From: Eric Vander Mey <ericv@rushingco.com>
Sent: Thursday, September 26, 2019 11:44 PM
To: DES SBCC <sbcc@des.wa.gov>
Subject: Public Comment - 2018 IRC -

This is public comment for the IRC.
None of the final action of the Mechanical TAG for the residential ventilation sections of the code as outline in the attached document entitled “ga-IMC32_Murray_403_8_IRC Final.pdf” were incorporated into the CR-102.

Per Mechanical TAG action this proposal completely revised section M1505.4 to be consistent with 2018 WSMC changes.

Section 1507 in the CR-102 should be removed as this section is replaced by 1505.4 as 2018 IRC moved ventilation from 1507 to 1505.

Thanks,

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STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

May 2018

Log No. _____

1. State Building Code to be Amended:

- ☐ International Building Code
- ☐ ICC ANSI A117.1 Accessibility Code
- ☐ International Existing tBuilding Code
- ☒ International Residential Code
- ☐ International Fire Code
- ☐ Uniform Plumbing Code
- ☐ International Mechanical Code
- ☐ International Fuel Gas Code
- ☐ NFPA 54 National Fuel Gas Code
- ☐ NFPA 58 Liquefied Petroleum Gas Code
- ☐ Wildland Urban Interface Code

For the Washington State Energy Code, please see specialized energy code forms

Section(s): IRC M1505
(e.g.: Section: R403.2)

Title: Ventilation systems for residential occupnacies
(e.g: Footings for wood foundations)

2. Proponent Name (Specific local government, organization or individual):

Proponent: Chuck Murray, Department of Commerce
Title:
Phone: 360-725-3113
Email: chuck.murray@commerce.wa.gov

3. Designated Contact Person:

Name: David Baylon
Title: Consultant
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4. **Proposed Code Amendment**. Reproduce the section to be amended by underlining all added language, striking through all deleted language. Insert new sections in the appropriate place in the code in order to continue the established numbering system of the code. If more than one section is proposed for amendment or more than one page is needed for reproducing the affected section of the code additional pages may be attached. (Examples on the SBCC website)

Code(s) __WA-IRC_____ **Section(s)** _ M1505_____

Additions to Chapter 2, Section 202 General Definitions

WHOLE HOUSE VENTILATION SYSTEM. A mechanical ventilation system, including fans, controls, and ducts, which replaces, by direct ~~or indirect~~ means, air from the habitable rooms with outdoor air.

BALANCED WHOLE HOUSE VENTILATION. Balanced whole house ventilation is defined as any combination of concurrently operating residential unit mechanical exhaust and mechanical supply whereby the total mechanical exhaust airflow rate is within 10% or 5 cfm, whichever is greater, of the total mechanical supply airflow rate. Intermittent dryer exhaust, intermittent range hood exhaust, and intermittent toilet room exhaust airflow rates above the residential dwelling or sleeping unit minimum ventilation rate are exempt from the balanced airflow calculation.

DISTRIBUTED WHOLE HOUSE VENTILATION. A whole house ventilation system shall be considered distributed when it supplies outdoor air directly (not transfer air) to each dwelling or sleeping unit habitable space (living room, den, office, interior adjoining spaces or bedroom), and exhausts air from all kitchens and bathrooms directly outside.

REMOVE EXISTING WASHINGTON STATE AMENDMENTS FOR M1507.1 AND AMEND 2018 IRC SECTION 1505

~~M1507.1 General. Local exhaust and whole-house mechanical ventilation systems and equipment shall be designed in accordance with this section.~~
~~M1507.2 Recirculation of air. Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or to another dwelling unit and shall be exhausted directly to the outdoors. Exhaust air from bathrooms and toilet rooms shall not discharge into an attic, crawl space or other areas of the building.~~
~~M1507.3 Whole-house mechanical ventilation system.~~
~~Whole-house mechanical ventilation systems shall be designed in accordance with Sections M1507.3.1 through M1507.3.3.~~

SECTION M1505
MECHANICAL VENTILATION
M1505.1 General. Where local exhaust or whole house mechanical ventilation is provided, the equipment shall be designed in accordance with this section.

M1505.2 Recirculation of air. Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or circulated to another dwelling unit and shall be exhausted directly to the outdoors. Exhaust air from bathrooms, toilet rooms and kitchens shall not discharge into an attic, crawl space or other areas inside the building. This section shall not prohibit the installation of ductless range hoods in accordance

with the exception to Section M1503.3.

M1505.3 Exhaust equipment. Exhaust equipment serving single dwelling units shall be listed and labeled as providing the minimum required airflow in accordance with ANSI/ AMCA 210-ANSI/ASHRAE 51.

M1505.4 Whole house mechanical ventilation system. Whole-house mechanical ventilation systems shall be designed in accordance with Sections M1505.4.1 through M1505.4.4.

M1505.4.1 System design. ~~The whole-house ventilation system shall consist of one or more supply or exhaust fans, or a combination of such, and associated ducts and controls. Local exhaust or supply fans are permitted to serve as such a system. Outdoor air ducts connected to the return side of an air handler shall be considered as providing supply ventilation~~.

The whole house ventilation system shall consist of one or more supply fans, one or more exhaust fans, or an ERV / HRV with integral fans, associated ducts and controls. Whole house mechanical ventilation system with supply and exhaust fans per M1505.4.1.2, M1505.4.1.3, M1505.4.1.4, M1505.4.1.5. Local exhaust fans are permitted to serve as part of the whole house ventilation system when provided with the proper controls per Section M1505.4.2. The systems shall be designed and installed to supply and exhaust the minimum outdoor airflow rates per Section M1505.4.3 as corrected by the balanced and/or distributed whole house ventilation system coefficients per Section M1504.5.3.1 where applicable. The whole house ventilation system shall operate continuously at the minimum ventilation rate determined per Section M1505.4.2 unless configured with intermittent off controls per M1505.4.3.2. The whole house supply fan shall provide ducted outdoor ventilation air to each habitable space within the dwelling unit.

M1505.4.1.1 Whole House System Component Requirements. Whole house ventilation supply and exhaust fans specified in this section shall have a minimum efficacy as prescribed in the Washington State Energy Code. Design and installation of the system or equipment shall be carried out in accordance with manufacturers' installation instructions. Whole house ventilation fans shall be rated for sound at no less than the minimum airflow rate required by Sections 403.8.2 and 403.8.3. These sound rating shall be at a minimum of 0.1 in. w.c. (25 Pa) static pressure in accordance with HVI procedures specified in Sections 403.8.6.1 and 403.8.6.2.

Exception: HVAC air handlers, ERV/HRV units, and remote mounted fans need not meet the sound requirements. To be considered for this exception, a remote mounted fan must be mounted outside the habitable spaces, bathrooms, toilets, and hallways, and there must be at least 4 ft (1 m) of ductwork between the fan and the intake grille.

The whole house supply fan shall provide ducted outdoor ventilation air to each habitable space within the residential unit.

Exception: Interior joining spaces provided with a 30 cfm whole house transfer fan or a permanent opening with an area of not less than 8 percent of the floor area of the interior adjoining space but not less than 25 square feet do not require ducted outdoor ventilation air to be supplied directly to the space. Whole house transfer fans shall meet the sone rating of Section M1505.4.1.1 and shall have whole house ventilation controls that comply with Section M1505.4.2.

M1505.4.1.2 Exhaust Fans: Exhaust fans required shall be ducted directly to the outside. Exhaust air outlets shall be designed to limit the pressure difference to the outside to limiting the outlet free area maximum velocity to 500 ft per min and equipped with backdraft dampers or motorized dampers in accordance with Washington State Energy Code. Exhaust fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute (HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure). Exhaust fans required in this section may be used to provide local ventilation. Exhaust fans that are designed for intermittent exhaust airflow rates higher than the continuous exhaust airflow rates in Table 403.8.3 shall be provided with occupancy sensors or humidity sensors to automatically override the fan to the high speed airflow rate. The exhaust fans shall be tested and the testing results

shall be submitted and posted in accordance with Section 403.8.6.7.

M1505.4.1.3 Supply Fans. Supply fans used in meeting the requirements of this section shall supply outdoor air from intake openings in accordance with IMC sections 401.4 and 401.5. Intake air openings shall be designed to limit the pressure difference to the outside to limiting the intlet free area maximum velocity to 500 ft per min and when designed for intermittent off operation shall be equipped with motorized dampers in accordance with Washington State Energy Code. Supply fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute (HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure). Where outdoor air is provided to each habitable dwelling unit or sleeping unit by supply fan systems the outdoor air shall be filtered. The filter shall be accessible for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 8.

M1505.4.1.4 Balanced Whole house Ventilation System. A balanced whole house ventilation system shall include both supply and exhaust fans. The supply and exhaust fans shall have airflow that is within 10% of each other. The tested and balanced total mechanical exhaust airflow rate is within 10% or 5 cfm, whichever is greater, of the total mechanical supply airflow rate. The flow rate test results shall be submitted and posted in accordance with section 403.8.6.6. The exhaust fan shall meet the requirements of section 403.8.6.2. The supply fan shall meet the requirements of Section 403.8.6.3. For dwelling units required by the Washington State Energy Code to have a balanced system, the system is required to have *balanced whole house ventilation* but is not required to have *distributed whole house ventilation* where the not distributed system coefficient from Table 403.8.2 is utilized to correct the whole house mechanical ventilation rate. Intermittent dryer exhaust, intermittent range hood exhaust, and intermittent toilet room exhaust airflow rates above the residential dwelling or sleeping unit minimum ventilation rate are exempt from the balanced airflow calculation.

M1505.4.1.5 Furnace Integrated Supply. Systems using space heating and/or cooling air handler fans for outdoor air supply distribution are not permitted.

Exception: Air handler fans shall have multi-speed or variable speed supply airflow control capability with a low speed operation not greater than 25% of the rated supply airflow capacity during ventilation only operation. Outdoor air intake openings must meet the provisions of sections IMC Sections 401.4 and 401.5 and must include a motorized damper that is activated by the whole house ventilation system controller. Intake air openings shall be designed to limit the pressure difference to the outside to limiting the inlet free area maximum velocity to 500 ft per min. The motorized damper must be controlled to maintain the outdoor airflow intake airflow within 10% of the whole house mechanical exhaust airflow rate. The supply air hander shall provide supply air to each habitable space in the residential unit. The flow rate for the outdoor air intake must be tested and verified at the minimum ventilation fan speed and the maximum heating or cooling fan speed. The results of the test shall be submitted and posted in accordance with section 403.8.6.6.

M1505.4.1.6 Testing. Whole-house mechanical ventilation systems shall be tested, balanced and verified to provide a flow rate not less than the minimum required by Section 403.8.2 and 403.8.3. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals, outlet terminals or grilles or in the connected ventilation ducts. Where required by the building official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the building official and be posted in the dwelling unit per M1505.4.1.7.

M1505.4.1.7 Certificate. A permanent certificate shall be completed by the mechanical contractor, test and balance contractor or other approved party and posted on a wall in the space where the furnace is located, a utility room, or an approved location inside the building. When located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label, or other required labels. The certificate shall list the flow rate determined from the delivered airflow of the whole house mechanical ventilation system as

M1505.4.2 System controls. The whole-house mechanical ventilation system shall be provided with controls that comply with the following: ~~enable manual override~~.

1) The whole house ventilation system shall be controlled with manual switches, timers or other means that provide for automatic operation of the ventilation system that are readily accessible by the occupant;
2) Whole house mechanical ventilation system shall be provided with controls that enable manual override off of the system by the occupant during periods of poor outdoor air quality. Controls shall include permanent text or a symbol indicating their function. Recommended control permanent labeling to include text similar to the following "Leave on unless outdoor air quality is very poor". Manual controls shall be readily accessible by the occupant.;
3) Whole house ventilation systems shall be configured to operate continuously except where intermittent off controls are provided per Section in 403.8.6.5 and allowed by 403.8.4.2.

M1505.4.3 Mechanical ventilation rate. The whole house mechanical ventilation system shall provide outdoor air at a continuous rate as determined in accordance with Table M1505.4.3(1) or Equation 15-1.

Ventilation rate in cubic feet per minute = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)] but not less 30 CFM for each dwelling unit

Equation 15-1

TABLE M1504.4.3(1)
WHOLE HOUSE MECHANICAL VENTILATION AIRFLOW RATE

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0-1	2	3	4	5 or more
	Airflow in CFM[a]				
< 500	30	30	35	45	50
501 – 1,000	30	35	40	50	55
1,001-1,500	30	40	45	55	60
1,501 – 2,000	35	45	50	60	65
2,001 – 2,500	40	50	55	65	70
2,501 – 3,000	45	55	60	70	75
3,001 – 3,500	50	60	65	75	80
3,501 – 4,000	55	65	70	80	85
4,001 – 4,500	60	70	75	85	90
4,501 – 5,000	65	75	80	90	95

a. Minimum airflow (Q_r) is set at not less than 30 CFM for each dwelling unit.

M1505.4.3.1 Ventilation quality adjustment. The minimum whole house ventilation rate from Section 1505.4.3 shall be adjusted by the system coefficient in Table M1505.4.3(2) based on the system type not meeting the definition of a *Balanced Whole House Ventilation* System and/or not meeting the definition of a *Distributed Whole House Ventilation* System.

Qv = Qr * Csystem **(Equation 15-2)**

where:

Qv = quality-adjusted ventilation airflow rate in cubic feet per minute (cfm)

Qr = ventilation airflow rate, cubic feet per minute (cfm) from 15-1 or Table M1505.4.3(1)

Csystem = system coefficient from Table 1505.4.3(2)

TABLE M1505.4.3(2)
SYSTEM COEFFICIENT (C_{system})

System Type	Distributed	Not distributed
Balanced	1.0	1.25
Not balanced	1.25	1.5

~~**Exception:** The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation~~

~~rate prescribed in Table M1505.4.3(1) is multiplied by the factor determined in accordance with Table M1505.4.3(2).~~

M1505.4.3.2 Intermittent off operation. Whole house mechanical ventilation systems shall be provided with advanced controls that are configured to operate the system with intermittent off operation shall operate for a least two hours in each four segment. The whole house ventilation airflow rate determined in accordance with M1505.4.3 as corrected by M1505.4.3.1 is multiplied by the factor determined in accordance with Table M1505.4.3(3).

TABLE M1505.4.3(3)
INTERMITTENT OFF WHOLE HOUSE MECHANICAL VENTILATION RATE FACTORS[a,b]

Run-Time % in Each 4-hour Segment	50%	66%	75%	100%
Factor[a]	2	1.5	1.3	1.0

a. For ventilation system run-time values between those given, the factors are permitted to be determined by interpolation.
b. Extrapolation beyond the table is prohibited.

M1505.4.4 Local exhaust rates. Local exhaust systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table M1505.4.4(1).

M1505.4.4.1 Local exhaust. Bathrooms, toilet rooms, and kitchens shall include a local exhaust system. Such local exhaust systems shall have the capacity to exhaust the minimum airflow rate in accordance with Table m1505.4.4(1). Fans required by this section shall be provided with controls that enable manual override or automatic occupancy sensor, humidity sensor or pollutant sensor controls. An "on/off" switch shall meet this requirement for manual controls. Manual fan controls shall be readily accessible in the room served by the fan.

M1505.4.4.2 Whole house exhaust controls. If the local exhaust fan is included in whole house ventilation system, in accordance with section 1505.4.1, then the exhaust fan shall be controlled to operate as specified in section M1505.4.2.

TABLE M1505.4.4(1)
MINIMUM LOCAL EXHAUST RATES

AREA TO BE EXHAUSTED	EXHAUST RATES	
	Intermittent	Continuous
Kitchens	100cfm	30 cfm
Bathrooms-Toilet Rooms	50 cfm	20 cfm

403.8.7.2 Local exhaust fans. Exhaust fan shall meet the following criteria.

1. Exhaust fans shall be tested and rated in accordance with the airflow and sound rating procedures of the Home Ventilating Institute (HVI 915, HVI Loudness Testing and Rating Procedure, HVI 916, HVI Airflow Test Procedure, and HVI 920, HVI Product Performance Certification Procedure).
   Exception: Where a range hood or down draft exhaust fan is used for local exhaust for a kitchen, the device is not required to be rated per these standards.
2. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table M1505.4.4(1). The airflows required refer to the delivered airflow of the system as installed and tested using a flow hood, flow grid, or other airflow measurement device. Local exhaust systems shall be tested, balanced and verified to provide a flow rate not less than the minimum required by this section.
3. Design and installation of the system or equipment shall be carried out in accordance with manufacturers' installation instructions.
4. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table M1505.4.4(1).

Exceptions:

1. An exhaust airflow rating at a pressure of 0.25 in.w.g. may be used, provided the duct sizing meets the prescriptive requirements of Table M1505.4.4(2).
2. Where a range hood or down draft exhaust fan is used to satisfy the local ventilation requirements for kitchens, the range hood or down draft exhaust shall not be less than 100 cfm at 0.10 in. w.g.

TABLE M1505.4.4(2).
PRESCRIPTIVE EXHAUST DUCT SIZING

Fan Tested cfm at 0.25 inches w.g.	Minimum Flex Diameter	Maximum Length in Feet	Minimum Smooth Diameter	Maximum Length in Feet	Maximum Elbows[a]
50	4 inches	25	4 inches	70	3
50	5 inches	90	5 inches	100	3
50	6 inches	No Limit	6 inches	No Limit	3
80	4 inches[b]	NA	4 inches	20	3
80	5 inches	15	5 inches	100	3
80	6 inches	90	6 inches	No Limit	3
100	5 inches[b]	NA	5 inches	50	3
100	6 inches	45	6 inches	No Limit	3
125	6 inches	15	6 inches	No Limit	3
125	7 inches	70	7 inches	No Limit	3

a. For each additional elbow, subtract 10 feet from length.
b. Flex ducts of this diameter are not permitted with fans of this size

5. Briefly explain your proposed amendment, including the purpose, benefits and problems addressed. Specifically note any impacts or benefits to business, and specify construction types, industries and services that would be affected. Finally, please note any potential impact on enforcement such as special reporting requirements or additional inspections required.

The code proposal is aimed at the residential occupancies that are covered in the IMC. The Washington State IMC has a unique feature of a specific section that specifies requirements for the ventilation system in residences separate from the table 403.3.1 requirements. This section has been constructed over time and includes the old VIAQ code that was part of the Washington code package since 1991. In 2015 the requirements were expanded using language from the IRC and language from the ASHRAE Standard 62.2-2016. As these disparate codes were merged, inconsistencies IMC resulted in contradictory requirements with the IRC and with the previous versions of the VIAQ. Specifically, the central table (from Standard 62.2) has resulted in a increase in the ventilation requirements without the attending offsets in that standard. The IRC remains at the previous level that was drawn from ASHRAE 62.2-2010. This combination of standards has led to a confusing set of requirements that demand high air flows without any guidance on the types of systems and the types of designs.

The proposed amendment removes the bulk of section 403.8 and replaces with a simplified (and enforceable) standard that is based on two tables. The first table (403.8.1) expands the IRC table and provides a more granular set of standards. In additions the table set a minimum ventilation rate of 30 CFM regardless of dwelling size. The second table provides design guidance (table 403.8.2) that is meant to increase ventilation flow when the system installed is providing only point source ventilation and relying on convection or other incidental mixing to distribute the ventilation air. These two tables together result in a ventilation flow similar to the existing standard if an exhaust only system is installed.

The second major change is a requirement for balanced flow ventilation in multi-family dwelling units. The impetus for this change is the observation from the Department of Health that cross contamination (odors, smoke, cooking fumes) between units are the leading cause of complaints to the DOH from multifamily units of all vintages. This proposal provides a continuous operation coupled with balanced flow to minimize pressure differential between units and thus reduce or eliminate the cross flow between adjacent units.

For single family attached units there is no restriction on ventilation system design but continuous operation is required. For single family dwellings there are no restriction on system design or control beyond the tables that set the ventilation CFM.

The local exhaust requirements in the current code are largely unchanged except that minimal continuous flow has been removed from the current language.

The proposed code amendment is substantially simplified from the current language and allows the building officials to check two significant table to establish compliance. The controls which are now unclear and allow many options that would otherwise confuse or degrade the ventilation provided is now limited at least for multifamily construction which would allow a very much simplified and enforceable standard for these systems.

6. **Specify what criteria this proposal meets.** You may select more than one.
   - X The amendment is needed to address a critical life/safety need.
   - ☐ The amendment clarifies the intent or application of the code.
   - ☐ The amendment is needed to address a specific state policy or statute.
   - ☐ The amendment is needed for consistency with state or federal regulations.
   - X The amendment is needed to address a unique character of the state.
   - ☐ The amendment corrects errors and omissions.

7. **Is there an economic impact:** X Yes ☐ No

   Explain:

   If there is an economic impact, use the tool below to estimate the costs and savings of the proposal on construction practices, users and/or the public, the enforcement community, and operation and maintenance. If preferred, you may submit an alternate cost benefit analysis.

   Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost **Analysis tool** and **Instructions;** use these **Inputs**. **Webinars on the tool can be found Here and Here**)

   $1.20/square foot ($950/ dwelling unit- Multi-family only)
   [This change does not imply a system change for other residential units.]

   Assumptions:

   - 10 units @ 800 sf/unit. Double loaded corridor
   - 50 CFM/unit ventilation requirement
   - Two penetration in each unit (supply and return) with 4" round metal duct (fire damper not required) [26 sq.in. per unit, 180 sq.ft. unit common wall to the corridor]
   - Remove one bath fan and duct penetration in each unit, $200/unit credit.

   Cost calculations:

○ 500 CFM Lossnay ERV or equivalent	$3000 (bid price at $6/CFM)
○ Exterior penetrations, ducts, terminations	1500 (bids estimate)
○ Interior duct at Corridor 2 @100 ft.	2000

- Unit transitions, ducts, ducts grills @ $500/unit 5000
- Unit credit (one penetration, bath fan and duct) @200/unit (2000)

- Total system cost (balanced system with ERV core) $9500

- Cost per unit (10 units) $950
- Cost per sq.ft. (8000 sq.ft.) $1.20/sf (units only)

Benefit calculations:

- Energy savings: .65 Sensible heat recovery (heating only) 940kWh/unit
- Annualized system benefit @ 0.09/kWh $85
- Annualized system cost (4%, 15 year life) $55
- Benefit/cost 1.5
- Payback (full system) 11.2 years

IAQ benefit not quantified-- but significant health benefits and reduced occupant complaints are anticipated.

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

The change proposal will require less interaction with the proposer. The Building official can establish compliance with the review of two prescriptive tables.

Please send your completed proposal to: sbcc@des.wa.gov

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.