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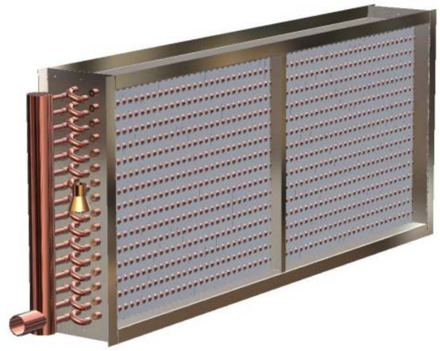
Installation, Operation, and Maintenance

ENG00013632 Rev B

Evaporator Coils - DX



Contents

1. **NOMENCLATURE**

DX	L	24	48	4R	8F	WR	L	SCT

Type of Coil
DX – Evap, D-X

Tube Size
S - 3/8" OD
M - 1/2" OD
L - 5/8" OD

Finned Height
4 through 72 inches
(Note: Finned height is equal to the number of
3/8" tubes high x 1.00"
1/2" tubes high x 1.25"
5/8" tubes high x 1.5")

Finned Length
12 through 240 in.

Rows Deep
2 through 12

Fins Per Inch
4 through 14

Fin Patterns
FF- Flat Fin, Flat Edge
FR- Flat Fin, Ripple Edge
WF- Waffle Fin, Flat Edge
WR- Waffle Fin, Ripple Edge

Header Location
R – Right Hand
L – Left Hand

Coil Circuiting
SCT – Single Circuit
FC# – Face Control, # of Circuits
RC# – Row Control, # of Circuits
IL# - Interlaced, # of Circuits

Fin Depth (in direction of airflow)
3/8" Rows x .8667"
1/2" Rows x 1.0825"
5/8" Rows x 1.2990"

2. **INSTALLATION**

2.1. **Inspection**

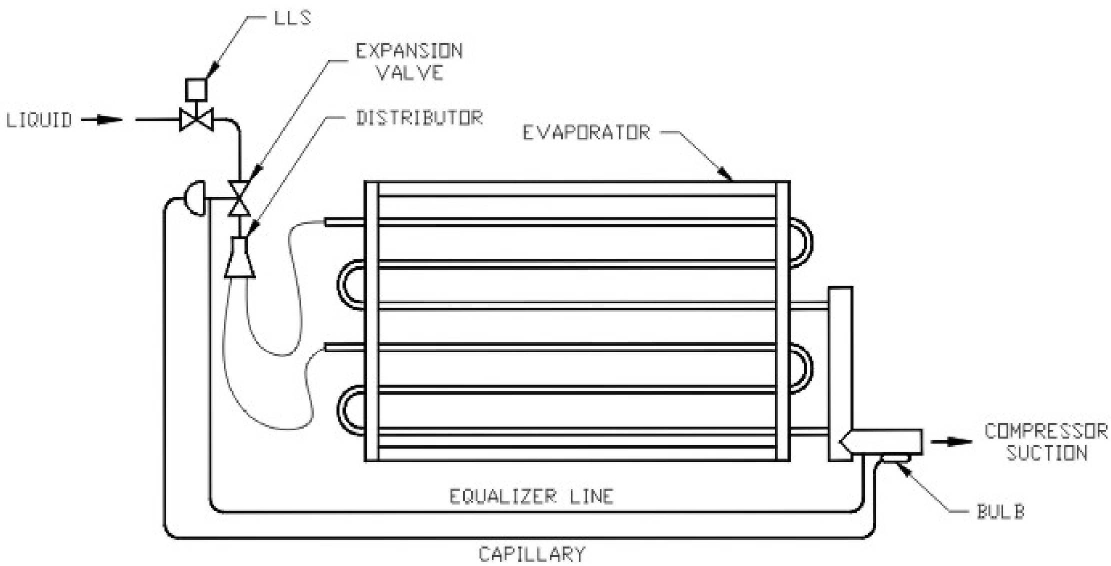
2.1.1. Upon receipt of equipment, inspect for shortage and damage. Any shortage or damage found during initial inspection should be noted on delivery receipt; this action notifies the carrier that you intend to file a claim. If any shortage or damage is discovered after unpacking the unit, call the deliverer for a concealed damage or shortage inspection. The inspector will need related paperwork, delivery receipt, and any information indicating his liability for the damage.

2.2. **General**

2.2.1. Direct Expansion (DX) type evaporator coils are used in both air conditioning and low temperature refrigeration applications to cool and sometimes dehumidify air. Air passing across the fins is cooled as the refrigerant flowing through the tubes absorbs heat and is boiled (evaporated). Refrigerant flowing through the coil tubes is controlled by an expansion device, usually a Thermostatic Expansion Valve ("TEV" or "TXV").

2.2.2. The TXV is mounted at the coil just ahead of the refrigerant distributor, and automatically feeds just enough refrigerant into the coil to be completely converted (boiled) from liquid to gas. The TXV is controlled by a temperature sensing bulb mounted on the coil outlet (suction) connection. See Figure 1. Proper operation of the TXV depends on the bulb sensing the required amount of superheat in the refrigerant gas at the coil outlet (superheat = the number of degrees above the boiling point temperature of the refrigerant).

Figure 1
Direct Expansion Coil



2.2.3. Most TXV manufacturers recommend minimum superheat of 12 F (6.7 C). That means that the refrigerant must be heated 12 F (6.7 C) above the saturated suction temperature (SST). Good DX coil design will put the suction connection on the air entering side of the coil (counterflow) closest to the warmest air. Note that the amount of superheat that can be generated is limited by the TD (difference between entering air and suction temperature).

NOTICE: When a TXV is operated with less than the required 12 F (6.7 C) superheat, valve “hunting” may occur which can cause reduced coil performance. Liquid floodback may also occur, which can result in premature compressor failure.

2.2.4. Typical low temperature refrigeration DX coil designs call for a TD of 12 F (6.7 C), which limits the maximum available superheat to 12 F (6.7 C). For example, if a coil is designed for 33 F (1.8 C) suction and 45 F (7.3 C) entering air, it is impossible to heat the refrigerant gas to more than 45 F (7.3 C). In other words, it is impossible to operate a TXV for this coil at more than 12 F (6.7 C) superheat. A minimum of 12 F (6.7 C) TD is recommended for low temperature refrigeration DX coil applications.

2.2.5. Air conditioning DX coils normally operate during conditions which provide an adequate difference between entering air temperature and suction temperature to obtain the required 12 F (6.7 C) superheat for proper operation of the TXV. However, part load conditions may exist when entering air temperatures become low enough to force the available TD for TXV superheat to be less than the required minimum.

2.2.6. It is important to anticipate part load conditions and to confirm the TXV, refrigerant distributor, and coil circuiting designs over the entire range of expected cooling loads. This will insure proper operation of the DX coil at all conditions.

2.2.7. It is important to recognize two other problems that will result in poor TXV operation and therefore poor coil performance:

- **Non-uniform refrigerant distribution**. In large coils with multiple feeds per distributor this can occur if the coil operates outside the rated range of the distributor. For example, underloading of the distributor can occur if there is more subcooling than anticipated, or during periods of low load or while compressors are unloaded. Under these conditions, some of the coil circuits will receive more refrigerant than others causing the TXV to close and starve the remaining circuits. The use of properly sized multiple distributors and TXVs controlled by load will solve this problem.

- **Non-uniform circuit loading**. This is caused by differences in air velocity or by large temperature gradients across the coil face. Here again, some of the coil circuits will receive more refrigerant than others causing the TXV to close and starve the remaining circuits. In this case, air mixing devices and/or diffusion plates can be installed upstream of the coil to create uniform velocity and temperature profiles across the coil face. Alternately, the use of properly sized multiple distributors and TXVs controlled by load will solve this problem.

2.2.8. There are three standard methods for designing DX coils with multiple distributors and TXVs, called "split circuits" (See Figure 2):

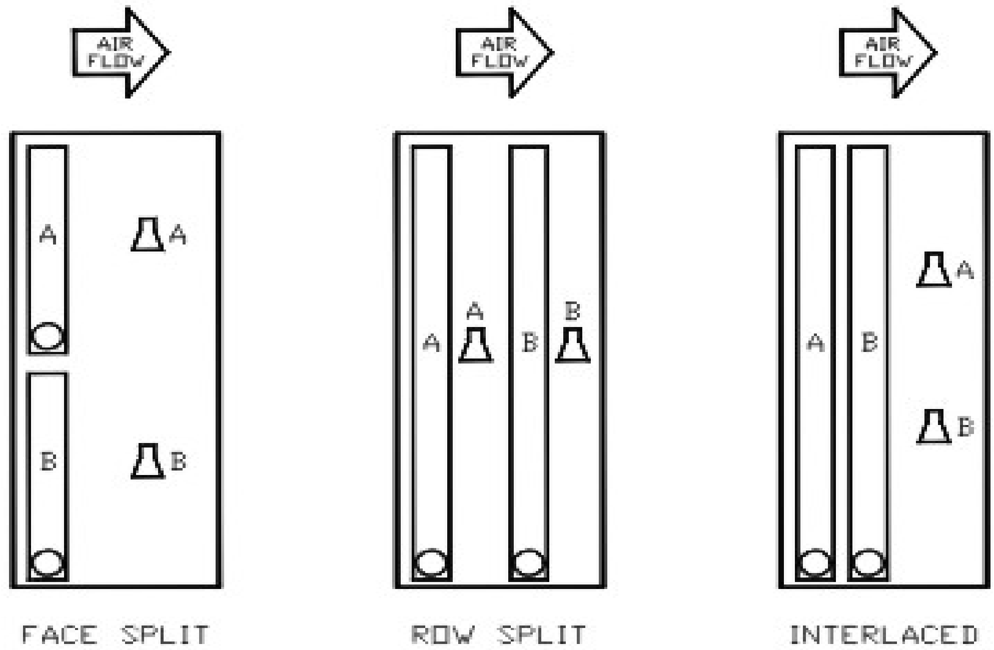
- **Face Split**. This method allows for the maximum number of distributors and TXVs per coil of the three methods. It works well whenever fins are dry or near dry, or when fins are wet and all circuits are active. When the active circuits have wet fins and inactive circuits are dry, however, there may be excessive air bypass through the dry sections.

- **Row Split**. Normally this method limits the number of distributors and TXVs to two or three. The entire face of the coil is active with this method and air bypass through inactive circuits is not a problem. However, in some cases it is not possible to match the required load split with the combination of rows available. For example, a six row coil with a 2/4 row split produces an approximate 50/50 load split, but with a four row coil an exact 50/50 load split is not possible.

- **Interlaced**. The entire face of the coil is active with this method and air bypass through inactive circuits is not a problem. Almost any load split can be achieved for a given coil with this method, but the maximum number of distributors and TXVs is limited to two or three.

Figure 2.

DX Multiple Circuit Arrangements



2.2.9. When designing coils with multiple distributors and TXVs, it is important to provide each TXV with its own suction header and connection for mounting the TXV bulbs. This allows for proper independent operation of the TXVs.

2.3. **Mounting**

2.3.1. DX coils should be mounted level, with tubes in a horizontal orientation. Airflow can be horizontal or vertical.

2.3.2. To insure counter flow heat exchange, mount DX coils so that the suction header is on the air entering side of the coil.

2.3.3. For DX coils with horizontal airflow, the suction connection should be located at the bottom of the coil to facilitate complete drainage of oil during operation.

3. **PIPING**

3.1. Refrigerant piping must be done in accordance with all applicable national and local codes.

3.2. All piping must be self-supporting and flexible enough to allow for thermal expansion and contraction. As a general rule, three x 90 degree changes in direction in a given piping run of copper piping will provide adequate flexibility to take up thermal expansion and contraction and vibration.

3.3. Inspect distributor and verify the nozzle is in place.

3.4. Thermostatic expansion valve function is vital to DX coil performance. Thermostatic expansion valves with external equalizers must be used. Carefully follow the TXV manufacturer's instructions when installing.

3.5. If a hot gas bypass kit was ordered with the coil, install it between the distributor and the thermostatic expansion valve. Be sure to align the side port with the hot gas line prior to brazing.

3.6. While brazing, purge effected area with nitrogen to reduce oxidation on the internal surfaces.

3.7. Install filter dryer(s) and a sight glass/moisture indicator upstream of the TXV to filter and detect moisture in liquid line.

4. **STARTUP**

4.1. Once the coil is installed, it should be pressurized to 150 psig with dry nitrogen. Thoroughly leak test the coil and system including all brazed joints, bolted joints, and especially threaded and flare fitting joints. Use of bubble solution is recommended for leak testing. If leaks are found, release pressure and repair leaks, Retest until system is absolutely leak free. Finally, the coil should be capable of holding test pressure for at least 1 hour with no loss of pressure ("pressure decay" test).

4.2. Prior to initial startup, clean coil with a commercially available coil cleaner.

4.3. Colmac recommends using the "triple evacuation", or "triple sweep" method of evacuating and charging systems with refrigerant. The basic procedure is as follows:

4.4. Evacuate system for approx. 1 hour using good quality vacuum pump, hoses, and gages. NOTE: Drain old vacuum oil and fill vacuum pump with new, virgin oil prior to every evacuation cycle. If the vacuum pump runs for an extended period of time (more than 3-4 hours), an oil change is recommended.

4.5. Break vacuum with dry nitrogen to approx. 2-5 psig pressure. Wait approx. 1 hour for the dry nitrogen to absorb free water in the system.

4.6. Release nitrogen and evacuate system again for approx. 1 hour.

4.7. Break vacuum with dry nitrogen to approx. 2-5 psig pressure. Wait approx. 1 hour.

4.8. Release nitrogen and evacuate to a hard vacuum (500 microns) for approx. 1 hour (longer if necessary). The system should be "dry" enough so that a vacuum of 500 microns or less can be held for at least 10 minutes with the service valves closed and the system isolated.

4.9. Follow compressor manufacturer's recommendations for charging the system with refrigerant, and starting the compressor.

4.10. After the system is started, adjust TXV superheat following TXV manufacturer's directions.

5. **OPERATION**

5.1. Airflow should not vary by more than 20% anywhere on the coil surface.

5.2. Air velocities should be maintained between 200 and 550 feet per minute.

5.3. Drain pan should never contain standing water.

6. **MAINTENANCE**

6.1. To insure proper coil performance, finned surfaces and tubes should be cleaned on a regular basis using a commercially available coil cleaner. Clean finned surface from the air leaving side.

6.2. Inspect coil and piping for corrosion and leaks on a regular basis.

6.3. Replace filter dryer cores after any major service work (i.e. compressor changeout), or whenever the refrigeration system is opened to atmosphere.

6.4. Inspect and tighten all bolted connections on a regular basis.

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