ADDENDUM NUMBER 2

PARTICULARS

1.01 DATE: OCTOBER 15, 2020

1.02 PROJECT: 20055.01 USC SOM MED PARK15 CHILLER REPLACEMENT

TO: PROSPECTIVE BIDDERS:

2.01 THIS ADDENDUM FORMS A PART OF THE CONTRACT DOCUMENTS AND MODIFIES THE ORIGINALPROCUREMENT DOCUMENTS DATED SEPTEMBER 9, 2020, WITH AMENDMENTS AND ADDITIONS NOTED BELOW.

2.02 ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE SPACE PROVIDED IN THE BID FORM. FAILURE TO DO SO MAY DISQUALIFY THE BIDDER.

2.03 THIS ADDENDUM CONSISTS OF 1 PAGE AND THE FOLLOWING ATTACHMENTS, SPECIFICATIONS, AND DRAWINGS:

A. 23 2113 - HYDRONIC PIPING

2.04 BIDS MUST BE RECEIVED BY OCT. 22, 2020 AT 10:30 AM. MAIL OR HAND DELIVERY WITH PROJECT NAME AND NUMBER TO HATICE HIKMET AT 1600 HAMPTON ST. SUITE 606, COLUMBIA, SC 29208. BID OPENING WILL BE VIA TELECONFERENCE ONLY (803) 753-1965/ACCESS CODE 7777162.

2.05 CONTRACTOR MAY USE THE FREIGHT ELEVATOR TO TRANSPORT MATERIALS UP THE THE TOP FLOOR. COORDINATE USE OF ELEVATOR WITH THE SCHOOL OF MEDICINE.

2.06 THE SCHOOL OF MEDICINE WANTS TO REMOVE PARTS FROM THE EXISTING AIR COOLED CHILLERS. CONTRACTOR SHALL COORDINATE WITH THE SCHOOL OF MEDICINE TO PROVIDE ENOUGH TIME TO REMOVE THESE PARTS BEFORE REMOVING THE EXISTING CHILLERS FROM THE SITE.

2.07 PROVIDE SUPPLEMENTAL STEEL BEAMS (W10X22) TO SUPPORT NEW CHILLERS. SECURE SUPPLEMENTAL STEEL TO EXISTING STRUTURAL FRAME.

2.08 ALL WORK SHALL OCCUR DURING NORMAL BUSINESS HOURS. CONTRACTOR SHALL COORDINATE WITH OWNER ON WHEN CHILLER CAN BE TAKEN OFFLINE.

CHANGES TO THE PROJECT MANUAL - SPECIFICATIONS:

3.01 SECTION 23 2113 - HYDRONIC PIPING

A. Replace Section in its entirety

3.02 SECTION 23 2123 - HYDRONIC SPECIALITIES

A. Add Patterson to list of approved manufacturers for pumps, suction diffusers, and expansion tanks.

B. Add American Wheatley to list of approved manufacturer's for air and sediment seperators.

C. Add Grundfos to list of approved manufacturers for pumps.

3.03 SECTION 23 2500 - HVAC WATER TREATMENT

A. Zee-Chemical is the chemical treatment manufacturer used at this facility. Contractor shall contract with Zee-Chemical to provide final chemical treament of the water system. Contractor may use other approved manufacturers for piping cleaning sequence.

3.04 SECTION 23 6463 - SCROLL WATER CHILLERS

A. Add Carrier to list of approved manufacturers.

END OF SECTION

SECTION 232113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.

B. Chilled water piping, above grade.

C. Equipment drains and overflows.

D. Pipe hangers and supports.

E. Unions, flanges, mechanical couplings, and dielectric connections.

F. Valves:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.
   4. Pressure independent temperature control valves and balancing valves.

G. Flow controls.

1.02 RELATED REQUIREMENTS

A. Section 230523 - General-Duty Valves for HVAC Piping.

B. Section 230548 - Vibration and Seismic Controls for HVAC.

C. Section 230553 - Identification for HVAC Piping and Equipment.

D. Section 230719 - HVAC Piping Insulation.

E. Section 232500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage 2013.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators 2019.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.

D. ASME B16.15 - Cast Copper Alloy Threaded Fittings Classes 125 and 250 2018.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.

G. ASME B16.34 - Valves - Flanged, Threaded and Welding End 2017.

H. ASME B31.9 - Building Services Piping 2017.

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.

J. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service 2018.

K. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts 2014.

L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2018a.

M. ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2014).

N. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).

O. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2016.

P. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2018.

Q. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2015, with Editorial Revision (2018).

R. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2015.

S. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 2017.

T. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 2015.

U. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2015.

V. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992,with Editiorial Revision (2018).

W. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications 2007 (Reapproved 2013).

X. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

Y. AWWA C606 - Grooved and Shouldered Joints 2015.

Z. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

1.04 SUBMITTALS

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

B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

C. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Indicate valve data and ratings.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

C. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

D. Welder Qualifications: Certify in accordance with ASME BPVC-IX.
   1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.06 DELIVERY, STORAGE, AND HANDLING

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.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.

2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Grooved mechanical joints may be used in accessible locations only.
   a. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
   b. Couplings: Ductile-iron housing and EHP – EPDM gasket of central cavity pressure-responsive design rated for 250 deg F; with nuts and bolts to secure grooved pipe and fittings. Basis of design products:
      1) NPS ½" to 2": Quick Vic Small Diameter Installation Ready Couplings for plain end pipe, Style P07
      2) NPS 2" to 12": Rigid Installation-Ready Grooved Couplings, Style 107
      3) NPS 2" to 8": Flexible Installation-Ready Grooved Couplings, Style 177
      4) NPS ¾" to 12": Flexible Couplings, Style 77
      5) NPS 14" and above: Advanced Grooved System Couplings, Style W07, W77
   c. Three Victaulic Flexible Couplings, Style 77, 177, or W77 may be used in close proximity to vibrating piece of equipment in lieu of a flexible connector or rubber bellow for vibration attenuation and stress relief.
   d. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
   e. Grooved mechanical connections and joints comply with AWWA C606.
      1) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
   f. Use rigid joints unless otherwise indicated.
   g. Use gaskets of molded synthetic rubber with central cavity, pressure responsive configuration and complying with ASTM D2000, Grade 2CA615A15B44F17Z for circulating medium up to maximum 250 degrees F or Grade M3BA610A15B44Z for circulating medium up to maximum 200 degrees F.
   h. Provide steel coupling nuts and bolts complying with ASTM A183.
   i. Victaulic Factory assembled equipment drops and headers are accepted in accordance with the intent of the specification and drawings
      1) Victaulic Series 380, 381, 382, 383 Vibration Isolation Pump Drops: Factory assembled, grooved end pump drop assembly. Installation-Ready, containing 3 flexible couplings for vibration attenuation. Drops will come with fully integrated straining device, back flow protection, throttling service and dead-end, bubble-tight isolation.
      2) Victaulic Series 385 Vibration Isolation Air Handling Drops: Factory assembled, grooved end, installation ready assembly provides isolation, straining, balancing and draining. Swing joint accommodates installation. Provide single or double coil in accordance with drawings.
      3) Victaulic Style 26, Vic-Header: Factory fabricated grooved end header all-in-one assembly for fluid distribution. Header shall consist of an ASTM A53, Grade B, standard-weight pipe spool with required outlet connections.
   j. Victaulic solutions for expansion and contraction may be utilized in both riser and distribution piping with engineer approval. Utilize Victaulic Style 77, 177 or W77 flexible couplings in line or in a loop configuration or Style 155/W155 expansion joint. Victaulic A10 anchors may be utilized to anchor pipe. Utilize Victaulic Engineering Services to provide appropriate solution and submit calculations to engineer including locations for flexible couplings, A10 anchors, and guides as necessary.
4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
   1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

D. Valves: Provide valves where indicated:
   1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
   2. Isolate equipment using butterfly valves with lug end flanges.
   3. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
   4. For throttling and isolation service in chilled water systems, use only butterfly valves.
   5. In heating water or chilled water systems, butterfly valves may be used interchangeably with gate and globe valves.
   6. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves.

2.02 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
   1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
   2. Threaded Joints: ASME B16.3, malleable iron fittings.
   3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Style 607 or approved comparable product.
      b. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
      c. Grooved-End-Tube Couplings: Ductile-iron housing with angled bolt pads for rigid installation and pre-lubricated EHP – EPDM gasket rated for 250 deg F ; installation-ready with nuts and bolts to secure grooved pipe and fittings.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Greater: 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 Greater: Welded steel bracket and wrought steel clamp.
   7. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
10. 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.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:
1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:
1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
2. Mechanical Couplings: Comply with ASTM F1476.
3. Housing Material: Ductile iron, galvanized complying with ASTM A536.
4. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 250 degrees F.
5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
6. When pipe is field grooved, provide coupling manufacturer's grooving tools.
7. Grooved Pipe Joint Construction: Square cut pipe ends and roll groove ends of pipe in accordance to manufacturer’s specifications. Use roll sets compatible with the pipe material and wall thickness per Victaulic installation instructions (I-100).Gaskets shall be verified as suitable for the intended service and shall be coated on the lips with a thin uniform coat of lubricant in accordance with the manufacturer's published instructions. For installation-ready coupling housing shall engage both grooves, otherwise the housing shall be assembled over the gasket and shall engage both grooves. The nuts shall be uniformly tightened until the housing pads are firmly together metal to metal allowing visual inspection, or until properly tightened per manufacturer’s specifications and instructions. A factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation including visual inspection of installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).) To assure uniformity and compatibility of piping components in grooved end piping systems, all grooved products and grooving tools utilized shall be supplied by a single manufacturer with smart tools recommended.

D. Dielectric Connections:
1. Waterways:
a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
b. Dry insulation barrier able to withstand 600 volt breakdown test.
c. Construct of galvanized steel with threaded end connections to match connecting piping.
d. Suitable for the required operating pressures and temperatures.
2. Flanges:
a. Dielectric flanges with same pressure ratings as standard flanges.
b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
c. Dry insulation barrier able to withstand 600 volt breakdown test.

d. Construct of galvanized steel with threaded end connections to match connecting piping.
e. Suitable for the required operating pressures and temperatures.

2.06 BALL VALVES

A. Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
2. Grinnell Products: www.grinnell.com/#sle.
3. Shurjoint Piping Products, Inc: www.shurjoint.com/#sle.

B. Up To and Including 2 Inches:
1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

C. Over 2 Inches:
1. Ductile iron body, chrome plated stainless steel ball, teflon or Virgin TFE seat and stuffing box seals, lever handle or gear operated, flanged ends, rated to 800 psi.

2.07 BUTTERFLY VALVES

A. Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
2. Grinnell Products: www.grinnell.com/#sle.
3. Shurjoint Piping Products, Inc: www.shurjoint.com/#sle.
4. Victaulic Valves: www.victaulic.com
a. Vic-300 MasterSeal grooved butterfly valves shall be used for shut off and rough throttling on a grooved system, Provide Series 761, W761.

B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.

C. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.

D. Stem: Stainless steel with stem offset from the centerline to provide full 360 degree circumferential setting.

E. Operator: 10 position lever handle.

2.08 SWING CHECK VALVES

A. Manufacturers:
1. Apollo Valves: www.apollovalves.com/#sle.
2. Grinnell Products: www.grinnell.com/#sle.
3. Shurjoint Piping Products, Inc: www.shurjoint.com/#sle.
4. Victaulic Valves: www.victaulic.com
a. Grooved check valves shall be utilized for back flow prevention on a grooved system, Provide Series 716, 779, W715.

B. Up To and Including 2 Inches:
1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

C. Over 2 Inches:
1. Iron body, bronze trim, stainless steel, bronze, or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.09 PRESSURE INDEPENDENT TEMPERATURE CONTROL VALVES AND BALANCING VALVES

A. Control Valves: Factory-fabricated pressure independent with internal differential pressure regulator (DPRV) which automatically adjusts to normal changes in system pressure and provides 100 percent control valve authority at all positions of the valve.
1. Maintain proportional and linear flow coil characteristics.
2. PICV to accurately control the flow from 0 to 100 percent full rated flow with an operating pressure differential range of 3 to 60 psig.
3. Provide ANSI/FCI 70-2 Class 4 shut-off on all sizes and field serviceable.

4. Provide control valve to incorporate control, balancing and flow limiting. Hydronic system pressure independent control valve bodies to comply with ASME B16.34 or ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150 percent of the system design operating pressure and have the following characteristics:
    a. 2 NPS and Smaller: Class 150 bronze or brass body with union connections, stainless steel trim trim, stainless steel rising stem, stainless steel disc or ball, and screwed ends with backseating capacity repackable under pressure.
    b. 2-1/2 NPS and Larger: Class 125 iron or ductile iron body, stainless steel trim, stainless steel rising stem, stainless steel disc or ball, flanged ends with backseating capacity repackable under pressure.
    c. Pressure Control Seat: Brass construction with vulcanized EPDM.
    d. Sizing: Line-size.
    e. Fittings and Components: All fittings and components to meet ANSI standards and be compatible with readily available components. 8 inch valves and above to be provided with proper companion flanges.
    f. Close-Off (Differential) Pressure Rating: Combination of actuator, DPRV action, and trim to provide a minimum close-off pressure rating of 150 percent of total system (pump) head. Provide actuator from the same manufacturer as the pressure independent control valve.

B. Victaulic hydronic balancing valves may be utilized for flow control on hydronic systems, Provide Victaulic Series 78KH, 786, 787, 788, 789 for manual balancing applications or Series 76 for automatic balancing applications. Victaulic Koil-Kits may be utilized, Provide Series 799, 79V, 79B, 79A to include the 78Y strainer/ball valve, 78T ball valve/union and 78U union port fitting.

C. Electronic Actuators: Direct-mounted, self-calibrating type designed for minimum 60,000 full-stroke cycles at rated force.

D. Provide actuator with visible position indication. Fail positions on power failure to include in-place, open or closed as indicated in the controls specifications.
    1. Valves: Sized for maximum circuit flow rate and nominally, line-sized.
    2. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
    3. Fail-Safe Operation: Mechanical, spring-return mechanism or capacitance return.

2.10 FLOW CONTROLS

A. Manufacturers:
    1. Griswold Controls: www.griswoldcontrols.com/#sle.
    2. Hays Fluid Controls: www.haysfluidcontrols.com/#sle.
    3. ITT Bell & Gossett: www.bellgossett.com/#sle.
    4. Taco, Inc: www.taco-hvac.com/#sle.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. Refer to Section 232500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

H. Slope piping and arrange to drain at low points.

I. Grooved Joints:
   1. Install in accordance with the manufacturer's latest published installation instructions.
   2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

J. Inserts:
   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 above slab.

K. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
   2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   6. Provide copper plated hangers and supports for copper piping.
   7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

M. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

O. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   5. 3 inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
   6. 4 inch: Maximum span, 12 feet; minimum rod size, 1/2 inch.
   7. 6 inch: Maximum span, 14 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.
   1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.

3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.

END OF SECTION