

Parallel Fan Powered Terminal Unit Hot Water Coil Location  
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The first thing to consider when selecting a heating coil is to determine the supply temperature to the space. The recommended temperature is 95F if you are trying to maintain a 70F space. It is not recommended that discharge temperatures exceed 25F above space temperature to maintain proper diffusion by the supply air distribution system.

There are two options available for the hot water location from unit manufacturers when selecting a terminal unit. They are the discharge of the unit and the plenum inlet. There are advantage and disadvantages to each and I hope this article will help explain.

The first and most widely used to date has been the terminal unit discharge location. The advantage of using this arrangement is that if the terminal unit fan fails to run, as long as there is primary air from the air handling unit, heat can be supplied to the space. The disadvantage is that the air handling unit must be designed to overcome the pressure drop of the heating coil even during the cooling season.

The second and most efficient method is for the heating coil to be installed on the plenum inlet. The advantage of and efficiency gain is due to the fact that primary air fan does not have to overcome the heating coil pressure drop. The disadvantage of this location is that if the terminal unit fan fails to run, no heat will be supplied to the space above the 55F supply air from the air handling unit. This is the arrangement that is becoming more popular especially on LEED projects. Always keep in mind the mixed air temperature equals the supply air temperature with this arrangement and that there is no way to increase the heating capacity by increasing the primary air. Increasing the primary air will only decrease the discharge air temperature in this arrangement.

As an example consider a terminal unit selected for 200 CFM primary air @ 55F and a secondary fan flow of 800 CFM with the heating coil located in the return plenum of the unit. The supply air temperature is 95F to the space. Please keep in mind also that with the parallel fan arrangement the total volume of air will be the sum of the primary and secondary air  $200 + 800 = 1000$  CFM to the space.

Using the mixed air temperature formula the following example will be helpful when solving for the secondary air temperature leaving the coil in this example:

$T_m$  = Mixed air temperature (F or C)

$\%p$  = Percentage of air volume primary air relative to total

$T_p$  = Primary air temperature (F or C)

$\%s$  = Percentage of air volume secondary air relative to total

$T_s$  = Secondary air temperature ( Air from heating coil)

$$T_s = (T_m - \%p * T_p) / \%s$$

$$T_m = 95F$$

$$\%p = 200/1000 = 20\%$$

$$T_p = 55F$$

$$\%s = 800/1000 = 80\%$$

$$T_s = (95 - .2 * 55) / .8$$

$$T_s = 105F$$