ENGINEERING WHITE PAPER

Internal use only

June 1, 2020

Condensate Trap Sizing

Recently, I have seen an increase in AHU specifications calling for the AHU manufacturer to be responsible for sizing the base rails so that there is enough vertical clearance to install an adequate condensate trap. The purpose of this white paper is to teach you how to calculate the required vertical distance from the centerline of the drain pan connection to the floor.

The purpose of a condensate trap is twofold; to allow the condensate to drain adequately, and to prevent air from entering a draw-through unit or escaping a blow-through unit.

Although this document will teach you how to calculate the required minimum vertical clearance, it is important to check the drawings for a detail on how the specific design engineer would prefer to have them sized. Not all engineers use the same method. I checked past designs from Arup, Hargis, Metrix, Wood Harbinger and McKinstry and found variances of several inches. In addition, some details include a clean out on the bottom of the trap which requires additional space.

Draw-Through Traps:

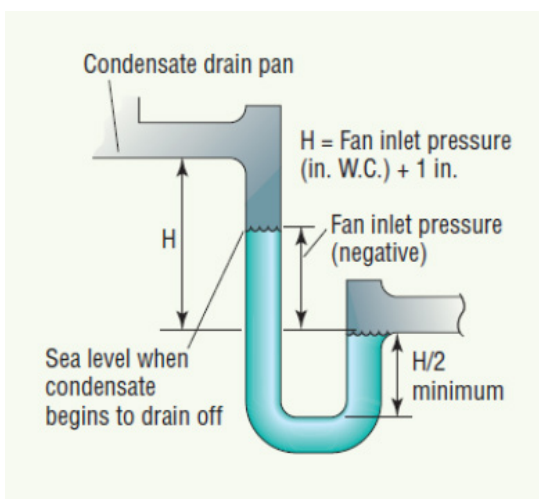


Figure 1 Draw-Through Trap with AHU Running

Figure 1 shows the recommended dimensions of a trap on a draw-through unit. Dimension "H" is shown as the fan inlet pressure, but this assumes there is no component between the cooling coil and the fan. It is simply the pressure over the drain pan. (Although this is a negative pressure, it is treated as a positive number.) The additional 1" is a safety factor added to the casing pressure and is a reasonable balance between unanticipated increases in that (negative) pressure (due to filter loading for example) and the need to minimize the total trap height.

Example: Assume you have a simple draw-through unit with a filter, cooling coil and fan. The total static pressure (TSP) is 5.5" and the external static pressure (ESP) is 3.5". The pressure over the drain pan would be 3.5-5.5 = -2.0". The value "H" is 2" + 1" = 3". Adding the "H/2" minimum water height gives us 4.5". The dimension from the centerline of the drain connection and the bottom of the trap depends on the diameter of the drain connection. If the connection has a 1" diameter, the total vertical distance would be 6".

If there is another component between the cooling coil and the fan, you will need to account for that in the calculation. A re-heat coil with a 0.25" pressure drop in the previous example would reduce the pressure over the drain pan to -1.75" and now our required vertical distance would be 5.63".

Blow-through Traps:

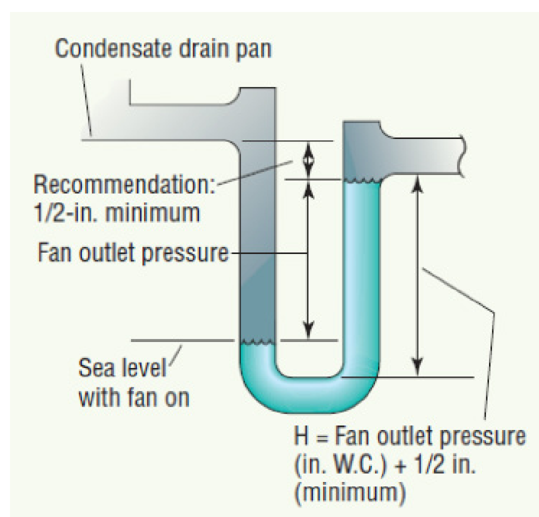


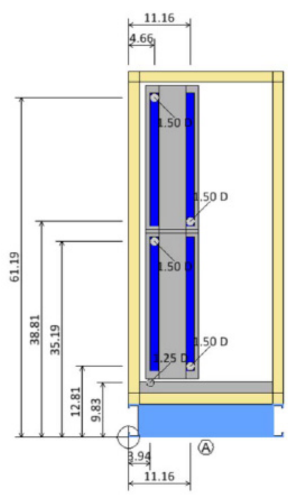
Figure 2 Blow-Through Trap with AHU Running

3290 146th Place SE, Suite F, Bellevue, WA 98007 | P 425.562.1150 | F 425.562.5123

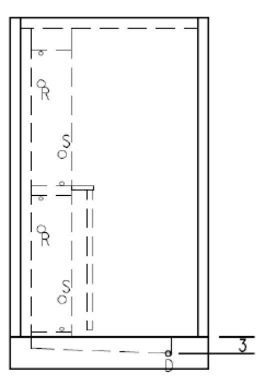
Figure 2 shows the recommended dimensions for a trap on a blow-through coil. The variable "H" is the fan outlet pressure and assumes the cooling coil is immediately downstream of the fan. We're using the same 1" safety factor but it's shown as two ½" safety factors that will add to 1".

Example: Let us take our original example and put the coils into a blow-through position. With a TSP of 5.5" and an ESP of 3.5", the pressure at the fan outlet will be 3.5" plus the static pressure loss through the coil (assuming the coil is the last component in the airstream). If we assume our airside coil PD is 0.60", the static pressure at the fan outlet will be 4.1". The value "H" = 4.1" + 0.5" = 4.6". Adding the remaining 0.5" safety factor and accounting for the 1" diameter of our condensate line, the minimum required vertical distance from the centerline of the drain connection and the bottom of the trap is 6.6".

There is an Excel spreadsheet on the H: drive in the "Engineering\Engineering White Papers" folder that you can use to automate this calculation.



Daikin: The coil section to the right has a 6" base rail. As you can see, the centerline of the 1.25" diameter condensate drain connection is 9.83" up from the bottom of the base rail.



Nortek: The Huntair coil section to the right also has a 6" base rail. As you can see, the centerline of the 1" diameter condensate drain connection is 3" down from the top of the base rail. This would be 3" up from the bottom on a 6" base rail or 5" up from the bottom on an 8" rail. Temtrol is another 1" up from the bottom (4" and 6" respectively) due to the way they design their coil sections.

Determining the Centerline Drain Connection Location:

There is a considerable difference on the location of the drain connection between Daikin and Nortek Air Solutions. It is important that you check this dimension for each specific project.

Potential Problems:

- No Trap Or Trap Outlet Too Low:
  - For draw-through units, air will get sucked into the drain pan causing any water in the pan to be carried into the downstream parts of the unit. This is sometimes referred to as "geysering".
  - For blow-through units, conditioned air will be lost to the water drain creating possible issues with meeting the building load or static pressure.
- Trap Outlet Too High:
  - For draw-through units, the water will be unable to drain, and water will be pulled back into the drain pan causing the pan to overflow. This is sometimes referred to as "floodback".
  - For blow-through units, the chance for flood-back exists if the outlet is higher than the inlet unless the positive pressure over the drain pan is sufficient to overcome the height difference.
- Dry Trap: A common problem in dry climates and during periods when the cooling coils are inactive, water can evaporate from the trap. Application of an electronic trap primer or manual priming will maintain a continuous water seal.
  - For draw-through units, a dry trap can be a source of obnoxious odors and poor indoor air quality depending on where the drain terminates.
  - For blow-through units, conditioned air would escape from the unit causing a loss of capacity and/or static pressure control.

If you have any questions on this, please contact the Engineering Department.

Thank You,

Ken Horsfall

3290 146th Place SE, Suite F, Bellevue, WA 98007 | P 425.562.1150 | F 425.562.5123