

Residential Ventilation

2018 IMC Proposal

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WA-IMC 403.8 (Washington amendment)

- Current version uses language from
 - National IMC (table 403.3.1),
 - Washington VIAQ (2006)
 - Obsolete installation guidance
 - Furnace Integrated ventilation from the 1980s
 - Reliance on “trickle” vents
 - Not appropriate for a modern code
 - ASHRAE 62.2-2016 (total ventilation target)
 - No credit or offsets from the Standard
 - Current IRC language
 - IRC table based on a different standard (ASHRAE Std. 62.2-2010)
 - Inconsistent with WA-IMC requirements by about 30%

Single Family Ventilation Systems

- Single Family:
 - Furnace integrated air supply
 - Duct to the furnace return
 - Often with a barometric damper
 - Ventilation provided when the furnace runs
 - Sometimes separate controller to operate the system when no heat
 - Whole House fan
 - Bath fan often with a low speed fan and ECM DC motor
 - Timer operation controlled by the occupant.
 - “Trickle vents” or envelope leakage for supply air
- Often Occupant intervenes to turn off or override whole house fan
- In furnace integrated systems
 - Excessive ventilation when furnace operates
 - Excessive power draw as increased furnace fan operation.

Multi-Family Ventilation Systems

- Whole House
 - Bath fan in each unit designated as the whole house ventilation
 - Sometimes a two speed fan with a low speed that operates continuously
 - Supply from trickle vents *and* corridor ventilation through door leakage
 - Sometimes no occupant control
- Whole building ventilation system
 - Corridor supply ventilation per IMC
 - Unit exhaust through central shafts to a central fan system
- IBC precludes corridor supply (although it is quite routine)
- Occupant intervention often leads to cross infiltration between units

Revision to the WA-IMC

- Goals for Residential dwellings
 - Introduce and/or improve ventilations system design (CFM is not enough)
 - Provide more continuous operation at appropriate ventilation rates
 - Give credit for effective design
- Emphasis on balanced systems
 - Provide minimum impact on house pressures
 - Provide opportunity to filter outside air (especially for PM2.5)
 - Opportunity for Heat Recovery
- Important for High Efficiency Buildings
 - Mandated by the Legislature
 - Very tight buildings are essential to this goal,
 - Ventilation system will be needed that make this possible

Proposed revisions to the WA-IMC

- System design definitions
 - Balanced
 - Distributed
- Minimum ventilation CFM requirements (using IRC existing targets)
- Requirements for Multi-family buildings beyond the IRC and the VIAQ
- Improve filtration opportunities for outside air supply
- Improve control and fan efficiency.

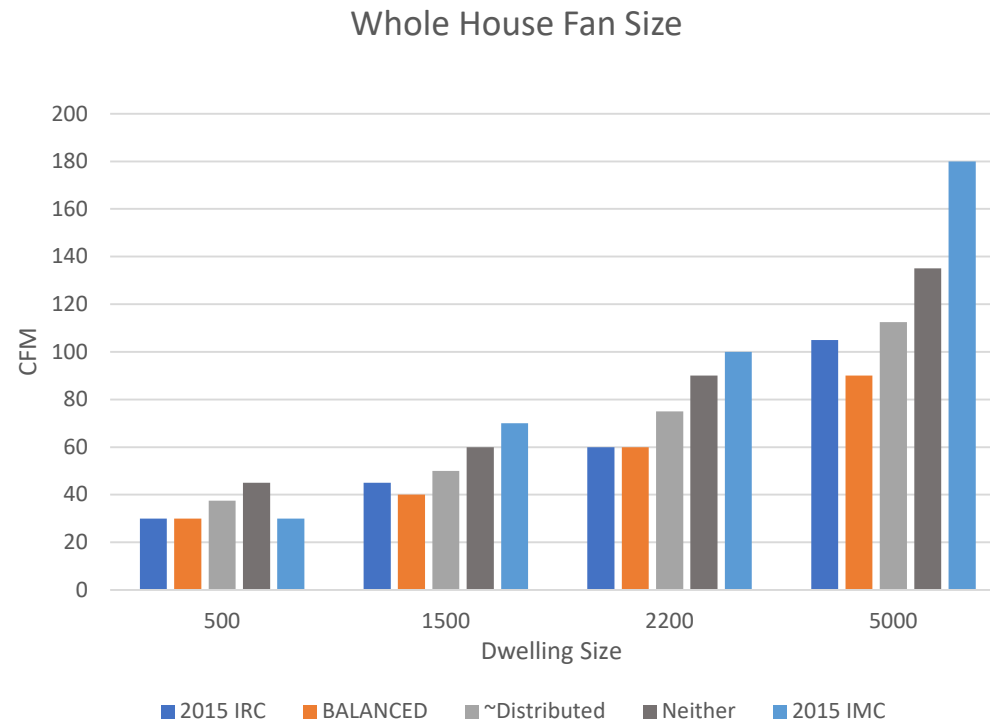
System Requirements

- Standard ventilation fan flow requirement from the current IRC.
 - $Q_{fan} = 0.01 * A_{floor} + 7.5(1+BR)$
 - Based on the use of a balanced distributed system
 - Based on continuous operation of ventilation system
- System design adjustments
 - Increased requirements for un-distributed and/or unbalanced systems
 - Based on Research from ASHRAE, NEEA, BA, 2009-2017

<u>System Type</u>	<u>Distributed</u>	<u>Not distributed</u>
<u>Balanced</u>	<u>1.0</u>	<u>1.25</u>
<u>Not balanced</u>	<u>1.25</u>	<u>1.5</u>

Air Flow Requirements

- Reduces air flow target by a third for fully credited system design
- Increases requirement to current levels with no system design in most dwellings



Design and Control

- Multi-Family Dwellings required to have balanced systems
 - Per code change passed for the commercial energy code (2018)
 - Control at ventilation requirement requires continuous operation and no occupant control.
 - System could be designed to cover multiple units
- Single family attached (townhouses) have no system design restrictions
 - Continuous operation without occupant intervention required
- Single family design and control requirements simplified but unchanged

Other requirements

- Minimum fan efficiency of .65 Watts per CFM.
- Restrictive measures for “furnace integrated” systems:
 - Variable speed air handler fan meeting ventilation fan efficiency requirements
 - Intake meets supply port requirements of the IMC
 - Is controlled by a motorized damper
 - Flow during ventilation operation is measured and reported
- Filtration required for supply fans in all cases (including furnace integrated systems)
 - MERV 13 (could be reduced to MERV 8 for consistency with national standards)

Conclusions

- Residential ventilation has been consistently ineffective.
 - Occupant intervention or misunderstanding
 - Noise, drafts, excessive parasitic energy requirements
- Requirements needed to meet RCW1927a will demand much tighter buildings.
 - Ventilation systems are need to meet these requirements
 - In high efficiency houses ventilation become the primary design for the entire HVAC system
- This proposal is designed to reduce the confusion and make an enforceable standard.
 - A crucial step toward effective residential ventilation