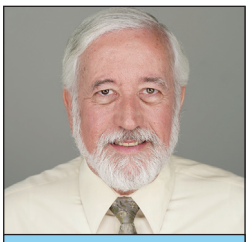
MECHANICAL CODE DISCUSSION

Ventilation



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Introduction: This discussion, based on the 2021 IRC/IMC is an update to my November/December 2009 discussion, which was based on the 2006 IRC/IMC. Fourteen years later, ventilation remains one of the top subjects I receive request for guidance.

One of the common challenges in meeting the requirements of any of the International Codes is understanding the definitions in the various Codes. Ventilation as defined in the IRC and IMC is regularly misunderstood, leading to code violations and poor air quality in a structure. Focusing on this term we have:

2021 IRC/IMC: VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

2021 IRC/IMC VENTILATION AIR. That portion of supply air that comes from the outside (outdoors), plus any re-circulated air that has been treated to maintain the desired quality of air within a designated space.

2021 IMC/IRC WHOLE-HOUSE VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air for outdoor air where operating continuously or through a programmed intermittent schedule to satisfy the whole-house ventilation rate.

Commentary Comment: Ventilation air is supplied to remove or dilute indoor air contaminants. In the context of Chapter 4, ventilation air is 100-percent outdoor air that is not re-circulated.

2021 IRC SECTION R303 LIGHT, VENTILATION AND HEATING (selected sections)

R303.1 Habitable rooms. All habitable rooms shall have an aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural ventilation shall be through windows, doors, louvers or other approved openings to the outdoor air. Such openings shall be provided with ready access or shall otherwise be readily controllable by the building occupants. The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

Exceptions:

1. For habitable rooms other than kitchens, the glazed areas need not be openable where the opening is not required by Section R310 and a whole-house mechanical ventilation system or a mechanical ventilation system capable of producing 0.35 air changes per hour in the habitable rooms is installed in accordance with Section M1505.
2. For kitchens, the glazed areas need not be openable where the opening is not required by Section R310 and a local exhaust system is installed in accordance with **Section M1505**.

The key to understanding ventilation is introducing

outside air into a home or other building, to maintain indoor air quality. It is most often confused with circulation — the circulating of the indoor air around the house. Ventilation may be provided by opening windows, doors, or louvers or by a mechanical means. Ventilation requirements may be met by:

1. Opening windows, doors, and louvers to allow fresh outside air to enter the home.
2. Exhausting contaminated air from the home with ventilation air being provided from outside by 'leakage' into the home to replace exhausted air. Exhaust is especially effective when contaminates are exhausted at the source. Range hoods and bath fans are examples of at source exhaust.
3. Drawing fresh air into a home, by use of a duct introducing outside air into the return air system or a fan/ventilator blowing outside ventilation air into the house. Inside air will then 'leak' to outside at a rate equal to the rate outside air is introduced into the home.
4. Whole-house ventilation systems, including balanced ventilation with ERVs or HRVs. The balanced systems include exhaust and supply fans.

Building theater rooms, sport courts, craft rooms, and others under garages continue in popularity. These rooms typically do not have operable windows or doors, leading to the necessity to provide mechanical ventilation. Adding a supply air and return air from the typical HVAC system provides circulation, not ventilation. Two of the methods that may be used to provide theater room ventilation follow:

OPTION 1 – Approved Mechanical ventilation capable of producing 0.35 air changes per hour:

Several manufacturers produce very quiet high efficiency exhaust fans in the range that will work for a home theater. A ventilation fan can be installed with a switch in the theater to be turned on when needed, just as a window may be opened where available for ventilation when needed. If the home is forced air- then the supply air and return air to the room will provide a path for replacement ventilation air back into the theater for air that is exhausted. If radiant heated, a transfer duct/grill will be required to let air into the theater.

Consider a 20' X 30' X 10' theater:

20 X 30 X 10 = 6000 cu. ft.

For 0.35 air changes in an hour: 6000 cu. ft. X .35 = 2100 cu. ft per hour

2100 cu. ft per hour divided by 60 min. per hour = 35 cu. ft. per minute (CFM)

An 80 CFM fan with a 4" discharge as available will move more than two times what is required. Infiltration will typically be able to provide this small amount of outside air to replace the air exhausted.

OPTION 2 – Whole house mechanical ventilation system capable of supplying outdoor ventilation air of 7.5 CFM per occupant computed based on two occupants for the first bedroom and one occupant for each additional bedroom.

Four-bedroom house-

Master bedroom:	15 CFM	(7.5 X 2)
Other bedrooms:	23 CFM	(7.5 X 3, rounded up)
Total:	38 CFM	

Under this option, 38 CFM may be introduced into the return air duct from outside, with the ability on the thermostat to run the fan continuously.

Of course, there are other options such as using energy/heat recovery ventilators; however, the above 2 options are simple and relatively inexpensive. If the home is extremely tight construction, the HRV/ERV option may be necessary because there simply is not enough leakage for the other methods to work.

Please be aware of uses where excess humidity or other contaminant are added to the inside environment which will increase the required air changes.

Thanks again for your positive comments, suggestions, and questions. If you have a particular subject you would like me to address, please let me know.—Brent. ■