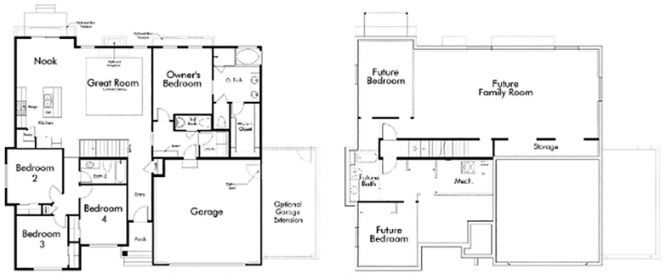
# MECHANICAL CODE DISCUSSION

## Clearing the Air Part 2: Residential Mechanical Ventilation

DURING OUR PREVIOUS DISCUSSION, we reviewed the IRC/IMC ventilation definitions and noted that code requirements, coupled with the improvement in tightening the thermal envelope, frequently necessitate mechanical ventilation in many new homes as opening windows for natural ventilation is impractical and terribly energy inefficient. Failure to implement proper mechanical ventilation can result in poor Indoor Air Quality (IAQ) and increase the risk of mold, mildew, and damage due to condensation within wall, floor, and ceiling cavities.

We recognize the need for mechanical ventilation — but how much air is necessary and what is the appropriate method?

Presented here is a floor plan for a 1900 square foot, 4-bedroom, 3-bathroom, single-level home with an unfinished basement. This example floor plan has been provided courtesy of Ivory Homes. (Thank you!)




Referring to the 2021 IRC, we find the following pertinent information:

**Section M1505 Mechanical Ventilation:**

**1505.4.1 – Design:** The system may be supply, exhaust, or a combination of supply and exhaust. Supply ventilation may involve outside air being drawn into the HVAC system's return air stream with balancing and back draft dampers. The positive pressure created by adding outside air will expel contaminated air through the thermal envelope, at a rate calculated with this formula:

Vent. Rate in CFM = (0.01x sq.ft.) + [7.5 x (# bedrooms + 1)]

In this example: (0.01x 1900) + [7.5 x (4 + 1)] =19 + 37.5 = 56.5 CFM

Rather than performing the calculation you can refer to a table in the IRC:

TABLE M1505.4.3(1)
CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIRFLOW RATE REQUIREMENTS

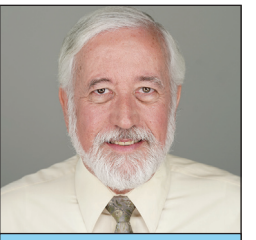
| DWELLING UNIT FLOOR AREA (square feet) | NUMBER OF BEDROOMS | | | | |
|---|---|---|---|---|---|
| | 0–1 | 2–3 | 4–5 | 6–7 | > 7 |
| | Airflow in CFM | | | | |
| < 1,500 | 30 | 45 | 60 | 75 | 90 |
| 1,501–3,000 | 45 | 60 | 75 | 90 | 105 |
| 3,001–4,500 | 60 | 75 | 90 | 105 | 120 |
| 4,501–6,000 | 75 | 90 | 105 | 120 | 135 |
| 6,001–7,500 | 90 | 105 | 120 | 135 | 150 |
| > 7,500 | 105 | 120 | 135 | 150 | 165 |

For SI: 1 square foot = 0.0929 $m^2$, 1 cubic foot per minute = 0.0004719 $m^3/s$.

The calculated 56.5 CFM for 4 bedrooms and 1900 sq. ft. is accurate and falls within the table's range. We'll use 60 CFM as our design basis, which is code compliant if continuously pushed or drawn from the home. *Continuous operation is required.* The code allows an exception for intermittent operation of at least 1 hour within every 4-hour period; *however, if chosen, the rate during that 1 hour must be quadrupled to 240 CFM.* Please note, this calculation is for the main finished floor, with the same procedure applying to the basement if finished.

We need to determine the method to achieve our goal. The primary options include:

- **Supply:** A duct connecting to the outside and integrated with the return system. The furnace/air handler must operate continuously and include high-efficiency motors.


BRENT URSENBACH

**BRENT URSENBACH**

**HVAC EDUCATOR/ EXPERT WITNESS**
bursenbach@gmail.com
801-381-1449

- **Exhaust Fan:** Should be quiet, must be efficient, and run continuously. This is a straightforward option.
- **HRV or ERV:** These are effective but costly options. Will be the topic in the future.

Select an exhaust option using a Panasonic, Broan, or another high efficacy DC motor exhaust fan with selectable CFM settings, set at approximately 60 CFM, wired to run continuously. These fans are common in multi-family apartments built to energy star or other higher code standards. They operate quietly while continuously exhausting air from one of the bathrooms.

In this home, install a 60 CFM fan in the main or master bathroom to run continuously. Other bathrooms can use standard fans with switches. Alternatively, split the 60 CFM between multiple bathrooms with efficient fans, though this raises costs. Running the main floor fan(s) will create a slight negative pressure, causing outside fresh air to leak in through the thermal envelope. The fan photo is a high efficacy fan. Notice the blower wheel and motor design – not a cheap shaded pole motor with a noisy propeller/ axial fan.

*We will further explore this subject in upcoming discussions and classes. Please feel free to share your thoughts, opinions, experiences, or ask questions at bursenbach@gmail.com.*

***Spring is approaching. Wishing you all success — Brent*** ■