SECTION 15184

REFRIGERANT PIPING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Furnish and install piping and specialties for refrigeration systems as described in Contract Documents.

B. Related Sections
   1. Section 15084 - Refrigerant Piping Insulation
   2. Section 15101 - General Piping Requirements

1.2 REFERENCES

A. American National Standards Institute / American Welding Society
   1. ANSI / AWS A5.8-92, 'Standard Specification for Brazing Alloys'

B. American Society For Testing And Materials
   1. ASTM A 36-00a, 'Standard Specification for Carbon Structural Steel'
   2. ASTM A 361-94, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Roofing and Siding'
   3. ASTM B 280-99, 'Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service'

1.3 SUBMITTALS

A. Shop Drawings - Show each individual equipment and piping support

B. Quality Assurance / Control - Technician certificate for use of CFC and HCFC refrigerants

1.4 QUALITY ASSURANCE

A. Qualifications - Refrigerant piping shall be installed by a refrigeration contractor licensed by State and by technicians certified in use of CFC and HCFC refrigerants.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Refrigerant Piping
   1. Meet requirements of ASTM B 280, hard drawn straight lengths. Soft copper tubing not permitted.
   2. Do not use pre-charged refrigerant lines.

B. Refrigerant Fittings
   1. Wrought copper with long radius elbows.
   2. Approved Manufacturers -
      a. Mueller Streamline
      b. Nibco Inc
      c. Grinnell
      d. Elkhart

C. Suction Line Traps
   1. Manufactured standard one-piece traps.

2. Approved Manufacturers -
    a. Mueller Streamline
    b. Nibco Inc
    c. Grinnell
    d. Elkhart

D. Connection Material
1. Brazing Rods in accordance with ANSI / AWS A5.8 -
    a. Copper to Copper Connections -
        1) Classification BCuP-4 Copper Phosphorus (6 percent silver).
        2) Classification BCuP-5 Copper Phosphorus (15 percent silver).
    b. Copper to Brass or Copper to Steel Connections - Classification BAg-5 Silver (45 percent silver).
    c. Do not use rods containing Cadmium.
2. Flux -
    a. Approved Products -
        1) Stay-Silv White Brazing Flux by J W Harris
        2) High quality silver solder flux by Handy & Harmon

E. Valves
1. Expansion Valves -
    a. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
    b. Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.
    c. Approved Manufacturers -
        1) Alco
        2) Henry
        3) Mueller
        4) Parker
        5) Sporlan
2. Manual Refrigerant Shut-Off Valves -
    a. Ball valves designed for refrigeration service and full line size.
    b. Valve shall have cap seals.
    c. Valves with hand wheels are not acceptable.
    d. Provide service valve on each liquid and suction line at compressor.
    e. If service valves come as integral part of condensing unit, additional service valves shall not be required.
    f. Approved Manufacturers -
        1) Henry
        2) Mueller
        3) Superior
        4) Virginia

F. Filter-Drier
1. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
2. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.
3. Size shall be full line size.
4. Approved Manufacturers -
    a. Alco
    b. Mueller
    c. Parker
    d. Sporlan
    e. Virginia

G. Sight Glass
1. Combination moisture and liquid indicator with protection cap.
2. Sight glass shall be full line size.

3. Sight glass connections and sight glass body shall be solid copper or brass, no copper-coated steel sight glasses allowed.
4. Approved Product -
   a. Alco AMI

H. Flexible Connectors
1. Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.
2. Approved Products -
   a. Vibration Absorber Model VAF by Packless Industries
   b. Vibration Absorbers by Superior Valve Co
   c. Anaconda 'Vibration Eliminators' by Universal Metal Hose
   d. Style 'BF' Spring-flex freon connectors by Vibration Mountings

2.2 MATERIALS

A. Refrigerant Piping Supports
1. Base, Angles, And Uprights - Steel meeting requirements of ASTM A 36.
2. Securing Channels -
   a. At Free-Standing Pipe Support -
      1) Acceptable Products -
         a) P-1000 channels by Unistrut
         b) HS-158-12 channels by Hilti
         c) Equal as approved by Architect prior to installation. See Section 01600.
   b. At Wall Support -
      1) Acceptable Products -
         a) P-3300 channels by Unistrut
         b) HS-1316-12 channels by Hilti
         c) Equal as approved by Architect prior to installation. See Section 01600.
   c. At Suspended Support -
      1) Acceptable Products -
         a) P-1001 channels by Unistrut
         b) MS-41 channels by Hilti
         c) Equal as approved by Architect prior to installation. See Section 01600.
3. Angle Fittings -
   a. Acceptable Products -
      1) P-2626 90 degree angle by Unistrut
      2) MW2 angle by Hilti
      3) Equal as approved by Architect prior to installation. See Section 01600.
4. Pipe Clamps -
   a. Acceptable Manufacturers -
      1) Hydra-Zorb
      2) ZSI Cush-A-Clamp
      3) Hilti Cush-A-Clamp
      4) Equal as approved by Architect prior to installation. See Section 01600.
5. Protective Cover - 18 ga steel, hot-dipped galvanized to meet requirements of ASTM A 361, 1.25 oz/sq ft.

2.3 MANUFACTURERS

A. Alco Controls Div, Maryland Heights, MO (314) 569-4500 www.alcocontrols.com
B. Cush-A-Clamp by ZSI Manufacturing, Westland, MI (800) 323-7053 or (734) 467-1716 www.cushaclamp.com
C. Elkhart Products Corp, Elkhart, IN (219) 264-3181 www.elkhartproducts.com
D. Grinnell Corp, Exeter, NH (888) 610-6101 or (630) 787-6100 www.grinnell.com
E. Handy & Harmon Products Division, Fairfield, CT (800) 245-2728 or (203) 259-8321 www.handyharmon.com
F. J W Harris Co Inc, Cincinnati, OH (800) 733-4533 or (513) 891-2000 www.jwharris.com
G. Henry Valve Co, Melrose Park, IL (800) 964-3679 or (708) 344-1100 www.paulsenpartners.com/henry-valve/

H. Hilti Inc, Tulsa, OK (800) 879-8000 or (918) 252-6000 www.hilti.com
I. Hydra-Zorb Co, Auburn Hills, MI (248) 373-5151 www.hydra-zorb.com
J. Mueller Steam Specialty, St Pauls, NC (877) 831-9464 or (910) 865-8241 www.muellersteam.com
K. Nibco Inc, Elkhart, IN (800) 642-5463 or (219) 295-3000 www.nibco.com
L. Packless Industries, Waco, TX (800) 347-4859 or (254) 666-7700 www.packless.com
M. Parker Hannefin Corp, Cleveland, OH (216) 896-3000 www.parker.com/cig/
N. Sporlan Valve Co, Washington, MO (314) 239-1111
O. Superior Refrigeration Products, Washington, PA (724) 225-8000 www.superiorvalve.com
P. Unistrut Corp, Wayne, MI (800) 521-7730 or (313) 721- 4040 www.unistrut.com
Q. Universal Metal Hose, Chicago, IL (800) 638-4673 or (773) 277-0700 www.universalmetalhose.com
R. Vibration Mountings & Controls, Bloomingdale, NJ (800) 569-8423 or (973) 838-1780 www.vmc-kdc.com
S. Virginia KMP Corp, Dallas, TX (800) 285-8567 or (214) 330-7731

PART 3 EXECUTION

3.1 INSTALLATION

A. Refrigerant Lines
1. Install as high in upper mechanical areas as possible. Do not install underground or in tunnels.
2. Slope suction lines down toward compressor one inch/10 feet 25 mm in 3 meters. Locate traps at vertical rises against flow in suction lines.

B. Connections
1. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary. No soft solder (tin, lead, antimony) connections will be allowed in system.
2. Braze manual refrigerant shut-off valve, sight glass, and flexible connections.
3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

C. Specialties
1. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.
2. Install thermostatic bulb as close to cooling coil as possible. Do not install on vertical lines.
3. Install equalizing line in straight section of suction line, downstream of and reasonably close to thermostatic bulb. Do not install on vertical lines.
4. Provide flexible connectors in each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons. Anchor pipe near each flexible connector.

D. Refrigerant Supports
1. Support Spacing -
a. Piping 1-1/4 inch And Larger - 8 feet on center maximum.
b. Piping 1-1/8 inch And Smaller - 6 feet on center maximum.
c. Support each elbow.
2. Isolate pipe from supports and clamps with Hydrozorb or Cush-A-Clamp systems.
3. Run protective cover continuous from condensing units to risers or penetrations at building wall.

3.2 FIELD QUALITY CONTROL

A. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
1. Draw vacuum on each entire system with two stage vacuum pump. Draw vacuum to 300 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns.

Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.

2. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 300 microns without vacuum pump running.
3. Conduct tests at 70 deg F ambient temperature minimum.
4. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
5. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.
6. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.

B. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

END OF SECTION