



STATE OF WASHINGTON
STATE BUILDING CODE COUNCIL

063
Proponent Revision
6/01/22

Log No. 21-GP2-063

1. State Building Code to be Amended:

- | | |
|---|--|
| <input type="checkbox"/> International Building Code | <input checked="" type="checkbox"/> International Mechanical Code |
| <input type="checkbox"/> ICC ANSI A117.1 Accessibility Code | <input type="checkbox"/> International Fuel Gas Code |
| <input type="checkbox"/> International Existing Building Code | <input type="checkbox"/> NFPA 54 National Fuel Gas Code |
| <input type="checkbox"/> International Residential Code | <input type="checkbox"/> NFPA 58 Liquefied Petroleum Gas Code |
| <input type="checkbox"/> International Fire Code | <input type="checkbox"/> Wildland Urban Interface Code |
| <input type="checkbox"/> Uniform Plumbing Code | For the Washington State Energy Code, please see specialized energy code forms |

Section(s):

202, 403.3.1.1, 403.4.6.1, 403.4.6.3, 403.4.7, 403.4.7.2, 403.4.7.3, 403.4.7.3.1, 501.4, 505.3, Chapter 44

Title:

Increased Range Hood Ventilation Requirements

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

Proponent: Mark Vossler

Title: President, Washington State Physicians for Social Responsibility

Date: 4/8/22

3. Designated Contact Person:

Name: Mark Vossler

Title: President, Washington State Physicians for Social Responsibility

Address: 2524 16th Ave S. #300, Seattle, WA 98144

Office Phone: (425) 894-8794

Cell: ()

E-Mail address: mark@wpsr.or

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.

Clearly state if the proposal modifies an existing amendment or if a new amendment is needed. If the proposal modifies an **existing amendment**, show the modifications to the existing amendment by underlining all added language and striking through all deleted language. If a new amendment is needed, show the modifications to the **model code** by underlining all added language and striking through all deleted language.

Code(s) Mechanical Section(s) 202, 403.3.1.1, 403.4.6.1, 403.4.6.3, 403.4.7, 403.4.7.2, 403.4.7.3, 403.4.7.3.1, 501.4, 505.3, Chapter 44

Enforceable code language must be used.
Amend section to read as follows:

SECTION 202 GENERAL DEFINITIONS

Enclosed kitchen: A kitchen whose permanent openings to interior adjacent spaces do not exceed a total of 60 ft² (6 m²).

Table 403.3.1.1 Minimum Ventilation Rates

...

k. Kitchenettes require exhaust when they contain a domestic cooking appliance range or oven that is installed in accordance with Table 507.~~12.24~~. Kitchenettes that only contain a microwave cooking appliance are not required to have exhaust. A kitchenette may not contain commercial cooking appliances that require Type 1 or Type II exhaust as these occupancies are required to be exhausted to the kitchen category in Table 403.3.1.1.

403.4.6.1 Exhaust fans. Exhaust fans required shall be ducted directly to the outside in accordance with Section 501.3. Exhaust air outlets shall be designed to limit the pressure difference to the outside to limiting the outlet free area maximum velocity to 500 feet per minute 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 HVI 915, HVI 916, and HVI 920. Exhaust fans required in this section may be used to provide local ventilation. Exhaust fans servicing spaces other than kitchens that are designed for intermittent exhaust ~~airflow rates higher than the continuous exhaust airflow~~ rates in Table 403.4.~~73~~ shall be provided with occupancy sensors, ~~or~~ humidity sensors, timer controls, or pollutant sensor controls 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 403.4.6.7.

Exception: Central exhaust fans serving multiple residential units do not need to comply with the HVI testing requirements.

403.4.6.3 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 percent of each other. The tested and balanced total mechanical exhaust airflow rate is within 10 percent 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 403.4.6.6. The exhaust fan shall meet the requirements of Section 403.4.6.2. The supply fan shall meet the requirements of Section 403.4.6.3. For R-2 dwelling and sleeping units, 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 403.4.2 is utilized to correct the whole house mechanical ventilation rate. The system shall be designed and balanced to meet the pressure equalization requirements of Section 501.4. ~~Intermittent dryer exhaust, intermittent range hood exhaust, and intermittent toilet room exhaust airflow rates above the residential dwelling or sleeping unit minimum ventilation rate~~ Local exhaust systems that are not a component of the whole-house mechanical ventilation system are exempt from the balanced airflow calculation.

403.4.7 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 403.4.7 and Table 403.3.1.1, including notes. Fans required by this section shall be provided with controls that enable manual override or automatic occupancy sensor, humidity sensor, timer controls, or pollutant sensor controls. An "on/off" switch shall meet this requirement for manual controls. Manual fan controls shall be provided with ready access in the room served by the fan.

**TABLE 403.4.7
MINIMUM EXHAUST RATES**

Area to be exhausted	Exhaust Rate	
	Intermittent	Continuous
<u>Open Kitchens</u>	<u>In accordance with Section 403.4.7.3</u>	<u>Not permitted</u>
<u>Enclosed Kitchens</u>	<u>400 cfm</u> <u>In accordance with Section 403.4.7.3</u>	<u>5 ACH based on kitchen volume</u> <u>30 cfm</u>
Bathrooms - Toilet rooms	50 cfm	20 cfm

403.4.7.2 Local exhaust fans. Exhaust fans shall meet the following criteria.

1. Exhaust fans shall be tested and rated in accordance with HVI 915, HVI 916, and HVI 920 or equivalent.

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 HVI 915 and 920.~~

2. Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table 403.4.7.4. 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. Intermittent local exhaust system serving kitchens shall be rated for sound at a maximum of 3 sones at one or more airflow settings not less than 100 cfm at a static pressure not less than that determined at working speed as specified in HVI 916 Section 7.2.
5. Continuous local exhaust system serving kitchens shall be rated for sound at a maximum of 1 sone at one or more airflow settings not less than 100 cfm at a static pressure not less than that determined at working speed as specified in HVI 916 Section 7.2.
4. ~~Fan airflow rating and duct system shall be designed and installed to deliver at least the exhaust airflow required by Table 403.4.3.~~

Exceptions:

1. The installed airflow is not required to be field-verified where A 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 403.4.7.2.
2. Remote mounted fans need not meet sound requirements. To be considered for this exception, a remote mounted fan shall be mounted outside the kitchen, and there shall be at least 4 ft (1m) of ductwork between the fan and the intake grille.
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 not be less than 100 cfm at 0.10 in. w.g.~~

403.4.7.3 Local intermittent kitchen exhaust system. Kitchen range hoods for domestic cooking appliances shall meet or exceed either the minimum airflow or the minimum capture efficiency in accordance with Table 403.4.7.3. Capture efficiency ratings shall be determined in accordance with ASTM E3087.

Exception: Other intermittent kitchen exhaust fans, including downdraft, shall meet or exceed 300 cfm airflow.

TABLE 403.4.7.3

KITCHEN RANGE HOOD AIRFLOW RATES (CFM) AND ASTM E3087 CAPTURE EFFICIENCY (CE) RATINGS ACCORDING TO KITCHEN RANGE FUEL TYPE

<u>Hood Over Electric Range</u>	<u>Hood Over Combustion Range</u>
<u>65% CE or 160 cfm</u>	<u>80% CE or 250 cfm</u>

403.4.7.3.1 Field verification and diagnostic testing for local intermittent kitchen exhaust

system. The local exhaust system for kitchens shall be installed to comply with local mechanical exhaust requirements specified in 403.4.7.3 and shall be field verified in accordance with the procedures below to confirm the model is rated by HVI or AHAM to comply with the following requirements:

1. Local intermittent exhaust system for kitchens shall be tested and verified to provide a minimum airflow rate or capture efficiency required by Section 403.4.7.3. Testing shall include verification of the maximum sound rating as specified in Section 403.4.7.2. Testing for the intermittent kitchen exhaust systems shall occur with the whole house ventilation system operating and with all dwelling unit or sleeping unit entry doors closed. Testing for exhaust systems that require mechanical makeup air in accordance with Section 505.4 shall include verifying that the mechanical makeup air opening is open. Testing for exhaust systems that require mechanical makeup air in accordance with Section 505.4 shall include verifying that the mechanical makeup air system is controlled to automatically start. Testing for exhaust systems that do not require mechanical makeup air in accordance with 505.4 and that are exempt from pressurize equalization per Section 501.4 shall be tested with operable openings manually opened unless design exhaust airflow can be achieved with all operable openings closed. 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.

Exception: The installed airflow is not required to be field-verified where an exhaust airflow rating at a pressure of 0.25 in. w.g. is used, provided the duct sizing meets the prescriptive requirements of Table M1505.4.4(2).

2. The verification shall utilize certified rating data from the HVI Publication 911: Certified Home Ventilating Products Directory or another directory of certified product performance ratings approved by code official for determining compliance. The verification procedure shall consist of visual inspection of the local intermittent kitchen exhaust system to verify and record the following information:
 - 2.1 The manufacturer name and model number.
 - 2.2 The model is listed in the HVI Directory.
 - 2.3 The rated airflow value listed in the HVI directory
 - 2.4 The sound rating value listed in the HVI directory
 - 2.5 If the value for the rated airflow given in the directory is greater than or equal to the airflow requirements specified in Section 403.4.7.3 and if the value for the sone rating given in the directory is less than or equal to the sone rating requirements specified in 403.4.7.2, then the local intermittent kitchen exhaust system complies, otherwise the local intermittent kitchen exhaust system does not comply.

501.4 Pressure equalization. Mechanical exhaust systems shall be sized to remove the quantity of air required by this chapter to be exhausted. The system shall operate when air is required to be exhausted. Where mechanical exhaust is required in a room or space, such space shall be

maintained with a neutral or negative pressure. If a greater quantity of air is supplied by a mechanical ventilating supply system than is removed by a mechanical exhaust for a room, adequate means shall be provided for the natural or mechanical exhaust of the excess air supplied. If only a mechanical exhaust system is installed for a room or if a greater quantity of air is removed by a mechanical exhaust system than is supplied by a mechanical ventilating supply system for a room, adequate makeup air consisting of supply air, transfer air or outdoor air shall be provided to satisfy the deficiency. The calculated building infiltration rate shall not be used to satisfy the requirements of this section.

Exception: Intermittent ~~domestic range kitchen~~ exhaust of 400 cfm or less, intermittent domestic dryer exhaust and intermittent local exhaust systems in R-3 occupancies and dwelling units in R-2 occupancies are excluded from the pressure equalization requirement unless required by Section 504 or Section 505.

505.3 Domestic systems. ~~Where domestic range hoods and domestic appliances equipped with downdraft exhaust are provided, such hoods and appliances~~ Ducting serving domestic cooking exhaust equipment shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls, shall be air tight, shall be equipped with a backdraft damper and shall be independent of all other exhaust systems. Domestic kitchen exhaust ducts may terminate with other domestic dryer exhaust and residential local exhaust ducts at a common location where each duct has an independent back-draft damper. Listed and labeled exhaust booster fans shall be permitted when installed in accordance with the manufacturer's installation instructions.

Exceptions:

1. In other than Group I-1 and I-2, where installed in accordance with the manufacturer's installation instructions and where ~~mechanical ventilation~~ continuous local exhaust is provided in an enclosed kitchen in accordance with Table 403.4.7 ~~is otherwise provided in accordance with Chapter 4,~~ listed and labeled ductless range hoods shall not be required to discharge to the outdoors. The local exhaust from the residential dwelling or sleeping unit kitchen area may be combined with other exhaust ductwork where the exhaust register/grille in the kitchen is a minimum of 6 feet from the domestic range cooktop. The exhaust register/grille shall be provided with a minimum MERV 3 filter or mesh filter (washable) for trapping grease.
2. Ducts for domestic kitchen cooking appliances equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:
 - 2.1. The duct shall be installed under a concrete slab poured on grade.
 - 2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.
 - 2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.
 - 2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.
 - 2.5. The PVC ducts shall be solvent cemented.

Add reference to Chapter 44, under ASTM:

E3087—18: Standard Test Method for Measuring Capture Efficiency of Domestic Range Hoods, 403.4.7.3.2, Table 403.4.7.3.2

Add reference to Chapter 44, under ASHRAE:

ASHRAE 62.2 - 2019: Ventilation and Acceptable Indoor Air Quality in Residential Buildings, 403.4.7.3.3

Add reference to Chapter 44, under HVI:

HVI Publication 911: Certified Home Ventilating Products Directory, 403.4.7.3.4

- 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.

Add differentiated ventilation requirements of hood ranges based on fuel type to reduce personal exposure and health impacts from ranges. These requirements are based on research done by Lawrence Berkeley National Laboratory where they found that dwellings are currently not adequately ventilating their stoves, which can increase the risk of asthma for children living in these dwellings.

- 6. Specify what criteria this proposal meets.** You may select more than one.
- 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.
 - The amendment is needed to address a unique character of the state.
 - The amendment corrects errors and omissions.

- 7. Is there an economic impact:** Yes No

If no, state reason:

If yes, provide economic impact, costs and benefits as noted below in items a – f.

- a. **Life Cycle Cost.** Use the OFM Life Cycle Cost [Analysis tool](#) to estimate the life cycle cost of the proposal using one or more typical examples. Reference these [Instructions](#); use these [Inputs](#). Webinars on the tool can be found [Here](#) and [Here](#)). If the tool is used, submit a copy of the excel file with your proposal submission. If preferred, you may submit an alternate life cycle cost analysis.

Operational cost difference should be negligible between a compliant range hood and a non-compliant range hood.¹

- b. **Construction Cost.** Provide your best estimate of the construction cost (or cost savings) of your code change proposal.

Minimum Airflow Requirement	Dwelling Unit Square Footage	Microwave-Range Hood Incremental Cost*	Microwave-Range Hood Incremental Cost/sq ft*	Under Cabinet Incremental Cost*	Under Cabinet Incremental Cost/sq ft*
250 cfm	1,000 ft ²	\$206	\$0.21/sq ft	\$415	\$0.42/sq ft

*Incremental compared to 180 cfm requirement, which 92% of products already meet²

If make up air is triggered, it will add roughly \$1,000 extra, or \$1-\$2 per sq ft, based on dwelling unit size.³

Where complying with the code requires installation of extra ductwork, the estimated cost is ~\$8/lf of 6" duct and ~\$77 for a termination. Assuming 10 ft of extra ductwork, this comes out to be \$157 extra, or \$0.1-\$0.2 per sq ft, based on dwelling unit size.⁴

Product availability:

¹ https://title24stakeholders.com/wp-content/uploads/2020/10/MF-IAO_Final-CASE-Report_Statewide-CASE-Team_Final.pdf,

page 115-117

² <https://efiling.energy.ca.gov/getdocument.aspx?tn=236201>, page 9 - 15

³ <https://drive.google.com/file/d/1HFKNTzrnw6kJXThmr86sjspijEpsZ08J/view?usp=sharing>

⁴ <https://drive.google.com/file/d/1uNrpoIF1Te1As0vOqzq7YjWZwkt3T-T2/view?usp=sharing>

Table 2. Count of Microwave Range Hoods Meeting Proposed Requirements

Rated CFM	Proportion of Compliant Products		Number of Brands with Compliant Products	
	Horizontal (n=66)	Vertical (n=66)	Horizontal (n=20)	Vertical (n=20)
>=110	100%	100%	20	20
>=130	100%	100%	20	20
>=160	100%	100%	20	20
>=180	92%	92%	20	20
>=250	48%	79%	16	19
>=280	17%	30%	6	7

Table 3. Count of Undercabinet Range Hoods Meeting Proposed Requirements

Rated CFM	Proportion of Compliant Products		Number of Brands with Compliant Products	
	Horizontal (n=30)	Vertical (n=43)	Horizontal (n=8)	Vertical (n=9)
>=110	100%	100%	8	9
>=130	100%	100%	8	9
>=160	100%	100%	8	9
>=180	100%	98%	8	9
>=250	77%	91%	8	9
>=280	63%	72%	5	9

Table 4. Count of Chimney Range Hoods Meeting Proposed Requirements

Rated CFM	Proportion of Compliant Products		Number of Brands with Compliant Products	
	Horizontal (n=3)	Vertical (n=64)	Horizontal (n=1)	Vertical (n=11)
>=110	100%	100%	1	11
>=130	100%	100%	1	11
>=160	100%	100%	1	11
>=180	100%	100%	1	11
>=250	100%	100%	1	11
>=280	100%	94%	1	11

- c. **Code Enforcement.** List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

This should have no impact on small businesses because it is targeted to Group R occupancies.

- d. **Small Business Impact.** Describe economic impacts to small businesses:

This should have no impact on small businesses because it is targeted to Group R occupancies.

e. **Housing Affordability.** Describe economic impacts on housing affordability:

This should have a small impact on housing affordability.

f. **Other.** Describe other qualitative cost and benefits to owners, to occupants, to the public, to the environment, and to other stakeholders that have not yet been discussed:

Exposure to poorly ventilated gas stove pollutants, such as nitrogen dioxide (NO₂), can increase the risk of asthma in household occupants, particularly children.⁵ The Environmental Protection Agency (EPA) states that homes with a gas stove have 50-400% higher average NO₂ levels than homes with an electric stove.⁶ The EPA found that even short-term exposure to NO₂ is linked to asthma and other chronic respiratory illnesses.⁷ In addition to respiratory effects NO₂ exposure has been linked to diabetes, cardiovascular disease, and birth outcomes.⁸ This risk of exposure to NO₂ can be lowered when high-performing externally vented range hoods are installed and used to decrease concentrations of NO₂ and other pollutants released from gas combustion.⁹ These findings could translate to a significant health and economic benefit from the regulation of gas stove combustion.

Per person costs of asthma in one California study were estimated to be \$3,288 annually.¹⁰ This estimate included costs of medications as well as office and emergency room visits. Assuming similar health costs for Washington, we could see a significant economic and medical benefit for the 9% of residents affected by asthma and other respiratory illnesses if exposure to gas stove pollution is reduced.¹¹

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.

⁵ Kathleen Belanger et al, "Household levels of nitrogen dioxide and pediatric asthma severity", *Epidemiology* 24(2), March 2013, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3686297/>.

⁶ *Integrated Science Assessment For Oxides Of Nitrogen – Health Criteria* (Final Report, July 2008), US Environmental Protection Agency, Washington, DC, EPA/600/R-08/071, 2008, p. 2–38, <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645>.

⁷ *Integrated Science Assessment (ISA) For Oxides of Nitrogen – Health Criteria* (Final Report, 2016). US Environmental Protection Agency, Washington, DC, EPA/600/R-15/068, 2016, p.1-31, <https://cfpub.epa.gov/ncea/isa/recordisplay>.

⁸ *Ibid*, p. 1-32, 1-33, 1-34, 1-35

⁹ Brett Singer et al., *Effective Kitchen Ventilation for Healthy Zero Net Energy Homes with Natural Gas*, 2021, Lawrence Berkeley National Laboratory, prepared for the California Energy Commission, <https://eta.lbl.gov/publications/effective-kitchen-ventilation-healthy>

¹⁰ American Thoracic Society. 2018. "Asthma costs the US economy more than \$80 billion per year." *ScienceDaily*. January 12. Accessed November 22, 2020. <https://www.sciencedaily.com/releases/2018/01/180112091212.htm> and <https://efiling.energy.ca.gov/getdocument.aspx?tn=236201>, page 15

¹¹ Most Recent Asthma State or Territory Data. March 24. Accessed November 22, 2020. https://www.cdc.gov/asthma/most_recent_data_states.htm