SECTION 15183 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES REFRIGERANT PIPING USED FOR AIR-CONDITIONING APPLICATIONS.

1.2 PERFORMANCE REQUIREMENTS

A. LINE TEST PRESSURE FOR REFRIGERANT R-410A:

1. SUCTION LINES FOR AIR-CONDITIONING APPLICATIONS: 300 PSIG.
2. SUCTION LINES FOR HEAT-PUMP APPLICATIONS: 535 PSIG.
3. HOT-GAS AND LIQUID LINES: 535 PSIG.

1.3 INFORMATIONAL SUBMITTALS

A. WELDING CERTIFICATES.

B. FIELD QUALITY-CONTROL TEST REPORTS.

1.4 QUALITY ASSURANCE

A. WELDING: QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE: SECTION IX, "WELDING AND BRAZING QUALIFICATIONS."

B. COMPLY WITH ASHRAE 15, "SAFETY CODE FOR REFRIGERATION SYSTEMS."

C. COMPLY WITH ASME B31.5, "REFRIGERATION PIPING AND HEAT TRANSFER COMPONENTS."

1.5 PRODUCT STORAGE AND HANDLING

A. STORE PIPING IN A CLEAN AND PROTECTED AREA WITH END CAPS IN PLACE TO ENSURE THAT PIPING INTERIOR AND EXTERIOR ARE CLEAN WHEN INSTALLED.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. COPPER TUBE: ASTM B 280, TYPE ACR.

B. WROUGHT-COPPER FITTINGS: ASME B16.22.

C. WROUGHT-COPPER UNIONS: ASME B16.22.

D. SOLDER FILLER METALS: ASTM B 32. USE 95-5 TIN ANTIMONY OR ALLOY HB SOLDER TO JOIN COPPER SOCKET FITTINGS ON COPPER PIPE.

E. BRAZING FILLER METALS: AWS A5.8.

2.2 VALVES AND SPECIALTIES

A. THERMOSTATIC EXPANSION VALVES: COMPLY WITH ARI 750.

1. BODY, BONNET, AND SEAL CAP: FORGED BRASS OR STEEL.
2. DIAPHRAGM, PISTON, CLOSING SPRING, AND SEAT INSERT: STAINLESS STEEL.
3. PACKING AND GASKETS: NON-ASBESTOS.
4. CAPILLARY AND BULB: COPPER TUBING FILLED WITH REFRIGERANT CHARGE.
5. SUCTION TEMPERATURE: 40 DEG F.
6. SUPERHEAT: NONADJUSTABLE.
7. REVERSE-FLOW OPTION (FOR HEAT-PUMP APPLICATIONS).
8. END CONNECTIONS: SOCKET, FLARE, OR THREADED UNION.
9. WORKING PRESSURE RATING: 700 PSIG.

B. MOISTURE/LIQUID INDICATORS:

1. BODY: FORGED BRASS.
2. WINDOW: REPLACEABLE, CLEAR, FUSED GLASS WINDOW WITH INDICATING ELEMENT PROTECTED BY FILTER SCREEN.
3. INDICATOR: COLOR CODED TO SHOW MOISTURE CONTENT IN PPM.
4. MINIMUM MOISTURE INDICATOR SENSITIVITY: INDICATE MOISTURE ABOVE 60 PPM.
5. END CONNECTIONS: SOCKET OR FLARE.
6. WORKING PRESSURE RATING: 500 PSIG.
7. MAXIMUM OPERATING TEMPERATURE: 240 DEG F.

2.3 REFRIGERANTS

A. ASHRAE 34, R-410A: PENTAFLUOROETHANE/DIFLUOROMETHANE.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. SUCTION LINES NPS 1-1/2 AND SMALLER FOR CONVENTIONAL AIR-CONDITIONING APPLICATIONS: COPPER, TYPE ACR, ANNEALED-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH BRAZED JOINTS.

B. SUCTION LINES NPS 2 TO NPS 4 FOR CONVENTIONAL AIR-CONDITIONING APPLICATIONS: COPPER, TYPE ACR, DRAWN-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH BRAZED JOINTS.

C. HOT-GAS AND LIQUID LINES, AND SUCTION LINES FOR HEAT-PUMP APPLICATIONS: COPPER, TYPE ACR, ANNEALED-TEMPER TUBING AND WROUGHT-COPPER FITTINGS WITH BRAZED JOINTS.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. INSTALL THERMOSTATIC EXPANSION VALVES AS CLOSE AS POSSIBLE TO DISTRIBUTORS ON EVAPORATORS.

1. INSTALL VALVE SO DIAPHRAGM CASE IS WARMER THAN BULB.
2. SECURE BULB TO CLEAN, STRAIGHT, HORIZONTAL SECTION OF SUCTION LINE USING TWO BULB STRAPS. DO NOT MOUNT BULB IN A TRAP OR AT BOTTOM OF THE LINE.
3. IF EXTERNAL EQUALIZER LINES ARE REQUIRED, MAKE CONNECTION WHERE IT WILL REFLECT SUCTION-LINE PRESSURE AT BULB LOCATION.

B. INSTALL MOISTURE/LIQUID INDICATORS IN LIQUID LINE AT THE INLET OF THE THERMOSTATIC EXPANSION VALVE OR AT THE INLET OF THE EVAPORATOR COIL CAPILLARY TUBE.

C. INSTALL FILTER DRYERS IN LIQUID LINE BETWEEN COMPRESSOR AND THERMOSTATIC EXPANSION VALVE.

3.3 PIPING INSTALLATION

A. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS; INDICATED LOCATIONS AND ARRANGEMENTS WERE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, PUMP SIZING, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON SHOP DRAWINGS.

B. INSTALL REFRIGERANT PIPING ACCORDING TO ASHRAE 15.

C. INSTALL PIPING IN CONCEALED LOCATIONS UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.

D. INSTALL PIPING INDICATED TO BE EXPOSED AND PIPING IN EQUIPMENT ROOMS AND SERVICE AREAS AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.

E. INSTALL PIPING ABOVE ACCESSIBLE CEILINGS TO ALLOW SUFFICIENT SPACE FOR CEILING PANEL REMOVAL.

F. INSTALL PIPING ADJACENT TO MACHINES TO ALLOW SERVICE AND MAINTENANCE.

G. INSTALL PIPING FREE OF SAGS AND BENDS.

H. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.

I. SELECT SYSTEM COMPONENTS WITH PRESSURE RATING EQUAL TO OR GREATER THAN SYSTEM OPERATING PRESSURE.

J. INSTALL PIPING AS SHORT AND DIRECT AS POSSIBLE, WITH A MINIMUM NUMBER OF JOINTS, ELBOWS, AND FITTINGS.

K. ARRANGE PIPING TO ALLOW INSPECTION AND SERVICE OF REFRIGERATION EQUIPMENT. INSTALL VALVES AND SPECIALTIES IN ACCESSIBLE LOCATIONS TO ALLOW FOR SERVICE AND INSPECTION. INSTALL ACCESS DOORS OR PANELS AS SPECIFIED IN SECTION 08311 "ACCESS DOORS AND FRAMES" IF VALVES OR EQUIPMENT REQUIRING MAINTENANCE IS CONCEALED BEHIND FINISHED SURFACES.

L. INSTALL REFRIGERANT PIPING IN PROTECTIVE CONDUIT WHERE INSTALLED BELOWGROUND.

M. INSTALL REFRIGERANT PIPING IN RIGID OR FLEXIBLE CONDUIT IN LOCATIONS WHERE EXPOSED TO MECHANICAL INJURY.

N. SLOPE REFRIGERANT PIPING AS FOLLOWS:

1. INSTALL HORIZONTAL HOT-GAS DISCHARGE PIPING WITH A UNIFORM SLOPE DOWNWARD AWAY FROM COMPRESSOR.
2. INSTALL HORIZONTAL SUCTION LINES WITH A UNIFORM SLOPE DOWNWARD TO COMPRESSOR.
3. INSTALL TRAPS AND DOUBLE RISERS TO ENTRAIN OIL IN VERTICAL RUNS.
4. LIQUID LINES MAY BE INSTALLED LEVEL.

O. WHEN BRAZING OR SOLDERING, REMOVE SOLENOID-VALVE COILS AND SIGHT GLASSES; ALSO REMOVE VALVE STEMS, SEATS, AND PACKING, AND ACCESSIBLE INTERNAL PARTS OF REFRIGERANT SPECIALTIES. DO NOT APPLY HEAT NEAR EXPANSION-VALVE BULB.

P. INSTALL PIPING WITH ADEQUATE CLEARANCE BETWEEN PIPE AND ADJACENT WALLS AND HANGERS OR BETWEEN PIPES FOR INSULATION INSTALLATION.

Q. IDENTIFY REFRIGERANT PIPING AND VALVES ACCORDING TO SECTION 15077 "IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT."

R. INSTALL SLEEVES FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.

S. INSTALL SLEEVE SEALS FOR PIPING PENETRATIONS OF CONCRETE WALLS AND SLABS.

T. INSTALL ESCUTCHEONS FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.

3.4 PIPE JOINT CONSTRUCTION

A. REAM ENDS OF PIPES AND TUBES AND REMOVE BURRS. BEVEL PLAIN ENDS OF STEEL PIPE.

B. REMOVE SCALE, SLAG, DIRT, AND DEBRIS FROM INSIDE AND OUTSIDE OF PIPE AND FITTINGS BEFORE ASSEMBLY.

C. BRAZED JOINTS: CONSTRUCT JOINTS ACCORDING TO AWS'S "BRAZING HANDBOOK," CHAPTER "PIPE AND TUBE."

1. USE TYPE BCUP, COPPER-PHOSPHORUS ALLOY FOR JOINING COPPER SOCKET FITTINGS WITH COPPER PIPE.

2. USE TYPE BAG, CADMIUM-FREE SILVER ALLOY FOR JOINING COPPER WITH BRONZE OR STEEL.

3.5 HANGERS AND SUPPORTS

A. HANGER, SUPPORT, AND ANCHOR PRODUCTS ARE SPECIFIED IN SECTION 15062 "HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT."

B. INSTALL THE FOLLOWING PIPE ATTACHMENTS:

1. ADJUSTABLE STEEL CLEVIS HANGERS FOR INDIVIDUAL HORIZONTAL RUNS LESS THAN 20 FEET LONG.
2. ROLLER HANGERS AND SPRING HANGERS FOR INDIVIDUAL HORIZONTAL RUNS 20 FEET OR LONGER.
3. PIPE ROLLER: MSS SP-58, TYPE 44 FOR MULTIPLE HORIZONTAL PIPING 20 FEET OR LONGER, SUPPORTED ON A TRAPEZE.
4. SPRING HANGERS TO SUPPORT VERTICAL RUNS.
5. COPPER-CLAD HANGERS AND SUPPORTS FOR HANGERS AND SUPPORTS IN DIRECT CONTACT WITH COPPER PIPE.

C. INSTALL HANGERS FOR COPPER TUBING WITH THE FOLLOWING MAXIMUM SPACING AND MINIMUM ROD SIZES:

1. NPS 1/2: MAXIMUM SPAN, 60 INCHES; MINIMUM ROD SIZE, 1/4 INCH.
2. NPS 5/8: MAXIMUM SPAN, 60 INCHES; MINIMUM ROD SIZE, 1/4 INCH.
3. NPS 1: MAXIMUM SPAN, 72 INCHES; MINIMUM ROD SIZE, 1/4 INCH.
4. NPS 1-1/4: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
5. NPS 1-1/2: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
6. NPS 2: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
7. NPS 2-1/2: MAXIMUM SPAN, 108 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
8. NPS 3: MAXIMUM SPAN, 10 FEET; MINIMUM ROD SIZE, 3/8 INCH.
9. NPS 4: MAXIMUM SPAN, 12 FEET; MINIMUM ROD SIZE, 1/2 INCH.

D. SUPPORT MULTIFLOOR VERTICAL RUNS AT LEAST AT EACH FLOOR.

3.6 FIELD QUALITY CONTROL

A. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.

B. TESTS AND INSPECTIONS:

1. COMPLY WITH ASME B31.5, CHAPTER VI.
2. TEST REFRIGERANT PIPING, SPECIALTIES, AND RECEIVERS. ISOLATE COMPRESSOR, CONDENSER, EVAPORATOR, AND SAFETY DEVICES FROM TEST PRESSURE IF THEY ARE NOT RATED ABOVE THE TEST PRESSURE.
3. TEST HIGH- AND LOW-PRESSURE SIDE PIPING OF EACH SYSTEM SEPARATELY AT NOT LESS THAN THE PRESSURES INDICATED IN PART 1 "PERFORMANCE REQUIREMENTS" ARTICLE.

A. FILL SYSTEM WITH NITROGEN TO THE REQUIRED TEST PRESSURE.
B. SYSTEM SHALL MAINTAIN TEST PRESSURE AT THE MANIFOLD GAGE THROUGHOUT DURATION OF TEST.

C. TEST JOINTS AND FITTINGS WITH ELECTRONIC LEAK DETECTOR OR BY BRUSHING A SMALL AMOUNT OF SOAP AND GLYCERIN SOLUTION OVER JOINTS.
D. REMAKE LEAKING JOINTS USING NEW MATERIALS, AND RETEST UNTIL SATISFACTORY RESULTS ARE ACHIEVED.

3.7 SYSTEM CHARGING

A. CHARGE SYSTEM USING THE FOLLOWING PROCEDURES:

1. INSTALL CORE IN FILTER DRYERS AFTER LEAK TEST BUT BEFORE EVACUATION.
2. EVACUATE ENTIRE REFRIGERANT SYSTEM WITH A VACUUM PUMP TO 500 MICROMETERS. IF VACUUM HOLDS FOR 12 HOURS, SYSTEM IS READY FOR CHARGING.
3. BREAK VACUUM WITH REFRIGERANT GAS, ALLOWING PRESSURE TO BUILD UP TO 2 PSIG.
4. CHARGE SYSTEM WITH A NEW FILTER-DRYER CORE IN CHARGING LINE.

END OF SECTION 15183