Coils for Heating & Cooling

Installation, Operation & Maintenance Manual

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Contents

1. General

Coil heat exchangers are supplied suitable for heating or cooling (cooling and dehumidifying) air and are available to suit various fluid side media; hot water, chilled water, refrigerant and steam. Installation and operation of the various types of coil is dependent of the fluid they are designed to work against.

Coils are installed in a number of different scenarios but most common are duct-mounted or air handling unit mounted. Special casings are available for non-standard applications.

2. Installation

2.1 Mounting

2.1.1 Duct-mounting

Coils for duct-mounting will be supplied with plain casing flanges which would normally have arrays of punched holes on all sides. Flanges are intended to be used for mating to adjacent ductwork flanges which should be suitably sized. A gasket will need to be fitted between the mating faces; this will be supplied by the installing contractor.

Coils are often sized with greater face areas than the area of the adjacent ducting. In these instances ductwork transformation pieces are required to be fitted on the entering and leaving faces of the coil; ideal angles of transformations would be 30 degrees or less. In order to ensure even airflow across the face of the coil it is recommended that 5 equivalent diameters of straight ducting are allowed on both the entering and leaving face of the coil. If site constraints mean that coils need to be fitted close to bends then turning vanes should be incorporated in the ducting.

Ductwork air leakage standards must not be applied to coils or other similar components as the rate of leakage through these items cannot be quantified in terms of a surface area of plain ductwork. Standard duct-mounted coil casings consist of rudimentary sideplates and tubeplates which are penetrated by the coil tubes. In order to allow for expansion and contraction of the coil tubes there is inevitably some air leakage into or out of the coil casing. Enclosed casings for duct-mounting incorporate coverboxes over the ends of the coil in order to minimise air leakage.

Coil casings are supplied uninsulated and are suitable for mounting internally. Any thermal insulation is the responsibility of the installer and would normally be to the same standard as the rest of the ducting. If externally mounted then the casing must be protected against the elements.

If cooling coils are installed with bends and manifolds outside the airstream then these should be vapour sealed to protect against sweating of the pipes.

2.1.2 Air Handling Unit mounting

Coils for use inside air handling units (AHUs) are intended to sit/slide inside the unit on its base or on rails. The overall size of the coil casing is sized to closely match the available space within the air handling unit. Coils may be supplied with baffle plates fitted around the manifolds and return bends to prevent flanking and bypassing of air.

The entering face, leaving face or both need to be blanked and sealed against the inner skin of the AHU to ensure that the fan is only drawing/blowing air through the active finned area of the coil.

Even in instances where the coils sit within rails in the base of the AHU it is important that they are fixed either along their height or at the top of the AHU to prevent excess movement. Coils are occasionally supplied in two sections in the height for mounting one above the other; these must be supported in their height to ensure the assembly is stable.

Cooling coil sections within AHUs would normally be complete with drain trays integral to the base. These trays readily collect any moisture which is formed on the surfaces of the coil. To facilitate drainage AHU cooling coils can be supplied with perforated baseplates. Occasionally AHUs may not have drain trays in the base of their cooling coil sections. In these instances coils can be supplied with integral drainpans which extend the width of the AHU below the ends of the coil. A coil fitted with a drainpan inside an AHU should be blanked off on the leaving air face as well as the entering air face; this prevents air bypassing the coil by flowing under it through the drainpan and out of the leaving air face. If the leaving air face is not blanked off then condensate inside the drainpan can be blown out into the AHU.

2.1.3 Non-standard application mounting

Coils can be supplied for any number of specialist applications not covered by the above and if unsure regarding the proper means to install these then please contact SPC.

2.2 Pipe work

***Coils must not be lifted or carried by the pipe connections. This will cause damage and invalidate the warranty.**

2.2.1 Water coils

Coils for hot water and chilled water applications are normally supplied with threaded steel flow and return pipes with a male BSP taper thread. These connections will seal on the thread to a union or other female fitting. Fittings should be made with jointing compound, hemp, tape etc in line with sound pipework practice. It is imperative that the connections are properly held-off during tightening to prevent damage to joints.

Water coils may be supplied with plain copper connections suitable for brazing to solder/sweat fittings or for use with compression components. The connections must be held off and not over-tightened.

Water coils may be supplied with connection flanges to a particular specification. These may be screw-on whereby they will be supplied loose or weld-on (slip-on). The correct gaskets will need to be fitted when making the mating flange connections. Gaskets are supplied by others.

2.2.2 Refrigerant coils

Coils for use with refrigerants are always supplied with plain copper connections suitable for brazing to adjoining pipework. Refrigerant coils are all brazed in the presence of nitrogen and brazing of coils into adjoining pipework should be made in a similar fashion. Refrigerant coils are supplied with a holding charge of nitrogen gas and capped off. The tubes should be cut using a tube cutter and there will be a release of nitrogen when the tubes are penetrated.

DX refrigerant cooling coils and reverse cycle coils which contain multiple tube circuits have capillary tubes and brass distributor connections on the liquid inlet pipes. When connecting thermostatic expansion valves to this type of coil it is imperative that external equaliser lines are used as the combination of distributor and capillary tubes offer a considerable resistance.

DX refrigerant coils may contain a number of individual circuits and corresponding sets of connections. While the tube circuits can be followed it is recommended that the matching inlet and outlet connections are identified by passing gas through them in turn.

2.2.3 Steam coils

Steam coils will be supplied either with BSP taper threads or with connection flanges. The comments regarding connecting water coils apply to steam coils.

It is imperative that the installation of steam coils into steam systems is undertaken by an installer who has experience in the field as there are added considerations which, if not abided by, will lead to premature failure of the coils. Considerations include assuring that the steam supply to the coil is dry and assuring that the condensation that forms within the steam coil tubes is allowed to drain out of the condensate connection at the rate at which it forms. The latter involves building in a vertical leg between the outlet and the steam trap, properly sizing the steam trap (float type are recommended for coils), ensuring there is no back pressure in the condensate line and fitting vacuum breakers if regulating valves are used in order to prevent sub-atmospheric pressures. If in doubt a steam specialist must be contacted.

2.3 Condensed moisture removal

Cooling coils (chilled water and refrigerant) can cause moisture to condense on their finned surfaces if they are forced below the dewpoint of the air that they are treating. This moisture will normally fall down the fins and be collected in a drainpan in the base of the coil casing. When air velocities are high (typically above 2.5m/s) then there is a risk that the moisture could be blown of the leaving face of the coil before it can reach the drainpan. This is termed moisture carryover and can be guarded against by fitting an array of plastic 'eliminator' blades on the leaving air face. These blades catch droplets of moisture blown off and direct them down into the drainpan.

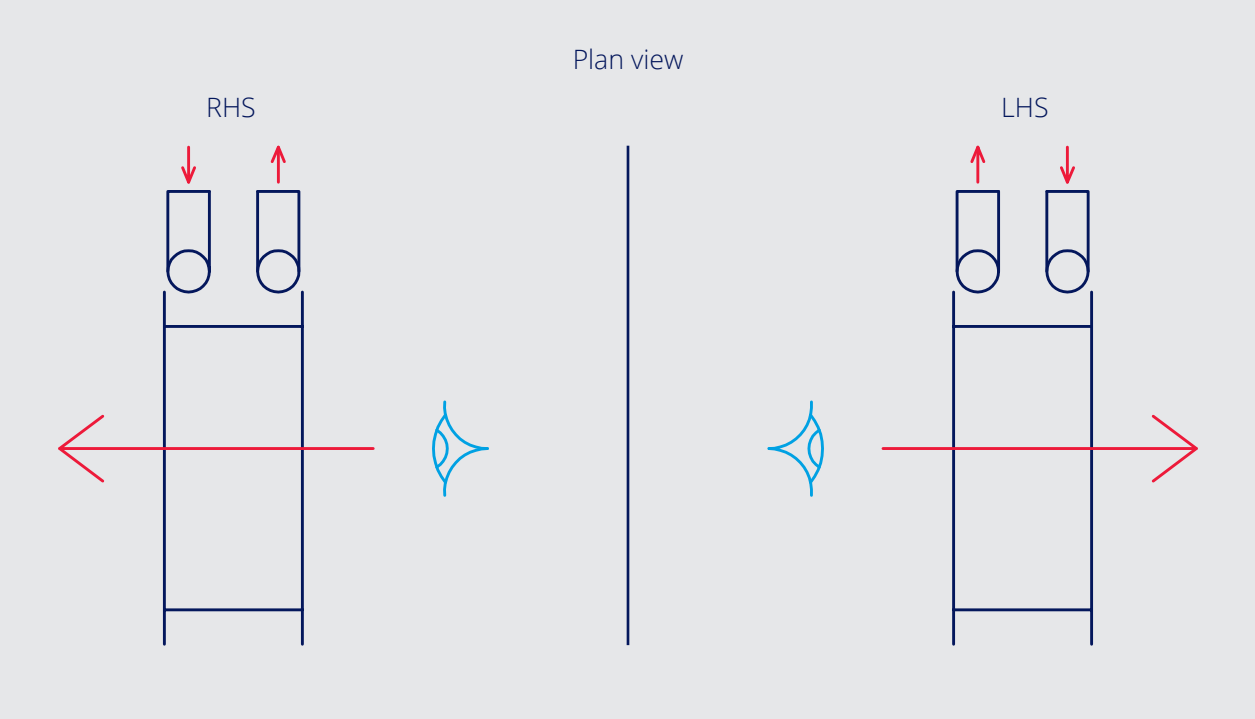
The drainpan will incorporate one or more drain connections which can be used to lead the condensate to waste. Any unused drain connections must remain blanked off to prevent air being drawn into or blown out of the ductwork. Active drain connections must be connected to a drain trap to ensure that moisture is correctly and effectively removed. It is recommended that drain traps be from glass or clear plastic so the trap levels can be monitored to ensure correct flow and that they do not run dry. For systems running under negative pressure a correctly sized trap prevents air being sucked into the ducting via the drainpan. If incorrectly trapped then moisture in the drainpan is held up leading to flooding and jets of high velocity air cause moisture to be blown out of the pan. For coils operating under positive pressure a correctly sized trap prevents the loss of live air. The outlet of traps should be arranged to discharge to atmosphere via a tundish in order to prevent any back pressure.

Trap height should be chosen to be at least twice the maximum negative operating pressure at the coil and if in doubt seek guidance from a trap manufacturer or expert.

2.4 Pipework handings

For cooling coils and heating coils consisting of multiple rows of tubes it is important that the internal fluid and air flow generally in opposite directions through the depth of the coil. This maximises the average temperature difference between the two fluids and will generate the design heat transfer rate. If such coils are piped the wrong way around with air and internal fluid flowing in the same direction then there will be a marked reduction in performance.

To ensure that counterflow between the fluids is achieved the entering fluid connection needs to be made closest to the leaving air face and the return internal fluid connection closest to the entering air face. The connection arrangement is then noted as being either Left Hand Side or Right Hand Side when looking in the direction of airflow. The sketch below identifies the arrangement.



For water coils it is conventional to make the flow connection at the bottom of the coil and the return connection at the top. This assists in ensuring that air is easily vented from the upper connection and that the coil can be drained of water via the lower connection. It is acceptable to reverse this to suit the airflow direction if it has been wrongly specified.

3. Operation

As coils are not stand alone equipment but elements of complete air conditioning systems they are only put into operation in conjunction with the rest of the system. The latter supplies the coil with an airflow to condition and a flow of internal fluid for the air to transfer heat with.

Commissioning of coils would be by a specialist and is beyond the bounds of this document but should be arranged such that the flowrates of fluids match the design data in the quotation documentation.

Coils may be included in complete pipework pressure testing but any such test should be limited to a pressure of 15barg and coincident temperature of 160°C.

Coils are exempt from airside pressure leakage testing standards and should be isolated from lengths of ducting under test.

4. Maintenance

4.1 Inspection/Cleaning

Coils collect dirt and debris on their external finned surfaces. The rate at which dirt accumulates is dependent on the state of the air and the degree of filtration. External coil surfaces can be cleaned using compressed air or vacuum or low pressure spray with mild detergent. It is not recommended that pressure washers are used to clean coils as they are capable of damaging the edges of thin aluminium fins.

It is recommended that the state of the finned surfaces is monitored regularly, at least initially, in order to ascertain the regularity with which they become compromised. A minimum inspection rate of 3 months is recommended.

Frost coils, which are unfiltered, will quickly become covered in debris and should be cleaned more regularly that other coils.

Cooling coils which are actively generating moisture are prone to corrosion and may have been manufactured with a corrosion protection on the fin surfaces. Care should be taken when cleaning such coils so as not to damage the coating; stiff brushes must not be used on the edges of the fins.

Coils are constructed, internally, from copper tubes and copper or steel connections. As such they replicate the majority of water systems and can be included in flushing and cleaning regimes undertaken on systems fabricated from these materials.

If cooling coil drainpans need to be cleaned/ inspected regularly then they should either be specified as removable or the ducting upstream/ downstream will need to incorporate inspection panels of a size sufficient not only to allow inspection but to allow cleaning fluid to be poured into the drainpans.

Disposal

Coils are constructed from a range of metallic materials according to the specification and wherever possible these materials should be separated prior to disposal.

Conformity

Coils are manufactured according to Article 3 of the Pressure Equipment Directive in line with sound engineering practice. They cannot carry the CE or UKCA marks.

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