

SECTION 230660 – HVAC AND REFRIGERATION REFRIGERANT PIPING SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. All work specified in this Section is governed by the Mechanical General Section 230100.
- B. This Section 230660 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the piping systems as specified herein and as shown for the heating, ventilating and air conditioning (HVAC) systems. These piping systems include, but are not limited to, the following:
 - 1. Refrigerant suction and liquid (RS&RL)
 - 2. Condensate drains (DR)

1.2 INTENT

- A. It is the intent of this Section of the specifications to provide complete and operable piping systems as shown and specified which are free of leaks, properly vented, free of noise, vibration and sweating, and fabricated so as to fit the space allotted and to exhibit a minimum resistance to fluid flow. It is also the intent of this Section of the specifications to provide a complete piping insulation system which is free of gaps and tears, properly fitted and finished, free of sweating, and fabricated so as to fit the space allotted and to exhibit a negligible heat transfer.
- B. The word "piping" is defined to mean all piping, fittings, joints, hangers, coatings, valves, test and sensor wells and accessories necessary for the refrigerant piping systems described, shown and specified.

1.3 GENERAL REQUIREMENTS

- A. Provide all reducing fittings, flanges, couplings and unions of the size and type of material to match the piping to each piece of equipment, valve and accessory.
- B. Union joints, couplings or flanges shall be provided in each pipe line connected to each piece of equipment and elsewhere as indicated and specified. Unions shall match the piping system in which they are installed.
 - 1. Unions or flanges shall be provided between all copper to steel connections in water-carrying piping. These unions shall be dielectric, insulating type.
- C. All changes in direction and branches shall be made with manufactured fittings.
- D. All pipe joints shall be cut square and all burrs shall be removed.
- E. Fabrication of a bull-head tee connection is strictly prohibited.
- F. Open ends of pipe lines not currently being handled shall be plugged during installation to keep dirt, water and foreign material out of the system.
- G. Horizontal drain piping shall slope down in the direction of flow at a minimum slope of 1/8"

per foot of run.

- H. Install all horizontal suction lines with a uniform slope downward toward the compressor.
- I. All insulation products installed indoors shall meet NFPA 90A, 90B and 255 requirements for Flame Spread Rating 25 and Smoke Developed Rating 50.
- J. Installation shall comply with all requirements of AHSRAE 15.
- K. All pipe, fittings, valves etc. shall be manufactured in the USA.

1.4 FIRE-STOPS

- A. Where pipes pass through fire partitions, fire walls and floors, install a fire-stop that shall provide an effective barrier against the spread of fire, smoke and gases. Fire-stop material shall be packed tight and completely fill clearances between pipes and openings. Fire-stop material shall conform to the following:
 - 1. Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke and gases under conditions of installation and use when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Fire-stopping material shall be noncombustible as defined by ASTM E136; and in addition for insulation materials melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection. Fire-stopping material shall be Dow-Corning RTV Foam or an approved equal.

1.5 ACCEPTABLE MANUFACTURERS

- A. Insulation products shall be as manufactured by Rubatex or Armstrong.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. All pipe and fittings shall be products of a domestic manufacturer.
- B. Pipe and fittings shall be as listed and outlined below:

<u>SERVICE</u>	<u>MATERIAL TYPE</u>	<u>SIZES</u>
1. Refrigerant Suction and Liquid	1	All
2. Drains	*2	All

*Note: As an option, on cooling coil condensate drains (which are not installed in a plenum) the drain piping may be schedule 40 PVC with solvent joints; subject to advance approval by the Local Authorities. Fittings shall meet ASTM D2466 and solvent shall meet ASTM D2564.

- C. The pipe, fittings and joints shall be as outlined below:
 - 1. Material Type 1:
 - a. Pipe - Type L hard drawn copper tubing meeting ASTM B88 or ASTM B280.

- b. Fittings - Wrought copper meeting ANSI B16.22.
- c. Joints - Silver brazed with sil-fos or silver solder.
- 2. Material Type 2:
 - a. Pipe - Copper drainage tube DWV meeting ASTM B306.
 - b. Fittings - Wrought copper solder-joint drainage fittings meeting ANSI B16.29.
 - c. Joints - Soldered with a solder meeting ASTM B32.

2.2 PIPE HANGERS AND SUPPORTS

- A. Pipe hangers, trapeze hangers, upper attachments, rods and other supports shall be selected based on pipe size and material contained therein. Provide all hangers, rods, turnbuckles, angles, channels and other supports to securely support the piping systems from the building structure.
- B. All materials utilized for the hanging and support of the piping systems shall be manufactured products which are specifically intended for the purpose of hanging piping systems. The use of wire, steel straps, plastic ties, etc. is strictly prohibited.
- C. Supports and hangers shall be selected to fit around the pipe (and insulation unless otherwise specified herein) and provide adequate movement for expansion of the piping systems. Anchors shall be provided to restrict and control such movement within offsets and expansion loops.
- D. All hangers and supports shall be selected at a minimum factor of safety of five based on the ultimate tensile strength of the material.
- E. Intermediate pipe supports shall be provided between building structural members so as not to exceed maximum support spacing specified and shall be structural steel angles (minimum 2 1/2" x 2 1/2" x 1/4"). In steel construction, intermediate supports shall be securely clamped to steel beams and to steel joists, and in no case shall supports be attached to roof decks.
- F. For suspending pipes from concrete beams, upper attachments shall be side beam bracket utilizing bolts in sleeves set in top portions of the beams. Where sleeves are not used, provide expansion shields or power-actuated fasteners.
- G. Hanger rods for pipe hangers shall be as follows:

<u>HANGER ROD SIZE</u>	<u>NOMINAL PIPE SIZE</u>
3/8"	2" and smaller
1/2"	2 1/2" and larger

- H. Pipe hangers selected for supporting horizontal insulated piping shall be sized to fit around the outside of the pipe insulation.
- I. Provide pipe saddles and shields on all insulated piping as outlined below:
 - 1. All insulated piping shall be supported on galvanized shields.
 - a. Shields shall be as follows:
 - 1) Pipes 2" and smaller: 18 gauge x 12" long.
 - 2) Pipes 2 1/2" and larger: 16 gauge x 18" long.
 - b. Shields shall be 180 degrees around the lower half of the pipe at all pipe hangers, except that on trapeze hangers, pipe racks and floor supported horizontal pipes, shields shall be 360 degrees around the entire pipe.

- J. Provide riser clamps at all floor penetrations.

2.3 VALVES

- A. All valves shall have the manufacturer's name or trademark and the working pressure cast or stamped on the valve body.
- B. All valves shall be designed and constructed for refrigerant service.

2.4 PIPING INSULATION

- A. Closed-cell insulation shall be provided over all refrigerant suction piping and other services as specified or noted. Closed-cell piping insulation shall be 1/2" thick 25/50 Armaflex or Rubatex. All glues and coatings shall be products of the same manufacturer as the insulation. Insulation shall be installed via the slip-on method. Slitting the insulation for installation is prohibited and shall be rejected.
- B. Insulation shall be continuous over all valve bodies, fittings, and wall and floor penetrations.

PART 3 – EXECUTION

3.1 ARRANGEMENT

- A. Piping shall follow the general layout, arrangement, schematics, and details. Provide all offsets, vents, drains, charging ports and connections necessary to accomplish the installation. Fabricate piping accurately to measurements established at the project site to avoid interference with ductwork, other piping, equipment, openings, electrical conduits and light fixtures. Make suitable provision for expansion and contraction with expansion loops and offsets.
- B. Provide unions at all valves, coiles, etc. to allow for the removal and service of valves, equipment, etc.
- C. All offsets, elbows, and turns shall be done with factory fabricated fittings.

3.2 MINIMUM HANGER SPACING

- A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and at the code required distances to ensure the pipes do not sag.
- B. Riser clamps shall be provided at each floor penetration.

3.3 REFRIGERANT PIPING INSTALLATION

- A. All refrigerant piping shall be sized in accordance with the air conditioning equipment manufacturer's written instructions. Provide charging ports, solenoid valves, service valves, dryers, etc. at each piece of equipment.
- B. All brazing shall be done while the line is being flushed with carbon dioxide, nitrogen or other inert gases.
- C. The inside of all tubing shall be thoroughly cleaned and internally wiped with a lintless, dry cloth.

- D. Suction lines shall drop below their coils before any horizontal run.
- E. Provide oil traps at least every ten feet for extended vertical risers.
- F. All oil traps shall be constructed from close-radius type fittings.
- G. Dryer cores shall be installed to remove horizontally or downward.
- H. Install external equalizer downstream of its expansion valve sensing bulb.
- I. Install expansion sensing valve bulb on top centerline of piping up to 5/8" size; install 45 degrees down from the horizontal centerline on pipe sizes 7/8" and larger.

3.4 CLOSED-CELL PIPING INSULATION INSTALLATION

- A. Insulation shall be provided on all refrigerant suction and indoor condensate drain lines. The insulation shall be installed by the slip-on method; slitting of the insulation is prohibited and shall be cause for rejection. All elbows shall be mitered and all such joints and butt joints shall be tightly made and glued.
- B. All insulation installed outdoors shall be coated with a glossy white, ultraviolet protective coating applied in two coats; Armacote or approved equal.

END OF SECTION 230660