

Outdoor Air Design for Multi V *

ASHRAE 62.1 and local codes require that certain quantities of outdoor (fresh) air be introduced into the occupied space. Outdoor air is required to minimize adverse health effects and it provides acceptable indoor air quality that is acceptable to human occupants. The five methods of accomplishing this with the LG Multi V are as follows:

1) Unconditioned Outdoor Air (Non-Ducted, Natural Ventilation):



The use of natural ventilation systems may be used when approved by local codes. Natural ventilation systems may be designed using operable windows or louvers. The open area of a window or the free area of a louver must meet the minimum percentage of the net occupied floor area as prescribed by the local code.

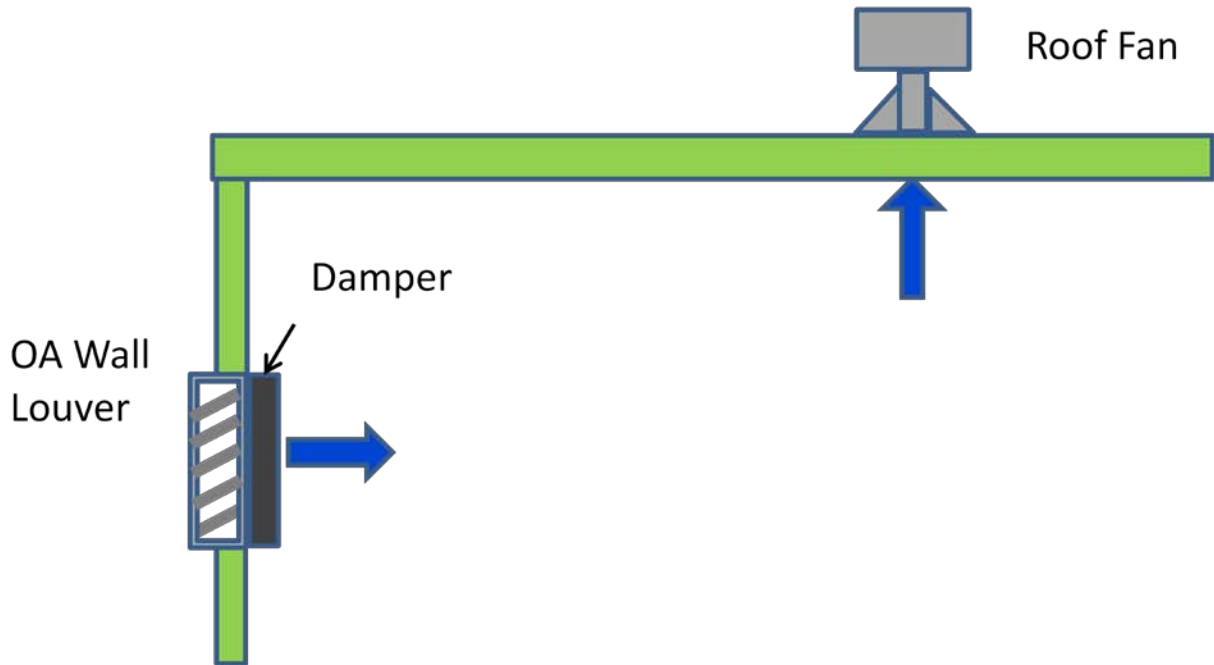
A. Advantages

- Occupants can manually control the amount of outdoor air
- Useful for historic buildings that have no ceiling space for outdoor air ductwork
- May not adversely affect indoor unit operation
- May be used with a full lineup of Multi V indoor units

B. Disadvantages

- It may be difficult to control humidity levels from outdoor air when windows are open
- Thermal comfort levels from outdoor air may be substandard when windows are open
- Indoor units may have to be oversized to account for the added heating/cooling loads when windows are open
- Outdoor air loads may be difficult to calculate since the quantity of outdoor air is not regulated

2) Unconditioned Outdoor Air (Non-Ducted, Fan Assisted Ventilation):



When approved by local codes, the fan assisted ventilation method uses exhaust fans to draw outdoor air into occupied spaces through a wall louver or gravity roof intake hood. Fans can also be used to push the outdoor air into the space and vent the air through louvers or gravity roof exhaust hoods.

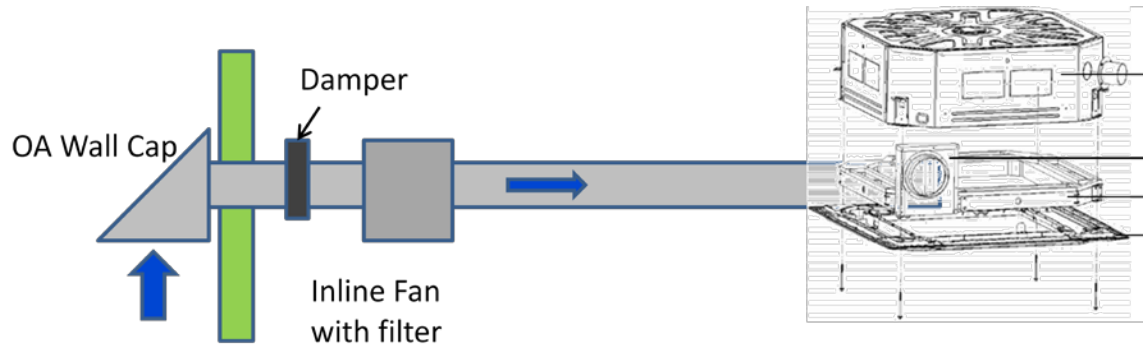
A. Advantages

- Outdoor air may be manually controlled by the occupant or automatic controls may be installed to open/close outdoor air dampers or to turn on/off ventilation fans
- Useful for large open spaces like warehouses, garages, workshops
- Outdoor air loads may be easier to calculate since fans will regulate the amount of outdoor air
- May be used with a full lineup of Multi V indoor units

B. Disadvantages

- It may be difficult to control humidity levels from outdoor air when louvers/hoods are opened
- Thermal comfort levels from outdoor air may be substandard when louvers/hoods are opened
- Indoor units may have to be oversized to account for the added heating/cooling loads when louvers/hoods are open
- Hot, cold, and humid spots may occur because the outdoor air may not be evenly distributed to the space in conjunction with the indoor unit

3) Unconditioned Outdoor Air Ducted to Indoor Units:



Outdoor air may be ducted directly into a Multi V indoor unit from a wall cap, louver, or roof hood. Mixed air shall not be lower than 59°F DB for heating, or higher than 76°F WB for cooling. Total and Sensible cooling limits as listed in the Indoor Unit Product Data Book shall not be exceeded.

Control Requirements: The factory mounted return air thermistor shall be disabled and a remote wall temperature sensor or zone controller shall be added and wired for each indoor unit.

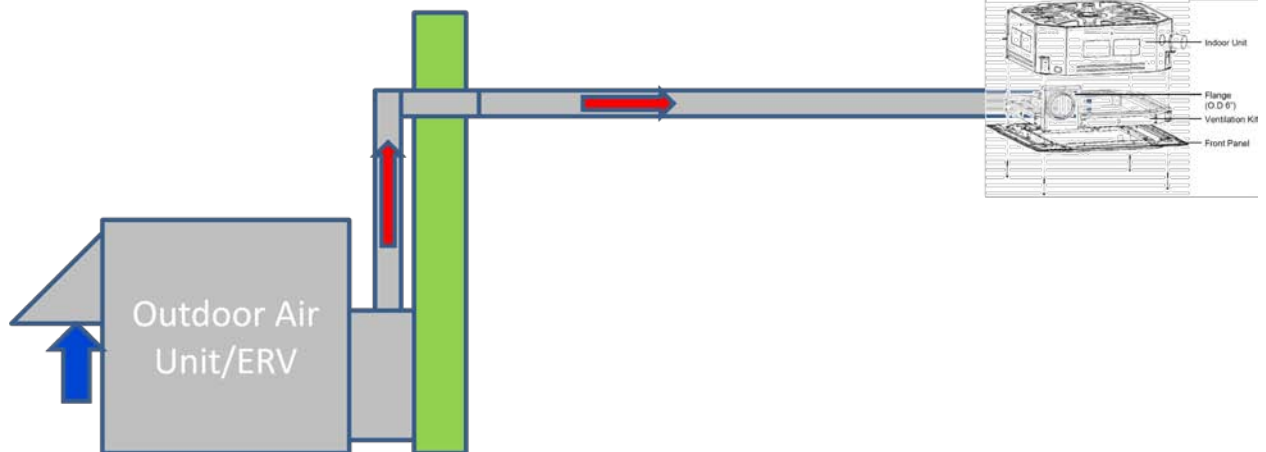
A. Advantages

- May require less ductwork if indoor units are placed near outdoor walls or a roof deck
- Controls may be added to shut off outdoor air when the space is unoccupied
- Third party demand control ventilation controls may be installed in order to regulate outdoor intake based on the CO₂ levels of the occupied space

B. Disadvantages

- Fan(s) shall be required to push outdoor air to the indoor unit because the indoor units are engineered for low sound levels and are not designed for the added static pressure from the outdoor air ductwork
- A filter system may be required because the outdoor air may bypass the main indoor unit filter
- Ducted, 1-way cassette, 4-way cassette, and vertical air handler indoor units are the only indoor units that can have ducted outdoor air
- Indoor unit capacity needs to be increased to account for added outdoor air heat/cool loads
- Motorized dampers may be required to prevent outdoor air from blowing into the indoor unit when indoor unit shuts off
 - Cool outdoor air may prevent a hot start of the indoor unit
 - An LG Dry Contact adapter must be added to each indoor unit for signaling to the motorized damper
 - Additional low voltage wiring and an isolation relay may be required

4) Coupled Dedicated Outdoor Air (CDOA):



A separate dedicated outdoor air unit/energy recovery ventilator (ERV) coupled to the Multi V system is designed to filter, condition, and dehumidify the outdoor air to near neutral conditions. The outdoor air is routed to the indoor unit(s) using common ductwork, or in some cases, high velocity air ducts. Mixed air shall not be lower than 59°F DB for heating, or higher than 76°F WB for cooling. Total and Sensible cooling limits as listed in the Indoor Unit Product Data Book shall not be exceeded.

Control Requirement: The factory mounted return air thermistor shall be disabled and a remote wall temperature sensor or zone controller shall be added and wired for each indoor unit.

A) Advantages

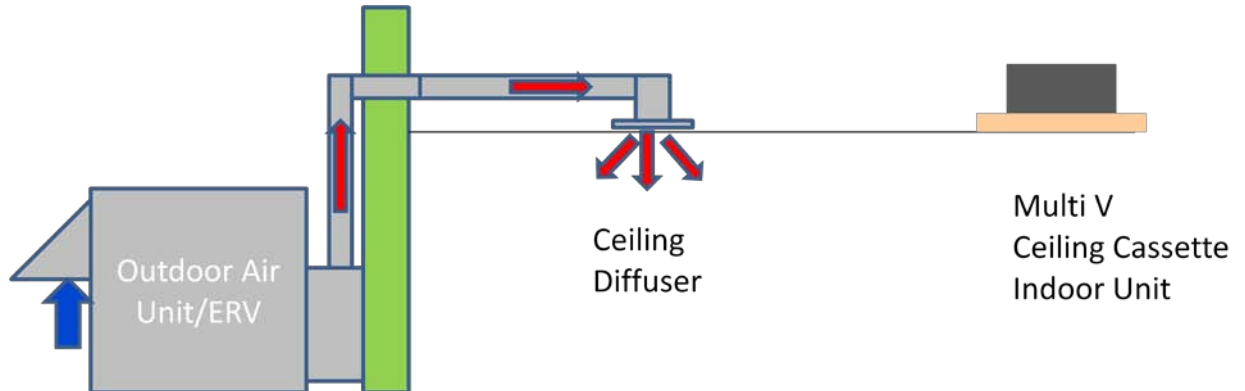
- The indoor unit capacity may not be increased by outdoor air
- Rather than separate fans and filters for each indoor unit, the fan and filter system is centralized to the main outdoor air unit making service easier

B) Disadvantages

- Ducted, 1-way cassette, 4-way cassette, and vertical air handler indoor units are the only indoor units that can have ducted outdoor air
- Ceiling space may be required for ductwork to be routed from the outdoor air unit to the indoor units
- Fire dampers may be required where outdoor air ductwork penetrates fire rated walls
- If the outdoor air unit fails, the failure may be masked by the indoor unit changing its operating parameters to compensate for the failure
 - The building occupant may not notice that the outdoor air unit is not working until the unconditioned outdoor air exceeds the indoor unit mixed air limits.
 - Once these mixed air limits are exceeded, the indoor unit microprocessor controls may prevent the indoor unit from operating

- Motorized dampers may be required to prevent outdoor air from blowing into the indoor unit when the indoor unit shuts off.
 - Cool outdoor air may prevent a hot start of the indoor unit.
 - An LG Dry Contact adapter must be added to each indoor unit for signaling to the motorized damper
 - Additional low voltage wiring and an isolation relay may be required

5) **Decoupled Dedicated Outdoor Air (DDOA):**



A separate dedicated outdoor air unit/energy recovery ventilator (ERV) decoupled from the Multi V system is designed to filter, condition, and dehumidify the outdoor air being introduced into the space. This system is ducted independently from the Multi V system and introduces “neutral” air into each occupied space using ceiling or wall registers.

A) *Advantages*

- Does not add heat/cool loads to indoor units
- May be used with a full lineup of the indoor units
- If the outdoor air unit fails, the resulting untreated air will be readily noticed by the occupants who can notify the building engineer
- The outdoor air unit may supply “neutral” air to the occupant space even when the indoor unit shuts off
 - Interlock controls may not be required
- Rather than separate fans and filters for each indoor unit, the fan and filter system is centralized to the main outdoor air unit making service easier
- Indoor unit operation and performance may not be affected by outdoor air
- Flexibility in many different types of building installations
- Third-party demand control ventilation controls may be more readily accommodated

B) Disadvantages

- Ceiling space is required for ductwork from outdoor air unit to ceiling diffusers
- Fire dampers may be required where ductwork penetrates fire rated walls

Due to potentially extreme temperatures and humidity levels of outdoor air, it is important to select equipment that is specifically designed to condition and dehumidify 100% of the outdoor air. Possible manufacturers of outdoor air units/ERV required for Methods #4 (CDOA) and #5 (DDOA) include, but are not limited to, AAON, Greenheck, Renewaire, and Desert Aire.

LG Multi V systems may work best with Method #5 (DDOA) as this methods ensures that the occupant has conditioned and filtered code required outdoor air. The required outdoor air may not affect the operation and performance of the Multi V indoor unit.

*Although we believe that the methods for outdoor air are accurate and will function properly, as of 12/2/10, they have never been tested, verified, or evaluated by LG Electronics, USA, Inc. in our lab or on any project to operate properly and function as stated.

The installer or contractor understands that if the suggested method is used, they use it at their own risk. LG Electronics USA, Inc. takes no responsibility and offers no warranty, expressed or implied, of Merchantability or fitness of purpose if this method fails to perform as stated or intended.

This disclaimer remains in effect until a written notice that the method has been tested and performs properly as intended is published by LG Electronics USA, Inc. Commercial Air Conditioning Applications Engineering Department.

Prepared by: Ed Ferrier

CAC-WP-TA-001-US 011C15