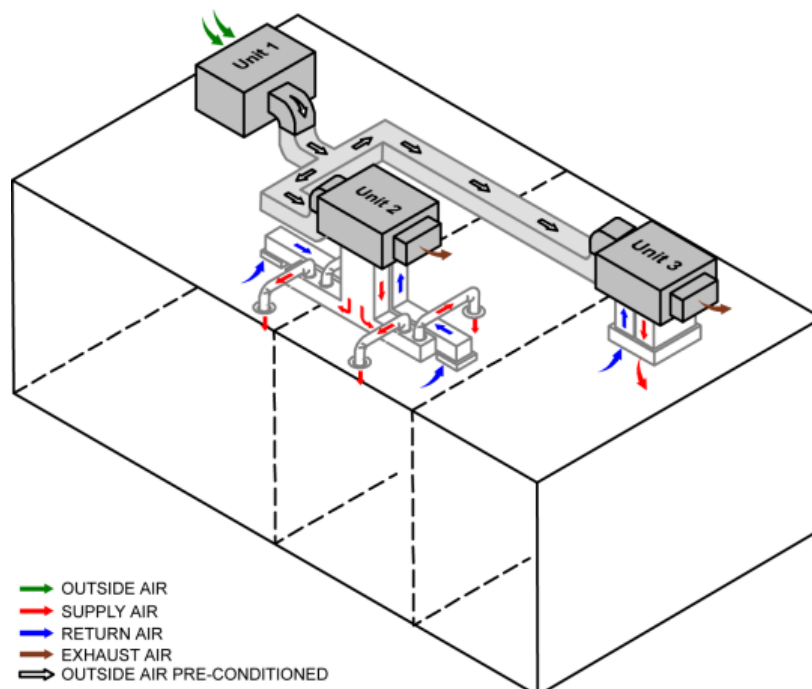


Ventilation requirements have become more stringent over the last few years. This has led to a rise in the demand for dedicated outside air systems. A dedicated outside air system (also referred to as 100% outside / outdoor air system) uses a separate unit to condition the entire outdoor air ventilation requirement for a particular application. It will then deliver the conditioned air to either the occupied space, or directly to the individual local units serving multiple spaces. This system makes it easier to verify sufficient ventilation for the application, and helps maintain comfortable humidity levels.

This document will focus on Lennox' solution for direct to unit dedicated outside air systems. This application will use only Lennox equipment and controls. All Lennox dedicated outside air system are *make-up air systems* which means they are used to supply air to an area or space without contributing to the building HVAC load. The dedicated outside air unit has no return path and no exhaust provisions, so the air must be exhausted some other way. These units supply *tempered* air that has been heated or cooled in moderation to nearly match the space temperature.

DIRECT TO UNIT DEDICATED OUTSIDE AIR SYSTEMS DEFINITION

In this type of dedicated outside air system, a separate Energence rooftop unit with the Humiditrol[®] option is used to precondition all of the outside air required to sufficiently ventilate the space(s). After the outside air is conditioned, it is then delivered to the local units. The outside air is usually either discharged into a plenum or ducted directly into the return of the local units. Since the outside air unit is sized to bring in exactly the amount of outside air needed, the system is assured to always meet the ventilation requirements. The dedicated outside air unit supplies the air to the units at a neutral temperature, which is typically between 65°F to 85°F. Although it is possible for this unit to provide some heating / cooling benefits, it is important that the dedicated outside air unit only be sized to handle the ventilation requirements. This unit is a make-up air unit, and must not be counted on to handle any part of the buildings latent or sensible load. Obviously the dedicated outside air unit will dehumidify and condition the outside air. The local units must be sized, using the new mixed air temperature, to offset the entire building HVAC load.



UNIT SELECTION

For all dedicated outside air systems use only Emergence 3-50 ton packaged gas/electric or electric/electric rooftop units. Again, the Emergence units should be selected only to meet the ventilation load, and cannot be counted on to provide any heating / cooling benefits. A bypass curb must be included with the unit. The Humiditrol option must be selected to account for days that create a need for dehumidification but not cooling. The Emergence units should also be selected with a stainless steel heat exchanger because of potential condensate buildup. Upon unit selection, it is important to verify there is enough airflow to meet the heating requirements. It is especially important for colder climates to select the sufficient amount of gas heat.

CONTROL

This system can be controlled using the Prodigy Controller Fresh Air Tempering (FAT) option along with a Lennox duct mounted zone sensor located somewhere in the supply air stream. Fresh Air Tempering (FAT) set points must be set to control the discharge air temperature within a desired range. In the event of extreme ambient conditions, the discharge air temperature will remain close to the desired value. Please see the Prodigy Control Operation technical literature for Fresh Air Tempering parameter setup instructions. The duct mounted zone sensor in the supply air stream will act as the secondary control for the outside air unit. This sensor will be a backup for Fresh Air Tempering control. The duct mounted zone sensor's set points should be set somewhere outside the Fresh Air Tempering dead band. A relative humidity sensor will measure the humidity and control the unit's Humiditrol system via the Prodigy. The Humiditrol option will initiate the dehumidification cycle when the Prodigy Controller senses the duct temperature is satisfactory, but the humidity level is above the desired set point, or the Prodigy Controller receives a call for dehumidification from a relative humidity sensor. A call for cooling or heating will always take priority over the Humiditrol dehumidification option. The unit will continue to dehumidify the space even after the call for cooling or heating has been met. Refer to the Humiditrol option technical literature for a detailed sequence of operation.

SENSOR LOCATIONS

To use Fresh Air Tempering control with the Prodigy Controller, the unit's standard discharge sensor must be relocated to the supply air duct. This will allow Fresh Air Tempering to have the maximum amount of control, and will help to ease space temperature fluctuations. The duct mounted zone sensor will only act as a backup for the Fresh Air Tempering control. The duct mounted zone sensor will only control the unit if the duct experiences an out of the ordinary temperature change or Fresh Air Tempering fails. In applications where the outside air will be delivered to a return air plenum, the duct mounted zone sensor should be placed in the return air plenum near the local units. Applications where the outside air is ducted directly to the return of the local units should have the duct mounted zone sensor placed as far down the supply air duct as possible, but before any branching to the local units occurs. The relative humidity sensor should be wall mounted in the space with the highest humidity load.

TYPICAL SEQUENCE OF OPERATIONS

Fresh Air Tempering will handle the primary control of the dedicated outside air unit. When ambient temperatures are high, the discharge air temperature will begin to rise. As it passes the Fresh Air Tempering cooling set point, then Fresh Air Tempering control will switch the unit into cooling mode. If the ambient temperature is low, then the discharge air temperature will begin to fall. As the discharge air temperature falls below the Fresh Air Tempering heating set point, then Fresh Air Tempering control will switch the unit into heating mode. See the Prodigy Controller Operation technical literature for information on setting the Fresh Air Tempering electronic configure to order (ECTO) parameters. The duct mounted zone sensor located in the supply duct handles the secondary control of the dedicated outside air unit. For days that have high humidity levels but are temperate and will not require a call for cooling or heating, the Humiditrol option is necessary to maintain humidity level set points. If the relative humidity sensor detects a humidity level above the set point, the outside air unit will initiate the Humiditrol option. The unit will run the Humiditrol option until the humidity level is reduced to the set point or there is a full call for cooling or heating.

UNOCCUPIED MODE

During the unoccupied mode, the damper for the dedicated outside air unit is driven closed. If the supply duct temperature were to meet the unoccupied set points, the unit would attempt to run with no provisions for airflow. All local units must have the same occupied and unoccupied schedule as the dedicated outside air unit. This ensures the supply fans all run together. During unoccupied periods, it is mandatory that the local unit's unoccupied set points are within 60°F to 90°F. Please refer to Installation Instructions for more information.

ADVANTAGES

This system has some advantages over other dedicated outside air systems. First, the air is pre-conditioned before it enters the secondary unit. This helps assure that no extremely humid air will be delivered to the space. The local units can be simpler since there is no need for outdoor air dampers or economizers. Ventilated air and return air are assured to mix thoroughly before being delivered to the space. This will decrease the possibility of warm and cold spots in the space.

SYSTEM DISADVANTAGES

Direct to unit dedicated outside air systems do not provide any help with the space's heating / cooling load. Since the outside air is always delivered to the return of the local units, it may be necessary to account for more outside air than needed to meet ventilation requirements. Outside air delivery is split among the local units, so it may also increase energy consumption since all of the units must remain in operation to achieve proper ventilation.

APPLICATIONS

Direct to unit dedicated outside air systems are very flexible and can be applied to most applications. They are best used in applications where there are multiple spaces with ventilation requirements. They are particularly useful when used in hotel, school (classrooms), or office building applications. This system should be avoided if the application calls for high ventilation requirements in one of the spaces (such as a gymnasium). Direct to space dedicated outside air systems are a more appropriate choice for these applications. Neither application should be used in situations where slight temperature fluctuations are not tolerable.

LENNOX SOLUTION LIMITATIONS

There are a few limitations of Lennox' solution to direct to unit dedicated outside air systems. Because an outside air sensor does not control the system, it is possible for fluctuations in the discharge air temperature. Fresh Air Tempering does not provide pinpoint control of the discharge air temperature, and has a dead band of around 10 degrees where Fresh Air Tempering is not active. Although temperature sensors can help control the discharge air temperature within the Fresh Air Tempering dead band, the controls accuracy is limited. These systems must be constant volume. Because of the ventilation requirements, the outside air unit must continuously run at full capacity during occupied modes. Demand control ventilation is not available on dedicated outside air units. Single compressor units should be avoided as well. Without the ability to stage the compressors, they are more liable to over heat or over cool the space. The ability to stage compressors gives Lennox a distinct advantage in the larger units. Do not use heat pumps for dedicated outside air applications.