SECTION 23 00 00

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 23.

1.02 GENERAL

A. The Contractor shall execute all work hereinafter specified or indicated on accompanying drawings. Contractor shall provide all equipment necessary and usually furnished in connection with such work and systems whether or not mentioned specifically herein or on the drawings.

B. The mechanical, electrical, and associated drawings are necessarily diagrammatic by their nature, and are not intended to show every connection in detail or every pipe or conduit in its exact location. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work.

C. When the mechanical and electrical drawings do not give exact details as to the elevation of pipe, conduit and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grades for the functioning of the system involved. Piping, exposed conduit and the duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure. The drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

1.03 CONTRACT DOCUMENTS

A. All dimensional information related to new structures shall be taken from the appropriate drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the site.

B. The interrelation of the specifications, the drawings, and the schedules are as follows: The specifications determine the nature and setting of the several materials, the drawings establish the quantities, dimensions and details, and the schedules give the performance characteristics. If the Contractor requires additional clarification, he shall request it in writing, following the contractually prescribed information flow requirements.
C. Should the drawings or specifications conflict within themselves, or with each other, the better quality, or greater size or quantity of work or materials shall be performed or furnished.

1.04 OWNER FURNISHED PRODUCTS

A. Products furnished to the site and paid for by Owner:

1. Thermacor Pre-Insulated Steam, Condensate and Chilled Water Piping

1.05 SUBMITTALS

A. Refer to Uniform General Conditions.

B. Proposed Products List: Include Products specified in the following sections:

1. Section 23 20 00 - Valves

2. Section 23 22 00 - Steam Traps

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

1.06 MATERIALS AND WORKMANSHIP

A. All materials, unless otherwise specified, shall be new, free from all defects, suitable for the intended use, and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall provide a neat, precise appearance. Materials and/or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site but shall be replaced with new materials and/or equipment.

B. The responsibility for the furnishing of the proper equipment and/or material and seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor who shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.
1.07 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. Storage at Site: The Contractor shall not receive material or equipment at the job site until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage.

B. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and become thoroughly familiar with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Owner of any discrepancy before performing any work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner.

1.08 MANUFACTURER'S RECOMMENDATIONS

A. The manufacturer's published directions shall be followed in the delivery, storage, protection, installation, piping, and wiring of all equipment and material. The Contractor shall promptly notify the Owner, in writing, of any conflict between the requirements of the Contract Documents and the manufacturer’s directions, and shall obtain the Owner's instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer’s directions or such instructions from the Owner, he shall bear all costs arising in connection with the deficiencies.

1.09 EXCAVATION, TRENCHING AND BACKFILL

A. Excavation

1. The subcontractors shall perform all excavations of every description, for their particular installations and of whatever substances encountered, to the depths indicated on the drawings and/or required for the installation of piping, conduit, utility systems, etc. All exterior lines shall be installed with a minimum cover of 24,” unless otherwise indicated. Generally, more cover shall be provided if grade will permit. All excavation materials not required for backfill or fill shall be removed and wasted as acceptable to the Construction Inspector. All excavations shall be made only by open cut. The banks of trenches shall be kept as nearly vertical as possible and where required, shall be properly sheeted and braced. Trenches shall be not less than 12” wider nor more than 16” wider than the outside edges of the pipe to be laid therein, and shall be excavated true to line so that a clear space not less than 6" nor more than 8" in width is provided on each side of the pipe.
2. All grading in the vicinity of excavation shall be controlled to prevent surface ground water from flowing into the excavations. Any water accumulated in the excavations shall be removed by pumping or other acceptable method. During excavation, material suitable for backfilling shall be stacked in an orderly manner a sufficient distance back from edges of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted and removed from the job site as directed by the Construction Inspector.

3. All shoring and sheeting required to perform and protect the excavations and to safeguard employees and/or adjacent structures shall be provided.

4. All surplus materials removed in these trenching operations becomes the property of the contractor, and shall be disposed of at the expense of the contractor, at a legal disposal site, off of the campus.

B. Backfilling

1. Trenches shall not be backfilled until all required tests are performed and until the piping, utilities systems, etc., as installed are certified by the Owner's inspector to conform to the requirements specified hereinafter. The trenches shall be carefully backfilled with sand to a depth of 12 inches above the top of the pipe. The next layer and subsequent layers of backfill may be excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale, or other approved materials free from large clods of earth or stones larger than 1 1/2" in diameter, flooded until the pipe has cover of not less than one foot. The remainder of the backfill material shall then be thrown into the trenches, moistened, and tamped or flooded in one-foot layers. Blasted rock, broken concrete or pavement, and large boulders shall not be used as backfill material. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and mounded over, and smoothed off.

2. Backfill under concrete slabs-on-fill shall be as specified above, shall be gravel, or shall be other such materials more suitable for the application. Installation and compaction shall be as required for compatibility with adjacent materials.

C. Opening and Re-closing Pavement and Lawns: Where excavation requires the opening of existing walks, streets, drives, other existing pavement, or lawns, such surfaces shall be cut as required to install new lines and to make new connections to existing lines. The sizes of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new work is completed and the excavation has been backfilled and flooded, the area shall be patched, using materials to match those cut out. The patches shall thoroughly bond with the
original surfaces and shall be level with them, and shall meet all the requirements established by the authorities having jurisdiction over such areas.

D. Excavation in Vicinity of Trees: All trees including low hanging limbs within the immediate area of construction shall be adequately protected to a height of at least 5 ft. to prevent damage from the construction operations and/or equipment. All excavation within the outermost limb radius of all trees shall be accomplished with extreme care.

PART 3 EXECUTION

3.01 PIPE PRESSURE TESTS

A. The following lines shall be tested at the stated pressure for the length of time noted:

<table>
<thead>
<tr>
<th>Testing Service</th>
<th>Testing Medium</th>
<th>Pressure (PSIG)</th>
<th>Time in Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled Water</td>
<td>Water</td>
<td>150</td>
<td>24</td>
</tr>
<tr>
<td>Steam</td>
<td>Water</td>
<td>150</td>
<td>24</td>
</tr>
<tr>
<td>Steam Condensate</td>
<td>Water</td>
<td>150</td>
<td>24</td>
</tr>
</tbody>
</table>

B. Where leaks occur, the pipe shall be repaired and the tests repeated. No leaks shall be corrected by peening. Defective piping and joints shall be removed and replaced.

END OF SECTION
SECTION 23 20 00

VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Valves

1.02 SUBMITTALS

A. Submit under provisions of Section 23 00 00.

B. Product Data: Provide data on valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.03 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welder’s Certification: In accordance with ASME Sec. 9. Submit welder’s certifications prior to any shop or field fabrication. Welder’s certifications shall be current within six months of submission.

D. Maintain one copy of each document on site.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years’ documented experience.

B. Installer: Company specializing in performing the work of this section with minimum of three years’ documented experience.

1.05 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 VALVES:

A. All iron body valves shall have the pressure containing parts constructed of ASTM designated of 126 class B iron. Stem material shall meet ASTM B16 Alloy 360 or ASTM 371 Alloy 876 silicon bronze or its equivalent. Gates and globes shall be bolted bonnet with OS&Y (outside screw and yoke) and rising stem design. A lubrication fitting is preferred on yoke cap for maintenance lubrication of the yoke bushing.

B. All forged steel body valves shall have the pressure containing parts constructed of ASTM 105, Grade 2 forged carbon steel. Seat and wedges shall meet ASTM A-182-F6 chromium stainless steel. Seat rings shall be hard faced. Valves shall conform to ANSI B16-34 pressure-temperature rating.

C. Standards of Quality for Valves:

<table>
<thead>
<tr>
<th>Class</th>
<th>Milwaukee</th>
<th>Nibco</th>
<th>Stockham or as noted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1/2&quot; &amp; larger</td>
<td>Gate Valve Steam, Cond.</td>
<td>125</td>
<td>F-2885</td>
</tr>
<tr>
<td>2-1/2&quot; &amp; larger</td>
<td>Butterfly Valve for Shutoff Chilled Water</td>
<td>150</td>
<td>NE-C,NF</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 23 21 00

CHILLED WATER PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Chilled Water Piping System

PART 2 PRODUCTS

2.01 UNDERGROUND PIPING

A. Underground pre-insulated chilled water piping will be supplied by the Owner. Coordinate with Owner for delivery to the site.

B. Thermacor Ferro-Therm Pre-Insulated piping system. Schedule 40 pipe.

PART 3 EXECUTION

3.01 PREPARATION

A. Follow manufacturer’s installation instructions for Pre-Insulated underground piping.

3.06 CLEANING AND FLUSHING OF WATER SYSTEMS

A. Water circulating Systems shall be thoroughly cleaned before placing in operation to rid systems of rust, dirt, piping compound, mill scale, oil, grease, any and all other material foreign to water being circulated.

B. Extreme care shall be exercised during construction to prevent dirt and other foreign matter from entering the pipe or other parts of systems. Pipe stored on the project shall have open ends capped and equipment shall have openings fully protected. Before erection, each piece of pipe, fitting, or valve shall be visually examined and dirt removed.

C. At pipe end locations a temporary bypass will be installed. Bypass shall be same size as the supply and return pipe. Prior to flushing the distribution system, the Contractor shall install the temporary bypass and a temporary line size strainer.
between the supply and return pipes. Contractor shall verify that the isolation valves are open.

D. After the temporary bypasses are installed, the Contractor shall provide and operate one pump which will cause a velocity of 10 feet per second in the main piping. This pump will be provided with a shot chemical feeder and a strainer assembly. If the pump is electric driven, rather than engine driven, the Contractor shall provide all temporary electrical disconnects, wiring, fuses, and other electrical devices that are required for safe operation.

E. Circulation will be started using the temporary pump. A non-hazardous cleaning compound (Entec 324 or approved equal) shall be added using the shot feeder until the concentration level of 20 parts per million is reached. Once this 20 parts per million concentration is reached, circulation will be maintained for 48 hours. After this period of time, the cleaning water shall be dumped to the sanitary sewer.

F. The distribution system will then be refilled with city water and circulated with continual bleed and make-up until the water is certified clean by the water treatment consultant, and accepted by the Owner. At the completion of this step an inhibitor shall be introduced. All waste water shall be dumped into the sanitary sewer system.

G. After the system is certified as clean, the Contractor shall close the valves. The bypass piping shall be removed as final connections to the building are accomplished.

H. During the flushing procedure, strainers shall be cleaned as often as necessary to remove debris and, in any event, all strainers shall be cleaned by physically removing the strainer screen from the body of the strainer at the end of flushing. Replace strainer basket and gasket.

I. Contractor shall add inhibitor to the cleaning and flushing chemicals if, once the system is approved as clean, there is any delay in connecting the new system to the existing system. This is to prevent any corrosion after the new pipe is clean.

END OF SECTION
SECTION 23 22 00

STEAM AND CONDENSATE PIPING

1.01 WORK INCLUDED
A. Steam Piping System
B. Steam Condensate Piping System

PART 2 PRODUCTS

2.01 STEAM AND CONDENSATE PIPING - UNDERGROUND:
A. Underground Pre-Insulated piping will be supplied by the Owner. Coordinate with Owner for delivery to the site.
B. Steam pipe will be Thermacor Duo-Therm 505 Schedule 80.
C. Condensate Pipe will be Thermacor Ferro-Therm Schedule 80.

PART 3 EXECUTION

3.01 PREPARATION
A. Install piping per Thermacor installation standards.

3.02 CLEANING AND FLUSHING OF STEAM SYSTEMS:
A. Steam and condensate systems shall be thoroughly cleaned before placing in operation to rid systems of rust, dirt, piping compound, mill scale, oil, grease, any and all other material foreign to water being circulated.
B. Extreme care shall be exercised during construction to prevent dirt and other foreign matter from entering the pipe or other parts of systems. Pipe stored on the project shall have open ends capped and equipment shall have openings
fully protected. Before erection, each piece of pipe, fitting, or valve shall be visually examined and dirt removed.

C. Chemicals, feeding devices, and water technician services shall be furnished by a single reputable manufacturer who will be responsible for the complete cleaning and flushing of the systems.

1. Add a temporary line with drain and isolate the building steam and condensate piping from the campus distribution piping to allow for proper circulation and cleaning of the new piping in the new tunnel and/or in the new or modified building piping system(s).

D. Systems shall be cleaned with a chemical compound specifically formulated for the purposes of removing the above listed foreign matter. These chemicals shall be injected to the systems, circulated and completely flushed out. Repeat the process if required. After each flushing, remove and thoroughly clean all strainers.

E. Final connection is not to be made to the campus loop system until the Chemical Contractor has filed with the Owner's representatives, a report stating that the systems are clean.

END OF SECTION
PART 1  GENERAL

1.01 WORK INCLUDED

A. Steam Traps

1.02 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.03 SUBMITTALS

A. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.

B. Submit schedule indicating manufacturer, model number, size, location, rated capacity, and features for each specialty.

PART 2  PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - STEAM TRAPS

A. Armstrong

B. Spirax/Sarco

2.02 INVERTED BUCKET TRAPS

A. Cast iron or semi-steel body and bolted cover for 250 psig WSP; provide access to internal parts without disturbing piping; with top test plug and bottom drain plugs, brass or stainless steel bucket, stainless steel seats and plungers, and stainless steel lever mechanism with knife edge operating surfaces, integral inlet strainer of monel or stainless steel.

PART 3  EXECUTION

3.01 INSTALLATION AND APPLICATION
A. Install specialties in accordance with manufacturer's instructions.

B. Install inverted bucket steam traps to drain condensate from steam main headers and branch lines.

C. Size steam traps to handle minimum of two times maximum condensate load of apparatus served.

D. Traps used on steam mains and branches shall be minimum 3/4 inch (20 mm) size.

E. Install steam traps with union or flanged connections at both ends.

F. Provide gate valve and strainer at inlet, and gate valve [and check valve] at discharge of steam traps.

END OF SECTION
**INSTALLATION INSTRUCTIONS: EXPANSION BOLSTERS PROCEDURE**

1. EXPANSION BOLSTER MATERIAL IS SUPPLIED IN PAIRS:
   4" L x 3" T x 3" H, 4" L x 3" T x 3" H, 6" L x 3" T x 3" H.

2. PLACE BOLSTER PAIRS AGAINST JACKET AND CURVE AROUND
dOWN AS SHOWN. HOLD IN PLACE BY ATTACHING TO JACKET WITH
DUCK TAPE OR EQUIVALENT ON TOP AND BEDDING SAND ON THE BOTTOM. BE CERTAIN THAT THE
BOLSTER PAIRS FITS SUCCU CAL TO JACKET.

3. BOLSTER PAD CONFIGURATION IS DEPENDENT ON LAYOUT &
WILL BE SHOWN ON THE INSTALLATION DRAWING.

*NOTE:* DUCT TAPE TO BE 1"-0" ON CENTER.

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**TABLE:**

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<th>Item</th>
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**CROSS SECTION**

- **Duct Tape:** 1"-0" on center.
- **Jacket:** 4" L x 3" T x 3" H
- **Foam Pad:** 3" L x 3" T x 3" H
- **Sand Bed:**

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**EXPANSION BOLSTER DETAIL**