with conductor.

Air terminals (Class I): Air terminals shall be made of copper, copper alloy, stainless steel, monel metal, or other equally corrosion resistant metal. Diameter of copper terminals shall be not less than 3/8 inch and shall have sharp nickel plated points. Terminals constructed of all other materials shall be not less than 1/2 inch in diameter, with sharp, nickel plated points. Terminals shall be of solid construction. Tubular construction is not allowed. Terminals shall project at least 10” above the object to be protected.

Ground rods: copperclad steel, not less than 3/4 inch diameter by 10 feet long. Each down conductor shall terminate at a ground rod dedicated to the lightning protection system.

ATTACHMENTS AND FASTENERS

Attachments and fasteners shall be of copper, copper alloy, stainless steel, or monel metal. They shall be firmly anchored to the structure by acceptable anchors or lay-in attachments. Horizontal conductors shall be fastened at intervals not exceeding 2 feet and vertical conductors at intervals not exceeding 3 feet.

Copper equipment shall not be used on aluminum roofs, sidings, or other aluminum surfaces. Conversely, aluminum equipment shall not be used on copper roofing, flashing, or other copper surfaces.

Copper and aluminum conductors shall be interconnected with acceptable bimetallic connectors only.

Aluminum conductors and equipment shall not be used underground.

Aluminum conductors and equipment shall not be used on surfaces coated with alkaline based paints.

Use appropriate adhesive to form a secure bond to roof surface. Adhesives shall be compatible with roofing material. Use two-part epoxy materials for attaching conductors or terminals to bitumous roofs. Do not use acetyl or solvent based adhesives on these roof types.

PART 3 - EXECUTION

INSTALLATION

Installation shall be coordinated with the roofing manufacturer and installer.

Install the conductors as inconspicuously as practical. Install the down conductors within the concealed cavity of exterior walls where possible. Run the down conductors to the exterior at elevations below the finished grade. Where main and down conductors shall be run on exterior of the building, install as hidden as possible. Down conductors on exterior of building shall be run in corners, adjacent to or behind gutters, or other locations that keep the conductors as concealed as possible.

Where down conductors are subject to damage or are accessible near grade, protect with non-metallic down conductor guards to 8 feet above grade.

Make connections of dissimilar metal with bimetallic type fittings to prevent electrolytic action.

Install ground rods not less than 2 feet deep and a distance not less than 3 feet nor more than 8 feet from the nearest point of the structure. Exothermically weld the down conductors to ground rods.

Bond down conductors to metal main water piping where applicable.

Connect roof conductors to all metallic projections and equipment above the roof as indicated on the drawings.

Connect exterior metal surfaces, located within 3 feet of the conductors, to the conductors to prevent flashovers.

Maintain horizontal or downward coursing of main conductor and insure that all bends have at least an 8 inches radius and do not exceed 90 degrees.

Install air terminal bases, cable holders and other roof-system supporting means without piercing membrane or metal roofs.

Use through-roof connectors for penetration of the roof system. Flashing shall be provided by roofing contractor.

Down conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel or the structural steel member at its upper and lower extremities.

A counterpoise or ground ring, where shown, shall be of No. 2/0 copper cable having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 2 feet deep at a distance not less than 3 feet nor more than 8 feet from the nearest point of the structure.

On construction utilizing post tensioning systems to secure precast concrete sections, the post tension rods shall not be used as a path for lightning to ground.

Roof conductors shall connect all air terminals together and shall offer a two-way path from each air terminal to ground, except for "dead-ends" as discussed.

Ridge conductor drops from a higher to a lower roof level shall require an extra downlead at the point of intersection if more than two air terminals are required on the lower level.

Where conductors are indicated to be run in piping, the top of the pipe shall be sealed so as to exclude moisture. Conductors shall not be run through metal piping.

Where down conductors are sleeved in PVC and embedded in reinforced concrete, bond to reinforcing steel where conductors enter and emerge from concrete.

Sheath copper conductors which pass over cast stone, cut stone, architectural concrete and masonry surfaces with a 1/16 inch thickness of lead to prevent staining of the exterior finish surfaces.

All conductors shall be carefully handled to avoid kinks or damage.

Not less than two down conductors shall be provided on opposite sides of the building, leading from the encircling conductor at the top of the building to ground terminals. Structures having a perimeter exceeding 250 feet shall have one additional down conductor for each additional 100 feet of perimeter or fraction thereof.

AIR TERMINALS

Install air terminals within two feet of the ends of ridges, corners and edges of flat roofs and roofs of prominent dormers and lower elevations. Air terminals shall not be spaced more than twenty feet apart.

BONDING

All extended metallic parts located within 6 feet of the system shall be bonded thereto. Such parts shall include metal caps, metal bands, metal ladders, metal breachings, steam pipes, water pipes, vents, hoods, drains, and gratings.

GROUNDING

An acceptable ground terminal shall be provided for each down conductor and shall be suitable for the soil conditions encountered. Grounds may be in the form of driven rods. Down conductors shall be interconnected to other systems at the base of the structure. No connections shall be made to plastic or other non-conductive water pipes. Where water pipe systems are connected together with a section of plastic pipe, the section of plastic pipe shall be bridged with a length of standard conductor terminating in acceptable water pipe fittings. All grounding mediums shall be bonded together. This is to include electric and telephone service grounds, antenna service, water service, gas service, and any other underground metallic piping systems which enter the structure.

Do not pierce structural steel in any manner. Connections to structural steel shall conform to UL Publication No. 96A.

TESTS

The entire system shall be tested for continuity after installation.

Provide a Ground Loop Conductor (GLC) continuity test, wire to wire to test resistance. Submit written results of the test. Statement shall be provided on Installer's letterhead paper.

Perform an Ohm test at each down conductor. Submit written results of the test. Statement shall be provided on Installer's letterhead paper.

The completed system shall be inspected by a UL representative. Obtain and install a UL numbered master label for the lightning protection system at the location directed by the Owner.

END SECTION

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SECTION 27 41 16 - SOUND REINFORCEMENT SYSTEM

PART 1 - GENERAL

SUMMARY

Section includes: Interior sound system including control center and other accessories for complete functional installation.

REFERENCES

American Society for Testing and Materials (ASTM) Publications:
ASTM B221 - Aluminum Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
National Electrical Code.
Federal Communications Commission, Part 15 Rules & Regulations.
UL and C-UL Standard for Electric Signs

SUBMITTALS

Submittals shall be in PDF format. The end user shall receive all pertinent hard-copy documentation at delivery.

Product data for controls, and accessories shall include descriptions of control functions, etc.

Installation drawings, face layout, dimensions, construction, electrical wiring diagrams, and method of anchorage.

Copy of guarantee required below.

Manufacturer's installation instructions.

Finish Samples.

QUALITY ASSURANCE

Source limitation: All components of the sound system and other accessories and installation hardware shall be products of a single manufacturer.

Manufacturer qualifications: Company specializing in manufacturing electronic scoreboards with 10 years minimum successful world-wide experience.

Scoreboards and other electrical components shall be certified for use in United States and Canada by Underwriter Laboratories, (UL), Inc. and shall bear either UL or C-UL label only.

GUARANTEE

Guarantee to cover defects in materials and workmanship.

5 years parts and factory labor guarantee for Arena Pro/Stadium Pro loudspeaker enclosures and accessories from invoice date.

2 years part and factory labor guarantee for wireless components from invoice date

1 year part and factory labor guarantee for scorer's tables, handheld controls, switches, and Arena Pro accessories and loudspeaker front printed scrim from invoice date.

Lifetime telephone support.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Nevco, Inc., 301 East Harris Avenue, Greenville, Illinois 62246; 800-851-4040; www.nevco.com.

Requests to use equivalent products of other manufacturers shall be submitted prior to the bid date for approval.

MATERIALS

Speakers
Frequency response:
(-10DB@1M): 37Hz to 20Khz
(+/-3db@1M): 43Hz to 20Khz
Max SPL @1m: 127dB
Max. System Coverage: 40°V x 120°H
Audio input: Includes 12 channel mixer with 6 high-gain balanced inputs and 3 stereo line inputs
Power input: 120VAC 15 Amp inputs

Includes automatically sequenced power to properly bring the amplifiers up and down avoiding risk of damage to the speakers.

Power input is required inside the control room, and will need a 120VAC power outlet available at each location.

Subwoofers
Single 12"
Ported Cabinet for optimal LF tuning
Independent Amplifier driven

Custom Designed Speaker Cabinet
6'H x 25"W"H x 18.5"D
Sturdy Steel Fram Construction
Total Cabinet Weight (speakers included): 100lbs

Control Equipment
4 space rack 9.5"H x 22.25"W x 24"D, with wheels
Furman Power Conditioner
Wireless Microphone Receiver

12-Channel Mixer
Bluetooth Receiver

User Sound system accessory packages consisting of one or more of the following:

EV Desktop Microphone
EV Handheld Wireless Mic with receiver
Front mount antenna cable kit

CABLE CONTORL / WIRING

22 gauge Mic/Line Cable to be installed between the wall/floor signal plate and first speaker box. Wire is ordered separately by the foot, maximum 1000 ft.

22 gauge Mic/Line Cable to be installed between two speaker boxes. Wire is ordered separately by the foot, maximum 1000 ft.

PART 3 - EXECUTION

PREPARATION

Verify exact Arena Pro 1000 and control center quantities and junction box locations with Architect.

Coordinate requirements for electrical power, wall blocking, auxiliary framing and supports, suspension cables, and other components to be provided under other Specification Sections to ensure adequate provisions are made for complete, functional installation of speaker system.

Coordinate Arena Pro 1000 electrical requirements to ensure proper power source, conduit, wiring, and boxes are provided. Prior to installation, verify type and location of power supply.

INSTALLATION

Install Arena Pro 1000 sound system and accessories in accordance with manufacturer's instructions and approved installation drawings.

Before installation, field test Arena Pro 1000 and accessories for operating functions. Ensure that sound system accurately perform all operations. Correct deficiencies.

Rigidly mount equipment and loudspeaker enclosures level and plumb with brackets and fasteners.

Clean exposed surfaces.

Protect speaker cabinet finishes from other construction operations.

DEMONSTRATING AND TRAINING

Provide demonstration and training session for Owner's representative covering operation and maintenance of electronic scoreboard.

END OF SECTION

SECTION 28 31 00 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

DESCRIPTION

This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled, intelligent reporting fire alarm equipment, with integrated voice evacuation, required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel(s), auxiliary control and monitoring devices, annunciators, communicators and wiring as shown on the drawings and specified here.

The fire alarm system installation shall comply with requirements of NFPA Standard No. 72 requirements for protected premises signaling systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

The FACP and peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).

The ability for selective input/output control functions based on ANDing, ORing, NOTing, timing and special coded operations is to also be incorporated in the resident software programming of the system.

To accommodate and facilitate job site changes, initiation circuits shall be individually configurable on-site to provide either alarm/supervisory/trouble operation, alarm only, supervisory only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit.

To accommodate and facilitate job site changes, notification appliance circuits shall be individually configurable on-site to provide, upon activation, a temporal code until reset upon any output circuit.

BASIC PERFORMANCE

Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Class B signaling line circuit. No T-taps will be permitted in system wiring.

Initiation Device Circuits (IDC) shall be wired Class B.

Notification Appliance Circuits (NAC) shall be wired Class B.

Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

The System Alarm LED shall flash.

A local audible signal in the control panel and remote annunciator panel shall sound.

A backlit LCD display shall indicate all information associated with the Fire Alarm condition, including the type of alarm point and its location within the protected premises.

History storage equipment shall log the information associated with each new fire alarm control panel condition and print on integrated control panel system printer, along with time and date of occurrence.

All system output programs assigned via control by event equations to be activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm notification appliances and/or relays) shall be activated.

A supervised signal to notify the local fire department or an approved central station is to be activated. This circuit shall be configured as required to properly interface with the existing digital communicator.

The mechanical controls shall activate the air handling systems for shutdown and/or fan control.

Selectively close doors normally held open by magnetic door holders.

Refer to fire alarm matrix for additional site specific alarm actions**.**

When a supervisory condition is detected and reported by the system, such as a tamper switch, the following functions shall immediately occur:

Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.

Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.

Record the event in the FACP historical log and print to the integrated control panel system printer.

Transmission of supervisory signal to the supervising station.

Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.

Refer to fire alarm matrix for additional site specific supervisory actions**.**

When a trouble condition is detected and reported by the system, such as a loss of AC power at control panel, the following functions shall immediately occur:

Activate the system trouble service audible signal and illuminate the LED at the control unit and the remote annunciator.

Pressing the Trouble Acknowledge Key will silence the trouble audible signal while maintaining the Trouble LED "on" indicating off-normal condition.

Record the event in the FACP historical log and print to the integrated control panel system printer.

Transmission of trouble signal to the supervising station.

Restoring the condition shall cause the Trouble LED to clear and restore the system to normal.

Refer to fire alarm matrix for additional site specific trouble actions**.**

Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Supervisory and Trouble events have second-, and third-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

Fire Suppression Monitoring

Water flow: Activation of a water flow switch shall initiate general alarm operations.

Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.

SUBMITTALS

General:

Submit manufacturer’s data to the Engineer for review in accordance with Division 1 requirements.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

Shop Drawings:

Shop Drawings shall comply with all NFPA 72 requirements.

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, and performance in the form of standard data sheets.

Provide equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts drawn to scaled floor plan depiction.

Provide system power requirements and battery sizing calculations for review.

Indicate each panels maximum connected load data in amperes at the 120V supply power level.

Show remote annunciator or secondary panel layout, configurations, and terminations.

Indicate interface of Owner furnished equipment and existing equipment to remain.

Manuals:

Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.

Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

Software Modifications:

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

The Contractor’s base bid shall include all programming and software modifications necessary to provide a fully functioning and properly operating system. Any modifications necessary for component additions or deletions to the system prior to system acceptance, and any modifications during the warranty period shall be included unconditionally in the base bid.

Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

Installing contractors shall have NICET Level 2 certification.

GUARANTY

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor, programming, materials, and testing required to correct any defect during this one year period shall be included in the submittal bid.

The fire alarm control panel manufacturer shall certify that the control panel and components will be supported for a minimum of 10 years following the project.

APPLICABLE STANDARDS AND SPECIFICATIONS

The specifications and standards listed below form a part of this specification. The system shall fully comply with all relevant standards currently adopted by the Florida Fire Prevention Code.

National Fire Protection Association (NFPA) - USA:

No. 15	Water Spray Systems.
No. 70	National Electric Code.
No. 72	National Fire Alarm Code.
No. 101	Life Safety Code.

Underwriters Laboratories Inc. (UL) - USA:

No. 268	Smoke Detectors for Fire Protective Signaling Systems.
No. 864	Control Units for Fire Protective Signaling Systems.
No. 268A	Smoke Detectors for Duct Applications.
No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances.
No. 38	Manually Actuated Signaling Boxes.
No. 346	Waterflow Indicators for Fire Protective Signaling Systems.
No. 1971	Visual Notification Appliances.

Local and State Building Codes

All requirements of the Authority Having Jurisdiction (AHJ).

The system shall be listed by the national agencies as suitable for extinguishing release applications.

APPROVALS

The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL	Underwriters Laboratories Inc.

PART 2 - PRODUCTS

EQUIPMENT AND MATERIAL, GENERAL

All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Ceiling mounted equipment shall be installed tight and flush up against ceiling. Gaps between devices and ceiling will not be accepted.

CONDUIT AND WIRE

Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements, and Section 260530 of these specifications.

All wiring shall be installed in a metal conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

Power limited circuits must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC.

All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backbox except where conduit entry is specified by the FACP manufacturer. Field modification of Control Panels that differs from manufacturer’s instructions is not permitted.

Conduit shall be 3/4 inch minimum.

Wire:

All fire alarm system wiring shall be new.

Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer.

All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. Initiating device circuits and notification appliance circuits shall not be laid along the same pathways or installed in the same conduit with each other, or with the communication loop (if applicable). This requirement does not apply specifically to junction boxes, device boxes or terminal cabinets where terminations or taps are made.

All field wiring shall be completely supervised by the Control Panel.

Terminal Boxes, Junction Boxes and Cabinets:

All boxes and cabinets shall be UL listed for their use and purpose.

Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Power Distribution Panel as FIRE ALARM CONTROL PANEL. The Control Panel Cabinet shall be grounded securely to service ground bus in main electrical panel. The control panel cabinet shall have the power circuit designation labeled inside the control panel door.

MAIN FIRE ALARM CONTROL PANEL

Fire Alarm Control Panel is existing to remain in Building 15 but shall be modified as required for obtaining voice evacuation functionality in new Gymnasium.

ONE-WAY VOICE COMMUNICATION

The system shall incorporate one-way voice communication and tone generating capabilities.

A central audio control module shall be provided for the necessary alarm message/tone generation, main and remote microphone connections, auxiliary inputs, and mixer/pre-amplifier circuits. Continuous supervision shall be provided along with specific information as to the type of failure should a problem occur (eg. main microphone trouble, tone trouble, etc.). Audio outputs shall have individual gain control.

A hand-held, push-to-talk microphone shall be provided, recessed within a protective panel-mounted enclosure. The microphone shall be a noise-canceling communication type with a frequency range of 200 Hz to 4000 Hz and shall be equipped with a self-winding five-foot coiled cable. An LED indicator shall be provided to indicate the microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. The microphone shall be supervised for disconnection.

An audio control switch module shall be furnished to provide manual access to audio operations for authorized personnel. The module shall include an "ALL Circuits" switch, "Aux Tone 1" switch, "Aux Tone 2" switch, tone generator stop switch, and "Audio Trouble Reset" switch. These switches and associated LED indicators shall be supervised for disarrangement or failure.

Audio power amplifiers shall be furnished with a self-contained filtered 24VDC power supply, transformer, and amplifier monitor circuits. The amplifiers shall provide a 25 Volt RMS output with a frequency response of 120 Hz to 12,000 Hz. Provide sufficient amplification to operate all system speakers simultaneously plus twenty (20) percent spare capacity.

The speaker circuits shall be capable of supplying 25 Volt RMS audio power from the system amplifiers. Supervision for open, short, or ground fault conditions shall be provided. Individual and distinct trouble indications shall be provided for each fault. Provide one circuit for each zone or area of distinct communication. System shall be configured with no more than one floor per speaker zone.

Digitized tones for alarm and auxiliary requirements (horn, etc.) shall be provided.

A pre-recorded digitized voice message capability is to be provided for automatic transmission to building occupants during alarm conditions. The automatic message player shall not rely on a tape or other mechanical means of transmitting the evacuation message. A standard evacuation message shall be provided under this contract; however, the message player must be capable of transmitting a minimum of six (6) custom messages of up to sixty seconds long and repeating. A self-contained speaker will provide testing of the message(s) without disturbing the occupants of the facility. AHJ will have final authority on which message is used.

Automatic Voice Evacuation Sequence:

The audio alarm signal shall consist of an alarm tone for a maximum of 15 seconds followed by automatic pre-selected voice evacuation messages. At the end of each voice evacuation message, the alarm tone shall resume and the cycle shall repeat. The alarm tones and voice messages shall sound alternately until the alarm silence switch at the fire alarm control panel has been operated.

All audio alarm operations (speaker circuit selection and alarm tone/voice message timing variations) shall be activated by the system software so that any required future changes to the evacuation sequence can be facilitated by authorized personnel without any component rewiring.

Manual Voice Paging Sequence:

The system shall be configured to allow selective voice paging. Upon activation of any speaker manual control switch, two (2) attention getting beeps shall sound over the speakers indicating an impending voice message will occur.

If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.

Facility for total building evacuation and paging shall be provided to allow for activation of all speakers. This shall be accomplished by the means of an "All Circuit" switch.

SYSTEM COMPONENTS

Notification appliances shall have wattage and candela setting visible without removing device from wall or ceiling.

Speakers:

Provide speakers that are UL listed, with high quality tone and voice reproduction. Speakers for alarm notification shall be supervised.

Provide with internal taps for 1/2W, 1W, and 2W power output. Minimum sound pressure output shall be 88dB at 3 meters.

Ceiling mounted speakers shall have painted metal grilles and backboxes for each speaker. Provide supports, tile bridges and other installation accessories as required.

Speakers for exterior use, including parking areas, shall be corrosion resistant and listed for the service.

Provide exterior speakers of the double re-entrant horn type, bracket mounted with all purpose, multi-position bracket.

Strobe Lights:

Shall operate on 24 VDC nominal and shall be LED type.

Shall meet the requirements of the ADA as defined in section 702.1 of FBC Accessibility Chapter 7 and shall meet the following criteria:

The strobe intensity shall meet the requirements of section 702.1 of FBC Accessibility Chapter 7.

The flash rate shall meet the requirements of section 702.1 of FBC Accessibility Chapter 7.

The appliance shall be placed 80 inches above the highest floor level within the space, or 6 inches below the ceiling, whichever is the lower.

If visual alarm devices are installed in different configuration than as shown on the plans, fire alarm contractor shall confirm spacing is in accordance with NFPA 72 requirements.

Audible/Visual Combination Devices:

Shall meet the applicable requirements above for audibility.

Shall meet the requirements above for visibility.

Units shall provide a common enclosure for the fire alarm audible and the visual alarm devices. The unit shall be clearly marked with "Fire" lettering visible from a 180 degree field of view.

Addressable Devices - General

Addressable Devices shall provide an address-setting means. This may be software coded.

Detectors shall be Intelligent and Addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.

Addressable smoke and thermal detectors shall provide an LED. LEDs shall identify normal, alarm, or trouble conditions. An output connection shall also be provided in the base to connect an external remote alarm LED.

Smoke detector sensitivity shall be set through the Fire Alarm Control Panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel.

Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).

Smoke detectors shall be photoelectric type only. Multi-criteria type are not permitted.

Addressable Pull Box (manual station)

Addressable Pull Boxes shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

Operating stations shall be double acting type.

All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

Manual Stations shall be constructed with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

Stations shall be suitable for semi-flush mounting, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

Intelligent Photoelectric Smoke Detector:

The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

Intelligent Thermal Detectors:

Thermal Detectors shall be intelligent addressable devices adjustable for activation temperature by software. Initial programming for all units shall be 135 degrees F and have a rate-of-rise element rated at 15 degrees F per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop.

The detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.

Intelligent Duct Smoke Detector:

In-Duct Smoke Detector Housing shall accommodate either an intelligent ionization sensor or an intelligent photoelectric sensor, of that provides continuous analog monitoring and alarm verification from the panel.

When sufficient smoke is sensed, an alarm signal is initiated at the FACP.

Provide remote alarm/power LED indicator where noted on the Drawings.

Addressable Dry Contact Monitor Module:

Addressable Monitor Modules shall be provided to connect one supervised IDC zone of conventional Alarm Initiating Devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.

The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.

The IDC zone may be wired for Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.

Two Wire Detector Monitor Module:

Addressable Monitor modules shall be provided to connect one supervised IDC zone of conventional 2-Wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

The Two-Wire Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box or with an optional surface backbox. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

Addressable Control Module:

Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox.

The control module NAC circuit may be wired with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.

The control module shall provide address-setting means and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.

The control module shall be suitable for pilot duty applications and rated for a minimum of .5 amps at 30 VDC.

Isolator Module:

Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.

If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section.

The Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.

The Isolator Module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

Sprinkler Valve Supervisory Switches:

Each sprinkler system water supply control valve riser or zone control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.

Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

The mechanism shall be contained in a weatherproof aluminum housing that shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

Switch housing to be finished in red baked enamel.

The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

All valve switches shall have dedicated address. Multiple valve switches sharing a single address is not permitted.

TERMINAL CABINETS

Provide manufacturer’s standard surface mounted terminal cabinets for termination of circuits as required. Terminate all conductors on designated terminal blocks or strips with identification of each conductor in the cabinet.

Use of standard NEMA 1 control enclosure is acceptable. Construction shall be 16 gauge steel with hinged front cover with flush latch operated with coin or screwdriver. Provide units with separate backpanel for mounting terminal blocks. Do not mount terminal block directly to back of enclosure.

All terminal cabinets, whether new or existing, shall be painted red and have “Fire Alarm Terminal Cabinet” stenciled in white letters.

BATTERIES

Shall be 12 volt, gel cell (SLA) type (at least two required).

Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.

The batteries are to be completely maintenance free. Liquid electrolytes are not acceptable. To prevent spills and leakage, fluid level checks or refilling shall not be required.

PART 3 - EXECUTION

INSTALLATION

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer. The manufacturer's authorized representative shall provide onsite supervision of installation.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

TEST

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

Pretesting: Contractor shall determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all flow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.

Open and short Notification Appliance Circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.

Check activation and operation of the agent release sequence.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

Verify all signals transmit properly to monitoring center.

Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

FINAL INSPECTION

At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate to the Engineer and AHJ that the systems function properly in every respect.

CLOSEOUT

Provide a spare parts kit that shall include one of every type of field device (one pull station, one speaker, one combination a/v, one strobe, one smoke detector, one heat detector, one relay control module, one relay monitor module).

Provide any special tools, equipment, programming devices and cables needed to maintain or repair the system shall be provided.

OPERATION MANUALS

General: The manuals shall include installation, operation, and service manuals.

AS-BUILT DRAWINGS

Point-to-point Wiring Diagram: A point-to-point wiring diagram shall be included with the "as-built" drawings.

CAD Format As-Built Drawings: All as-built drawings shall be submitted on flash drive (USB) in AutoCAD format (check for latest acceptable release). Contractor is responsible for modifying as-builts during construction and maintaining clear and accurate drawings.

Field Devices: All field devices installed in the fire alarm control panel shall be included in all diagrams. These devices include, but are not limited to, air handler shut down relays and remote reporting relays.

Function Diagram: A one-line function diagram of the fire alarm control panel shall be provided.

Detailed Plan Views: Floor plans shall indicate all detailed conduit routing, all control panels, all terminal cabinets, all junction boxes, all pull boxes, all disconnect switches, all circuit breaker locations serving fire alarm equipment or shunt trip circuits, all fire alarm devices, all surge protection devices, and end of line resistors. Plan views shall indicate device addresses, dB, candela ratings, and other specific device information adjacent to each fire alarm device.

Accuracy: As-built drawings shall be verified by contractor and 100% accurate with actual installation conditions in the field.

Refer to drawings for additional as-built requirements.

INSTRUCTION

Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the owner.

END OF SECTION

SECTION 311000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 015713 - Temporary Erosion and Sediment Control.

D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

E. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

F. Section 024100 - Demolition: Removal of built elements and utilities.

G. Section 312200 - Grading: Topsoil removal.

H. Section 312323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 SUBMITTALS

A. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

1.04 QUALITY ASSURANCE

A. Clearing Firm: Company specializing in the type of work required.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 017000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Do not remove or damage vegetation beyond the limits indicated on drawings.

B. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.

C. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

D. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.

E. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 311000

SECTION 323113.10
CHAIN LINK FENCES AND GATES

PART I – GENERAL

1.01 DESCRIPTION

A. Base metal of the fabric shall be a good commercial quality steel wire of number nine gauge. The fabric shall withstand the breaking load of one thousand two hundred ninety (1,290) pounds.

B. The fabric shall be zinc-coated weaving with a minimum 2.0 oz. of zinc per square foot of surface area and conform to ASTM A-392, Class II. The zinc used for the coating shall conform to the grades specified in ASTM Designation B6-B8 for Slab Zinc (Seltzer).

C. The fabric shall be nine (9) gauge with a mesh size of two (2) inches and a diameter of .1483.

D. Fabric height shall vary according to the project coordinator's request.

E. The fabric shall be made of high-grade materials utilizing excellent workmanship. The zinc coating shall be applied in a continuous process and shall not be applied to the fabric in roll form. Excessive roughness, blisters, sal ammoniac spots, bruising and flaking shall be noted. These and other obvious defects, if present, shall provide a basis for product rejection.

1.02 POST

A. End and pull post shall be standard weight, schedule forty (40) piping. Weight of material shall be in accordance with the diameter per foot. Plans should clearly identify location of intermediate pull post.

B. Line post shall be standard weight, schedule forty (40) piping. Weight of material shall be in accordance with diameter. Post shall be a maximum of 10'0" on center.

C. All post shall be zinc coated after fabrication, using zinc grade "E" in accordance with Federal Specifications 00-Z-351. Weight of coating per square foot of actual surface area shall average not less than 1.2 ounces.

D. All posts that are installed in walkways and anchored to walls shall be anchored using the appropriate size anchoring devices.

1.03 TOP RAIL

A. Top Rails shall be standard weight, schedule forty (40) piping in lengths into a continuous run. Couplings shall not be less than six (6) inches long, with 0.70 minimum wall thickness and shall allow for expansion and contraction of the rail. Suitable ties or clips shall be provided in sufficient number for

1. attaching the fabric securely to the top rail at intervals between six and eight (6" – 8") inches apart. Means shall be provided for attaching the top rail to each pull and end post. The top rail shall be zinc coated after fabrication, using zinc grade "E" in accordance with Federal Specifications 00-Z-351. Weight of material shall be 2.28 pounds per foot.

1.04 POST BRACES

A. Post braces shall be piping of standard weight, schedule forty (40) at all end bays. Plans should clearly specify locations of additional bracings at intermediate pull posts.

1.05 TENSION WIRE

A. Tension wire shall be spiraled wire, zinc coated of not less than number seven (7) gauge. Ties or clips shall be provided and installed for attaching each wire to the fabric at intervals not exceeding one (1) foot.

1.06 TIES AND BANDS

A. Ties and bands shall be adequate strength and in sufficient number to anchor fabric to post, top rail, tension wire and other locations. Steel ties and bands shall be required no more than nine -

twelve (9” – 12”) inches apart.

1.07 STRETCHER BARS

A. Stretcher bars shall be not less than 3/16” x ¾” and shall be of lengths one (1) inch or less than full height of the fabric with which they are to be used. One stretcher bar shall be provided at each end post and each side of pull post. All material shall be zinc coated.

1.08 POST HOLES

A. Three (3) inch O.D. Post holes shall be twelve (12) inches in diameter and 4’0” deep

B. Two (2) inch O.D. Post holes shall be six (6) inches in diameter and 3’0” deep

1.09 CONCRETE

A. All concrete shall be two thousand (2,000) P.S.I. No calcium chloride shall be used without prior approval from the project coordinator in writing.

1.10 DIAMETER

A. The following diameter sizes shall be matched to the fabric height and shall comply with the weights and finishes as specified.

	Line Post	Terminal Post	Corner Post
4’ 0” High	2” O.D.	3” O.D.	3” O.D.
5’ 0” High	2” O.D.	3” O.D.	3” O.D.
6’ 0” High	2” O.D.	3” O.D.	3” O.D.
10’ 0” High	2 ½” O.D.	3” O.D.	3” O.D.
12’ 0” High	2 ½” O.D.	3” O.D.	3” O.D.
	Pull Post	Gate Post	Top Rail
4’ 0” High	3” O.D.	3” O.D.	1 5/8” O.D.
5’ 0” High	3” O.D.	3” O.D.	1 5/8” O.D.
6’ 0” High	3” O.D.	3” O.D.	1 5/8” O.D.
10’ 0” High	3” O.D.	3” O.D.	1 5/8” O.D.
12’ 0” High	3” O.D.	3” O.D.	1 5/8” O.D.

Braces (Corner and Intermediate)	
4’ 0” High	1 5/8” O.D.
5’ 0” High	1 5/8” O.D.
6’ 0” High	1 5/8” O.D.
10’ 0” High	1 5/8” O.D.
12’ 0” High	1 5/8” O.D.

1.11 GATES (SWING OR ROLL GATES)

A. Gate frames shall be 1 5/8” standard weight schedule forty (40) piping with braces and shall have industrial (pressed steel) hinges.

B. Gate hardware: Fork latch with gravity drop for single gate. Center gate stop and drop rod for double gate; malleable heavy industrial box hinges, two per leaf, and hardware for padlock. If 180 degree hinges are used, they must be adjusted properly and welded in place.

C. When panic hardware is requested, an eighteen (18) inch wide, 3/8 inch plate shall be welded the full width of the gate for mounting of the panic hardware. Welds should be solid across both ends of plate. Also, an eighteen (18) inch latch plate shall be welded on terminal post. Installation of panic hardware shall require an upgrade of one (1) inch to terminal post. All shall be painted to match gate.

D. The diameter sizes in item J shall be matched to the fabric height and shall comply with the weights and finishes as specified below:

1. Provide gate and frame replacing all aluminum elements with steel-prepared and finished with appropriate powder coating as noted below. NOTE: welded hinges to be revised to barrel hinge #44-2003 as provided by “King Architectural Metals” and install gap at 1 ¾” as required by manufacturer.
2. Coating – after appropriate pretreatment, aluminum members are to be dried and powder coating shall be applied meeting or exceeding the following criteria:
   a. AAMA 2605 specification
   b. 3,000 hr. of salt spray testing under ASTM B117
   c. Final color to be selected by LCS from standard color selections
3. Surrounding elements gate of vary per school campus and site condition – coordinate with LCS
4. Coordinate hardware with LCS

PART III – EXECUTION

2.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

2.02 INSTALLATION

A. All material must be checked upon receipt at the job site prior to installation to check for damage that may have occurred during transport. The fence system must be stored is a safe place and dry environment so as to protect it from any potential damage. The fence system must be installed with manufacturer’s standard procedures.

B. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F567

C. Set intermediate terminal, gate and corner posts plumb, in concrete footings with top of footing 2” above finish grade. Slope top of concrete for water runoff

D. Footing depth below finish grade: ANSI/ASTM F567 two feet minimum

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts

F. Provide top rail through line post tops and splice with 6” long rail sleeves

G. Install center and bottom brace rail on corner gate leaves

H. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less

I. Position bottom of fabric at 2” above finished grade

J. Fasten fabric to top rail, line posts, braces and bottom tension wire with tie wire at maximum 15” on centers.

K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips

L. Install bottom tension wire stretched taut between terminal posts

M. Install support arms sloped outward and attach barbed wire; tension and secure

N. Do not swing gate from building wall; provide gate posts

O. Install gate with fabric to match fence. Install three hinges per leaf, for six feet high and over, latch, catches, drop bolt, foot bolts and sockets, torsion spring retainer, retainer and locking clamp

P. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

END OF SECTION 323113.10

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SECTION 323116
PVC COATED CHAIN LINK FENCING

PART I – GENERAL

1.01 DESCRIPTION

A. Furnish and install PVC coated steel chain link fence fabric and gates as indicated on the drawings and as specified. Include all labor, materials, equipment, and transportation to furnish and install a galvanized chain link fence system and gates. The work includes, but is not limited to fences, gates and related hardware.

1.02 QUALITY ASSURANCE

A. STANDARDS
   1. ASTMB 6 Slab Zinc
   2. ASTM F567 Installation of Chain Link Fence
   3. ASTM F668 Poly (Vinyl Chloride) (PVC) and Other Organic Polymer Coated Steel Chain Link Fence Fabric, Class 1
   4. Federal Specification RR-F-19 1 K/1 D Fencing, Wire and Post Metal (Chain-Link Fence Fabric), Type IV

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design PVC- coated steel chain link fence fabric and gates, including comprehensive engineering analysis by a qualified engineer, using performance requirements and design criteria indicated.

B. Structural Performance: PVC- coated steel chain link fence fabric and gate framework shall withstand the effects of gravity loads and the following stresses within limits and under conditions indicated according to applicable codes.

1.04 SUBMITTALS

A. Product Data - for each type of product indicated include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain link fences and gates.

B. Shop Drawings
   1. Shop drawings in sufficient detail to show fabrication, anchorage and interface of the work. Include plan layout, accessories, fittings, and hardware (excluding items not in contract).
   2. Include plans, elevations, sections, details, and attachment to other work. Show accessories, hardware, gate operation, and operational clearances.

C. Samples for verification: Prepared on sample size indicated below

D. Product Certificates: For each type of chain link fence from manufacturer

E. Product Test Reports: For framing strength

F. Warranty: Sample of Special Warranty

1.05 QUALITY ASSURANCE

A. Emergency Access Requirements: Comply with requirements of local authority having jurisdiction for gates with panic hardware and closers serving a required means of access.

1.06 PROJECT CONDITIONS

A. Field Measurement: Verify layout information for chain link fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.07 WARRANTY

A. Extruded PVC coated steel chain link fence fabric is warranted for 15 years against failure due to rust or corrosion.

1.08 PERMITTING

1. Any fence 7’ or greater in height requires permitting through LCS Code Enforcement (https://www.leonschools.net/Domain/6096)

PART II – PRODUCTS

2.01 MANUFACTURERS – ONGUARD CHAIN LINK FENCE

A. STEPHENS PIPE & STEEL, LLC.
   1. 300 Bowman Mill Rd SE Winder, GA 30680
   2. (877) 868-5518 / (770) 868-1800
   3. Fax: (770) 868-1809
   4. Branch Managers: Bill Dickert

B. Or Approved Equal

2.02 SPSV EXTRUDED POLY - PVC COATED STEEL CHAIN LINKFENCE FABRIC

A. Extruded fabric shall be vinyl coated, high strength galvanized steel, chain link fence fabric for industrial, commercial and institutional application. Extruded fabric shall be the highest quality available.

B. COMPOSITION AND MATERIALS - The galvanized steel core wire for producing fused PVC coated steel chain link fence fabric shall be produced by cold drawing good commercial grade steel rod into wire of the appropriate diameter. The steel rod from which the wire is drawn shall be produced by the open hearth, electric furnace or basic oxygen process. The galvanized coating shall be produced by passing the cleaned wire through a bath of molten z.inc which conforms to ASTM B6.

C. CHAIN LINK FENCE FABRIC - The base metal of the chain link fence fabric shall be composed of commercial quality, medium-carbon galvanized (zinc coated) steel wire. The vinyl coating shall be extruded to galvanized steel wire. Vinyl coating thickness, galvanized coating weight, and wire tensile strength shall conform to Federal Specification RR-F-191, ASTM F668, and Class 1. The wire shall be PVC coated before weaving and shall be free and flexible at all joints. Unless otherwise specified, fabric woven in 2 in. (50 mm) mesh, under 72" (1,830 mm) in height, shall be knuckled at both selvages; fabric 72" (1,830mm) high and over shall be knuckled at one selvage and twisted at the other. All fabrics woven into meshes under 2 in. (50 mm) shall have both selvages knuckled.

D. WIRE DIAMETER - Core wire sizes shall be 9 gauge core.

E. WIRE COATNG - Only plasticized poly (vinyl chloride) (PVC) with a low temperature (-20 °C; -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, shall be used.

F. ASTM COLOR SYSTEM - Standard colors shall conform to ASTM F934 and include:

Green	Brown	Black
28.61	27.76	22.30
-12.59	3 .37	-0.09
1 .95	4.28	-0.85

G. COATING ADHESION - The PVC coated wire shall pass the test for adhesion contained in ASTM F668 for Class 1 chain link fabric.

PART III – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Follow manufacturer's instructions for the installation of all gates and fencing.

B. All material must be checked upon receipt at the job site prior to installation to check for damage that may have occurred during transport. The fence system must be stored is a safe place and dry environment so as to protect it from any potential damage. The fence system must be installed with manufacturer's standard procedures.

C. If PVC coating is damaged during installation, contractor must replace or repair the material at own expense.

3.03 SETTING POSTS

A. Remove loose and foreign materials from sites and bottoms of holes and moisten soil prior to pouring concrete. Center and align posts in holes. Place concrete around posts in a continuous pour and vibrate or tamp for consolidation.

B. Check each post for vertical and top alignment. Hold in position during placement and finishing operation. Trowel tops of footings and slope or dome to direct water away from posts.

C. Set keeps, stops, sleeves and other accessories into concrete as required. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with a membrane curing material. Grout- in those parts with are set into sleeved holes, concrete constructions or rock excavations using non- shrink Portland cement grout.

3.04 INSTALLING GATES

A. Install gates plumb, level and secure for full opening without interference. Install ground-set items in concrete for anchorage in accordance with manufacturer's recommendations as approved by the architect. Lubricate and adjust the hardware for smooth operation.

END OF SECTION 323116

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SECTION 323119.10
ALUMINUM SECURITY FENCES & GATES

PART - GENERAL

1.01 DESCRIPTION - FURNISH AN INDUSTRIAL SERIES GRADE ALUMINUM ORNAMENTAL FENCE AND ACCESSORY MATERIALS. THE WORK INCLUDES, BUT IS NOT LIMITED TO THE FENCING, GATES AND RELATED HARDWARE.

1.02 QUALITY ASSURANCE

1.03 TESTS

A. AAMA 2605 – Covers high performance organic coatings on architectural extrusions and panels.

B. ASTM D2247 – Humidify resistance of 3000 hours.

C. ASTM B117 – Salt spray resistance of 3000 hours.

D. Accelerated weathering for 1000 hours under Method 6152 of Federal Test Method 141 shall show no adhesion loss, with only slight fading, chalking and water staining.

E. Outdoor weathering shall show no adhesion loss, checking of crazing, with only slight fade and chalk when exposed for five years in Florida facing south at a 45 degree angle.

1.04 EMERGENCY ACCESS REQUIREMENTS: COMPLY WITH REQUIREMENTS OF LOCAL AUTHORITY HAVING JURISDICTION FOR GATES WITH PANIC HARDWARE AND CLOSERS SERVING A REQUIRED MEANS OF ACCESS.

1.05 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design aluminum fences and gates, including comprehensive engineering analysis by a qualified engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Aluminum Fences and Gate framework shall withstand the effects of gravity loads and the following stresses within limits and under conditions indicated according to applicable codes.

1.06 SUBMITTALS

A. Product Data - for each type of product indicated include construction details, material descriptions, dimensions of individual components and profiles and finishes for aluminum fences and gates.

B. Shop Drawings:
   1. Shop drawings in sufficient detail to show fabrication, anchorage and interface of the work. Include plan layout, accessories, fittings, and hardware (excluding items not in contract).
   2. Include plans, elevations, sections, details, and attachment to other work. Show accessories, hardware, gate operation, and operational clearances.

C. Samples for verification: Prepared on sample size indicated below

D. Product Certificates: For each type of aluminum fence from manufacturer

E. Product Test Reports: For Framing strength

F. Warranty: Sample of Special Warranty

1.07 PROJECT CONDITIONS

A. Field Measurement: Verify layout information for aluminum fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements

1.08 WARRANTY

A. The entire fence system shall have a limited lifetime warranty against defects in workmanship and material while the finish must also carry a limited lifetime warranty against cracking,

chipping or peeling.

1.09 PERMITTING

A. Any fence 7’ or greater in height requires permitting through LCS Code Enforcement (https://www.leonschools.net/Domain/6096)

PART II – PRODUCTS

2.01 MANUFACTURERS – BASIS OF DESIGN

A. Barrette Outdoor Living 7830 Freeway Circle
   1. Middleburg Heights, Ohio 44130 www.barrettoutdoorliving.com

B. Or Approved Equal

2.02 MATERIALS

A. Aluminum Extrusions: The structural members of the fence shall be extruded from HS-35™ aluminum alloy (or an equivalent performing alloy) with minimum yield strength of 35,000 PSI. Pickets shall be extruded Aluminum manufactured from HS-35 (or an equivalent performing alloy) with a minimum yield strength of 25,000 PSI. 6063-T5 aluminum alloy does not meet these performance requirements and is therefore not permitted.

B. Fasteners: All fasteners shall be stainless steel with a zinc dichromate coating for enhanced corrosion resistance. Phillips head screws shall be used to attach the pickets to the rails while self-drilling, self- tapping (Phillips) head screws shall be used to connect the rails to the post. All screws shall be painted to match the finish of the fence.

C. Accessories: All castings used for post caps, finials, scrolls, rail/base attachments and latches shall be made from aluminum. Zinc castings are not allowed. Only stainless steel fasteners may be used with these accessories. All accessories will be painted to match the finish of the fence.

2.03 FINISH

A. Pretreatment: Before the finish is applied, a five-stage pretreatment must be applied to assure maximum adhesion and corrosion resistance.
   1. Stage 1: High alkaline cleaner to prepare the surface
   2. Stage 2: Water rinse
   3. Stage 3: Conversion coating for maximum adhesion and corrosion
   4. Stage 4: Water rinse

B. Coating: After the pretreatment, the metal is dried and super-durable powder coating shall be applied. The finish shall meet or exceed all of the AAMA 2605 specifications, including 3,000 hours of salt spray testing under ASTM B117.

C. Color: The color to be selected by the architect from the manufacturer’s standard color selections.

2.04 CONSTRUCTION

A. Industrial Series
   1. Horizontal Rails shall be 1-5/8” square “U” channels. Pickets shall pass through holes punched in the top rail. The rails shall have a top wall thickness of 0.70” and a side wall thickness of .100”. The number of rails shall vary according to manufacturer specifications.
   2. Pickets shall be fastened to the rails using zinc-coated stainless steel screws painted to match the color of the fence. Screws shall be used on only one side of the rail leaving the other side with a clean appearance. Pickets shall be 1” square with a .062” wall thickness. Welding the pickets to the rails will not allow the fence to rake and is unacceptable.
   3. Posts shall be 2-1/2” square with a .075” wall thickness.
   4. Gate posts shall be 4” square with a .125” wall thickness. A gate requires a gate post on both sides. A cast aluminum cap is to be used on all posts.
   5. Spreader Bar shall be 4” square with a .125 wall thickness.
   6. Spacing shall be 3-31/32” between pickets.

7. Installed centers shall be 71” on center (2-1/2” posts)
8. Height shall be 48”, 60”, or 72”
9. Color shall be black
10. Horizontal rails shall be 3 on 48”, 60”, 72”; and 4 on 84”, 96” height if applicable
11. Swing Gates
    a. shall be fabricated to manufacturer’s standard methods
    b. Framework shall be 2 1/2” square with a .125” wall thickness
    c. NO Spring hinges shall be used
        1) 36” wide thru 71” wide (self-closing)
        2) 72” wide thru 96” wide (barrel)
12. Strength: Assembled sections should be able to support a minimum of 1,100 pounds of vertical load at the mid-point of any horizontal rail without permanent deformation

PART III – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Follow manufacturer’s instructions for the installation of all gates and fencing.

B. All material must be checked upon receipt at the job site prior to installation to check for damage that may have occurred during transport. The fence system must be stored is a safe place and dry environment so as to protect it from any potential damage. The fence system must be installed with manufacturer’s standard procedures.

3.03 SETTING POSTS

A. Remove loose and foreign materials from sites and bottoms of holes and moisten soil prior to pouring concrete. Center and align posts in holes. Place concrete around posts in a continuous pour and vibrate or tamp for consolidation.

B. Check each post for vertical and top alignment. Hold in position during placement and finishing operation. Trowel tops of footings and slope or dome to direct water away from posts.

C. Set keeps, stops, sleeves and other accessories into concrete as required. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with a membrane curing material. Grout- in those parts with are set into sleeved holes, concrete constructions or rock excavations using non- shrink Portland cement grout.

3.04 INSTALLING GATES

A. Install gates plumb, level and secure for full opening without interference. Install ground-set items in concrete for anchorage in accordance with manufacturer’s recommendations as approved by the architect. Lubricate and adjust the hardware for smooth operation.

END OF SECTION 323119.10

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ARCHITECTS LEWIS & WHITLOCK
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Tallahassee, FL 32301

April 8, 2025
SESI Job No.: T24-278
FL Licensed Asbestos Consulting Firm
No.: ZA-0000092

Subject: **Point Specifications for Asbestos Abatement of the Identified ACM in Buildings #9 & #10 at Griffin Middle School located at 800 Alabama Street in Tallahassee, Florida**

Attention: **Mr. Camden Whitlock, AIA/Principal**

Southern Earth Sciences, Inc., is the Florida Licensed Asbestos Consultant for developing project specifications and performing monitoring/clearance testing at the project site referenced above. The identified ACM is summarized below and shown on the attached marked-up floor plans:

- Built-up roofing (BUR/tar) on the roofs of Buildings 9 & 10 was non-ACM but silver paint coating on the roofing contained 2% chrysotile asbestos. The lower Building 10 roof BUR/tar contained 10% chrysotile asbestos. (Bldgs 9 & 10 – 21,000sf)
- Buildings 9 & 10 had black mastic on foamglass pipe insulation that was ACM. (unknown quantities of piping; some piping runs were underground)
- Buildings 9 & 10 exterior door casings (about 30 casings) had 2% chrysotile asbestos in white caulking.
- Building 9 & 10 older exterior windows (about 40 windows) had ACM caulking & glazing.
- Building 9 Rooms 001A, 001, 006, 007, 008, 106, 107, 108, 109, 110, 111, 112 and 800 had black tile mastic residue that contained 3% chrysotile asbestos on the slab. Building 10 Room 10-001A had black mastic around the stage and Room 10-012 had black mastic that contained 3% chrysotile asbestos on the slab. (approximately 3000sf)

Recommended conditions for various abatement activities:

- The metal roof shell and other building materials could be removed and disposed or recycled **as long as ACM is not disturbed during the removal. The 10 Working day Notification to FDEP should be observed prior to any removal.**
- The silver paint coating on the roofing can be abated using a regulated area boundary with drop-cloths & posting up to 8'-10' from the base of the walls to catch any debris.
- The roofing on Building 10 lower roof can also be abated similar to the silver paint coating above but all layers of the BUR/tar must be removed and disposed.

- A regulated area boundary with drop-cloths shall be posted on each room inside and outside where older windows and/or door casings are to be abated.
- Containments (NPE) with NAMs and showers shall be used for OSHA Class 2 work associated with abatement of VAT & black tile mastic under carpeting.
- Black mastic on foamglass pipe insulation can either be done with wet removal and drop-cloths using regulated areas or cut and wrap the piping for disposal.

All EPA (40CFR Part 61), OSHA (29CFR 1926.1101), state and local requirements shall be followed by the abatement contractor. Asbestos abatement industry standard practices shall be followed. Appropriate safety precautions shall be taken to protect workers working above 6' (ladders, scaffolding, lifts, safety harnesses, etc.). The steps below should be considered the minimum allowed for performance of this work. Negative pressure half-mask respirators as a minimum shall be required for this work.

The Abatement Contractor shall provide copies of the company and contractor licenses and certifications to perform the abatement work. The contractor shall provide supervisor and worker training (from approved Florida Training Providers), fit tests and physicals to SESI at least 10 working days prior to the start of work for review and approval.

The Contractor shall ensure that his supervisors/workers have proper clearances and badges to work on Leon County School Board Property. They shall wear proper attire (shirt & pants) outside the containments and shall not harass students or staff personnel/visitors (verbally or by visual means). The Contractor shall at all times enforce strict discipline and good order among his employees and shall not have any unfit person or anyone not skilled in the work assigned to him nor anyone who has not received notice of the hazards of asbestos removal and training in use of respirators, safety procedures, equipment, clothing, and work procedures in the regulated areas.

Coordinate with the owner and General Contractor for access to water and electricity as needed. Parking and placement of the dumpster and work vehicles shall also be coordinated with the owner and the general contractor, including removal of equipment/facilities/connections and notification of all trades/employees of work. Refer to the sequence of work and requirements below for this job task (some of the tasks may be performed concurrently at the contractor's discretion):

Interior Asbestos Abatement of Carpet, tile & Black Mastic (ACM) in Buildings 9 & 10 (see attached SESI Figures 1 & 2):

1) Setup a wet decon for containment access into the regulated areas, it can also be used for waste-out if needed, consisting of double layers of 6-mil polyethylene sheeting. **(NOTE: The decon shall provide access to areas to be abated.)**

2) All wastewater shall be filtered prior to return to the storm drains or sanitary drains.

3) Ventilate the containment (NPE) to move contaminated air away from the workers using an adequate number of NAMs provided with HEPA filtration to maintain the containment at -0.02"H_2O with respect to the outside.

4) All containment penetrations shall be isolated by critical barriers; consisting of single layers of 6-mil poly (including doors, operable windows, ceiling penetrations, and vents).

5) Ensure that the HVAC system is shut-down and locked-out. HVAC registers and returns shall be isolated using two layers of 6-mil poly.

6) Baseboards shall be removed by the abatement contractor and disposed of as construction debris.

7) Splash guards consisting of 6-mil poly sheeting shall be used at least 3' up the wall.

8) The abatement contractor is responsible for controlling access to the regulated area. All personnel entering the containment are to sign release forms.

9) Appropriate signage shall be employed to prevent inadvertent exposure of non-abatement workers.

10) All workers/supervisors shall wear appropriate personal protective equipment inside the containment including, as a minimum, half-mask negative pressure respirators. The abatement contractor shall provide documentation of physicals and fit tests to the owner as part of the abatement package.

11) Carpeting in the rooms shall be removed and can be disposed of as construction debris unless black tile mastic or VAT is adhered to the back of the carpet.

12) No known VAT was present; however, any incidental VAT should be removed wet (minimum breakage), properly wrapped and disposed as asbestos waste.

13) Black tile mastic shall be abated using low-odor mastic dissolver.

14) All asbestos waste shall be bagged in appropriately marked and labeled containers. The waste bags shall be removed from the containment and placed in a locked dumpster/box truck. **The dumpster/box truck shall be appropriately marked while being used to store asbestos waste on site.**

15) The work areas shall be inspected by the contractor's supervisor for adequacy of work and cleanliness prior to contacting SESI for clearance sampling.

16) The building can be encapsulated using appropriate techniques following satisfactory inspection results by SESI.

17) Aggressive clearance testing of the containment following a satisfactory inspection shall be by Phase Contrast Microscopy (PCM). Satisfactory results shall be ≤0.01 f/cc by PCM analysis (all samples) for the work area. The Contractor will be responsible for cleaning and additional costs for testing upon failure.

18) The containment and regulated areas can be deactivated following satisfactory results from the clearance tests.

Asbestos Abatement of Exterior Door Casings and Older Windows (Buildings 9 & 10):

1) Setup a regulated area boundary with proper OSHA Posting to keep non-abatement workers out of the rooms & away from the windows, walls, exterior doors.

2) Appropriate signage shall be employed to prevent inadvertent exposure of non-abatement workers.

3) Step-off pads with wash-down areas & disposal containers shall be provided at all entry/exit points to the regulated areas.

4) Drop cloths consisting of 6-mil poly sheeting shall be placed on the ground under the work areas extending at least 6' from the base of the wall both inside and outside the rooms of the building.

5) Appropriate safety precautions shall be taken for workers above 6'. Precautions shall also be taken to ensure slip, trip & fall protection.

6) The abatement contractor is responsible for controlling access to the regulated areas. All personnel entering the regulated areas are to sign release forms.

7) All workers/supervisors shall wear appropriate personal protective equipment inside the regulated areas including, as a minimum, half-mask negative pressure respirators. The abatement contractor shall provide documentation of physicals and fit tests to the owner as part of the abatement package.

8) Exterior doors/casings can be disposed as non-ACM debris if caulking is removed prior to disposal. White caulking shall be removed wet and/or with HEPA-shrouded equipment from the walls.

9) Exterior windows/casings shall be removed and disposed as ACM debris.

10) Caulking material from the window & door casings shall be demolished wet or removed from the wall with HEPA-shrouded equipment to limit dust generation during removal.

11) All asbestos waste shall be bagged or wrapped in appropriately marked and labeled containers. The waste bags shall be placed in a locked dumpster/box truck. **The dumpster/box truck shall be appropriately marked while being used to store asbestos waste on site.**

12) The work area shall be inspected by the contractor's supervisor for adequacy of work and cleanliness prior to contacting SESI for visual inspections.

13) The regulated areas can be deactivated following satisfactory inspections & testing.

14) The Abatement Contractor shall coordinate with the Owner and the General Contractor for removal of the dumpster and other facilities installed for the abatement.

Asbestos Abatement of Silver Paint Coating on the BUR of Buildings 9 & 10 Roofs (including Building 10 Lower Roof):

1) The metal shell on the roofs of Buildings 2 & 4 can be removed and recycled or disposed as non-ACM debris by a demolition contractor as long as the silver paint and BUR/tar on Building 10 Lower Roof are not on the metal pieces of the roof beams & supports.

2) ACM was noted only in the Silver Paint Coating applied to the surface of the BUR on Buildings 9 & 10 roofs. The BUR/tar on Building 10 Lower Roof was ACM and all layers must be removed.

3) Setup a regulated area boundary with proper OSHA Posting to keep non-abatement workers out of the building & away from the roof where the BUR/tar, silver paint coating and wall flashing is to be disturbed.

4) Air intakes and HVAC makeup air units should be secured and/or shielded from exposure to dust/debris while abatement of the silver paint coating & wall flashing is in process.

5) Appropriate signage shall be employed to prevent inadvertent exposure of non-abatement workers.

6) Step-off pads with wash-down areas & disposal containers shall be provided at all entry/exit points to the regulated areas.

7) Drop cloths consisting of 6-mil poly sheeting shall be placed on the ground under the work areas extending at least 8'-10' from the base of the building, if applicable.

8) Appropriate safety precautions shall be taken for workers above 6'. Precautions shall also be taken to ensure slip, trip & fall protection.

9) The abatement contractor is responsible for controlling access to the regulated areas. All personnel entering the regulated areas are to sign release forms.

10) All workers/supervisors shall wear appropriate personal protective equipment inside the regulated areas including, as a minimum, half-mask negative pressure respirators. The abatement contractor shall provide documentation of physicals and fit tests to the owner as part of the abatement package.

11) The silver paint coating on the top layers of the roofs shall be removed wet and/or cut with HEPA-shrouded cutting equipment to limit dust generation during removal.

12) Once the silver paint coating on the roofs is abated from the roofs, the rest of the BUR can be removed using normal demolition practices.

13) Building 10 Lower Roof BUR/tar (all layers) shall be removed wet and/or cut with HEPA-shrouded cutting equipment to limit dust generation during removal.

14) The work areas shall be inspected by the contractor's supervisor for adequacy of work and cleanliness prior to contacting SESI for visual inspections.

15) The regulated areas can be deactivated following satisfactory inspections & testing.

16) The Abatement Contractor shall coordinate with the Owner and the General Contractor for removal of the dumpster and other facilities installed for the abatement.

We appreciate the opportunity to be of service to you on this project should require additional information, please advise.

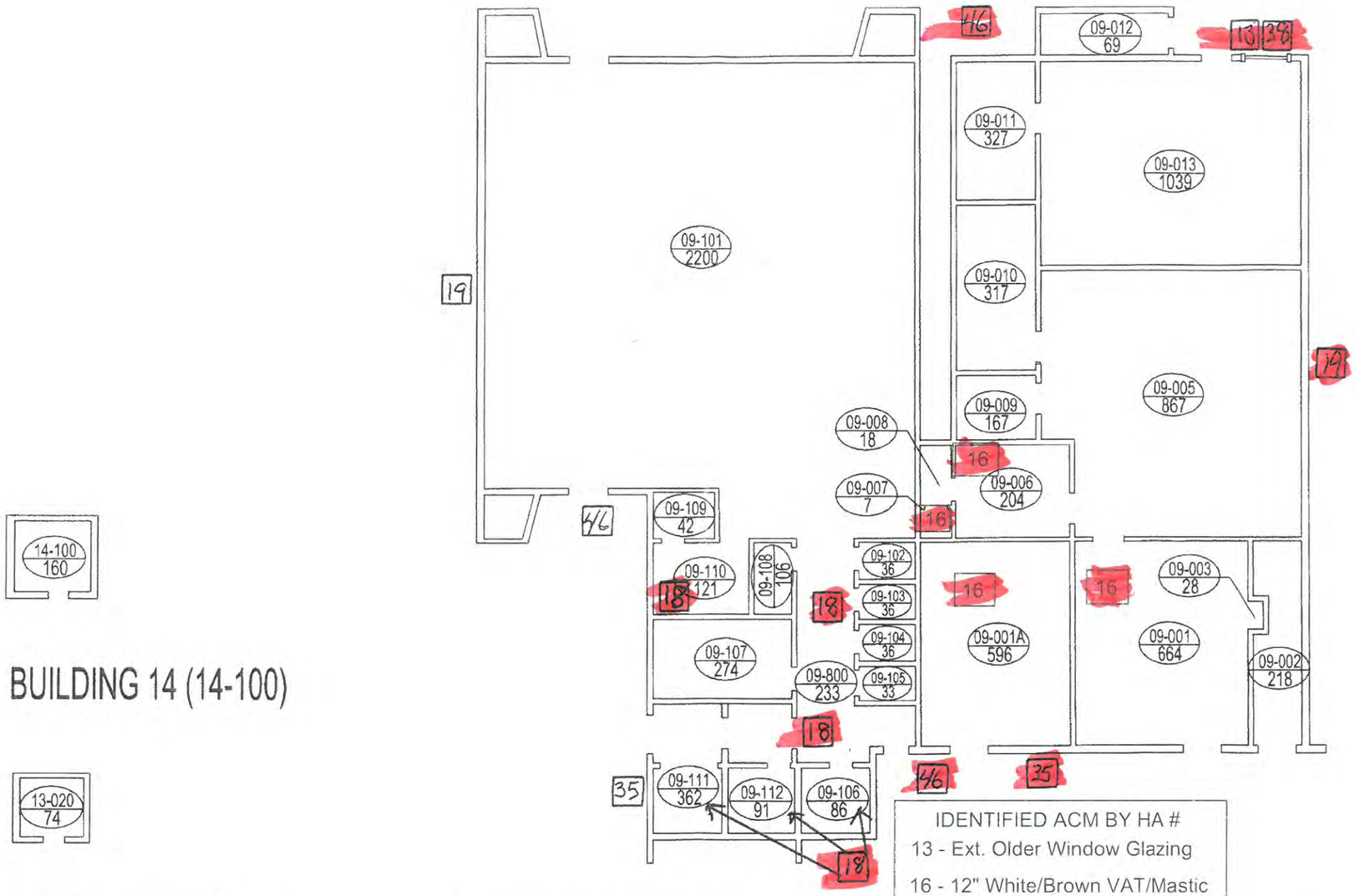
Sincerely,

SOUTHERN EARTH SCIENCES, INC.

Roy L. Russell
Asbestos Dept. Manager – LEP #60/CIEC
EPA TSCA LBP Inspector No.: LBP-I-5950-3

Mark E. Wilson, P.E.
Florida State Licensed Asbestos Consultant
SESI Asbestos Business No.: ZA-0000092
Florida Licensed Asbestos Consultant No.: AX85
04-08-2025

SOUTHERN EARTH SCIENCES



IDENTIFIED ACM BY HA #

13 - Ext. Older Window Glazing

16 - 12" White/Brown VAT/Mastic

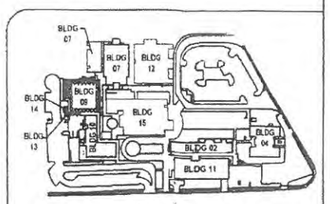
18 - Black Tile Mastic Residue

19 - Built-up Roofing

35 - Black Mastic/Wrap on Foamglass Pipe Insulation, above Ground & In the Ground

38 - Ext. Older Window Caulking

46 - Ext. Older Door Caulking



KEY MAP

LEON COUNTY SCHOOL BOARD
FACILITIES & CONSTRUCTION
3420 WEST THARPE STREET
TALLAHASSEE, FLORIDA 32303
(850) 617-5900

GRIFFIN MIDDLE SCHOOL
800 ALABAMA STREET

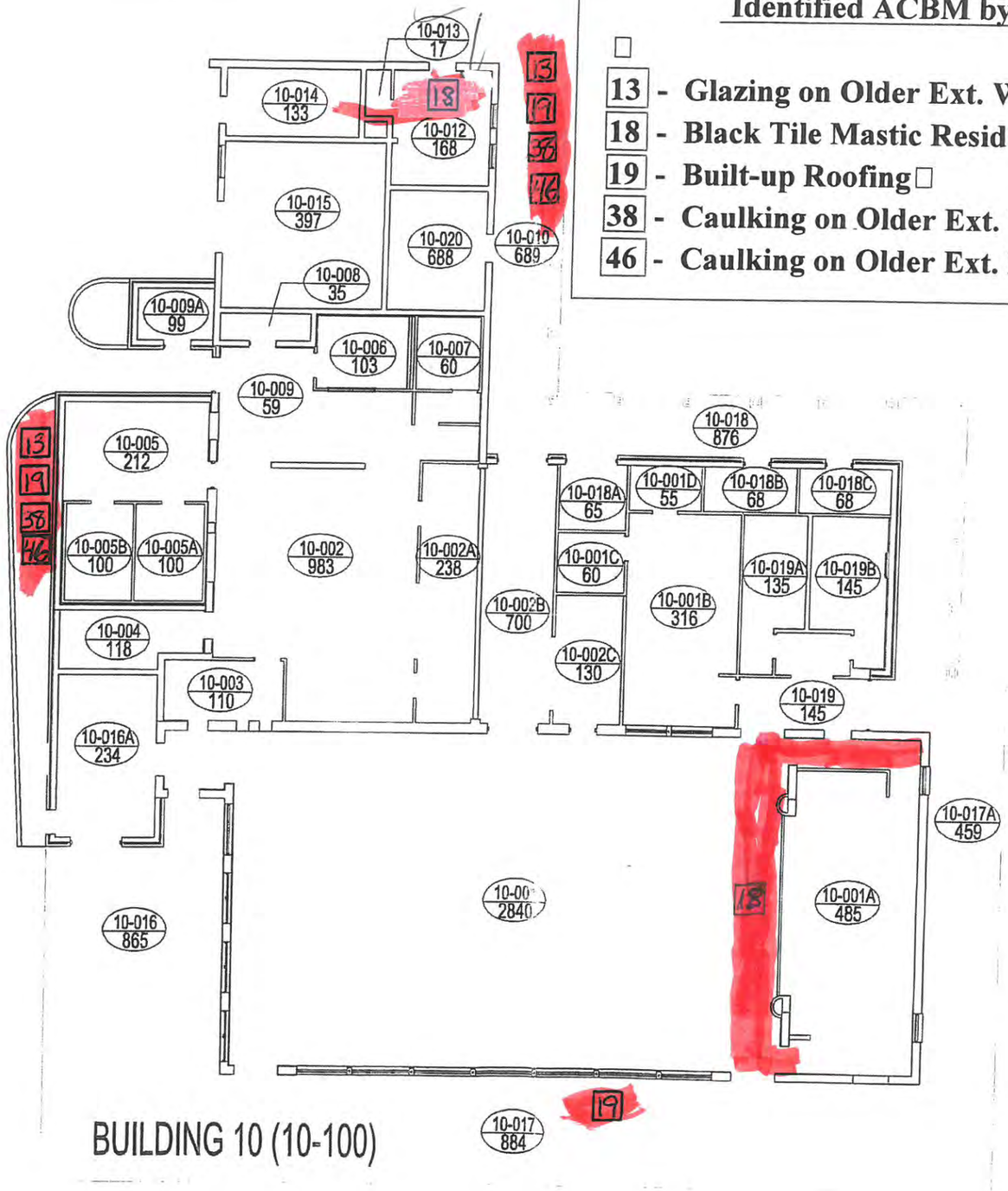
LEON COUNTY SCHOOLS

DRAWN BY DIS
FILE Schematic - Griffin Middle.dwg
DATE 05/08/95
REVISIONS
11/18/08
01/12/09
05/16/12

SHEET TITLE
BUILDING 09, 13, & 14

Identified ACBM by HA

- 13 - Glazing on Older Ext. Window Casings
- 18 - Black Tile Mastic Residue
- 19 - Built-up Roofing
- 38 - Caulking on Older Ext. Window Casings
- 46 - Caulking on Older Ext. Door Casings



LEON COUNTY SCHOOL BOARD
ADMINSTRATION FACILITIES & CONSTRUCTION
TALLAHASSEE, FLORIDA 32303
3397 W. THARPE STREET

GRIFFIN
MIDDLE SCHOOL
800 ALABAMA STREET

LEON COUNTY SCHOOLS

DRAWN BY	DIS
FILE Schematic - Griffin Middle.dwg	
DATE	05/05/95
REVISIONS	
11/18/05	
01/12/09	

SHEET TITLE
BUILDING 10

SHEET

KEY MAP

Subsurface Exploration and
Geotechnical Engineering Evaluation for
Griffin Middle School Gymnasium Phase 2,
800 Alabama Street,
Tallahassee, Leon County, Florida

Ardaman & Associates, Inc.

CORPORATE HEADQUARTERS

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Louisiana: Baton Rouge, New Orleans, Shreveport
Texas: Houston

MEMBERS:

ASTM International
Society of American Military Engineers
American Council of Engineering Companies

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

January 13, 2025
Ardaman File No. 113-24-40-1990

Architects Lewis + Whitlock
206 West Virginia Street
Tallahassee, Florida 32301
Email: cwhitlock@think3d.net

Attention: Mr. Camden Whitlock, AIA LEED AP BD+C

Subject: Subsurface Exploration and
Geotechnical Engineering Evaluation for
Griffin Middle School Gymnasium,
800 Alabama Street,
Tallahassee, Leon County, Florida

Dear Mr. Whitlock:

As requested and authorized, we have completed a subsurface exploration and geotechnical engineering evaluation for the subject project. The purposes of performing this exploration were to evaluate the general subsurface conditions within the building areas and to provide recommendations for site preparation and foundation support. This report documents our findings and presents our engineering recommendations.

SITE LOCATION AND SITE DESCRIPTION

The project site is located at 800 Alabama Street in Tallahassee, Florida (Section 26, Township 1 North, Range 1 West) and is shown on Figure 1 attached to this report. The site is currently developed and will require razing existing facilities that cover portions of the proposed construction.

PROPOSED CONSTRUCTION AND GRADING

It is our understanding that the proposed development includes construction of a New Gymnasium and a Chiller Plant. For the purposes of our analysis, we have assumed the maximum loading conditions for the 1-story building to be on the order of 3 klf for wall foundations and 75 kips for individual column foundations. Floor loads are assumed to be less than 100 pounds per square foot. Grading plans are not complete at this time, therefore, we have assumed that approximately 1 to 2 feet of cut/fill is required to reach the building area final elevation. If actual building loads or fill height exceed our assumptions, then the recommendations in this report may not be valid.

REVIEW OF SOIL SURVEY MAPS

Based on information obtained online from the Web Soil Survey as operated by the U.S. Department of Agriculture Natural Resources Conservation Services, the site is located in an area mapped as the “Orangeburg-Urban land complex, 2 to 12 percent slopes” soil series.

The Orangeburg formation consists of loamy and clayey fine-loamy marine deposits. The internal drainage of the Orangeburg formation is well drained and the soil permeability is moderate. According to the Soil Survey, the seasonal high water table for this formation is typically deeper than 80 inches of the natural ground surface.

FIELD EXPLORATION PROGRAM

Soil Borings

The field exploration program included performing six (6) soil borings. Four (4) soil borings were Standard Penetration Test (SPT) borings advanced to 20 feet below the existing ground surface using the methodology outlined in ASTM D-1586. Remaining two (2) soil borings were hand auger borings augmented with Dynamic Cone Penetration (DCP) in general accordance with ASTM STP #399. A summary of these field procedures is included in the Appendix A.

The test holes were initiated using a hand auger without penetration testing to 4.5 feet below grade to avoid potential damage to underground utilities. Borings were sampled at 18-inch intervals to 10 feet deep and at 5-foot interval below 10 feet. Soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory in sealed sample bags.

The groundwater levels at each of the boring locations were measured during drilling. The borings were backfilled with soil cuttings upon completion.

Test Locations

The approximate locations of the borings are schematically illustrated on a site plan shown on Figure 1. The boring location plan was provided by Architects Lewis and Whitlock. Ardaman determined the GPS coordinates of these locations by overlaying the provided boring location plan on Google Earth Pro. These locations were determined in the field by using hand-held GPS device and should be considered accurate only to the degree implied by the method of measurement used.

LABORATORY PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification. The soil samples

were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488) and AASHTO M-145. The resulting soil descriptions are shown on the soil boring profiles presented on Figure 2.

In addition, we conducted natural moisture content tests (ASTM D2216), percent fines analyses (ASTM D1140), and Atterberg limits tests (ASTM D4318) on selected soil samples obtained from the borings. The results of these tests are presented adjacent to the sample depth on the boring profiles on Figure2.

GENERAL SUBSURFACE CONDITIONS

General Soil Profile

The results of the field exploration and laboratory programs are graphically summarized on the soil boring profiles presented on Figure 2. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory examinations of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

The results of the borings indicate the following general soil profile:

Depth Below Ground Surface (feet)		Description
From	To	
0	1	Medium to fine sand with silt to silty medium to fine sand, asphaltic concrete, and limerock base
1	13	Clayey to very clayey medium to fine sand to sandy fat clay, very loose to loose
13	20	Silty, clayey medium to fine sand, medium dense

The above soil profile is outlined in general terms only. Please refer to Figure 2 for soil profile details.

We note that the thickness of asphaltic concrete and base shown on the boring profiles should be considered approximate.

Groundwater Level

The groundwater level was measured in the boreholes during drilling and was not encountered in the test borings on the date drilled. However, this does not necessarily mean that groundwater would not be encountered within the vertical reach of these borings at some other time.

Fluctuations in groundwater levels should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted. We note that groundwater may also “perch” (be held high) over clayey, low permeability soils within more permeable sandy soils during wet weather periods.

NORMAL SEASONAL HIGH GROUNDWATER LEVEL

The groundwater level is affected by a number of factors. The amount of rainfall and the drainage characteristics of the soils, the land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the important factors influencing the groundwater level.

The normal seasonal high groundwater level each year is the level in the August-September period at the end of the rainy season during a year of normal (average) rainfall. The water table elevations associated with a higher-than-normal rainfall and in the extreme case, flood, would be higher to much higher than the normal seasonal high groundwater level, and could occur at times outside of the August-September period. The normal high-water levels would more approximate the normal seasonal high groundwater levels.

Based on our interpretation of the site conditions using our boring logs, we estimate the normal seasonal high groundwater level at the boring locations to be at least 15 feet below grade. Perched groundwater may be present shallower than 15 feet below existing grade, trapped in relatively high permeability soils between or over lower permeability clayey soils, particularly during wet periods.

ENGINEERING EVALUATION AND RECOMMENDATIONS

General

Based upon subsurface conditions encountered at the site, and the assumed structural loads, it is our opinion that a shallow foundation system is suitable for support of the proposed structures, provided that accommodations to the potential volume change from underlying moderately to highly plastic clay are provided.

The borings encountered moderately to highly plastic soils with a potential for volume change with variations in moisture content. Fluctuations in volume of these clays typically causes differential movement of shallow foundations, which can affect the superstructure and cause cracks. Stiffening of the foundation is a locally accepted technique to mitigate the effects of differential movement of the foundations. These recommendations are elaborated on the “Foundation and Slab-on-Grade Design” section below.

We also note that the clayey soil will also likely be difficult to moisture condition and compact. If the degree of compaction recommended below cannot be achieved, the clayey soils should be

partially over-excavated and replaced with select structural fill, defined as clean sand to fine sand with silt, free of organics and other deleterious materials, with less than 12% passing the U.S. No. 200 sieve. These soil types are less sensitive to moisture than the silty and clayey soils encountered.

The following are our recommendations for overall site preparation and foundation support for the proposed facility based on the existing soil conditions encountered during the exploration. The recommendations are made as a guide for the design engineer and/or architect, parts of which should be incorporated into the project's specifications.

Stripping and Grubbing/Root-Raking

The "footprints" of the proposed buildings and other hardscape areas, plus a minimum margin of five feet, should be stripped of all surface vegetation, stumps, debris, organic topsoil or other deleterious materials, as encountered. Buried utilities and other underground structures should be removed or plugged to eliminate conduits into which surrounding soils could erode.

After stripping, the site should be grubbed/root-raked such that roots with a diameter greater than ½ inch, stumps, or small roots in a dense state, are completely removed. The actual depth(s) of stripping and grubbing/root-raking must be determined by visual observation and judgment during the earthwork operation. Grubbing/root-raking should continue until determined to be adequate by Ardaman's representative who is monitoring the root-raking.

All existing foundations, slabs, asphalt, and any other underground structures should be removed from the proposed construction area. If pipes or any collapsible or leak prone utilities are not removed or completely filled (with grout or concrete), they might serve as conduits for subsurface erosion resulting in excessive settlements. Over-excavated areas resulting from the removal of underground structures and unsuitable materials should be backfilled in accordance with the fill soils section of this report. This excavation must not undermine the existing building foundations. Provide shoring, bracing, and/or underpinning of existing footings as necessary to protect from failure.

It has been our experience that soils surrounding existing buildings sometimes contain pockets of construction debris or other deleterious materials requiring removal and replacement with compacted clean fine sands. Therefore, we recommend that the stripped surface be inspected by Ardaman & Associates, Inc.

Proof-rolling

We recommend proof-rolling the cleared surface to locate any unforeseen soft areas or unsuitable surface or near-surface soils, to increase the density of the upper soils, and to prepare the existing surface for the addition of the fill soils (as required). Proof-rolling of the building area should consist of at least 10 passes of a compactor capable of achieving the density requirements

described in the next paragraph. Each pass should overlap the preceding pass by 30 percent to achieve complete coverage. If deemed necessary, in areas that continue to "yield", remove all deleterious material and replace with clean, compacted suitable backfill. The proof-rolling should occur after cutting and before filling. The number of passes can be reduced to 3 within the proposed parking/drive areas. Proof-rolling should be monitored in the field by an Ardaman representative.

A density equivalent to or greater than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 2 feet in the building areas and 1 foot in the parking/drive areas must be achieved beneath the stripped and grubbed ground surface. Additional passes and/or overexcavation and recompaction may be required if these minimum density requirements are not achieved. The soil moisture should be adjusted as necessary during compaction.

We note that the surficial soils are relatively clayey and will retain excess moisture during “wet” periods. When these soils retain excess moisture, they will be difficult to dry and compact. Over-excavation of these soils and replacing with suitable fill materials, as provided below, may be required if they cannot be appropriately moisture conditioned within the projects time schedule. Commonly, replacement of the soils about 2 feet below the planned subgrade is appropriate to achieve compaction at the subgrade, however, the actual condition should be reviewed by Ardaman personnel to provide condition-specific recommendations.

Care should be exercised to avoid damaging any neighboring structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing condition (i.e., cracks) of the structures documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and Ardaman & Associates should be notified immediately. Heavy vibratory compaction should not be used where it could affect existing structures.

Suitable Fill Material and Compaction of Fill Soils

All fill materials should be free of organic materials, such as roots and vegetation. We recommend using fill with less than 12 percent by dry weight of material passing the U.S. Standard No. 200 sieve size. Soils with more than 12 percent passing the No. 200 sieve can be used in some applications but will be more difficult to compact due to their inherent nature to retain soil moisture. On-site borrow with fines content (percent passing the No. 200 sieve) of up to 35 percent, or with a liquid limit up to 40 and plastic index up to 10 may be used for structural fill.

All structural fill should be placed in level lifts not to exceed 12 inches in uncompacted thickness. Each lift should be compacted to at least 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value. The filling and compaction operations should continue in lifts until the desired elevation(s) is achieved. If hand-held compaction equipment is used, the lift thickness should be reduced to no more than 6 inches.

The use of soils with relatively high fines content (i.e., silty and clayey soils) as fill should be avoided near the ground surface in green-space areas since these relatively low permeability soils promote ponding of water during and following rainfall. Also, in high groundwater areas, silty and clayey soils may cause "wet" site conditions due to capillary action. Additionally, these relatively low permeability soils should not be used directly beneath any pavement section as they may trap water within the pavement section leading to premature pavement failure.

Foundation Support and Foundation Compaction Criteria

After the mass earthwork discussed in the previous report sections is complete, excavate the foundations to the proposed bottom of footing elevations. If any of Strata 2, 2B, and 3 are encountered within the foundation/slab excavations, these soils should be over-excavated to 2 feet below bottom of footings and slabs. Perform test pits or borings at no more than 50 feet apart to identify areas where over excavation is appropriate. Backfill these over-excavations in accordance with the recommendations provided in the fill section above. Verify the in-place compaction for a depth of 2 feet below the footing bottoms. If necessary, compact the soil at the bottom of the excavations to at least 95 percent of the modified Proctor maximum dry density for a depth of 2 feet below the footing bottoms. We note that since the near surface soils were commonly clayey or very clayey, weather conditions at the time of construction will affect these soil types and over-excavation and replacement may be needed. Their moisture content is often well above the optimum moisture content, and it may prohibit compaction to the specified degree without removal and drying or replacement.

We recommend stiffening the foundation (conventional stiffening with added reinforcement or post tensioning) to mitigate the effects of differential movement of the foundations. Stiffening typically consists of increasing the percentage of steel reinforcement within the strip footings by adding a layer of steel reinforcement to address negative moments. The slab-on-grade should also be stiffened as well by providing two layers of welded wire mesh. Post-tensioning may also be used in lieu of typical reinforcement. Details of the foundation stiffening should be determined by the structural engineer. Based on the conditions encountered, we estimate differential movement due to the lean to fat clays to be on the order of 1-inch in 40 feet.

The soil volume change can be mitigated by maintaining favorable site conditions that provide relatively stable soil moisture. Conditions that induce more than climactic variations in soil moisture, such as vegetation, irrigation, or poor site drainage, could induce greater variations in volume change.

Based on the existing soil conditions, and assuming the above outlined proof-rolling and compaction criteria are implemented, an allowable soil bearing pressure of 1,500 pounds per square foot (psf) may be used in the foundation design and a modulus of subgrade reaction of 125 psi/inch may be used for floor slab design. This bearing pressure should result in load related foundation settlement within tolerable limits (i.e., maximum total settlement of less than 1-inch).

Note that this foundation settlement is in addition to the differential movement provided above due to the clayey soils volumetric change with varying moisture content.

All bearing wall foundations should be a minimum of 18 inches wide and column foundations 24 inches wide. A minimum soil cover of 18 inches should be maintained from the bottom of the foundations to the adjacent finished grades.

Floor Slab Moisture Reducer and Slab Compaction Requirements

Prior to concrete placement, soil compaction beneath floor slabs should be verified for a depth of 12 inches and meet the 95 percent criteria (modified Proctor, ASTM D-1557).

Based on the existing soil conditions, and assuming the above outlined proof-rolling and compaction criteria are implemented an allowable subgrade modulus of 125 pci may be used in the slab design.

Precautions should be taken during the slab construction to reduce moisture entry from the underlying subgrade soils. Moisture entry can be reduced by installing a membrane between the subgrade soils and floor slab. Care should be exercised when placing the reinforcing steel (or mesh) and slab concrete such that the membrane is not punctured. We note that the membrane alone does not prevent moisture from occurring beneath or on top of the slab.

If interior columns are isolated from the floor slab, an expansion joint should be provided around the columns and sealed with a water-proof sealant.

QUALITY ASSURANCE

We recommend establishing a comprehensive quality assurance program to verify that all site preparation and foundation and pavement construction is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Ardaman & Associates.

As a minimum, an on-site engineering technician should monitor all stripping and grubbing to verify that deleterious materials have been removed and should observe the proof-rolling operation to verify that the appropriate number of passes are applied to the subgrade. In-situ density tests should be conducted during earthwork activities and below all structural areas including footings, floor slabs, and other hardscape areas to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered.

Finally, we recommend inspecting and testing the construction materials for the foundations and other structural components.

IN-PLACE DENSITY TESTING FREQUENCY

Earthwork testing is typically performed on an on-call basis when the contractor has completed a portion of the work. The test result from a specific location is only representative of a larger area if the contractor has used consistent means and methods and the soils are practically uniform throughout. The frequency of testing can be increased and full-time construction inspection can be provided to account for variations. We recommend that the following minimum testing frequencies be utilized.

In proposed building areas, a minimum frequency of one in-place density test for each 2,500 square feet of area should be used. In-place density testing should be performed at this minimum frequency for a depth of 2 feet below natural ground and for every 1-foot lift of fill placed in the structural area. In addition, density tests should be performed in each column footing for a depth of 2 feet below the bearing surface. For continuous or wall footings, density tests should be performed at a minimum frequency of one test for every 50 linear feet of footing, and for a depth of 2 feet below the bearing surface.

Utility backfill should be tested at a minimum frequency of one in-place density test for each 12-inch lift for each 200 linear feet of pipe. Additional tests should be performed in backfill for manholes, inlets, etc.

Representative samples of the various natural ground and fill soils should be obtained and transported to our laboratory for Proctor compaction tests. These tests will determine the maximum dry density and optimum moisture content for the materials tested and will be used in conjunction with the results of the in-place density tests to determine the degree of compaction achieved.

CLOSURE

The analyses and recommendations submitted herein are based on the data obtained from the soil borings presented on Figure 2 and the assumed loading conditions. This report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report after performing on-site observations during the construction period and noting the characteristics of the variations.

In the event any changes occur in the design, nature, or location of the proposed construction, Ardaman and Associates, Inc. must review the applicability of the conclusions and recommendations in this report. Recommendations in this report shall not be applicable if all the above is not fulfilled by the client or the consultant involved in the project.

This is a relatively shallow exploration and is not intended to be an evaluation for sinkhole potential. It does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface.

This report has been prepared for the exclusive use of Architects Lewis & Whitlock in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

We are pleased to be of assistance to you on this phase of the project. When we may be of further service to you or should you have any questions, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Florida Registry 5950

Aayush R. Tiwary, E.I.
Project Engineer

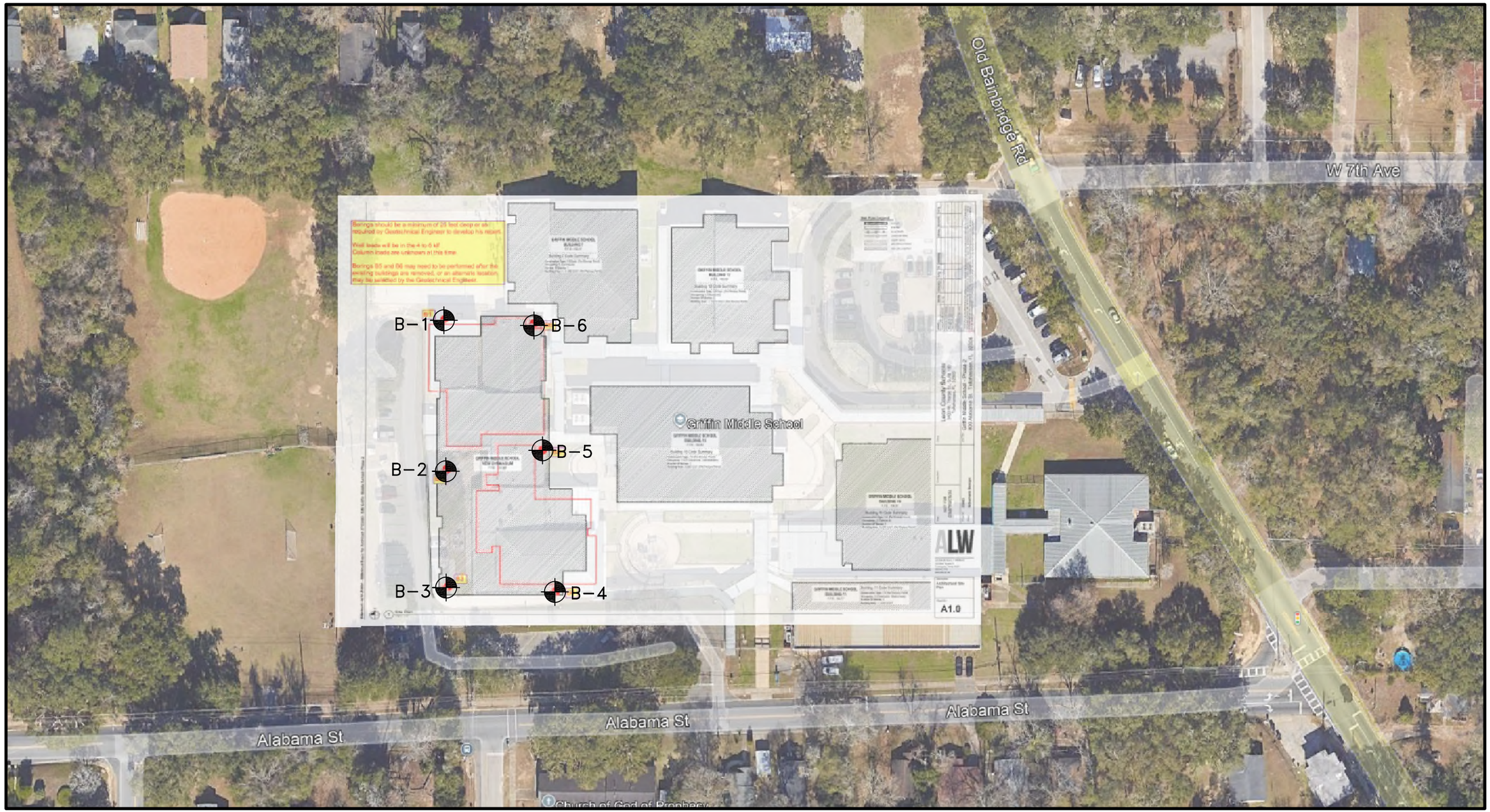
Michael S. Wilson, P.E.
Tallahassee Branch Manager
Florida License: 46088

ART/MSW

This item has been digitally signed and sealed by Micheal S. Wilson, P.E. on the date indicated adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

TEST BORING LOCATION PLANS

(Image Source: Google Earth Pro & Architects Lewis & Whitlock's Architectural Site Plan dated 10/18/24)



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NOT TO SCALE

Ardaman & Associates, Inc.
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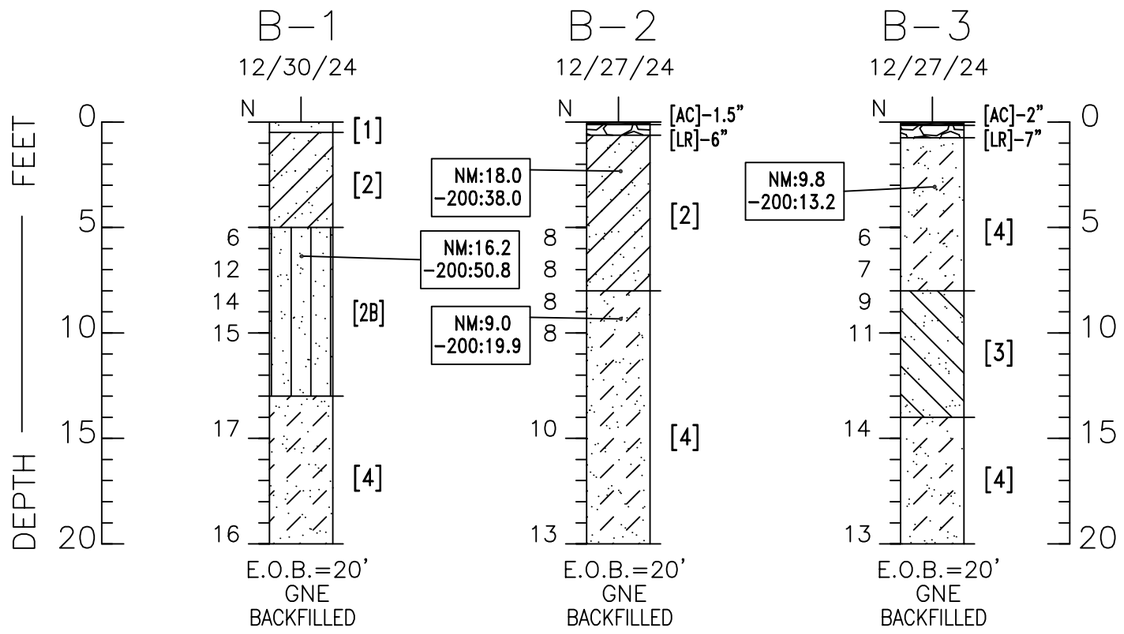
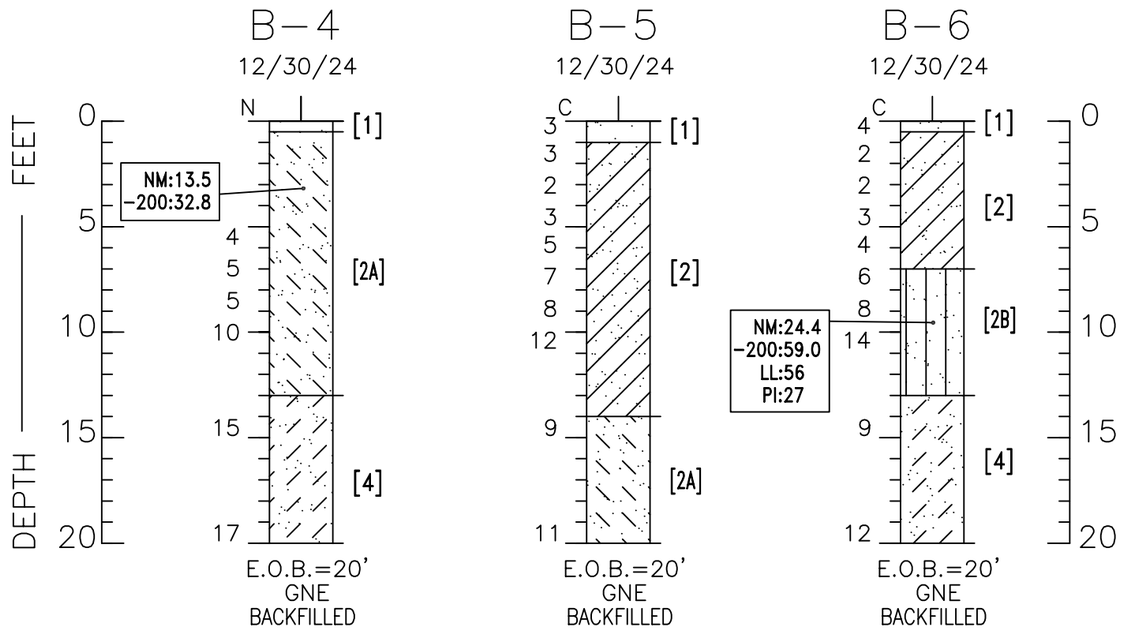
(850) 576-6131

SHEET TITLE:
SUBSURFACE SOIL EXPLORATION
GRIFFIN MIDDLE SCHOOL- 800 ALABAMA STREET
TALLAHASSEE, FLORIDA

DRAWN BY: ART	CHECKED BY: MSW	DATE: 12/27/24	
FILE NO. 113-24-40-1990	APPROVED BY: M.S. WILSON, P.E.		FIGURE 1

SOIL BORING PROFILES





SOIL LEGEND

- [AC] ASPHALTIC CONCRETE
- [LR] LIMEROCK BASE
- [1] BROWN TO TAN MEDIUM TO FINE SAND W/SILT TO SILTY MEDIUM TO FINE SAND (SP-SM TO SM; A-3 TO A-2-4)
- [2] BROWN TO ORANGISH BROWN CLAYEY TO VERY CLAYEY MEDIUM TO FINE SAND (SC; A-2-6 TO A-6)
- [2A] BROWN TO ORANGISH BROWN SILTY, CLAYEY MEDIUM TO FINE SAND (SM-SC; A-2-6)
- [2B] BROWN TO ORANGISH BROWN VERY CLAYEY FINE SAND TO SANDY FAT CLAY (SC TO CH; A-7)
- [3] ORANGISH BROWN, TAN & GRAY CLAYEY TO VERY CLAYEY FINE SAND (SC; A-2-6 TO A-6)
- [4] TAN TO ORANGISH BROWN SLIGHTLY CLAYEY, SILTY MEDIUM TO FINE SAND (SM; A-2-4)

FIGURE KEY

B	APPROXIMATE TEST BORING LOCATION
EOB	END OF BORING
GNE	GROUNDWATER NOT ENCOUNTERED ON DATE DRILLED
N	STANDARD PENETRATION RESISTANCE (BLOWS PER FOOT) (ASTM D-1586)
C	DYNAMIC CONE PENETRATION RESISTANCE OF SOILS (ASTM STP #399)
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
-200	PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)
LL	LIQUID LIMIT (ASTM D-4318)
PI	PLASTICITY INDEX (ASTM D-4318)
SP-SM,SM,SC	UNIFIED SOIL CLASSIFICATION SYSTEM
A-3,A-2-4	AASHTO SOIL CLASSIFICATION SYSTEM
DRILLERS:	JDA & JK

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
MEDIUM STIFF	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR. ABSENCE OF WATER SURFACE DATA ON CERTAIN BORINGS IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE, BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THESE LOCATIONS OR WITHIN THE VERTICAL REACHES OF THESE BORINGS IN THE FUTURE.

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APPENDIX

Standard Penetration Test and DCP Procedures

STANDARD PENETRATION TEST

The standard penetration test is a widely accepted test method of *in situ* testing of soils (ASTM D 1586), and Ardaman & Associates generally follows this test method. A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 or 24 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties.

The tests are usually performed at 5-foot intervals. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid.

Representative split-spoon samples from the soils are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary.

HAND AUGER BORINGS

Auger borings are used when continuous sampling of soil strata close to ground surface is desired. A 3-inch diameter, hand-held bucket auger with a cutting head at its end is rotated into the ground in 1-foot sections. The sample is recovered by withdrawing the auger out of the ground without rotating it. The soil sample so obtained, is classified and representative samples put in bags or jars and brought back to the laboratory for further evaluation and testing, if necessary.

Excerpts from ASTM Special Technical Publication #399

Dynamic Cone For Shallow In-Situ Penetration Testing1

Penetration tests have been used to evaluate soil consistency and density. The relationship between soil strength and penetration resistance is a function of the shear pattern. This can be determined by a plastic analysis of the shear zone or by empirical correlation with laboratory tests.

Dr. George F. Sowers developed a lightweight portable dynamic cone penetrometer in 1959 to be used in field exploration and for verifying individual footing foundations during construction. The device is a dynamic portable cone penetrometer utilizing a 15-pound steel ring weight falling 20 inches on an E-rod slide drive (Figure 1). The cone point is enlarged to minimize shaft resistance during testing. The penetration test is made through an augured hole using the auger cuttings to identify the soil. This is essential because the interpretation varies with the soil type.

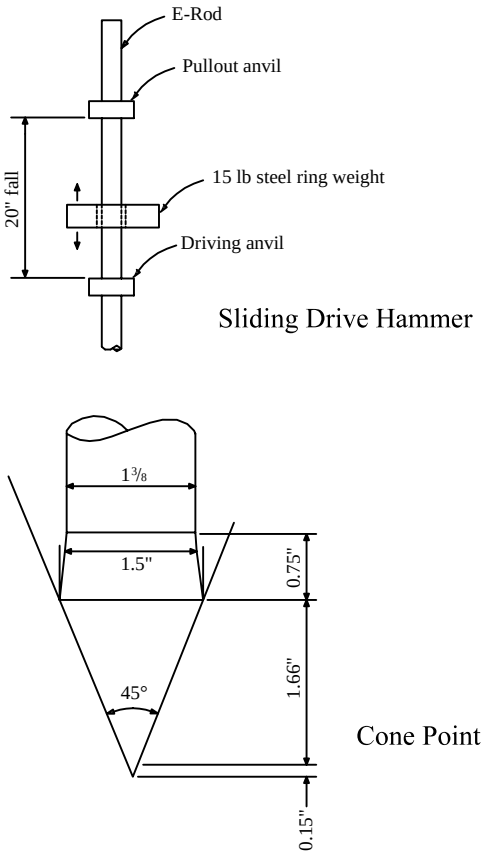

FIG. 1- Dynamic portable penetrometer.

After auguring to the test depth, the cone point is seated 2 inches into the undisturbed bottom of the hole to be sure the cone is completely embedded. The cone point is further driven 1¾ inch using the 15 pound ring weight hammer falling 20 inches. These blows are counted and recorded. If need be, a second and third penetration test can be made by driving the cone point additional 1¾ inch increments. Beyond this distance the effect of side friction of the shaft may become apparent, and the shape of the shear zone may be altered and jeopardize the value of the blow count readings.

The penetrometer can effectively be used in auger holes to depths of 15 to 20 feet. Beyond this it is difficult to handle the weight of rods by hand, and also it is possible the penetration blow resistance could be affected by the dynamic energy loss in overcoming the inertia.

The soils in which the penetrometer has been most reliably calibrated with reference to ASTM Method D1586 resistances are the sandy micaceous silts and clayey sandy micaceous silts of the Piedmont geologic province; the silty sands, clayey sands, and Interbedded and Intermixed sandy, silty clayey soils of the Coastal Plain province; and the silty clays and clayey silts and sandy clays of the Appalachian Valley province. It has also been calibrated for compacted fills made of the above soils.

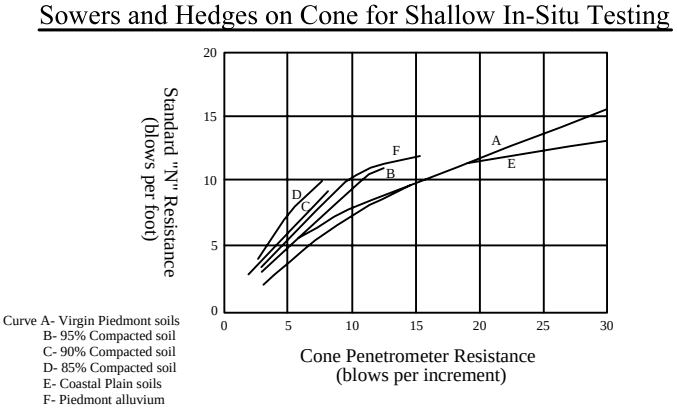

FIG. 2- Penetration relationships

1- This is not the complete document as published by ASTM. Some modifications and deletions have been made to summarize the procedure used by Ardaman & Associates, Inc.