PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, Section 230500 - Basic HVAC Materials and Methods, and other Sections in Division 23 specified herein.

1.2 SCOPE

A. Includes, but not limited to:
1. Furnish and install piping and piping specialties for refrigeration systems serving split system air conditioning units.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230500: Basic HVAC Materials and Methods

B. Section 230700: Mechanical Insulation

C. Division 26: Electrical

1.4 QUALITY ASSURANCE

A. Qualifications: A refrigeration contractor licensed by the State shall install refrigerant piping.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. Meet requirements of ASTM B 280-88, "Specification for Seamless Copper Tube for Air Conditioning & Refrigeration Field Service", hard drawn straight lengths. Reflok aluminum piping and mechanical fittings may be considered with prior approval.

B. Do not use pre-charged refrigerant lines more than 50 feet in length..

2.2 REFRIGERANT FITTINGS

A. Wrought copper with long radius elbows.

B. Approved Manufacturers:
1. Mueller Streamline
2. Nibco, Inc.
3. Grinnell
4. Elkhart Products Corp.

2.3 SUCTION LINE TRAPS

A. Manufactured standard one-piece traps.

2.4 CONNECTION MATERIAL

A. Brazing Rods:
1. Copper to Copper Connections:
a. AWS Classification BCuP-4 Copper Phosphorus (6% silver).
b. AWS Classification BCuP-5 Copper Phosphorus (15% silver).
2. Copper to Brass or Copper to Steel Connections
a. AWS Classification BAg-5 Silver (45% silver)
3. Do not use rods containing Cadmium.

2.5 FLUX

A. Approved Manufacturers
1. "Stay-Silv white brazing flux" by J.W. Harris Co.
2. High quality silver solder flux by Handy & Harmon.

2.6 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. Singer
6. Sporlan

2.7 FILTER-DRIER

A. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with non-ferrous casing and Schraeder type valve.

B. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.

C. Size shall be full line size.

D. Approved Manufacturers:
1. Alco
2. Mueller
3. Parker
4. Sporlan
5. Virginia

2.8 SIGHT GLASS

A. Combination moisture and liquid indicator with protection cap.

B. Sign glass shall be full line size.

C. Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.

D. Approved Manufacturers:
1. Alco
2. Asco
3. Mueller
4. Parker
5. Sporlan

2.9 MANUAL REFRIGERANT SHUT-OFF VALVE

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. CoBraCo (Apollo)
2. Henry
3. Mueller
4. Superior
5. Virginia

2.10 FLEXIBLE CONNECTORS

A. Provide each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons.

B. Anchor pipe near each flexible connector.

C. Connectors shall be for refrigerant service with bronze seamless corrugated hose and bronze braiding.

D. Approved Manufacturers:
1. Anaconda "Vibration Eliminators" by Anamet
2. Vibration Absorber Model VAF by Packless Industries
3. Vibration Absorbers by Superior Valve Co.
4. Style "BF" Spring-flex refrigerant connectors by Vibration Mountings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Slope suction lines down toward compressor or one inch/10 feet. Locate traps at

vertical rises against flow in suction lines.

B. 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.
   1. No soft solder (tin, lead, antimony) connections will be allowed in system.
   2. Braze valve, sight glass, and flexible connections.
   3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

C. Insulate all suction and hot gas lines. Insulate liquid lines where pipe may be in close contact to humans.

3.2 FIELD QUALITY CONTROL

A. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping system. Positive pressure test will not suffice for procedure outlined below:
   1. Draw vacuum on each entire system with vacuum pump to 200 microns using vacuum gauge calibrated in microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum. Isolate compressor from system piping using shut-off valves prior to pulling vacuum.
   2. Break vacuum with refrigerant to be used and re-establish vacuum test. Vacuum shall hold for 24 hours at 200 microns without compressor running.
   3. Conduct test at 70°F ambient temperature minimum.
   4. Do not use systems until 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. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlets at same end of coil

END OF SECTION