

**ADDENDUM NUMBER: 3**

**UNC CHARLOTTE  
ELM, MAPLE AND PINE RESIDENCE HALLS RENOVATIONS  
SCO#120994003 - Code: 41226 - Item 307  
PROJECT NUMBER 3523-00  
January 29, 2016**

**NOTICE TO CONTRACTORS**

This Addendum issued prior to receipt of Bid shall and does hereby become a part of the Construction Documents for the above project.

All principal Contractors shall be responsible for seeing that their Subcontractors are properly apprised of the contents of this Addendum.

All information contained in this Addendum shall supersede and shall take precedence over any conflicting information in the original Bidding Documents dated 12/18/15 and all previous Addendum.

All Contractors shall acknowledge receipt of this Addendum in the space provided in the Proposal Form. Failure to do so may subject Bidder to disqualification.

**A. CHANGES TO PRIOR ADDENDA**

No changes

**B. CHANGES TO BIDDING REQUIREMENTS**

No changes.

**C. CHANGES TO CONDITIONS OF THE CONTRACT**

No changes.

**D. CHANGES TO SPECIFICATIONS**

**SECTION - 10 11 01 VISUAL DISPLAY BOARDS**

- a. Delete this section in its entirety.

**SECTION - 12 93 00 SITE FURNISHINGS**

- a, Add to Spec in its entirety. Listed on Table of Contents, but omitted in original Spec.

**SECTION - 22 10 05 PLUMBING PIPING**

- a. Section reissued in its entirety.

**SECTION - 22 11 13 FACILITY WATER DISTRIBUTION PIPING**

- a. Section reissued in its entirety.

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**SECTION - 32 14 00 UNIT PAVING**

- a. Section reissued in its entirety.

**E. CHANGES TO DRAWINGS**

**SHEET - A140 ENLARGED FLOOR PLANS**

- a. Sheet reissued dated 1/29/16.

**SHEET - A142 ENLARGED FLOOR PLANS - MAPLE HALL**

- a. Sheet reissued dated 1/29/16.

**SHEET - A301 INTERIOR AND CUSTOM CABINET ELEVATIONS**

- a. Sheet reissued dated 1/29/16.

**SHEET - C900 SITE DETAILS**

- a. Sheet reissued dated 1/29/16.

**SHEET - M100 SITE PLAN MECHANICAL NEW WORK**

- a. Sheet reissued dated 1/29/16.

**SHEET - P100 SITE PLAN PLUMBING NEW YORK**

- a. Sheet reissued dated 1/29/16.

**F. CLARIFICATIONS**

1. The elevator door smoke containment system is shown in detail 1/A533 and 1/A532. 6 elevator doors have this item according to what is shown. They are all in the Maple building. Is this correct? There are 4 additional elevator doors in Maple and all the elevator doors in Pine and Elm that do not show the containment system. I have not been able to find this item shown on any other plan sheets. Please confirm that the 6 shown are all that are required. **Response: Addressed in Addenda 2.**
2. Detail 3/A140 shows closet E104C with what appears to be a rod and shelf unit. We have no elevation, details or spec information on this item. Please provide a detail or at least a description of what this shelf is made of and what the finish is. **Response: Standard Bedroom closet rods shall be a 1-1/2" dia. wooden rod with standard end support brackets. Rod to have clear stain finish. The closet shelf shall be a 3/4" melamine wood shelf. Laminate selection to match P-Lam 5. See "Keynote 32" on 15/A140 on revised drawing.**
3. We need some guidance concerning wood blocking in existing walls. When we install the new wall hung kitchen cabinets or the new toilet accessories are we expected to chase through the existing drywall to install wood support blocking or is the blocking already there? Obviously these existing items are currently being supported by the walls that are there. Will what is there now be sufficient. **Response: General Contractor shall verify the condition and location of wood blocking in existing walls. If existing wood blocking is determined to not be adequate or in the proper location for the installation of new wall hung kitchen cabinets or toilet accessories or similar items within the scope of work, new fire-retardant wood blocking shall be installed by the General Contractor.**

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4. Section 10 11 01 covers markerboards and tackboards. I have not been able to locate them on the floor plans. Can you shed some light as to which drawing(s) they are shown? **Response: There are no marker-boards or tack-boards included in the scope of work. This section of the specifications shall be removed from the project manual.**
5. Spec section 321400 Unit Paving: 1.1C references Alternate #6. Alternate #6 per the alternates spec does not involve pavers. Alternate #7 is the only applicable unit paver alternate. No unit paver price will be submitted for Alternate #6. **Response: Section 321400 has been revised and included with this addendum. Alternate #6 has been deleted from the Section.**
6. Spec section 321400 Unit Paving: 1.2B1 references plaza deck pavers. No plaza deck pavers have been located on drawings. Advise as to location, if any. **Response: Section 321400 has been revised and included with this addendum. Paragraph 1.2.B1 has been deleted.**
7. Spec section 321400 Unit Paving: 1.3D 4&5 precast concrete curbs & granite for stone curbs are included. Neither of these items have been located on drawings. Advise as to location, if any. **Response: Section 321400 has been revised and included with this addendum. Paragraphs 1.3.D 4&5 have been deleted.**
8. Spec section 321400 Unit Paving: 2.1A...noted paver color is rose. All details on C900 call for red (border) and flashed red (field). Please clarify the correct paver color(s). **Response: Section 321400 has been revised and included with this addendum. Red is the specified color.**
9. Details 10-12/C900 all state different minimum depths for gravel base. Please clarify the correct minimum depths of gravel base for both pedestrian & vehicular paver applications. **Response: Detail 10/C900 specifies the depths for pedestrian pavers. Detail 11/C900 specifies the depths for vehicular pavers. Detail 12/C900 shows the relationship of concrete curb edge and paver section. The depth shown on Detail 12/C900 has been changed to 8 inches to match details 10 and 11. The revised sheet C900 is included with this addendum.**
10. C300 – 303: keyed note #3 calls for heavy duty brick pavers at driveway. Site legend for C300 – 303 calls for precast concrete pavers. Unit Paving spec does not reference a product for vehicular pavers. Please clarify the correct product for vehicular pavers at driveways. **Response: Refer to the revised Section 321400 paragraph 2.1.B for vehicular paver specifications.**
11. Engineered Control Solutions, Inc. (ECS) respectfully asks to be added as an Acceptable Controls System Installer for the above referenced project. After a thorough examination of specification section 230900 Controls for HVAC, no exceptions are taken. **Response: ECS is approved as an acceptable controls installer (see attached).**

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12. Since we are providing tracer boxes can we have a spec on the boxes? **Response: University does not have a specification for terminal boxes, but has expressed a preference for the following system: [http://www.copperheadwire.com/product\\_snakepit.html](http://www.copperheadwire.com/product_snakepit.html). Please base bid on this system or equal.**
13. Does the aquatherm pipe needs to be insulated and what type and thickness? **Response: Insulation is a pour in fill that will included with the Aquatherm piping system. The piping will not require addition, separate insulation.**
14. On Sheets A140 and A141 Note 21 refers to solid surface material being applied to the shower. There is no place on the plans that indicates what this note is for. **Response: See revised Detail 3/A140 with the “Keynote 21” identified for the location of the 1/2” solid surface panel.**
15. We have a pipe layout for drawing M-100 that the scale is not correct. We have a pipe layout drawing C-601 with the correct scale but is different than M-100. What drawing do we use? **Response: Overall plan is confirmed to be to 1”=20’ scale and vault detail which was not drawn to scale and noted thus has been modified to 1/2”=1’ scale as part of Addendum 1, 2016-01-15. In the case of any discrepancy, civil drawings take precedent for pipe routing.**
16. On demolition drawings A085, all details indicate ceiling removal except for detail 3 Resident Counselor Unit. Is this correct or an oversight? **Response: Extent of existing ceiling removal per Detail 3/A085 is correct.**
17. I have not been able to find any model numbers that are the basis for design for the appliances for this project. Section 11 31 00 mentions provide Frigidaire product indicated or comparable but no model numbers. **Response: See “Keynotes 08, 09, 10, 11, 12, & 13” with regards to manufacturer model numbers for new appliances.**
18. On plan sheet A084 demolition item #29 talks about the owner's input concerning salvaging the roof top mechanical equipment. We need to know the scope of the salvaging prior to bidding this project. Is all the equipment to be salvaged and turned over to the owner? This impacts how we remove this equipment and the type of lifting equipment needed to set the items off the roof. Also, are there any particular items that gets removed from the buildings that we are to salvage and turn over to the owner? **Response: All rooftop equipment, whether fully-installed or stored and in addition to the “jobbox”, are to be removed from the roof and set on the ground by the General Contractor. Owner shall retain 25% of equipment with the remainder to be disposed of by General Contractor. General Contractor to reclaim all refrigerant from equipment prior to equipment disposal and shall dispose of all refrigerant in accordance with EPA guidelines.**

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19. Drawing A301 Detail 15 says (180) Mailslots: 60 Units High x 18 Units Wide which totals 1,080 mails boxes. Specification section 10 55 00.13 # 2.01 Item 1 gives a National Mailbox model number H150035RL as the basis of design. This model number is 7 Units High x 5 Units Wide for a total of 35 mailboxes each. **Response: See reissued sheet A301.**
20. By our count there are 251 mailboxes needed to have one for each tenant bedroom. Is it your intent to have 180 mailboxes or do you want one mailbox per tenant bedroom? **Response: The intent is to have a total of 140 mailboxes.**
21. The table of contents in volume 1 of the specifications has a section, 12 96 00, for site furnishings. This section is not included in the manual that J.M. Thompson has. Is it applicable to this project? If so, please furnish it. **Response: Section 12 93 00 has been Included in Addenda 3.**
22. Spec. section 105500.13 calls for mailboxes to meet current 4C standards. The elevation showing the mailboxes do not meet any current standards. The elevation shows an old style mailbox that would be used for private delivery. Does the University have prior approval from the postmaster to use this type of mailbox? 4C mailboxes would take up considerably more room than what is shown. There would have to be 1 parcel locker and 1 outgoing locker for every 10 tenants. Please respond to these question that I received from a mailbox supplier.  
**Response: The University is considered to be private in terms of mail delivery. Larger packages are handled through Central Receiving for student pick-up. Mailboxes shall be provided with combination locks as specified.**

**ENCLOSURES:**

**SPECIFICATION SECTIONS**

12 93 00	SITE FURNISHINGS
22 10 05	PLUMBING PIPING
22 11 13	FACILITY WATER DISTRIBUTION PIPING
32 14 00	UNIT PAVING

**SHEETS**

<b>CIVIL</b>	<b>ARCH</b>	<b>PLUMB</b>	<b>MECH</b>
C900	A140 A142 A301	P100	M100

End of Addendum

## SECTION 129300 - SITE FURNISHINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Bench.
  - 2. Cluster Seating.
  - 3. Hanging Bench.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for in concrete footings.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For units with factory-applied color finishes.
- C. Material Certificates: For site furnishings, signed by manufacturers.
- D. Maintenance Data: For site furnishings to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
  - 1. Rolled or Cold-Finished Bars, Rods, and Wire: **ASTM B 211** (ASTM B 211M).
  - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: **ASTM B 221** (ASTM B 221M).
  - 3. Structural Pipe and Tube: ASTM B 429.

4. Sheet and Plate: **ASTM B 209** (ASTM B 209M).
5. Castings: ASTM B 26/B 26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
7. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
8. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

C. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant.

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on-grade substrate; one per leg.
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit.

D. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.

E. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

## 2.2 BENCHES

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

1. Maglin Site Furniture Inc., 27 Bysham Park Drive, Woodstock, Ontario N4T 1P1 Canada. Toll Free: (800) 716.5506. Phone: (519) 539.6776. Fax: (877) 260.9393. Website: [www.maglin.com](http://www.maglin.com). E-mail: [sales@maglin.com](mailto:sales@maglin.com).

B. Basis-of-Design Product: Subject to compliance with requirements, provide **Maglin MLB300-MH Metal Horizontal Bench** or a comparable product by one of the following:

1. Forms+Surfaces.
2. Landscape Forms.
3. Webcoat Products

- C. Frame: Cast aluminum (95% recycled material).
- D. Seat and Back:
  - 1. Material:
    - a. Flat bar straps and H.S. steel tube.
  - 2. Seat Height: 17.25".
  - 3. Seat Surface Shape: Contoured or dished.
  - 4. Overall Height: 31".
  - 5. Overall Width: 70".
  - 6. Overall Depth: 23".
  - 7. Arms: Two, one at each end.
    - a. Arm Material: Cast aluminum (95% recycled material).
  - 8. Weight: 160 lbs.
  - 9. Seating Configuration: Multiple units as indicated.
    - a. Straight shape.
- E. Finish: Powder-coated.
  - 1. All steel components are protected with automotive-grade electrocoating.
  - 2. Provide standard manufacturers color samples for selection.
- F. Mounting:
  - 1. Surface Mount

### 2.3 CLUSTER SEATING - Standard (4 seats) & Wheelchair Accessible (3 seats)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Maglin Site Furniture Inc., 27 Bysham Park Drive, Woodstock, Ontario N4T 1P1 Canada. Toll Free: (800) 716.5506. Phone: (519) 539.6776. Fax: (877) 260.9393. Website: [www.maglin.com](http://www.maglin.com). E-mail: [sales@maglin.com](mailto:sales@maglin.com).
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **Maglin MLPT1100-M Cluster Seating** or a comparable product by one of the following:
  - 1. Forms+Surfaces.
  - 2. Landscape Forms.
  - 3. Webcoat Products
- C. Frame: Steel.
- D. Seat and Back:
  - 1. Material:
    - a. Steel: Evenly spaced, parallel flat straps or bars.
  - 2. Table Height: 29.50" (74.9 cm)
  - 3. Total Length: 70.00" (177.8 cm)



4. Table Width: 36.00" (91.4 cm)
5. Arms: None
6. Seating Configuration: Multiple units:
  - a. 6 Standard with 4 seats
  - b. 2 Wheelchair Accessible with 3 seats, locations as indicated on plan

- E. Table Top:
1. Steel panels lasarcut.
  2. Stainless Steel Fasteners.

- F. Finish:
1. All steel components are protected with automotive-grade electrocoating.
  2. Provide standard manufacturers color samples for selection.

- G. Mounting:
1. Surface Mount

## 2.4 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## 2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 ALUMINUM FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

## 2.7 STEEL AND GALVANIZED STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and **3/4 inch (19 mm)** larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

**END OF SECTION 129300**

## **SECTION 22 10 05**

### **PLUMBING PIPING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Gas.

##### **1.02 RELATED SECTIONS**

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels.
- C. Section 09 90 00 - Painting and Coating.
- D. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.
- E. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- F. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- G. Section 22 07 19 - Plumbing Piping Insulation.
- H. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.
- I. Section 31 23 16 - Excavation.
- J. Section 31 23 23 - Fill.
- K. Section 31 23 16.13 - Trenching.
- L. Section 33 13 00 - Disinfecting of Water Utility Distribution.
- M. Section 08 31 00 - Access Doors and Panels.
- N. Section 09 90 00 - Painting and Coating.

##### **1.03 REFERENCES**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers.
- C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.
- D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- G. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers.

- H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers.
- I. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers.
- J. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.1).
- K. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers.
- L. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).
- M. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers.
- N. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- O. ASTM A 47/A 47M - Standard Specification for Ferritic Malleable Iron Castings.
- P. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- Q. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- R. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- S. ASTM B 32 - Standard Specification for Solder Metal.
- T. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
- U. ASTM B 43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
- V. ASTM B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed.
- W. ASTM B 68M - Standard Specification for Seamless Copper Tube, Bright Annealed (Metric).
- X. ASTM B 75 - Standard Specification for Seamless Copper Tube.
- Y. ASTM B 75M - Standard Specification for Seamless Copper Tube (Metric).
- Z. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- AA. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).
- AB. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- AC. ASTM B 302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.
- AD. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV).
- AE. ASTM C 4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile.
- AF. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
- AG. ASTM C 14M - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
- AH. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

- AI. ASTM C 76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric).
- AJ. ASTM C 425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
- AK. ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- AL. ASTM C 443M - Standard Specification for Joints for Circular Concrete Culvert and Sewer Pipe, Using Rubber Gaskets (Metric).
- AM. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AN. ASTM C 700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- AO. ASTM C 1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.
- AP. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- AQ. ASTM D 2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- AR. ASTM D 2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- AS. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- AT. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
- AU. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- AV. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- AW. ASTM D 2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
- AX. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- AY. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AZ. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
- BA. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- BB. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- BC. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- BD. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- BE. ASTM F 1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.

- BF. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- BG. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association (ANSI/AWWA C105/A21.5).
- BH. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association.
- BI. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association (ANSI/AWWA C111/A21.11).
- BJ. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association (ANSI/AWWA C151/A21.51).
- BK. AWWA C651 - Disinfecting Water Mains; American Water Works Association (ANSI/AWWA C651).
- BL. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution; American Water Works Association (ANSI/AWWA C900).
- BM. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; American Water Works Association.
- BN. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute.
- BO. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute.
- BP. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BQ. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BR. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BS. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BT. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BU. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BV. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BW. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BX. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BY. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

BZ. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.

CA. NFPA 58 - Liquefied Petroleum Gas Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves and all piping and associated items.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with State and all local codes pertaining to location of construction and work site.
  - 1. Maintain one copy on project site.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- D. Welders Certification: In accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, material classification, specification, potable water certification, water pressure rating.

#### **1.06 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with State and local plumbing codes.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install underground piping when bedding is wet or frozen.

#### **1.09 EXTRA MATERIALS**

- A. See Section 01 60 00 - Project Requirements, for additional provisions.
- B. Provide two repacking kits for each size valve.



## **PART 2 PRODUCTS**

### **2.01 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A 74 hub and spigot service weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.

### **2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A 74 hub and spigot extra heavy; or service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets or lead and oakum.

### **2.03 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Couplings:
  - 1. No hub couplings shall have a shield constructed of type 304 stainless steel with minimum shield thickness of 0.016 inches - 28 gauge. Bolts shall be a minimum of 3/8 inch diameter with hex heads to accept 3/8 inch. Corrugated shield couplings 1-1/2 inch - 4 inches shall have four (4) bands and 6-10 inch shall have six (6) bands, torqued to minimum of 80 inch pounds.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
- C. Steel Pipe: ASTM A 53/A 53M Schedule 40, galvanized.
  - 1. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, threaded fittings.
  - 2. Malleable Iron Fittings: ASME B16.3, screwed type.
  - 3. Malleable Iron Fittings: ASTM A 47/A 47M.
  - 4. Mechanical Grooved Couplings: Malleable iron, galvanized.

### **2.04 BRANCH WASTE AND VENTS 2 INCHES (50 MM) AND SMALLER**

- A. Cast Iron Pipe: ASTM A74, service weight cast iron pipe and fittings.
  - 1. Fittings: Cast iron.
  - 2. Joints: ASTM C 564, neoprene gasket system or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless cast iron pipe and fittings.
  - 1. Fittings: Cast iron.
  - 2. Couplings: No hub couplings shall have a shield constructed of type 304 stainless steel with minimum sheild thickness of 0.016 inches - 28 gauge. Bolts shall be a minimum of 3/8 inch diameter with hex heads to accept 3/8 inch. Corrugated shield couplings 1-1/2 inch - 4 inches shall have four (4) bands and 6-
- C. Steel Pipe: ASTM A53 Schedule 40, galvanized.
  - 1. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, screwed fittings.
  - 2. Malleable Iron Fittings: ASE B16.3, screwed type. ASTM A47.

### **2.05 DELETED**

### **2.06 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Copper Pipe: ASTM B 42, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints:
    - a. 1" and Smaller: ASTM B 32, alloy Sn95 solder.
    - b. 1-1/4" and Larger: AWS A5.8, BCuP silver braze.

## 2.07 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L , Hard Drawn (H).
  - 1. Joints:
    - a. 1" and Smaller: ASTM B 32, alloy Sn95 solder.
    - b. 1-1/4" and Larger: AWS A5-8, BCuP silver braze.

## 2.08 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 2 Inches and Under:
  - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
  - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 2 Inches:
  - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
  - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
  - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.09 PIPE HANGERS AND SUPPORTS

- A. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Conform to ASME B31.9.
  - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 7. Vertical Support: Steel riser clamp.
  - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
  - 10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded. Hanger rod diameters shall be based on MSS SP69, Table 4.
- B. Plumbing Piping - Water:
  - 1. Conform to ASME B31.9.
  - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
  - 5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
  - 6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
  - 7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
  - 8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

## 2.10 GATE VALVES

- A. Manufacturers:
  1. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  3. Substitutions: As specified on drawings.
- B. Up To and Including 3 Inches:
  1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, **solder** ends.
- C. 2 Inches and Larger:
  1. MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## 2.11 GLOBE VALVES

- A. Manufacturers:
  1. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  3. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  4. Substitutions: As specified on drawings.
- B. Up To and Including 3 Inches:
  1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, teflon disc, solder ends.
- C. 4 inches and Larger:
  1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## 2.12 BALL VALVES

- A. Manufacturers:
  1. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  3. Substitutions: As specified on drawings.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 600 psi CWP, bronze, two piece body, chrome plated solid brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops. Provide with stem extension. Provide Conbraco 776-100 series.

## 2.13 PLUG VALVES

- A. Manufacturers:
  - 1. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  - 2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  - 3. Substitutions: As specified on drawings.
- C. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

## **2.14 BUTTERFLY VALVES**

- A. Manufacturers:
  - 1. Hammond Valve: [www.hammondvalve.com](http://www.hammondvalve.com).
  - 2. Crane Valve: [www.cranevalve.com](http://www.cranevalve.com).
  - 3. Substitutions: As specified on drawings.
- B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, aluminum bronze disc, resilient replaceable EPDM seat, grooved ends, extended neck, infinite position lever handle with memory stop.
- C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

## **2.15 FLOW CONTROLS**

- A. Manufacturers:
  - 1. Griswold Controls: [www.griswoldcontrols.com](http://www.griswoldcontrols.com).
  - 2. Substitutions: As specified on drawings.
- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet, blowdown/backflush drain.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## **2.16 SWING CHECK VALVES**

- A. Manufacturers:
  - 1. Hammond Valve: [www.hammondvalve.com](http://www.hammondvalve.com).
  - 2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  - 3. Substitutions: As specified on drawings.
- B. Up to 3 Inches:
  - 1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, threaded ends.
- C. Over 3 Inches:
  - 1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

## **2.17 SPRING LOADED CHECK VALVES**

- A. Manufacturers:
  - 1. Hammond Valve: [www.hammondvalve.com](http://www.hammondvalve.com).
  - 2. Crane Valve: [www.cranevalve.com](http://www.cranevalve.com).
- B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

## **2.18 WATER PRESSURE REDUCING VALVES**

- A. Manufacturers:
  - 1. Amtrol Inc: [www.amtrol.com](http://www.amtrol.com).
  - 2. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
  - 3. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 4. Substitutions: As specified on drawings.
- C. Up to 2 Inches:
  - 1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- D. Over 2 Inches:
  - 1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

## 2.19 RELIEF VALVES

- A. Pressure Relief:
  - 1. Manufacturers:
    - a. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
    - b. Henry Technologies: [www.henrytech.com](http://www.henrytech.com).
    - c. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
    - d. Substitutions: As specified on drawings.
  - 2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure Relief:
  - 1. Manufacturers:
    - a. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
    - b. Henry Technologies: [www.henrytech.com](http://www.henrytech.com).
    - c. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
    - d. Substitutions: As specified on drawings.
  - 2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

## 2.20 STRAINERS

- A. Manufacturers:
  - 1. Armstrong International, Inc: [www.armstrong-intl.com](http://www.armstrong-intl.com).
  - 2. Green Country Filtration: [greencountryfiltration.com](http://greencountryfiltration.com).
  - 3. WEAMCO: [www.weamco.com](http://www.weamco.com).
  - 4. Substitutions: As specified on drawings.
- B. Size 2 inch and Under:
  - 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  - 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 2-1/2 inch to 4 inch:
  - 1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.
- D. Size 5 inch and Larger:
  - 1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.
- I. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Section 07 53 00.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- N. Excavate in accordance with Section 31 23 16.
- O. Backfill in accordance with Section 31 23 23.
- P. Install bell and spigot pipe with bell end upstream.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- S. Install water piping to ASME B31.9.
- T. Install fuel oil piping to ASME B31.9.
- U. Sleeve pipes passing through partitions, walls and floors.

- V. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
1. Provide inserts for placement in concrete formwork.
  2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- W. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
  2. Support horizontal piping as scheduled.
  3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  4. Place hangers within 12 inches of each horizontal elbow.
  5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
  7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  8. Provide copper plated hangers and supports for copper piping.
  9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 05 48.
  11. Support cast iron drainage piping at every joint.
  12. Install in accordance with International Plumbing Code. The most restrictive requirements shall govern.

### 3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install ball valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide plug valves in gas systems for shut-off service.
- I. Provide flow controls in water recirculating systems where indicated.

### 3.05 ERECTION TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM.

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### 3.07 SCHEDULES

- A. Pipe Hanger Spacing: Install per International Plumbing Code. The most restrictive requirements shall govern.
  - 1. Metal Piping:
    - a. Pipe size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum hanger spacing: 6.5 ft.
      - 2) Hanger rod diameter: 3/8 inches.
    - b. Pipe size: 1-1/2 inches to 2 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 3/8 inch.
    - c. Pipe size: 2-1/2 inches to 3 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 1/2 inch.
    - d. Pipe size: 4 inches to 6 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 5/8 inch.
    - e. Pipe size: 8 inches to 12 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 7/8 inch.
    - f. Pipe size: 14 inches and Over:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 1 inch.

**END OF SECTION**



## **SECTION 22 11 13**

### **FACILITY WATER DISTRIBUTION PIPING**

#### **PART 1 - GENERAL**

##### **1.01 RELATED DOCUMENTS**

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

##### **1.02 SUMMARY**

- A. This Section includes water-distribution piping and related components outside the building for water service and fire-service mains.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

##### **1.03 DEFINITIONS**

- A. EPDM: Ethylene propylene diene terpolymer rubber.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
- H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

##### **1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
  - 1. Wiring Diagrams: Power, signal, and control wiring for alarms.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

##### **1.05 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  - 1. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
  - 2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA

70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- G. NSF Compliance:
  - 1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.
- H. Fusion Welding: Certify training per Manufacturer's standards for each installer.
- I. Manufacture of PP-R pipe must also manufacture same PP-R resin.
- J. Special Engineered PP-R products shall be certified by NSF International as complying with NSF 14.
- K. Provider of PP-R material shall have an Aquatherm certified master trainer on staff and have at least 8 years of experience in the US with this.
- L. Supplier of PP-R material shall have at least 8 years of experience in the US with job names and reference of same ages or greater.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  - 1. Ensure that valves are dry and internally protected against rust and corrosion.
  - 2. Protect valves against damage to threaded ends and flange faces.
  - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

#### **1.07 PROJECT CONDITIONS**

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  - 1. Notify General Contractor no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of water-distribution service without General Contractor's and Owner's written permission.
- B. Verify existing utility locations. Contact utility-locating service for area where Project is located.
- C. Verify that water system piping may be installed in compliance with original design and referenced standards.
- D. Site Information: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

#### **1.08 COORDINATION**

- A. Coordinate connection to water main with utility company.

### **PART 2 - PRODUCTS**

#### **2.01 COPPER TUBE AND FITTINGS**

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
  1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
  2. Copper, Pressure-Seal Fittings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Elkhart Products Corporation; APOLLOXPRESS.
      - 2) NIBCO INC.
      - 3) Viega; Plumbing & Heating Systems.
    - b. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
    - c. NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

#### **2.02 POLYPROPYLENE (PP-R) PIPE AND FITTINGS**

- A. Pipe and Piping Products.
  1. Pipe shall be manufactured from a PP-R resin (Fusiolen) meeting the short-term properties and long-term strength requirements of ASTM F 2389. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in an extrusion process. Domestic hot water shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
  2. Pipe shall be Aquatherm® Green Pipe®, or Green Pipe® MF (Faser®), available from Aquatherm, NA. Piping specifications and ordering information are available at [www.aquatherm.com](http://www.aquatherm.com).
- B. Fittings.
  1. Fittings shall be manufactured from a PP-R resin (Fusiolen) meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
  2. Fittings shall be aquatherm® Green pipe® available from Aquatherm, NA. Fittings specifications and ordering information are available at [www.aquatherm.com](http://www.aquatherm.com).

- C. Polypropylene Fittings: socket fusion, butt fusion, electrofusion, or fusion outlet fittings shall be used for fusion weld joints between pipe and fittings.
- D. Mechanical fittings and transition fittings shall be used where transitions are made to other piping materials or to valves and appurtenances.
- E. Polypropylene pipe shall not be threaded. Threaded transition fittings per ASTM F 2389 shall be used where a threaded connection is required.
- F. 1. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.
- G. Plastic-to-Metal Transition Fittings shall be PP-R one-piece fitting with threaded stainless steel, brass, or copper insert and one PP-R fusion weld joint end.

### **2.03 GATE VALVES**

- A. AWWA, Cast-Iron Gate Valves:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Co.; American Flow Control Div.
    - b. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
    - c. East Jordan Iron Works, Inc.
    - d. Mueller Co.; Water Products Div. e. U.S. Pipe and Foundry Company.
  - 3. Nonrising-Stem, Resilient-Seated Gate Valves:
    - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile- iron gate, resilient seats, bronze stem, and stem nut.
      - 1) Standard: AWWA C509.
      - 2) Minimum Pressure Rating: 200 psig (1380 kPa).
      - 3) End Connections: Mechanical joint.
      - 4) Interior Coating: Complying with AWWA C550.

### **2.04 GATE VALVE ACCESSORIES AND SPECIALTIES**

- A. Tapping-Sleeve Assemblies:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
    - b. East Jordan Iron Works, Inc.
    - c. Mueller Co.; Water Products Div.
    - d. U.S. Pipe and Foundry Company.
  - 3. Description: Sleeve and valve compatible with drilling machine.
    - a. Standard: MSS SP-60.
    - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
    - c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125

mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

- C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

## 2.05 CHECK VALVES

### A. AWWA Check Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American AVK Co.; Valves & Fittings Div.
  - b. American Cast Iron Pipe Co.; American Flow Control Div.
  - c. Mueller Co.; Water Products Div.
  - d. Watts Water Technologies, Inc.
3. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
  - a. Standard: AWWA C508.
  - b. Pressure Rating: 175 psig (1207 kPa).

## 2.06 DETECTOR CHECK VALVES

### A. Detector Check Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ames Fire & Waterworks; a division of Watts Regulator Co. b. Badger Meter, Inc.
  - c. FEBCO; SPX Valves & Controls. d. Mueller Co.; Hersey Meters.
3. Description: Galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.
  - a. Standards: UL 312 and FMG approved.
  - b. Pressure Rating: 175 psig (1207 kPa).
  - c. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.
4. Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.
  - a. Standards: UL 312 and FMG approved.
  - b. Pressure Rating: 175 psig (1207 kPa).
  - c. Pressure Rating: 150 psig (1035 kPa).

## 2.07 CORPORATION VALVES AND CURB VALVES

### A. Manufacturers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

- a. Amcast Industrial Corporation; Lee Brass Co.
  - b. Ford Meter Box Company, Inc. (The); Pipe Products Div.
  - c. Jones, James Company.
  - d. Master Meter, Inc.
  - e. McDonald, A. Y. Mfg. Co.
  - f. Mueller Co.; Water Products Div.
- B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
  2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
  3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches (75 mm) in diameter.
1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

## **2.08 WATER METERS**

- A. Meters shall be approved for interface to the Building Automation System (BAS) for real time monitoring and trending.
- B. Potable Domestic Water metering shall be by turbine or nutating disk meter with magnetic drive. Meter to be located in mechanical room, easily accessible, read in cubic feet, and provide output to building automation. Verify adequate turn down ration is provided with the meter for measurement at low flow.
- C. Non-sewered water (consumed but not returned to the sewer, e.g. irrigation, cooling tower makeup, etc.) should be metered at its source. Meter should be located in mechanical room, easily accessible, read in cubic feet and provide output to building automation. Meters and transmitters must conform to Charlotte Mecklenburg Utilities (CMU) Standards for providing sewer credits.

## **2.09 BACKFLOW PREVENTERS**

- A. Reduced-Pressure-Principle Backflow Preventers:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ames Fire & Waterworks; a division of Watts Regulator Co.
    - b. Conbraco Industries, Inc.
    - c. FEBCO; SPX Valves & Controls.
    - d. Flomatic Corporation.
    - e. Watts Water Technologies, Inc.
  3. Standard: AWWA C511.
  4. Operation: Continuous-pressure applications.

5. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
  6. Size: See plans.
  7. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
  8. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
  9. Configuration: Designed for horizontal flow.
  10. Accessories:
    - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
    - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
- B. Reduced-Pressure-Detector, Fire-Protection Backflow Preventer Assemblies:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ames Fire & Waterworks; a division of Watts Regulator Co.
    - b. Conbraco Industries, Inc.
    - c. FEBCO; SPX Valves & Controls.
    - d. Watts Water Technologies, Inc.
  3. Standards: ASSE 1047 and UL listed or FMG approved.
  4. Operation: Continuous-pressure applications.
  5. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
  6. Size: See plans.
  7. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved.
  8. End Connections: Flanged.
  9. Configuration: Designed for horizontal flow.
  10. Accessories:
    - a. Valves: UL 262, FMG-approved, OS&Y gate type with flanged ends on inlet and outlet.
    - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
    - c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- C. Backflow Preventer Test Kits:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. FEBCO; SPX Valves & Controls.
    - c. Flomatic Corporation.
    - d. Watts Water Technologies, Inc.
  3. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

## 2.10 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
  2. Manhole: ASTM A 48/A 48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.
    - a. Dimension: 24-inch (610-mm) minimum diameter, unless otherwise indicated.

3. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
  - a. Dimension: 24-inch- (610-mm-) minimum diameter, unless otherwise indicated.
4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

## 2.11 PROTECTIVE ENCLOSURES

### A. Freeze-Protection Enclosures:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Aqua Shield.
  - b. BF Products, Inc.
  - c. DekoRRa Products.
  - d. Dunco Manufacturing, Inc.
  - e. G&C Enclosures.
  - f. Hot Box, Inc.
  - g. HydroCowl, Inc.
  - h. Watts Water Technologies, Inc.
3. Description: Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F (4 deg C) when external temperatures reach as low as minus 34 deg F (minus 36 deg C).
  - a. Standard: ASSE 1060.
  - b. Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.
  - c. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing. Retain subparagraphs and associated subparagraphs below with either "Class" Subparagraph retained above. Edit to suit Project.
    - 1) Housing: Reinforced-fiberglass construction.
      - a) Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
      - b) Drain opening for units with drain connection.
      - c) Access doors with locking devices.
      - d) Insulation inside housing.
      - e) Anchoring devices for attaching housing to concrete base.
    - 2) Electric heating cable or heater with self-limiting temperature control.

### B. Weather-Resistant Enclosures:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Aqua Shield.
  - b. BF Products, Inc.
  - c. DekoRRa Products.
  - d. Dunco Manufacturing, Inc. e. G&C Enclosures.
  - f. Hot Box, Inc.
  - g. HydroCowl, Inc.
  - h. Watts Water Technologies, Inc.
3. Description: Uninsulated enclosure designed to protect aboveground water piping,



equipment, or specialties from weather and damage.

- a. Standard: ASSE 1060.
- b. Class III: For equipment or devices other than pressure or atmospheric vacuum breakers.
- c. Class III-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
  - 1) Housing: Reinforced fiberglass construction.
    - a) Size: Not less than those required for access and service of protected unit.
    - b) Drain opening for units with drain connection.
    - c) Access doors with locking devices.
    - d) Anchoring devices for attaching housing to concrete base.

## **2.12 UNDERGROUND TRACER WIRE AND WARNING TAPE**

- A. All underground piping and utilities (both metallic and non-metallic), except copper pipe, shall have a separate copper tracer wire and non-metallic warning tape installed above the utility line.
- B. The tracer wire shall be traced for continuity prior to backfill, immediately upon completion of backfill and compaction and once again during final utility location/as-built at the end of the project. This also will include landscape irrigation mains to the points of the valves. All above ground utility features such as vaults, manholes, valves, handholds, etc to be properly labeled. Contractor shall provide an inventory of all installed outdoor utility features including type and model.
- C. Identification Tape: The 1st stage of identification shall be a buried warning tape. This tape shall provide an early warning at shallow depth excavation. The tape shall be 6" wide, and buried approximately 18" to 30" above the service pipe, but a minimum of 10" below finished grade. It shall consist of multiple layers of polyethylene with an overall thickness of 3 to 5 mils. It shall be installed continuous from valve box to valve box or manhole to manhole, and shall terminate just outside of valve box or manhole wall. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color-coded background that conforms to APWA color code standards. The lettering on the tape should name the utility it is protecting. (i.e. Caution Buried Sewer Line Below).
- D. Tracer Wire: The 2nd stage of identification shall be a buried tracer wire. This tracer wire shall provide pipeline identification, be fully detectable from above grade utility locators, and be able to provide a depth reference point to top of pipe.
- E. All pipe, including lawn irrigation lines, and metallic pipe with compression gasket fittings installed underground shall have a tracer wire installed along the length of the pipe. The wire shall be taped to the bottom of the pipe at a maximum of 10' intervals and not allowed to "float freely" within the backfill.
- F. Tracer wire shall be single-conductor, 12 gauge minimum, copper single-conductor wire with type "UF" (Underground Feeder) insulation, and shall be continuous along the pipeline passing through the inside of each valve box. A #12 AWG or heavier (smaller AWG number), solid, insulated (RHW, THW, or polyethylene insulation is recommended), copper wire shall be taped to pipe at 10 foot intervals. Do not wrap wire around pipe. The wire must be one continuous, unbroken length. Coil tracer wire at meter location and street end with enough wire to extend a minimum of two feet above grade.

## **PART 3 - EXECUTION**

### **3.01 EARTHWORK**

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

### **3.02 PIPING APPLICATIONS**

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following

applications.

- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be any of the following:
  - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed or pressure-sealed joints.
  - 2. Polypropylene (PP-R) piping in SDR 7.4, 11, or 17.6 per manufacturer's instructions and ASTM D2774.
- F. Underground Fire-Service-Main Piping NPS 4 to NPS 12 (DN 100 to DN 300) shall be the following:
  - 1. Ductile-iron, mechanical-joint pipe joints.
  - 2. PE, Class 150, fire-service pipe; molded PE fittings; and heat-fusion joints.
  - 3. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.
  - 4. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.
  - 5. Fiberglass, AWWA, FMG-approved RTRP, Class **150**; RTRF; and gasketed joints.
  - 6. Fiberglass, UL RTRP, Class **150**; RTRF; and gasketed joints.

### **3.03 VALVE APPLICATIONS**

- A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
  - 2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
  - 3. Use the following for valves in vaults and aboveground:
    - a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, nonrising stem.
    - b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron.
    - c. Check Valves: AWWA C508 swing type.
  - 4. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

### **3.04 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. See Division 22 Section "Common Work Results for Plumbing" for piping-system common requirements.

### **3.05 PIPING INSTALLATION**

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:
  - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
  - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
  - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove

- tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards
  2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves
  3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping
  4. Install corporation valves into service-saddle assemblies
  5. Install manifold for multiple taps in water main
  6. Install curb valve in water-service piping with head pointing up and with service box
- D. Bury piping with depth of cover over top at least **42 inches** below the proposed grade.
- E. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- F. Sleeves are specified in Division 22 Section "Common Work Results for Plumbing."
- G. Mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- I. See Division 21 Section "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.
- J. See Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.

### **3.06 JOINT CONSTRUCTION**

- A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.
- B. Make pipe joints according to the following:
1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
  2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

### **3.07 ANCHORAGE INSTALLATION**

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
1. Concrete thrust blocks.
  2. Locking mechanical joints.
  3. Set-screw mechanical retainer glands.
  4. Bolted flanged joints.
  5. Heat-fused joints.
  6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
  2. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
  3. Fire-Service-Main Piping: According to NFPA 24.

- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

### **3.08 VALVE INSTALLATION**

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

### **3.09 WATER METER INSTALLATION**

- A. Install water meters, piping, and specialties according to UNCC's written instructions.

### **3.10 ROUGHING-IN FOR WATER METERS**

- A. Rough-in piping and specialties for water meter installation according to UNCC's written instructions.

### **3.11 BACKFLOW PREVENTER INSTALLATION**

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 (DN 65) and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

### **3.12 CONCRETE VAULT INSTALLATION**

- A. Install precast concrete vaults according to ASTM C 891.

### **3.13 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. See Division 22 Section "Common Work Results for Plumbing" for piping connections to valves and equipment.
- C. Connect water-distribution piping to utility water main. Connect water-distribution piping to interior domestic water and fire-suppression piping.
- D. Connect waste piping from concrete vault drains to storm-drainage system. See Division 33 Section "Storm Utility Drainage Piping" for connection to storm-sewer piping.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and

Cables."

### **3.14 FIELD QUALITY CONTROL**

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
  - 1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

### **3.15 IDENTIFICATION**

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Division 22 Section "Common Work Results for Plumbing" for identifying devices.

### **3.16 FIELD QUALITY CONTROL**

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water. Contractor to coordinate with Designer and OWASA for witnessing of all test and flush procedures.
- B. Hydrostatic Tests: Test at not less than 200 psi for 2 hours or 50 psi above static pressure in excess of 150 psi for 2 hours.
  - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits. The amount of allowable leakage specified can be increased by 1 fluid ounce per inch valve diameter per hr. for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open so the hydrant are under pressure, an additional 5 ounces per minute leakage is permitted for each hydrant.
  - 2. Conduct all hydrostatic tests in accordance with article 312.5 of the North Carolina Plumbing Code and NFPA-24.
- C. Flushing: Flow the required flow rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm for 4-inch, 880 gpm for 6-inch, 1,560 gpm for 8-inch, 2,440 gpm for 10-inch, 3,520 gpm for 12-inch pipe. When supply cannot produce stipulated flow rates, obtain maximum available.

### **3.17 CLEANING**

- A. Clean and disinfect water distribution piping as follows:
  - 1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.
  - 2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if method is not prescribed by that authority, use procedure described in AWWA C651 or as described below:

- a. Comply with NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
  - b. Fill system or part of system with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) system or part thereof and allow to stand for 24 hours.
  - c. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine; isolate and allow to stand for 3 hours.
  - d. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
  - e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by authority shows evidence of contamination.
- B. Prepare reports for purging and disinfecting activities.

**END OF SECTION**

## SECTION 32 14 00

### UNIT PAVING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to Annex F – Design Guide Illustrations of the University of North Carolina at Charlotte Design and Construction Manual.
- C. Section 012300 – Alternates: Alternates No. 7.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Brick pavers set in aggregate and mortar setting beds.
  - 2. Cast-in-place concrete edge restraints.
- B. Related Sections include the following:
  - 1. DELETED
  - 2. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit pavers with elastomeric sealants.
  - 3. Division 31 Section "Earth Moving" for excavation and compacted subgrade.

##### 1.3 SUBMITTALS

- A. Product Data: For materials other than water and aggregates.
- B. Product Data: For the following:
  - 1. Pavers.
- C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- D. Samples for Initial Selection: For the following:
  - 1. Each type of unit paver indicated.
  - 2. Joint materials involving color selection.
  - 3. Exposed edge restraints involving color selection.
  - 4. DELETED
  - 5. DELETED
- E. Samples for Verification:
  - 1. Full-size units of each type of unit paver indicated. Assemble a sample of each type of unit on suitable backing and grout joints.
  - 2. Joint materials.
- F. Compatibility and Adhesion Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- B. Preconstruction Compatibility and Adhesion Testing: Submit to latex-additive manufacturer, for testing indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.

1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be nonstaining to, installed pavers and other materials constituting paver installation.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.

### **1.6 PROJECT CONDITIONS**

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout:
  1. Cold-Weather Requirements: Protect unit paver work against freezing when ambient temperature is 40 deg F (4 deg C) and falling. Heat materials to provide mortar and grout temperatures between 40 and 120 deg F (4 and 49 deg C). Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F (4 deg C), cover with weather-resistant membrane; below 25 deg F (minus 4 deg C), cover with insulating blankets; below 20 deg F (minus 7 deg C), provide enclosure and temporary heat to maintain temperature above 32 deg F (0 deg C).
  2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
    - a. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set pavers within 1 minute of spreading setting-bed mortar.

## **PART 2 - PRODUCTS**

### **2.1 BRICK PAVERS**

- A. Brick Pavers: ASTM C 902, Class SX, Type I, Application PX. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
  1. Basis-of-Design Product: The design for brick pavers is based on Pinehall Brick Company English Edge Pavers. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
    - a. Pinehall Brick Company
    - b. CapBrick
    - c. Glen Gery



- d. Higgins Brick Company
  - e. Oldcastle
  2. Thickness: 2-1/4 inches (57 mm).
  3. Face Size: 4 by 8 inches (102 by 203 mm).
  4. Color: Red.
- B. Vehicular Heavy Duty Brick Pavers: ASTM C 902, Class SX, Type I, Application PX. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
1. Basis-of-Design Product: The design for brick pavers is based on Pinehall Brick Company English Edge Pavers. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
    - a. Pinehall Brick Company
    - b. CapBrick
    - c. Glen Gery
    - d. Higgins Brick Company
    - e. Oldcastle
  2. Thickness: 2-3/4 inches (57 mm).
  3. Face Size: 4 by 8 inches (102 by 203 mm).
  4. Color: Submit full range of available colors for selection by Designer. Provide samples for a mockup.
- C. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C 67.
- D. Temporary Protective Coating: Precoat exposed surfaces of brick pavers with a continuous film of a temporary protective coating that is compatible with brick, mortar, and grout products and can be removed without damaging grout or brick. Do not coat unexposed brick surfaces.

## 2.2 ACCESSORIES

- A. Job-Built Concrete Edge Restraints: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mixed concrete with minimum 28-day compressive strength of 3000 psi (20 MPa).
- B. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.
- C. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

## 2.3 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with requirements in Division 31 Section "Earth Moving" for subbase material.
- B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with requirements in Division 31 Section "Earth Moving" for base course.
- C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.
- D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.
- E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.
  1. Provide sand of color needed to produce required joint color.
- F. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  1. Survivability: Class 2; AASHTO M 288.
  2. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
  3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

- G. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
  2. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
  3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
  4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- H. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

#### **2.4 MORTAR SETTING-BED MATERIALS**

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144.
- D. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
1. Manufacturer: Subject to compliance with requirements, provide latex additive by one of the following:
    - a. Boiardi Products Corporation.
    - b. Bonsal, W. R. Company.
    - c. Bostik Findley Inc.
    - d. C-Cure.
    - e. Custom Building Products.
    - f. DAP Inc.
    - g. Jamo Inc.
    - h. Laticrete International, Inc.
    - i. MAPEI Corp.
    - j. SGM.
    - k. Summitville Tiles, Inc.
    - l. TEC Incorporated; H. B. Fuller Company.
- E. Water: Potable.
- F. Reinforcing Wire: Galvanized, welded, 0.062-inch- (1.57-mm-) diameter wire; 2-by-2-inch (51-by-51-mm) mesh; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

#### **2.5 MORTAR MIXES**

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout if they have reached their initial set before being used.
- B. Mortar-Bed Bond Coat: Mix neat cement or cement and sand with water to a creamy consistency.
- C. Portland Cement-Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.
- D. Latex-Modified, Portland Cement Setting-Bed Mortar: Proportion and mix portland cement, sand, and latex additive for setting bed to comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

- E. Latex-Modified, Portland Cement Slurry Bond Coat: Proportion and mix portland cement, sand, and latex additive for slurry bond coat to comply with written instructions of latex-additive manufacturer.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 2. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations. Examine areas where waterproofing system is turned up or flashed against vertical surfaces and horizontal waterproofing. Proceed with installation only after protection is in place.

#### **3.2 PREPARATION**

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- B. Clean concrete substrates to remove dirt, dust, debris, and loose particles.
- C. Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

#### **3.3 INSTALLATION, GENERAL**

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Exercise care in handling coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. Remove coating from bonding surfaces before setting brick.
- E. Joint Pattern: Herringbone with brick border. Repressed, lugged, and chamfered. Match and continue existing unit paver joint pattern.
- F. Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.
  - 1. Provide joint filler at waterproofing that is turned up on vertical surfaces, unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete.
- G. Tolerances: do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- H. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide foam filler as backing for sealant-filled joints, unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 07 Section "Joint Sealants."
- I. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

- J. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
  - 1. Install job-built concrete edge restraints to comply with requirements in Division 03 Section "Cast-in-Place Concrete."
  - 2. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
  - 3. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.
- K. Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers.
  - 1. Where pavers set in mortar bed are indicated for steps constructed adjacent to pavers set in aggregate setting bed, install steps and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

### 3.4 AGGREGATE SETTING-BED APPLICATIONS

- A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.
- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches (300 mm).
- D. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.
- E. Place aggregate subbase and base, compact to 100 percent of ASTM D 698 maximum laboratory density, and screed to depth indicated.
- F. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).
- G. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
- H. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- I. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
  - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- J. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
  - 1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
  - 2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to protect them from rain.

- K. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- L. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- M. Repeat joint-filling process 30 days later.

### **3.5 REPAIRING, POINTING, AND CLEANING**

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
  - 1. Remove temporary protective coating from brick pavers as recommended by protective coating manufacturer and as acceptable to unit paver and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

**END OF SECTION**



January 18, 2016

To Approving Authority,

Re: Substitution Request for DDC Controls for Elm Maple Pine Residence Hall UNCC.

Engineered Control Solutions, Inc. (ECS) respectfully asks to be added as an Acceptable Controls System Installer for the above referenced project. After a thorough examination of specification section 230900 Controls for HVAC, no exceptions are taken.

Founded in 1999, ECS is consistently rated as one of the top 10 Honeywell contractors in the United States. A large part of this success is related to our focus on the Higher Education market. ECS has installed DDC systems for several higher education facilities including UNC Wilmington and multiple community colleges.

The proposed DDC control system for this project includes Honeywell Spyder controllers connected to a Honeywell branded Tridium Niagara AX JACE which will provide web based access to both the graphics package and the on-board programming tool.

Items of note regarding ECS:

- ECS has obtained the highest level of contractor for Honeywell products (ACI Elite).
- ECS has a P.E. on staff to oversee all controls engineering functions.
- ECS is licensed by the State of North Carolina as both an Electrical Contractor and a Mechanical Contractor.
- No modifications are required to the current HVAC or BAS Control System as specified, our installation will utilize the specified Niagara AX based software and hardware and the Honeywell Lonworks Controllers
- The owner shall be provided ownership of all software and shall be granted administrative rights for access to all software components.

I thank you in advance for your consideration of this request.

Michael Smith Charlotte 704-914-5373

Enclosure: Company brochure, Company resume, sample controls submittal package



## Engineered Control Solutions, Inc.

P.O. Box 1885, Fuquay-Varina, NC 27526

Phone: 919-567-0706

Fax: 919-567-0705

[www.ECScontrols.net](http://www.ECScontrols.net)

March 2014

### Firm's History

Engineered Control Solutions, Inc. was founded in August, 1999, in order to fulfill a need for a high-end DDC controls integrator who could provide superior customer service at a reasonable price.

Engineered Control Solutions is an award-winning Honeywell Authorized Controls Integrator, a certified Honeywell Open Integrated Systems Provider (i.e., Tridium Systems Integrator), a Distech Controls System Provider and KMC Controls Authorized Dealer, with offices in North Carolina and South Carolina. Our emphasis is on the design and installation of medium- and large-size DDC control systems, primarily open-protocol (LonMark™ and BACnet) and Ethernet-based systems (Tridium™). We are also certified as an Echelon® Network Integrator, giving us even greater flexibility to utilize whatever Lon-based controllers make the most sense for each application. ECS is fully licensed as an unlimited mechanical and unlimited electrical contractor in both North Carolina and South Carolina and is equipped to provide full coverage for warranty and after-warranty service. Our home office is located in Fuquay-Varina, NC with branch offices located in Wilmington, NC and Greenville, SC.

We currently have control systems installed in the following school districts: Bladen County, Person County, Darlington County, Duplin County, Sampson County, Harnett County, Vance County, Wake County, and Lenoir County, as well as systems in several major universities including University of North Carolina at Wilmington. Other systems and customers of ECS include multiple sites at Fort Bragg and Camp Lejeune military bases, multiple North Carolina Municipal Government complexes, multiple North Carolina Department of Corrections facilities, several hundred financial institutions, multiple churches, and many commercial facilities including several large data centers for multiple banking clients.

Having Honeywell, Distech, and KMC controller lines available for our customers allows ECS to offer the “best in class” for every application by using the latest products in the design and development of open systems. We believe that this trend in facility control systems, coupled with LAN- and Internet-based “thin-client” graphical user interfaces, is the future for the HVAC controls industry. Control system installation and service will continue to become less influenced by brand-name and more dependent on quality (solutions, responsiveness, and relationship).

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*Creative Solutions for Your Building Environments*

## **Organizational Structure**

### **ENGINEERED CONTROL SOLUTIONS, INC. PROPRIETARY**

With a great deal of experience working in various corporate settings, the management team at ECS strives to balance the benefits of big-business systems with the benefits of small-business flexibility. As such, our organizational structure is based on some of the principles of team-based work cells, where all members are expected to have working proficiency in a wide range of tasks.

The organization can be broken down into the following functional areas:

- Management
- Office Administration
- Sales
- Estimating
- Project Engineering and Design
- Programming
- Graphics
- Installation
- Startup and Commissioning
- Service

## **Key Employee Qualifications**

### **ENGINEERED CONTROL SOLUTIONS, INC. PROPRIETARY**

Refer to Appendix I, Resumes.

Overall, ECS has a high concentration of experience and talent in areas directly or indirectly related to the development and implementation of creative, comprehensive and cost-effective energy-saving solutions. This includes an extensive track record of DDC installations. There is also a proven understanding of the performance contracting process, developed through principal employees' past experience in the implementation of over \$55m in contracts.

## **Project Management Approach**

Before the receipt of a formal contract, ECS reviews the scope and schedule of expected projects and develops general manpower plans. Our targeted bidding/negotiated process results in an unusually high "hit rate", allowing us to cost-effectively begin project development work during the estimating phase. Preliminary project engineering is completed, such as valve sizing and component selection. Upon receipt of contract and associated project documents, the design submittal is completed. We are proud that our submittals have been praised by our customers, project engineers and installing contractors as some of the best in the industry.

Job progress is tracked through each phase of the project, utilizing various visual and electronic tracking tools. A project manager is assigned to serve as the primary point of contact throughout the project, with the broader project team providing ongoing support.

Engineered Control Solutions, Inc. [www.ECScontrols.net](http://www.ECScontrols.net)  
Mail: P.O. Box 1885, Fuquay-Varina, NC 27626  
Office: 230 Jarco Drive, Fuquay-Varina, NC 27526

Phone: 919-567-0706  
Fax: 919-567-0705  
[info@ECScontrols.net](mailto:info@ECScontrols.net)

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We also work very closely with our installation subcontractors to position them as representatives of ECS on the jobsite.

### **Controls Installation**

ECS originally subcontracted the installation of our control systems for all projects; however, we created our own controls installation department in 2010 as a means of consistently applying our strict installation standards. Today we utilize both our own installation department as well as subcontract labor for project installation.

### **Project Commissioning**

ECS has developed a project commissioning process based on strict military standards that is applied to all new installations. This process is constantly under review and refinement and can be modified to meet all levels of commissioning, including LEED.

### **Problem Resolution Process**

ECS was founded on the principle that the level of customer service and design/installation/support quality in the local DDC controls market was well below where it could and should be. Our goal has been to develop every customer relationship such that any customer could be a good reference, and we have been able to meet that goal year after year.

Our problem resolution process is simple – timely and honest situation analysis with a response that is mutually satisfactory to all parties. This sometimes means an open admission to a mistake or misunderstanding on our part, and we are willing to do what needs to be done to make things right.

### **Warranty Provisions**

Warranty terms for projects are typically one year after the agreed-to date of substantial completion but extended warranties are offered should the project require. In the case of larger projects progressive completion and warranty start dates may be appropriate. Honeywell provides a five year parts-only warranty for its actuators, and we will support the customer to obtain actuator warranty replacement throughout this period.

### **Training Services**

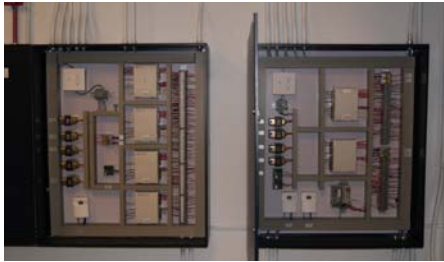
ECS regularly provides customized training at our training center in Fuquay-Varina as well as various customer sites, covering our installations, other control systems and on mechanical systems. In addition, there is a wide range of factory course offerings for our multiple product lines. Details on the extensive list of courses are available on request.

### **Long-Term Support Capabilities**

Engineered Control Solutions is firmly established as a locally-owned, cost-effective, quality-oriented DDC contractor with offices in North Carolina and South Carolina. We expect to continue to support our ever-growing customer base with engineering, service and contracting services well into the future. We have both local support phone lines and toll free lines allowing customers to reach our organization for technical assistance.

## DIRECT DIGITAL CONTROLS INSTALLATIONS UTILIZING

- LonWorks Systems
- Tridium Niagara Framework (R2 and AX)
- LonWorks with LNS Database
- BACnet Systems
- BACnet with BACnet IP Routing



## WHAT WE OFFER

- 24/7 Controls Service Department
- On Site Training Center
- UL-508a Control Panel Design and Assembly
- Technical Support
- Large Replacement Parts Inventory
- Custom Controls Programming Capability
- Custom Graphics and Energy Dashboards
- Comfort Problem Resolution
- Performance Contracting Experience

## WHAT WE VALUE

Superior Customer Service  
 Responsiveness  
 An Integrated Systems Perspective  
 Cost-Effective, Creative Solutions



AUTHORIZED  
 NETWORK  
 INTEGRATOR

**Honeywell**



## Engineered Control Solutions, Inc.

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 Branch Locations: Greenville, SC and Wilmington, NC  
[www.ECScontrols.net](http://www.ECScontrols.net)



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**Engineered Control Solutions**  
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## COMPANY PROFILE

Engineered Control Solutions, Inc. provides installation, design, and integration services including HVAC Direct Digital Controls, Access Controls, and CCTV/Digital recording systems for customers in the commercial, industrial, and institutional markets. Our business is based on the premise that high-quality, creative control systems for new or retrofit projects can also be economical. This can only be accomplished through careful cost control at each stage of design and construction, and by leveraging the latest developments in control and communications technology.



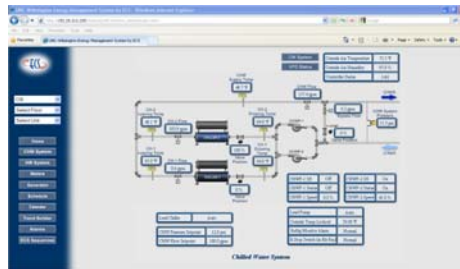
## EXPERIENCE

The employees of ECS provide a wide range of system experience including HVAC system design engineering, mechanical contracting, HVAC and Access controls engineering, HVAC and Access controls programming, and project implementation. We have a client base with a variety of control systems and technologies, from simple time clock-based controllers to sophisticated Internet-based integrated DDC systems.

Over the years, ECS has developed a loyal customer base, with a variety of projects at public and private universities, industrial facilities, K-12 school districts, government, military sites, commercial properties, and other markets.

## LICENSES AND CERTIFICATIONS

- Licensed Mechanical Contractor
- Echelon LonWorks Network Integrator
- Licensed Unlimited Electrical Contractor
- Certified Tridium™ Systems Integrator
- Licensed Engineering Firm with P.E.s on Staff
- Honeywell Security Contractor
- Fully Insured and Bondable
- UL-Certified 508-A Panel Shop
- Honeywell Authorized Controls Integrator
- LEED Accredited Professional on Staff
- KMC Controls Authorized Contractor



## WHAT WE DO

ECS is a building control system contractor, specializing in solving facility comfort and efficiency problems for both new construction and existing facilities. We take a comprehensive, systems approach with all of our customers, recognizing that building controls, mechanical systems, architectural space and, most importantly, the occupants all interact in ways that demand an integrated perspective.

- Direct Digital Control Systems
- Honeywell Authorized Controls Integrator for Excel 5000®, WEBS<sup>AX</sup>® and WEBS<sup>R2</sup>®
- Distech Authorized Integrator
- KMC Controls Authorized Contractor
- Authorized Echelon Network Integrator for LonWorks® Open Systems
- ACT 5100 Service, Parts and Installations
- Internet- and LAN-Based Control Systems
- Robust Integration of Truly Interoperable Multi-Vendor Control Systems
- Energy-Savings Strategies
- Simple Solutions for Complex Facility Management Problems
- Creative and Competitive New Construction or Retrofit Control Systems
- Facility Review Services
- Multi-Site Installation and Management

**Honeywell**  
**ACI**  
**Elite**

## WHAT WE'VE DONE

Energy control solutions implemented at:

- ✓ Colleges and Universities
- ✓ Correctional Institutions



- ✓ Commercial Buildings
- ✓ Government Facilities
- ✓ Solar Cooling/Heating Systems



- ✓ Medical Facilities
- ✓ Multi-site Enterprise Management



- ✓ Industrial Facilities
- ✓ Military Bases
- ✓ School Systems; Independent Schools



## MISSION STATEMENT

Engineered Control Solutions provides cost-effective, valued HVAC control and building automation solutions for our customers, emphasizing comfort, efficiency, responsiveness, and quality in everything we do.

