

How does a "Non-Freeze" Steam Coil operate?

There is no such thing as a "Non-freeze" steam coil. Under the right circumstances any steam coil can freeze, including those labeled "Non-freeze"! The proper nomenclature to use when describing a steam coil is "Steam Distributing". The whole idea behind this type of coil is to insert an inner tube down the entire length of the outer tube. Steam is distributed down the inner tube evenly. There are holes in the inner tube that are spaced approximately 9" to 12" apart. As the steam turns to condensate (as it travels down the inner tube), the condensate is released through these holes to the outer tube. Whatever steam doesn't turn to condensate is eventually dumped out the end of the open inner tube to the outer tube. The outer tube is "capped" with no return bends, so that the condensate under pressure has no place to go but back down the outer tube toward the manifold where the steam originally came from. The idea behind the original design of this coil was to evenly distribute the steam and the condensate throughout the coil so there were no "dead spots" or "cold spots" in the coil. After much testing, it was found that a side benefit was that this type of coil was much more difficult to freeze than the standard conventional steam coil. Hence, the name "Non-freeze" surfaced. The steam traveling down the inner tube kept the condensate traveling the opposite direction in the outer tube from freezing. Today it's an accepted industry practice to install these coils in applications where entering air temperatures are 40°F or below. Keep in mind however, that Non-freeze coils don't freeze easily, but it's possible to freeze them under the right conditions, and it happens all the time.

5/8" outer tube vs. 1" outer tube

Many companies sell and build 5/8" or 1" Non-freeze steam coils, as though they are interchangeable. Whatever is quicker or cheaper is what they use, depending on the job. We're here to tell you that there is a major difference in the construction of these coils and when you use them depends on the application.

5/8" outer-3/8" inner Steam Distributing Coil

Most Steam Distributing coils have a 5/8" outer tube with a 3/8" inner tube. This leaves a space between the tubes that is 1/4", but really this space is 1/8" on each side of the tube. From this 1/8" you must subtract the thickness of the outer tube. As you can see, there is very little space between the outer and inner tube to pass condensate back through the outer tube.

1" outer-5/8" inner Steam Distributing Coil

The real O.D. of 1" Steam Distributing coils is 1-1/8" with a 5/8" inner tube. As you can see, there is more than twice as much room to pass the condensate through the outer tube. The wall thickness is also .035" in lieu of .025".

Whenever you are using a lot of outside air across a Non-freeze coil, the temperature rise and the amount of B.T.U.'s becomes larger. As a result, you need more lbs. per hour of steam and you get more lbs. per hour of condensate that have to pass through the coil. If you want a high air temperature rise or you have a low entering air, then you want to use a 1" Non-freeze steam coil. If you have mostly recirculated air or need only a 30°F or 40°F air temperature rise, then a 5/8" Non-freeze coil is usually O.K.

The real problem here is cost. As you would expect, 1" steam coils are more expensive than 5/8", and some companies don't even build them. So, no matter what the condition, 5/8" steam coils are installed, and often they don't work. On long coils over 72" you can diagnose this problem by feeling the far end of the coil away from the manifold. If the coil feels cold, that means the condensate is trapped and blocks the steam from getting down the coil. The coil is probably the incorrect design for that application and needs to be replaced.

We are enclosing a "cut-away" of a typical same-end Steam Distributing coil so that you can easily see how they work. USA builds any kind of steam coil that you might require, so please don't hesitate to call us if you have any questions.

Typical Application

Recommended Steam Coil

Entering air above 40°F
(Reheat)

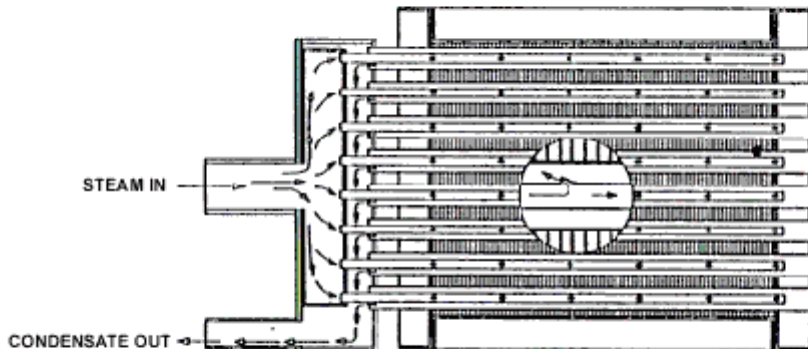
Standard Steam Coil
No inner tube required

Entering air below 40°F
but a low temp. rise
(Preheat)

5/8" O.D. Steam Dist. Coil
w/ 3/8" inner tube

Entering air below 40°F
-20° to +20°F
(Preheat)
High temp. rise

1 " O. D. Steam Dist. Coil
w/ 5/8" inner tube



Steam distributing coils with a two pass design have the same advantages of their multiple pass standard design counterparts. And like single pass steam distributing coils, these two pass coils work well in low or modulating steam applications and perform well when freezing air temperatures are encountered.



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