

Outdoor Air Preheat

In pool rooms, the ASHRAE 62 ventilation code defines a specific volume of outdoor air that must be introduced into the indoor facility. The design professionals have also started to require high ventilation rates for Purge cycles and Event Modes. This greater amount of outdoor air can present several design problems for the dehumidifier in cold climates. When ultra-cold air is introduced into the top section of a dehumidifier several issues can happen that must be taken into consideration.

- The mixed air temperature can drop below the room’s dewpoint causing condensation on the grills and ducts.
- Creation of fog in the pool room.
- Frost and ice build up on the condenser reheat coil or other surfaces within the dehumidifier.

The following two design philosophies must be utilized to prevent any of the problems in list above from occurring in the pool facility.

Desert Aire’s first equipment design philosophy is that the mixed air temperature entering the internal condenser reheat coil must be maintained at or above 45°F in order for the refrigeration system to work properly. The equipment must be evaluated to determine if a preheater is needed to maintain a 45°F mixed air condition before the internal condenser reheat coil.

Our second design philosophy is that equipment must deliver at all times a supply air condition at or above the space dew point. This is normally obtained through our standard refrigeration system design however when more outside air is being introduced other options must be considered. To maintain this dewpoint temperature for the 50% purge option, the equipment will utilize the auxiliary heater which must have the capacity to heat the outside air at its winter design condition up to at least 65°F (the space dewpoint). The system uses a zone reset control algorithm to achieve this temperature.

Occupied Time Calculation: (Compressors ON)

A preheater must be included when design mixed air is expected to go below 45°F to ensure proper refrigeration system operation.

OSA%	Lowest OSA Temperature 83°F ret. air w/o Preheat
35%	-24 °F
40%	-12
45%	-1
50%	7

Table 1 - Mixed Air Minimum OSA Temperature with Varying Outside Air Volumes

Please refer to figure 1 for a plot of the maximum outside air (as a percent of supply air volume) that can be introduced into a dehumidifier before the resultant mixed air condition reaches 45°F. For example, if the outdoor air design temperature is minus 5, the maximum outdoor air percentage would be 43%. If more outdoor air is required, then preheat would need to be added to the dehumidifier.

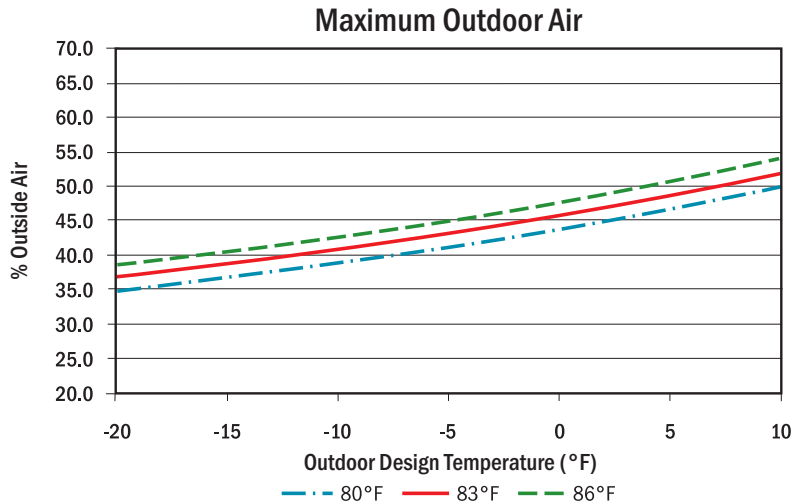


Figure 1 - Maximum Outdoor Air as a Percent of Supply Air Volume

Purge Only Operation Calculation: (Compressors Off)

Either a preheater or a properly sized auxiliary space heating coil will be required to raise the outside air temperature to a value where the mixed air condition is maintained above space dew point. This is typically between 64°F and 70°F. Since the purge operation is for a very short duration (typically less than 2 hours), the space heat loss of the building is ignored for this sequence. The calculation for the amount of auxiliary heat is:

$$\text{Btu Heat} = \text{Mixed Air Temp} \times \text{Supply Air Volume} \times \Delta T$$

If the auxiliary heater has this capacity, no preheat is required. If not, a preheater must be included into the dehumidifiers design specification.

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