

University Contact: Energy & Engineering Group  
(302) 831-1744

## SECTION 23 23 00\_REFRIGERATION PIPING AND SPECIALTIES

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. This standard includes refrigeration piping standards for use refrigeration piping used for DX based refrigeration heating and cooling systems.
- B. The intent of these standards are to provide input to the design team on the University's preference of manufacturers, design, equipment options and quality assurance to maintain the longevity of its assets.

#### 1.2 REFERENCES

- A. Common Work for HVAC Systems 23 05 00
- B. Common Requirements for HVAC Systems 23 05 01
- C. Identification for HVAC Piping & Equipment 23 05 53
- D. DX Refrigeration Based Split Systems - Comfort 23 81 00

#### 1.3 DESIGN REQUIREMENTS

- A. It is the responsibility of the consulting engineer or design build contractor to properly design and size the refrigerant piping. Refrigerant/HVAC equipment manufacturer must be consulted during the design process. The Refrigerant/HVAC equipment manufacturer must approve all refrigeration piping system design (including pipe sizes) prior to review and approval by the University of Delaware.
- B. Consulting engineer or design build contractor shall consult equipment manufacturer when determining the thickness of the refrigerant pipe. Equipment manufacturer shall calculate pipe size based on system pressure. Documentation shall be submitted that refrigerant pipe wall thickness is in compliance with equipment manufacturer's requirements.

1.4 SUBMITTALS

- A. Shop Drawings: Contractor shall supply for approval a shop drawing to scale of the refrigeration piping system 7 ½ tons are larger. Shop drawings shall include all equipment, valves and in line piping specialties. All refrigeration piping shall have their sizes indicated. Shop drawings shall indicate changes of elevation. Refrigeration/HVAC equipment manufacturer must approve shop drawings prior to submitting shop drawings prior for final approval.
- B. Product Data :
  - 1. Refrigerant Specialties: Submit manufacturers catalog information including capacity, component sizes, rough-in requirements, and service sizes for the following:
    - a. Refrigerant moisture and liquid indicators.
    - b. Refrigerant strainers.
    - c. Refrigerant pressure regulators.
    - d. Refrigerant pressure relief valves.
    - e. Refrigerant filter-driers.
    - f. Refrigerant solenoid valves.
    - g. Refrigerant expansion valves.
    - h. Electronic expansion valves.

1.5 CLOSEOUT SUBMITTALS

- A. Close out submittals must conform to standard XX – Close Out Submittals.

1.6 QUALITY ASSURANCE

- A. Verify field measurements prior to fabrication.
- B. Pressure test must comply with RSES standards and guidelines

B. Press Test refrigeration system per RSES standards. Contractor must submit a report stating that the refrigeration system held pressure per RSES standards.

C. Pressure test must be witnessed by a University of Delaware Maintenance & Operations Manager, Assigned Project Engineer or Commissioning Agent.

#### 1.7. DELIVERY, STORAGE, AND HANDLING

Dehydrate and charge refrigeration components including piping and receivers, seal prior to shipment. Maintain seal until connected into system.

Accept valves on site in shipping containers with labeling in place. Inspect for damage.

Accept equipment on site in factory packaging. Inspect for damage.

### PART 2 PRODUCTS

#### 2.1 REFRIGERANT PIPING

Copper Tubing: ASTM B280, ACR.

Fittings: ASME B16.22 wrought copper.

Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F

#### 2.2 REFRIGERANT MOISTURE AND LIQUID INDICATORS

- A. Indicators:
  - 1. Port: Single, UL listed.
  - 2. Body: Copper or brass, brazed ends.
  - 3. Sight glass: Color-coded paper moisture indicator with removable element cartridge and plastic cap.
  - 4. Maximum working pressure: 500 psig.
  - 5. Maximum working temperature: 200 degrees F.

#### 2.3 VALVES

- A. Diaphragm Packless Valves:
  - 1. UL listed, globe or angle pattern, forged brass body and bonnet brazed ends.
  - 2. Phosphor bronze and stainless steel diaphragms, rising stem and hand wheel.
  - 3. Stainless steel spring, nylon seats, disc with positive back seating.
  - 4. Maximum working pressure: 500 psig.
  - 5. Maximum working temperature: 275 degrees F.

- B. Packed Angle Valves:
  - 1. Forged brass, brazed ends.
  - 2. Forged brass seal caps with copper gasket, rising stem and seat, molded stem packing.
  - 3. Maximum working pressure: 500 psig.
  - 4. Maximum working temperature: 275 degrees F.
  
- C. Ball Valves:
  - 1. Two piece forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals, brazed ends.
  - 2. Maximum working pressure: 500 psig
  - 3. Maximum working temperature 325 degrees F.
  
- D. Service Valves:
  - 1. Forged brass body with copper stubs, brass caps, removable valve core flared or brazed ends.
  - 2. Maximum working pressure: 500 psig.
  
- E. Refrigerant Check Valves:
  - 1. Globe Type:
    - a. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc.
    - b. Maximum working pressure: 500 psig.
    - c. Maximum working temperature: 300 degrees F.
  - 2. Straight Through Type:
    - a. Spring, neoprene seat.

#### 2.4 REFRIGERANT STRAINERS

- A. Straight Line or Angle Line Type:
  - 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire reinforced with brass.
  - 2. Maximum working pressure: 430 psig

#### 2.5 REFRIGERANT PRESSURE REGULATORS

- A. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psig range, for maximum working pressure of 450psig.

#### 2.6 REFRIGERANT PRESSURE RELIEF VALVES

- A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB; for standard 450 psig setting;

## 2.7 REFRIGERANT FILTER-DRIERS

- A. Replaceable Cartridge Angle Type:
  - 1. Shell: UL listed, brass removable cap, for maximum working pressure of 500 psig.
  - 2. Filter/Dryer Cartridge: Pleated media with solid core sieve with activated alumina.

## 2.8 REFRIGERANT SOLENOID VALVES

- A. Valve: pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, integral strainer, with brazed ends; for maximum working pressure of 500 psig. Stem designed to allow manual operation in case of coil failure.
- B. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

## 2.9 ELECTRONIC EXPANSION VALVES

- A. Valve:
  - 1. Brass bodies with brazed connection, needle valve with floating needle and machined seat, stepper motor drive.
- B. Evaporation Control System:
  - 1. Electronic microprocessor control is preferable.
- C. Refrigeration System Control: Electronic microprocessor control is preferable

## 2.10 REFRIGERANT RECEIVERS

- A. Internal Diameter 6 inch and Smaller: ARI 495, UL listed, steel, brazed; 400 psig maximum pressure rating, with taps for inlet, outlet, and pressure relief valve.
- B. Internal Diameter 6 inch and Larger: ARI 495, welded steel, tested and stamped in accordance with ASME Section VIII; 400 psig with taps for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

### PART 3 EXECUTION

#### 3.1 INSTALLATION REFRIGERATION PIPING

- A. Install piping as per RSES
- B. All refrigeration piping must be properly supported with approved pipe supports or pipe hangers
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
- E. Sleeve pipe passing through partitions, walls and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access doors where valves and fittings are not accessible.
- I. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
- J. Install piping penetrating roofed areas to maintain integrity of roof assembly.
- K. Pay attention to oil trapping when routing refrigeration piping. Refrigeration piping shall be installed to insure lubricating oils are properly returned to the compressor.

#### 3.2 INSTALLATION - REFRIGERANT SPECIALTIES

- A. Refrigerant Liquid Indicators:
  - 1. Install line size liquid indicators in main liquid line downstream of condenser.
  - 2. When receiver is provided, install line size liquid indicators in liquid line downstream of receiver.
  - 3. Install line size liquid indicators downstream of liquid solenoid valves.
- B. Refrigerant Valves:
  - 1. Install service valves on compressor suction and discharge.

2. Install check valves on scroll and screw compressor discharge as per manufacturer's recommendations.
  3. Install check valves on condenser liquid lines on multiple condenser systems.
  4. Install refrigerant charging valve in liquid line between receiver shut-off valve and expansion valve.
- C. Strainers:
1. Install line size strainer upstream of each automatic valve.
  2. Where multiple expansion valves with integral strainers are used, install single main liquid-line strainer.
  3. On steel piping systems, install strainer in suction line.
  4. Install shut-off valves on each side of strainer.
- D. Install pressure relief valves/rupture discs on ASME receivers. Install relief valve/rupture disc discharge piping to terminate outdoors above roof line. Manifold multiple relief devices so that maintenance can be performed on relief devices without removing refrigerant from the system.
- E. Filter-Dryers:
1. Install permanent filter-dryer in systems containing hermetic compressors.
  2. Install replaceable cartridge filter-dryer vertically in liquid line adjacent to receivers.
  3. Install replaceable cartridge filter-dryer upstream of each solenoid valve.
  4. Install shut off valves on each side of the filter-dryer.
- F. Solenoid Valves:
1. Install in liquid line of systems operating with single pump-out or pump-down compressor control.
  2. Install in liquid line of single or multiple evaporator systems.
  3. Install in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

**END OF SECTION**