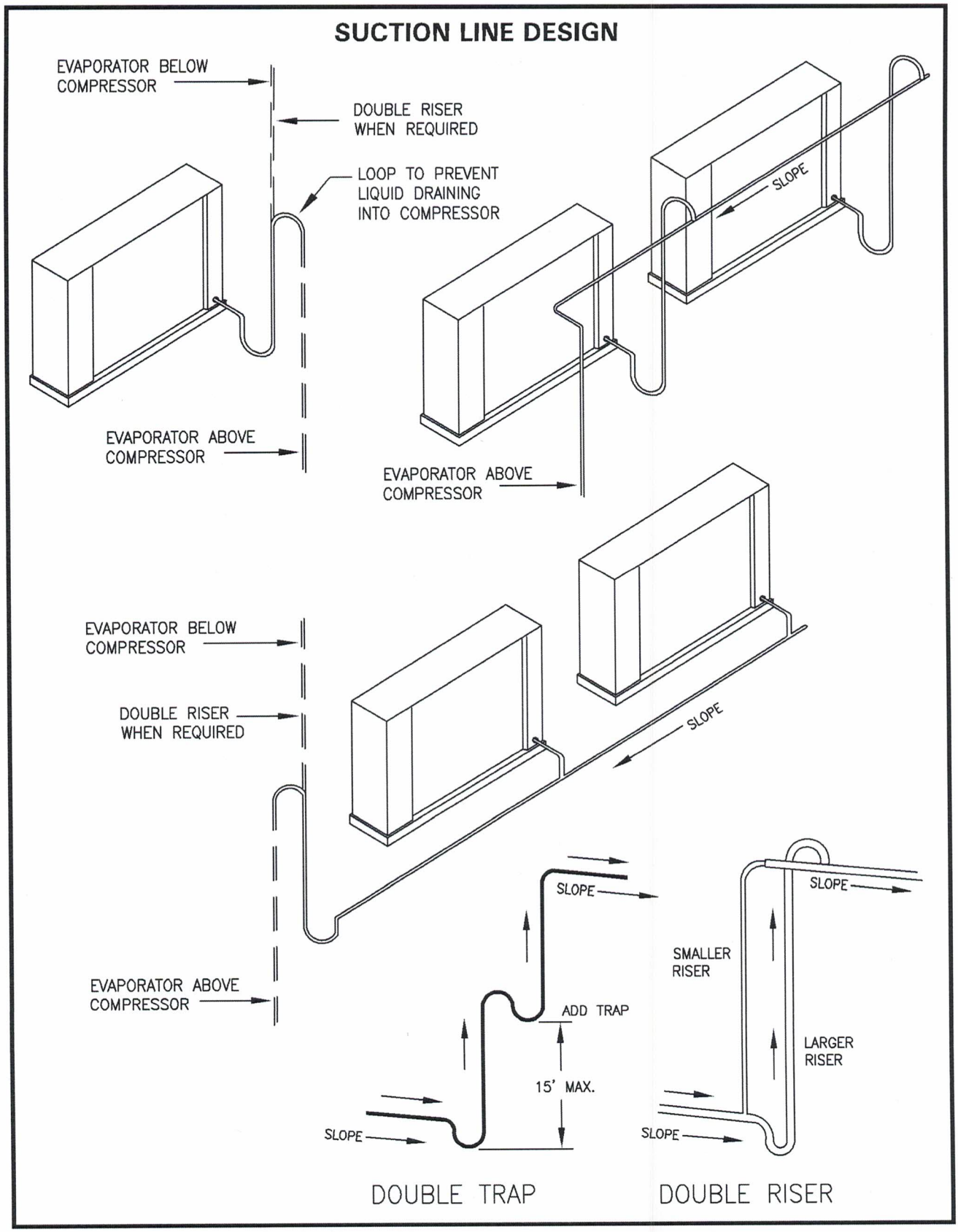
Drawing 8


SUCTION LINE DESIGN
EVAPORATOR BELOW COMPRESSOR
DOUBLE RISER WHEN REQUIRED
LOOP TO PREVENT LIQUID DRAINING INTO COMPRESSOR
SLOPE
EVAPORATOR ABOVE COMPRESSOR
EVAPORATOR ABOVE COMPRESSOR
EVAPORATOR BELOW COMPRESSOR
DOUBLE RISER WHEN REQUIRED
SLOPE
EVAPORATOR ABOVE COMPRESSOR
SLOPE
ADD TRAP
15' MAX.
SLOPE
SLOPE
SMALLER RISER
LARGER RISER
SLOPE
DOUBLE TRAP
DOUBLE RISER

PIPING

Condensing Unit and Evaporator coils are thoroughly cleaned and dehydrated at the factory. Care must be taken when field piping to prevent foreign materials and moisture from entering the system. Do not leave units or piping open to the atmosphere any longer than necessary. Use ACR grade Copper tube, keeping it dry, clean, and capped. If type "L" tube is used, it should be thoroughly cleaned internally. When brazing, always pass dry nitrogen through the tubing to prevent oxide and scale from forming. A suitable silver alloy solder should be used on suction and liquid lines. Use only wrot Copper fittings. Long radius elbows should be used. Install all piping and components in accordance with local and national codes and in conformance with good refrigeration practice for proper operation of the systems.

The suction line and its components must be selected and installed with extreme care. The suction line must be sized for high enough refrigeration velocity to assure good oil return, and low enough pressure drop to prevent excessive system capacity loss. The optimum line size for a system will result in a reasonable line size for a system and will result in a reasonable velocity at minimum pressure drop. Total suction line pressure loss should not exceed 2° F equivalent loss.

Suction lines risers must be carefully selected, have an oil trap at the bottom and at 15 foot intervals up the riser. They should be the same size as the vertical riser connected to its outlet. Riser should not be larger in diameter than horizontal runs.

Horizontal runs of suction line should slope 1 inch per 10 feet in the direction of flow. A 1/4 inch male flare schrader fitting should be installed in the suction line at the evaporator outlet to obtain accurate evaporator pressure and superheat readings.

Liquid lines, both horizontal and vertical, are normally the same size. In vertical lines with upward flow there will be a pressure loss similar to that in water line riser, due to the lift involved. If ignored, this pressure loss can result in liquid line flash gas that will prevent good expansion valve and system performance. Sizing the liquid line too small will also result in flash gas. Sizing a liquid line larger than necessary will increase the system refrigerant charge. Flash gas can be avoided by adding subcooling to the system, however, subcooling should not be considered as an acceptable alternative to properly sized liquid lines.

One method to obtain liquid subcooling and return gas superheat is to join the liquid and suction line together and then insulate them. This economical method is often used on vertical lines. Another alternative is to use a manufactured liquid-suction heat exchanger. This type of heat exchanger is usually located inside the cooler or freezer, near the evaporator. Most HTPG Air Cooled Condensing Units include an integral liquid subcooling circuit in the condenser coil. Any one of these methods will normally provide enough subcooling to offset the liquid line pressure loss due to friction and lift. Liquid lines with more than 30 feet of vertical lift need special attention!

A liquid line solenoid should be installed near the expansion valve inlet. If there are multiple evaporators, locate the solenoid near the branch line to the first evaporator.

Before installing the expansion valve on the distributor, check the distributor to be sure it has a nozzle installed or is a venturi type. For optimum performance, the expansion valve outlet should be installed directly to the distributor. If reducing couplings or adapters are required keep them close coupled. Do not have elbows between the expansion valve and distributor. The expansion valve must be selected to match the system capacity. Follow the expansion valve manufacturers ratings when selecting the valve and use the appropriate capacity multiplier if liquid is subcooled below 70° F. If the amount of liquid subcooling may vary, a balanced port expansion valve should be used.

Evaporators with 1/2 inch flare nut (FN) inlet distributors can be converted to a sweat type inlet. All distributors have room to remove the flare with a mini-cutter. The inlet would be 1/2 inch OD and an expansion valve with 1/2" ODF outlet would fit. Sporlan type EG, SBF, or S expansion valves are available with 1/2" ODF extended Copper outlet connections. To protect the valve(s), wrap them with a wet rag while brazing. Disassembly of the valve is not required.

PIPING

Expansion valves are supplied with clamps for securing the bulb to the suction line. The bulb must be secured at the evaporator outlet, on the side of a horizontal run of suction line, at the 4 o'clock or 8 o'clock position, before any traps, the bulb must be in uniform contact with clean Copper tube and must not bridge any fitting or uneven surface. A thermal mastic or heat transfer compound may be used with the expansion valve bulb and suction line for quicker expansion valve response. DO NOT OVERTIGHTEN BULB CLAMPS OR DEFORM THE BULB IN ANY WAY.

Drain lines should be the size of the evaporator drain pan connection or larger. They should not be reduced in size. Plastic drain lines are often used in coolers, however, Copper or metal lines are recommended if room temperature is below 35° F. All drain lines must be protected from freezing. All drain lines must be trapped and run to an open drain. Drain lines should be sloped 4 inches per foot to insure positive drainage. Never connect a condensate drain directly to a sewer line. Never drain onto a floor or walkway, creating a safety hazard. Traps must be in warm ambient or be protected from freezing. It may be necessary to run heat tape the entire length of the drain line and trap to prevent freezing. Insulating the drain line is recommended with the heat tape energized continuously. Drain properly and safely!

All piping must be adequately supported to prevent vibration and breaking. Tube clamps should have a gasketed surface to prevent abrasion. Inspect all piping while the equipment is operating and add supports to prevent stress and vibration. When the liquid solenoid opens and closes, the liquid line will tend to move forcefully. Without proper support the joints at the liquid solenoid, expansion valve, distributor, and distributor leads can fracture. Take care to secure the liquid line at the evaporator. Line supports are inexpensive compared to downtime and refrigerant loss. All piping must be protected where it passes through walls or ceilings. Precautions should be taken to see that the piping does not touch any structural members and is properly supported in order to prevent the transmission of vibration into the building. The piping chase must be thoroughly sealed to protect the tube and prevent ambient air from entering the refrigerated space. Seal around the drain line where it passes through the wall. Air leaks can cause equipment problems, damage the structure and product, increase load, increase operating cost, and can cause a safety hazard. Eliminate all air leaks.

In low temperature application, or where proper oil circulation cannot be maintained, an oil separator may be required. When operating at evaporator temperatures of -20° F and lower, oil separators should be considered in order to minimize the amount of oil in circulation.

In addition to the critical nature of oil return, there is no better invitation to system difficulties than an excessive refrigerant charge. A reasonable pressure drop is far more preferable than oversized lines which can contain refrigerant far in excess of the systems needs. On systems with a larger refrigerant charge, or on systems where liquid floodback is likely to occur, a suction line accumulator is strongly recommended.