SECTION 23-22-16 - STEAM AND CONDENSATE SPECIALTIES

PART I - 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. Section 23 05 19 - Meters and Gauges for HVAC Piping

C. Section 23 20 00 - Pipe Joining

D. Section 23 23 13 – Steam and Condensate Piping

E. Section 23 07 16 – HVAC Equipment Insulation

F. Section(s) 23 09 13 – Instrumentation and Control Devices for HVAC (and companion sections)

G. Section 23 07 19 – HVAC Piping Insulation

H. Section 33 63 13 – Underground Steam and Condensate Distribution Piping

I. Section 33 63 23 – Tunnel Steam and Condensate Systems

1.2 SUMMARY

A. Specifications for utility steam systems (i.e. tunnel and underground) including pipe, fittings and valves are provided separately in Division 33 – Utilities. This Section 23 22 16 within HVAC applies to building steam and condensate systems only.

B. Specifications for utility steam system components, including valves, are provided separately in Division 33 - Utilities as referenced herein.

C. This section includes the following:
   1. Strainers
   2. Steam Traps
   3. Vacuum Breakers
   4. Pressure Regulating Valves
   5. Safety Relief Valves

[Note to PSC: Although treated within F&S as components of Division 33 – Utilities steam systems, PRVs and condensate pump units are specified within Division 23 given that they are physically located within buildings. However, specifications for strainer and trap at “first valve” inside building are specified in Division 33.]

1.3 RELATED SECTIONS

A. Section 23 07 19 – HVAC Piping Insulation

1.4 DEFINITIONS

A. Manufacturers: In Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

   1. Basis of Design: Products indicated by manufacturer and model within the contract documents are considered the Basis of Design. This includes plan drawings, drawing details, schedules, specifications, etc. Subject to compliance with requirements, provide the basis of design products unless the manufacturer provisions (below) or substitution provisions within the contract documents are complied with.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified. Non basis of design products which are listed by manufacturer name only may be considered for bid. By submitting a bid based on a non-basis of design product, the contractor acknowledges performance of a comprehensive review of the collateral impacts to themselves and to other trades. Contractor use of non-basis of design products shall not be the basis for additional time of costs to the Owner.

3. Non-listed Products: Subject to compliance with requirements, Products not indicated within the Contract Documents shall not be used unless positively reviewed within a substitution request.

B. Abbreviations:
   1. >: Greater than.
   2. <: Less than.
   3. <=: Less than or equal to
   4. #: Number.
   5. %: Percent.
   6. ASME: The American Society of Mechanical Engineers.
   7. dbA: Decibels (A-weighted).
   8. E.g.: Exempli gratia “for example.”
   9. Etc.: Et cetera “and other similar things”
   10. F: Degrees Fahrenheit.
   11. F&S: Facilities and Services
   12. FT or “: Feet
   13. F&T: Float and thermostatic
   15. HVAC: Heating, Ventilating, and Air-conditioning.
   16. I.e.: Id est “in other words.”
   17. In or “: Inches.
   18. NPT: National pipe thread.
   19. PRV: Pressure regulating valve.
   20. PSC: Professional Service Consultant such as engineer, architect, etc.
   21. PSID: Differential pressure (PSIG)
   22. PSIG: Pounds-per square-inch gauge pressure.
   23. SCFC: Standard cubic feet per minute.
   24. UIUC or U of I: The University of Illinois at Urbana-Champaign.

1.5 REFERENCES
   A. ASME-B31.9 – Building Services Piping
   B. ASME Boiler and Pressure Vessel Code
   C. Applicable ASME Standards
   D. Illinois Steel Products Procurement Act
   E. International Mechanical Code
1.6 QUALITY ASSURANCE
   A. Products and execution shall be in compliance with applicable codes and standards including those referenced above in paragraph entitled REFERENCES.
   B. Installation, start-up and operation shall be in compliance with Manufacturer’s recommendations and installation, operations, and maintenance manuals.

1.7 SUBMITTALS
   A. Strainers: Type, materials of construction, temperature/pressure rating, strainer screen mesh size.
   B. Steam traps: Type, design, materials of construction, temperature/pressure rating, parameters, size/capacity. Trap schedule shall be submitted.
   C. Vacuum breakers: Type, materials of construction, temperature/pressure rating, capacity.
   D. Pressure regulating valves: Type, design, materials of construction, temperature/pressure rating, pressure setting, capacity.
   E. Safety relief valves: Type, design, materials of construction, temperature/pressure rating, size, capacity.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING
   A. Materials and equipment shall be protected from physical damage and weather during transport.
   B. Materials and equipment shall be stored indoors protected from physical damage and exposure to dust and debris.
   C. Materials and equipment shall be protected from physical damage and exposure to dust and debris during construction.

1.9 WARRANTY
   A. Products shall be warranted by manufacturer to be free from defects in material and workmanship for period of one year from date of startup or 18-months from date of delivery, whichever occurs first. Manufacturer shall repair or replace failed item at no cost to UIUC F&S.
   B. Joints shall be warranted to be free from leaks and imperfections for same time period. Defective joints shall be repaired or replaced at no cost to UIUC F&S.

PART 2 – PRODUCTS
   Note: Specifications for utility (tunnel) pipe, fittings, valves are provided in Division 33 – Utilities

2.1 Y-PATTERN PIPELINE STRAINERS
   A. High Pressure Steam and Condensate ≤ 150-PSIG (175-PSIG worst case)
      1. Size 2” and Smaller, Threaded Cast Iron
         a. Pressure class 250
         b. Cast iron body
         c. NPT connections
         d. Threaded blow-off connection
         e. 20 mesh stainless steel screen
      2. Size 2” and Smaller, Threaded Cast Steel
         a. Pressure class 300
         b. Cast carbon steel body
c. NPT connections
d. Threaded blow-off connection
e. 20 mesh stainless steel screen

3. Size 2-1/2" and Larger, Flanged Cast Steel
   a. Pressure class 300
   b. Cast carbon steel body
c. Flanged connections
d. Threaded blow-off connection
e. Size 2-1/2" through 4": 1/16" perforated stainless steel screen
f. Size 6" and larger: 1/8" perforated stainless steel screen

B. Medium Pressure Steam and Condensate ≤ 60-PSIG (125-PSIG worst case)
   1. Size 2" and Smaller, Threaded Cast Iron
      a. Pressure class 250
      b. Cast iron body
c. NPT connections
d. Threaded blow-off connection
e. 20 mesh stainless steel screen

   2. Size 2-1/2" and Larger, Flanged Cast Iron
      a. Pressure class 250
      b. Cast iron body
c. Flanged connections
d. Threaded blow-off connection
e. Size 2-1/2" through 4": 1/16" perforated stainless steel screen
f. Size 6" and larger: 1/8" perforated stainless steel screen

   3. Size 2-1/2" and Larger, Flanged Cast Steel
      a. Pressure class 150
      b. Cast carbon steel body
c. Flanged connections
d. Threaded blow-off connection
e. Size 2-1/2" through 4": 1/16" perforated stainless steel screen
f. Size 6" and larger: 1/8" perforated stainless steel screen

C. Low Pressure Steam and Condensate ≤ 15-PSIG (25-PSIG worst case)
   1. Size 2" and Smaller, Threaded Cast Iron
      a. Pressure class 125
      b. Cast iron body
c. NPT connections
d. Threaded blow-off connection
e. 20 mesh stainless steel screen
2. Size 2-1/2” and Larger, Flanged Cast Iron
   a. Pressure class 125
   b. Cast iron body
   c. Flanged connections
   d. Threaded blow-off connection
   e. Size 2-1/2” through 4”: 1/16” perforated stainless steel screen
   f. Size 6” and larger: 1/8” perforated stainless steel screen
3. Size 2-1/2” and Larger, Flanged Cast Steel
   a. Pressure class 150
   b. Cast steel body
   c. Flanged connections
   d. Threaded blow-off connection
   e. Size 2-1/2” through 4”: 1/16” perforated stainless steel screen
   f. Size 6” and larger: 1/8” perforated stainless steel screen

2.2 STEAM TRAPS

Note: For a typical building served by Campus steam there is no pressure regulation at the building level. In such case, the components of a building medium pressure system must be rated for power plant relief valve setting, 125-PSIG. Relief setpoint for high pressure at the power plant is 175-PSIG.

A. Rating
   1. Trap body and internals shall be rated for minimum of 1.5-times system design operating pressure or relief valve pressure setting, whichever is greater. Trap shall be rated for simultaneous temperature listed.
      a. High pressure system \( \leq 400\)-degrees-F
         1) \( 1.5 \times 150\)-PSIG = 225-PSIG
         2) Relief valve setting = 175-PSIG
      b. Medium pressure “Campus Steam” system (building with no PRV) \( \leq 350\)-degrees-F
         1) \( 1.5 \times 60\)-PSIG = 90-PSIG
         2) Relief valve setting = 125-PSIG
      c. Low pressure system (building with PRV) \( \leq 300\)-degrees-F
         1) \( 1.5 \times 15 = 22.5\)-PSIG
         2) Relief valve setting = 25-PSIG

B. Inverted Bucket
   1. Body: Cast iron
   2. Cover: removable, bolted
   3. Internals, including valve and seat: Replaceable, stainless steel
   4. Connections: NPT
   5. Manufacturers:
      a. Armstrong
b. Sarco
c. Mepco

C. Float and Thermostatic
1. Body: Cast iron
2. Cover plate: Removable, bolted
3. Internals, including valve and seat: Replaceable, stainless steel
4. Connections: NPT
5. Manufacturers
   a. Armstrong
   b. Sarco
   c. Mepco

D. Thermostatic (Radiator)
1. Body: Bronze or brass
2. Cover: Removable, threaded
3. Valve and seat: replaceable, stainless steel
4. Diaphragm: replaceable phosphor bronze or stainless steel
5. Connections: NPT with integral union
6. Manufacturers
   a. Watts (Illinois Engineering)
   b. Mepco
   c. Barnes and Jones
7. Options for coordination with existing conditions:
   d. Same as other existing traps within building if predominant
   e. Direct replacement of existing traps to avoid unnecessary pipe modifications

E. Thermodynamic
1. Body: stainless steel
2. Cover: removable, threaded
3. Disc and seat: replaceable, stainless steel
4. Connections: NPT
5. Manufacturers
   a. Armstrong
   b. Sarco
   c. Mepco

F. Sizing
1. Traps shall be sized with warm-up safety factor as recommended by manufacturer for application.

2.3 VACUUM BREAKERS
A. Stainless steel construction
B. 1/2" or 3/4" NPT connection
C. Rated 300-PSIG, 400-degrees-F
D. 10-SCFM (minimum) at 0.5” Hg (maximum)
E. Basis of Design
   1. Armstrong / VB21
      a. 1/2” NPT connection, 10-SCFM airflow rate at 0.35” Hg cracking pressure

2.4 STEAM PRESSURE REGULATING VALVES

[Note to PSC: Discuss project inlet design pressure with UIUC F&S. Inlet pressures are impacted by season and location on campus. Do not oversize PRVs by sizing based upon maximum winter load at minimum summer pressure. Size based upon winter load at winter inlet pressure and/or summer load at summer inlet pressure.]

[Note to PSC: Discuss Options for project with UIUC F&S. Edit section as appropriate.]

A. Medium Pressure Steam (Campus Steam) – Option #1: Direct Acting PRV (Boylston)
   Uses include: Building Heating Service
   - Normal Operation: 20-40-PSIG Inlet, 5-10-PSIG outlet, ≤350-degrees-F
   1. Size 2” and smaller
      a. Self-contained, direct acting, spring-loaded, diaphragm type (non-piloted)
      b. Failure position, open
      c. Dead-end service, leakage class 4
      d. Bronze body
      e. NPT connections
      f. Pressure class 250
      g. Stainless Steel, plug and shaft
      h. Exposed springs for easy adjustment
      i. Spring range as appropriate for application
      j. Minimum pressure differential: 5-PSID
      k. Minimum outlet pressure:
         1) Perimeter heating (radiation) applications: 3-PSIG
         2) Coil and heat exchanger applications: 5-PSIG
         3) Other: Per system requirement
      l. Maximum temperature: 400-degrees-F
      m. Basis of design:
         1) Boylston / Fig. 90
   2. Size 2-1/2” and larger
      a. Direct acting, spring-loaded, diaphragm type (non-piloted)
      b. Failure position, open
      c. Dead-end service, leakage class 4
      d. Semi-steel body
      e. Pressure class 125
      f. Flanged connections
g. Single seat design, easily renewable
h. Stainless steel plug, seat and shaft
i. Exposed springs for easy adjustment
j. Spring range as appropriate for application
k. 3-ply composition diaphragm
   1) Perimeter heating (radiation) applications: 3-PSIG
   2) Coil and heat exchanger applications: 5-PSIG
   3) Other: Per system requirements
l. Maximum temperature: 400-degrees-F
m. Basis of design:
   1) Boylston / Fig. 390

B. Medium Pressure Steam (Campus Steam) – Option #2 - Externally Piloted PRV (e.g. Spence)

Uses include: Building Heating Service
- Normal Operation: 20-40-PSIG Inlet, 5-10-PSIG, ≤ 350F

1. Size 2” and smaller
   a. Externally piloted, diaphragm or bellows operated
   b. Pressure class 250 – cast or ductile iron body
   c. Pressure class 300 – cast carbon steel body
   d. NPT connections
   e. Replaceable hardened stainless steel plugs and seats
   f. Replaceable stainless steel diaphragm/bellows and hardware
   g. Spring range as appropriate for application
   h. Accuracy: 10% of set point over full range of operation
   i. Manufacturers
      1) Spence
      2) Cashco
      3) Fisher

2. Size 2-1/2” and Larger
   a. Externally piloted, diaphragm or bellows operated
   b. Pressure class 250 – cast or ductile iron body
   c. Pressure class 300 – cast carbon steel body
   d. Flanged connections
   e. Replaceable hardened stainless steel plugs and seats
   f. Replaceable stainless steel diaphragm/bellows and hardware
   g. Spring range as appropriate for application
   h. Accuracy: 10% of set point over full range of operation
   i. Manufacturers
      1) Spence
2) Cashco
3) Fisher

C. High Pressure Steam – Externally Piloted PRV

Uses include: Building Heating Service

- Normal Operation: 150-PSIG Inlet, 60-PSIG outlet or 60-PSIG inlet, 10-PSIG outlet, ≤400-degrees-F

1. Size 2” and smaller
   a. Externally piloted, diaphragm or bellows operated
   b. Pressure class 250 – cast or ductile iron body
   c. Pressure class 300 – cast carbon steel body
   d. NPT connections
   e. Replaceable hardened stainless steel plugs and seats
   f. Replaceable stainless steel diaphragm/bellows and hardware
   g. Spring range as appropriate for application
   h. Accuracy: 10% of set point over full range of operation
   i. Manufacturers
      1) Spence
      2) Cashco
      3) Fisher

2. Size 2-1/2” and Larger
   a. Externally piloted, diaphragm or bellows operated
   b. Pressure class 250 – cast or ductile iron body
   c. Pressure class 300 – cast carbon steel body
   d. Flanged connections
   e. Replaceable hardened stainless steel plugs and seats
   f. Replaceable stainless steel diaphragm/bellows and hardware
   g. Spring range as appropriate for application
   h. Accuracy: 10% of set point over full range of operation
   i. Manufacturers
      1) Spence
      2) Cashco
      3) Fisher

D. High Pressure Steam – Internally Piloted PRV

Uses include: Process Equipment, Kitchen Equipment

- Normal Operation: 150-PSIG Inlet, 60-PSIG outlet ≤400F

1. Size 2” and smaller
   a. Internally piloted, piston operated
   b. Pressure class 250 – cast or ductile iron body
   c. Pressure class 300 – cast carbon steel body
d. NPT connections
e. Replaceable hardened stainless steel plugs and seats
f. Replaceable stainless steel piston and hardware
g. Accuracy: 10% of set point over full range of operation
h. Manufacturers
   1) Spence
   2) Cashco
   3) Fisher

E. Medium Pressure Steam – Internally Piloted PRV
Uses include: Domestic Water Heater, Humidifier
- Normal Operation: 20-40-PSIG Inlet, 5-10-PSIG outlet ≤350°F
1. Size 2” and smaller
   a. Internally piloted, piston operated
   b. Pressure class 125 – cast or ductile iron body
   c. Pressure class 150 – cast carbon steel body
d. NPT connections
e. Replaceable hardened stainless steel plugs and seats
f. Replaceable stainless steel piston and hardware
g. Accuracy: 10% of set point over full range of operation
h. Manufacturers
   1) Spence
   2) Cashco
   3) Fisher

2.5 SAFETY RELIEF VALVES
A. Size 2” and smaller
1. ASME Section I and VIII certified and labeled
2. Pressure class 250
3. Bronze or cast iron body with side outlet
4. NPT connections
5. Stainless steel trim
6. Lift lever
7. Basis of design
   a. Kunkle / Model 6030
   b. Or comparable product by the following:
      1) Consolidated
      2) Keckley
B. Size 2-1/2” and larger
1. ASME Section I and VIII certified and labeled
2. Pressure class 250
3. Cast iron body
4. Side outlet
5. Flanged connections
6. Stainless steel trim
7. Bolted bonnet
8. Lift lever
9. Basis of design
   a. Kunkle / Model 6252
   b. Or comparable product by the following:
      1) Consolidated
      2) Keckley

A. Relief valve pressure setting shall be as indicated on drawings or in schedule. Pressure setting shall be as required to provide adequate protection for piping, devices, equipment and components in the steam system.

B. Safety relief valve sizing shall be in compliance with applicable sections of ASME Boiler and Pressure Vessel Code.

PART 3 - EXECUTION

3.1 STRAINERS

A. Y-Pattern Pipeline Strainers
   1. Strainer blowdown connection shall be fitted with drain valve nipple and cap. Drain valve shall be full port ball valve per specifications for service. Reference section 23 22 13 Steam and Condensate Piping for valve specifications.
   2. Strainer shall be installed in horizontal piping or in vertical piping with downward flow.
   3. Strainer located in horizontal line shall be installed with basket in horizontal plane to prevent condensate build-up in basket.
   4. Strainer shall be provided in steam system upstream of each control valve and at other locations indicated on drawings.
   5. Strainer shall be provided in condensate system upstream of each trap and at other locations indicated on drawings.
   6. Pipe union shall be provided downstream of each strainer with threaded connections to facilitate removal.

3.2 STEAM TRAPS

A. Steam trap shall be provided at outlet of each steam utilizing device or piece of equipment to provide full condensate drainage. Trap shall be located for ease of access to facilitate service and removal/replacement.

B. Steam trap shall be provided at each low point and at end-of-main in steam system to prevent collection of condensate in piping and maintain a dry steam system.

C. Traps serving equipment with modulating control valves shall be F&T type to provide continuous condensate removal and venting of large volumes of air. F&T traps shall be piped for full gravity drainage without vertical lift.

D. Traps for drip applications shall be inverted bucket type for robustness and fail-open function. Drip traps may be piped with vertical lift within pressure differential limitations.
E. Traps for on-off applications may be inverted bucket or thermodynamic type. On-off traps may be piped with vertical lift within pressure differential limitations.

F. Drip leg with scale pocket shall be provided for each trap. Drip leg shall be extended and trap positioned such that trap inlet is no less than 14” below bottom of steam pipe or device outlet. Where potential for superheated steam exists, trap inlet shall be no less than 28” below steam pipe.

G. Trap shall be positioned such that distance from drip leg to trap inlet is no greater than 18” to prevent trap locking.

H. Strainer shall be provided at each trap inlet.

I. Test valve and swing check valve shall be provided at each trap outlet. Pipe unions shall be provided at trap inlet and outlet to facilitate removal.

J. Exceptions for thermostatic traps serving radiators, fin tube and similar applications where space constraints dictate:
   1. Drip leg may be reduced.
   2. Strainer may be deleted.
   3. Test valve and/or check valve may be deleted.

K. Trap Application Table:

<table>
<thead>
<tr>
<th>Application</th>
<th>Trap Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW converter</td>
<td>F&amp;T</td>
<td></td>
</tr>
<tr>
<td>Air coil</td>
<td>F&amp;T</td>
<td></td>
</tr>
<tr>
<td>Domestic water heater</td>
<td>F&amp;T</td>
<td></td>
</tr>
<tr>
<td>Low point drip, end-of-main</td>
<td>Inverted</td>
<td></td>
</tr>
<tr>
<td>drip</td>
<td>bucket</td>
<td></td>
</tr>
<tr>
<td>Radiator, convector, fin</td>
<td>Thermostatic</td>
<td>Reduced drip leg allowed</td>
</tr>
<tr>
<td>tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HP process equipment</td>
<td>Thermodynamic</td>
<td>e.g. Lab sterilizer, cage washer</td>
</tr>
<tr>
<td>Superheated steam applications</td>
<td>Thermodynamic</td>
<td></td>
</tr>
</tbody>
</table>

L. Drip Leg Sizing Table:

<table>
<thead>
<tr>
<th>Main Size</th>
<th>Drip Leg Size, Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” and smaller</td>
<td>Full main size</td>
</tr>
<tr>
<td>6”</td>
<td>4”</td>
</tr>
<tr>
<td>8” and larger</td>
<td>½ main size</td>
</tr>
</tbody>
</table>

3.3 VACUUM BREAKERS

A. Vacuum breakers shall be installed in vertical upright position.

B. Steam coil applications
   1. Vacuum breaker shall be provided at coil outlet. Elevation shall be at or above coil outlet. Vacuum breaker shall not be located at steam trap elevation.

C. Heat exchanger applications
1. Vacuum breaker shall be provided at shell connection provided by manufacturer for such purpose. If no such connection exists vacuum breakers shall be provided as indicated above for steam coil.

D. Additionally, vacuum breakers shall be provided at other locations indicated on drawings.

3.4 PRESSURE REGULATING VALVES

A. Self-Contained PRV
1. Accessibility
   a. Pressure regulating valve shall be located for ease of access to facilitate service and removal/replacement.

2. Piping
   a. Lengths of straight pipe shall be provided upstream and downstream of regulator in compliance with manufacturer’s recommendation. Straight piping shall be no less than 10 diameters upstream and 20 diameters of regulator.
   b. Properly sized pipe reducer shall be provided at valve inlet and outlet.

3. Strainer
   a. Line-size strainer and eccentric reducer shall be provided in piping system upstream of regulator.

4. Isolation Valves
   a. Isolation valves shall be provided to allow isolation of strainer and regulator from system.

5. Unions/Flanges
   a. Pipe union or flanges shall be provided on each side of regulating valve to facilitate removal and replacement.

6. Pilot Line
   a. Pilot/control line shall be provided for each direct acting or externally piloted regulator in conformance with Manufacture’s IOM. Pilot shall be connected to steam main no nearer than 10 pipe diameters downstream of regulator.
   b. Pilot/control line shall be pitched away from regulator.
   c. Throttling valve shall be provided in pilot/control line.

7. Orientation
   a. Regulating valve shall be installed in horizontal piping.
   b. Regulating valve shall be oriented as recommended by Manufacturer.

8. Accumulator
   a. “Condensate accumulator” (Basis of Design: Boylston / #300) shall be provided as indicated in manufacturer’s installation instructions. Applies to Boylston direct-acting regulating valves only.

   [Note to PSC: Installation of an accumulator appears to be unique to Boylston regulators. Its primary purpose is to protect the diaphragm from direct exposure to live steam. The Boylston manual includes the following text.

   “The No. 300 condensate accumulator embodies no moving parts and consequently acts entirely by the action of the steam. The pumping action of the rubber diaphragm will naturally displace the condensate in the diaphragm chamber at times. This will cause a slight variation of reduced pressure. With the accumulator installed, the water held in the vertical pipe connection will never vary more than one or two inches due to the water merely flowing from one chamber to another.”]
9. Adjustment
   a. Regulator shall be adjusted for system pressures according to manufacturer’s
      instructions.

10. Sound Attenuation
   a. Sound attenuating valve trim and/or external covering shall be provided as
      required to maintain acceptable noise level. Unless specified or scheduled
      otherwise sound level shall not exceed 85-dBA. [Not to PSC: Standard insulation
      typically provides approximately 10-dBA of attenuation.]

3.5 SAFETY RELIEF VALVES
   A. Relief valve shall be provided at every location in steam system where over-pressure
      protection could occur.
   B. Relief valve shall be located for ease of access to facilitate operation of trip handle,
      adjustment and removal/replacement.
   C. Relief valve shall be installed in vertically upward configuration with horizontal discharge.
   D. Relief valve vent piping shall be provided. Vent piping shall be extended and terminated in
      safe manner with consideration of hazard to maintenance personnel as well as general
      public. Vent piping shall be insulated as required to eliminate burn hazard. Vent piping
      shall be terminated with vertical discharge 7-ft. minimum above roof unless clearly
      indicated otherwise in drawings.
   E. Vent piping shall be configured as required to minimize physical force on valve body over
      the entire range of operating temperatures.
   F. Drip pan elbow shall be provided unless specifically indicated otherwise in drawings. Drain
      piping shall be extended full size from drip pan elbow to floor drain. With approval of PSC,
      flexible metal hose may be used to provide necessary flexibility if installation precludes use
      of drip pan elbow.
   G. Vent piping shall be continuously pitched backward toward relief valve. If drip pan elbow is
      not provided, drain leg shall be provided at base of vent piping to collect water and prevent
      collection at relief valve outlet. 3/4” drain piping shall be extended from drain leg to floor
      drain and turned downward to discharge directly into drain.

3.6 FLOW METERS
   A. Flow Meters for Steam Condensate.
      1. Installation of magnetic flow meters for steam condensate applications shall comply
         with requirements listed in Section 23 09 13 - Instrumentation and Control Devices for
         HVAC.

3.7 INSULATION
   A. Steam and condensate specialties shall be insulated in compliance with Section 23 07 16 –
      HVAC Equipment Insulation.

END OF SECTION 23 22 16

This section of the U of I Facilities Standards establishes minimum requirements only.
It should not be used as a complete specification.