GREENHECK
Building Value in Air.

P.O. Box 410
Schofield, WI 54476

Phone: 715.359.6171
www.greenheck.com

Installation, Operation & Maintenance Manual

Water Coils

- Chilled Water
- Hot Water

Steam Coils

- Standard Steam
- Steam Distribution (Non-Freeze)

Refrigerant Coils

- Condenser Coils
- DX Coils (Evaporator)
- Heat Reclaim

Maintenance

Water Coil Installation Recommendations

1. Piping should be in accordance with accepted industry standards. Always use a back up wrench on the coil connections when attaching the piping to the coil if pipe thread connections are utilized.

2. When drainable coils are desired, tubes should be installed in a horizontal position. Use a spirit level. If the tubes cannot be installed level, special drain headers are available on request.

3. Connect the water supply to the bottom connection on the air leaving side and the water return to the top connection on the air entering side.

4. When four connections are provided the extra bottom connection can be used for an auxiliary manual drain connection, and the extra top connection can be used for an automatic air vent or the extra connections can be capped. Connecting the supply and/or return in any other manner will result in very poor performance.

5. Water coils are not normally recommended for use with entering air temperatures below 40°F. Glycol solutions or brines are the only freeze-safe media for operation of water coils for low entering air conditions.

6. When fresh and return air are to be heated or cooled by a water coil, care should be used in the design of the ductwork to insure thorough mixing before the air enters the coil. The return air should always enter the bottom of the duct. Fresh air should enter the top of the duct. The greater the distance between the points of mixing and entrance to the coil, the better the application.

7. Two position control valves, modulating valves, three way valves or a combination of these controls can accomplish control of water coils. Follow the recommendations of the control manufacturer regarding types, sizing and locations. Face and bypass dampers may also be used, but do not close off tightly. Air leakage in cooling applications has no appreciable effect. In heating applications, however, the air temperature may rise several degrees and should be considered in system design. Low leakage dampers may be required.

8. Pipe sizes for the system must be selected on the basis of the head [pressure] available from the circulating pump. It is recommended that the velocity should not generally exceed 8 feet per second and that the friction loss should be approximately 3 feet per 100 feet of pipe.

9. When cooling coils are banked two or three high, an intermediate drain pan with plastic drain tubes extending into the main drain pan should be installed on the air leaving side of each coil. On high latent installations, the condensate draining from top coils may load the lower coils with condensate, resulting in reduced air flow and performance or condensate being blown downstream into the ductwork. All individually installed water cooling coils and the bottom of all cooling coil banks should be mounted in drain pans extending at least ten inches from the leaving air edge of the coil. A drain line trap must be installed to allow condensate to drain freely. The drain line trap depth must be twice the negative static pressure of the operating system for the unit to drain correctly. Incorrect trapping can cause the drain pan to overflow.

   Note: *Vent and Drain connections are provided on Greenheck Coils water coils unless otherwise specified. This allows the coils to be drained. Keep in mind that when draining the coils, all water may not drain from the coil. In order to completely drain the coil to prevent the possibility of freezing during cold ambient temperatures, air or nitrogen pressure must be utilized to blow any remaining water from the coil.*

Steam Coil Installation Recommendations

A. General

1. Provide separate supports and hangers for the coil and for the piping. Always use a back up wrench on coil connections when attaching piping to the coil. Coils not designed with pitched casing or fin pack must be pitched ¼" per foot towards the return connection at installation.

2. Be certain that adequate piping flexibility is provided. Stresses resulting from expansion of closely coupled piping and coil arrangement can cause serious damage.

3. Do not reduce pipe size at the coil return connection. Carry the return connection size through the dirt pocket, making the reduction at the branch leading to the trap.

4. Vacuum breakers and air vents must be installed on all applications to prevent retaining condensate or air in the coil. Generally the vacuum breaker is to be connected between the coil inlet and the trap. For a system with a flooded return main, the vacuum breaker should be open to the atmosphere and the trap design should allow venting of large quantities of air.

5. Do not drip steam mains through coils.

6. Insure steam pressure and condensate line pressure differential is sufficient to allow efficient condensate removal from the steam coil, especially when using modulating steam control valves to control the leaving air temperature of the coil.

7. Do not attempt to lift condensate without the assistance of a condensate pump. The pressure required to lift condensate must also be considered for sufficient pressure differential. Check valves are also required to prevent reverse flow of condensate back into the coil.

8. Entering air temperatures should not be below 40° F to insure freezing doesn't occur.

B. Traps

1. Size traps in accordance with the manufacturer's recommendations. Be certain that the required pressure differential will always be available. Do not undersize.

2. Float and thermostatic traps are recommended for high or low-pressure steam systems, but bucket traps may be used. Float and thermostatic traps should be used when air venting is necessary. Bucket traps are recommended for use with on-off control only. It is recommended that traps be located at least 12 inches below the coil return connection. When traps without air venting capabilities are used, air vents are required in the system.

3. Multiple coil installations:
   a. Each coil or group of coils that is individually controlled must be individually trapped.
   b. Coils in series; separate traps are required for each coil, or bank of coils, in series.
   c. Coils in parallel; a single trap may be used but an individual trap for each coil is preferred.

C. Control

1. With coils arranged for series airflow, a separate control is required on each bank, or coil, in the direction of airflow.

2. On high-pressure installations, a two-position steam valve with a face and bypass arrangement is preferred where modulating control is required.

3. Modulating valves must be sized properly—DO NOT OVERSIZE

Refrigerant Coil Installation Recommendations

Refrigeration coils manufactured by Greenheck Coils are shipped with a small nitrogen holding charge. Care should be taken when opening these coils for installation. DX coil distributors have caps installed with soft silver solder. Once the cap is removed and if the TEV is to be installed using anything other than soft solder, the distributor connection should be sufficiently cleaned with emery cloth to remove the soft solder. Follow accepted refrigeration piping practices and safety precautions per Ashrae Standards. If bends or 90's are necessary, long radius fittings must be used to keep the pressure drop through the piping at a minimum. General recommendations for component selection and line sizing follow. Nitrogen charged and capped piping is recommended.

A. Liquid Line Sizing

All compressors have a Refrigerant Charge Limit [RCL] that must not be exceeded. Since the RCL and pressure drop are in direct conflict with each other, Greenheck Coils recommends that the liquid line be sized as small as possible, while maintaining a low enough pressure drop to ensure 5°F of sub-cooling at the expansion valve.

B. Liquid Line Components

Greenheck Coils recommends the use of a properly sized liquid line filter-drier, installed upstream from the expansion valve and as close to the evaporator coil as possible. Filter-drier selection should be based on a maximum pressure drop of 2 psi at the design condition.

A moisture indicator / sight glass should be installed between the expansion valve and filter-drier. The moisture indicator / sight glass must be sized to match the size of the liquid line at the thermal expansion valve.

A liquid line shut-off valve with an access port should be sized with the selected liquid line OD, and installed close to the condenser.

The use of other valves, tube bends and reducers should be minimized, since these items tend to increase pressure drop and to reduce sub-cooling at the expansion valve. Liquid line receivers, other than those factory-installed, are **not** recommended.

The Thermal Expansion Valve [TEV] must be selected for proper size, capacity and refrigerant being used. A slightly oversized valve will allow the unit to operate satisfactorily at low-load conditions. An undersized valve should not be used at any time as this will starve the evaporator of refrigerant causing insufficient air temperatures. The use of a hot gas bypass valve should also be considered when sizing the TEV. Select expansion valves with external equalizer connections, and those designed to operate against a backpressure of 20 pounds per square inch higher than actual evaporator pressure.

The TEV must be installed directly on the evaporator coil liquid line connection provided. The liquid distributor must be in a vertical position. Insure that the distributor nozzle is installed in the distributor if required and that the correct nozzle for the refrigerant being used is installed. Sensing bulbs must be mounted on a clean horizontal suction line close to the evaporator outlet and insulated properly. The bulb must be tight against the suction line at a 10 or 2 o'clock position, but take care not to over tighten and cause damage to the sensing bulb. The bulb should not be mounted directly on top or bottom of the suction line.

CAUTION: Disassemble the thermal expansion valve before completing the brazing connections. If necessary, wrap the valve in a cool wet cloth while brazing. Failure to protect the valve from high temperatures may result in damage to the internal components.

C. Suction Line Sizing

Suction line tubes must be sized to maintain refrigerant vapor velocities that are high enough to ensure good oil return to the compressor under all operating conditions. It is necessary to pitch horizontal suction lines toward the compressor to insure sufficient oil return to the compressor. Traps should be provided at the bottom of suction line risers and at 15 foot intervals for sufficient oil return.

D. Suction Line Components

A suction line pressure tap should be installed on the leaving side of the evaporator coil near the TEV sensing bulb location. Accurate superheat measurement and TEV adjustment demands that suction pressure and temperature be measured near the evaporator coil outlet.

Suction line filter-driers are usually only necessary on systems that have experienced a severe compressor motor burn out or other failure that results in extremely high refrigerant temperature. This filter-drier should not be left in the suction line permanently.

Suction lines should be insulated completely with sufficient wall thickness insulation for the application temperature range being utilized.

Installation Checklist

Use the following checklist to verify that all necessary installation procedures have been completed.

1. Coils are installed with airflow in same direction as indicated on the coil nameplate or casing.
2. Suction connection is at the bottom of the suction header on the evaporator coil, suction line is pitched towards compressor and traps are installed in suction risers. Suction line is insulated with correct wall thickness insulation for the temperature application utilized.
3. If stacking coils, stacking channels are properly installed and bypass air is prevented.
4. Condensate drain pans and piping is installed with a trap in the condensate line and piping insulated and heated if installed in applications that are below freezing.
5. Clean filters are installed upstream of the condenser coil when applicable.
6. A liquid line filter-drier is installed upstream of the expansion valve.
7. A moisture indicator/sight glass is installed between the expansion valve and filter-drier.
8. A liquid line shutoff valve with access port is installed close to the condenser.
9. A schrader valve is installed in the suction line close to the evaporator coil outlet.
10. The TEV, with external equalizer connections, is installed directly on the evaporator liquid connection, sensing bulb mounted in the horizontal position on the suction line and insulated. The liquid distributor must be in a vertical position.
11. Piping system is leak-tested with dry nitrogen, evacuated to 500 microns, and charged with correct refrigerant type and amount.
12. Superheat and sub cooling measurements are taken. Thermal expansion valve is adjusted to obtain desired superheat. Desired superheat on most applications is 8° to 12° at the outlet of the evaporator.

Maintenance

Coil Cleaning

Coils should be kept clean to maintain maximum performance. For operation at it's highest efficiency, the coil should be cleaned often during periods of high cooling demand or when dirty conditions prevail. Power should be disconnected and locked out and motors should be covered to insure that no moisture penetrates into the windings causing motor failure if applicable.

Remove large debris from the coils and straighten fins before cleaning.

Clean refrigerant coils with cold water and detergent or with one of the commercially available chemical coil cleaners. Rinse coils thoroughly after cleaning.

CAUTION: Do not clean the coil with hot water or steam. The use of hot water or steam as a refrigerant coil-cleaning agent will cause high pressure inside the coil tubing and subsequent damage to the coil.

CAUTION: Do not use acidic chemical coil cleaners. Do not use alkaline chemical coil cleaners that, after mixing, have a ph value greater than 8.5 without also using an aluminum corrosion inhibitor in the cleaning solution. Failure to follow these guidelines or the manufacturer's instructions for use of cleaning chemicals could result in damage to the unit.

WARNING: SOME CHEMICAL COIL-CLEANING COMPOUNDS ARE CAUSTIC, AS WELL AS TOXIC. USE THESE SUBSTANCES ONLY IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY, DEATH OR EQUIPMENT DAMAGE.

Fin Straightening

Coil fins may have been bent during shipping or servicing, and should be straightened to maintain maximum heat transfer. Reduction of the effective coil surface will correspondingly reduce coil capacity. Always check fin appearance after any handling of the coil and after any servicing is done near the coils.

Fin combs are sized according to number of fins per inch of the coil. For relatively small bends that require only minor repair, other tools may be used to evenly space the fins. Be careful not to damage the coils.

Steam Coil Applications

A steam trap maintenance program should be implemented to insure that steam traps are operating correctly and at maximum efficiency. Failure to do so could result in premature failure of the coil and loss of warranty due to condensate backing up into the coil causing leaks or allowing the coil to freeze during low ambient conditions if supply air drops below 40° F.

Note: *Steam distributing coils may also be called "NON-FREEZE" coils. These coils will freeze if temperatures drop below the freezing point. Care should be taken to insure that these coils are not operated at or below freezing temperatures. If there is the possibility that the coils will experience freezing temperatures, freeze safeties should be installed in the system to prevent damage to the coils. Any coil that has failed due to freezing temperatures will not be covered under the standard warranty.*