



STATE OF WASHINGTON
STATE BUILDING CODE COUNCIL

Log No. 24-GP1-136 ver 2
Proponent Revision 11/20/24

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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):
403.4.6, 403.4.7

Title:
Duct length verification

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

Proponent: Mike Moore, Stator LLC, representing Broan-NuTone
Title: Principal Consultant
Date: August 15, 2024; [Revised November 20, 2024](#)

3. Designated Contact Person:

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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.

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) Washington State Mechanical Code **Section(s)** 403.4.6, 403.4.7

Enforceable code language must be used.

Amend the existing amendment in Washington State's Mechanical Code to read as follows:

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 laboratory 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 serving spaces other than kitchens that are designed for intermittent exhaust rates in Table 403.4.7 shall be provided with occupancy sensors, humidity sensors, timer controls, or pollutant sensor controls to automatically override the fan to the high speed airflow rate. The exhaust fans shall be field tested and verified, and the testing results shall be submitted and posted in accordance with Section 403.4.6.7.

EXCEPTIONS:

1. Central exhaust fans serving multiple residential units do not need to comply with the HVI laboratory testing requirements.
2. Inlet free area maximum velocity may exceed 500 feet per minute when a factory-built combined exhaust/intake termination fitting is used.

403.4.6.2 Supply Fans

Supply fans used in meeting the requirements of this section shall supply outdoor air from intake openings in accordance with Sections 401.4 and 401.5. Intake air openings shall be designed to limit the pressure difference to the outside to limiting the inlet free area maximum velocity to 500 feet per minute and when designed for intermittent off operation shall be equipped with motorized dampers in accordance with the Washington State Energy Code. Supply fans shall be laboratory tested and rated in accordance with HVI 915, HVI 916, and HVI 920. 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 provided with access for regular maintenance and replacement. The filter shall have a Minimum Efficiency Rating Value (MERV) of at least 8.

EXCEPTION: Central supply fans serving multiple residential units do not need to comply with the HVI laboratory 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 field 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 airflow rate test results shall be submitted and posted in accordance with Section 403.4.6.7. The exhaust fan shall meet the requirements of Section 403.4.6.1. The supply fan shall meet the requirements of Section 403.4.6.2. For Group 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 403.4.3 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. Local exhaust systems that are not a component of the whole-house mechanical ventilation system are exempt from the balanced airflow calculation.

403.4.6.4 Furnace Integrated Supply

Systems using space condition heating and/or cooling air handler fans for outdoor air supply air distribution are not permitted.

EXCEPTION: Air handler fans shall be permitted that have multi-speed or variable speed supply airflow control capability with a low speed operation not greater than 25 percent of the rated supply air-flow capacity during ventilation only operation. Outdoor air intake openings must meet the provisions of 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 percent of the whole house mechanical exhaust airflow rate. The supply air handler shall provide supply air to each habitable space in the residential unit. The whole house ventilation system shall include exhaust fans in accordance with Section 403.4.6.1 to meet the pressure equalization requirements of Section 501.4. The [airflow](#) rate for the outdoor air intake must be [field](#) 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 403.4.6.7.

403.4.6.6 Testing

Whole house mechanical ventilation systems shall be tested, balanced and [field](#) verified to provide an [airflow](#) rate not less than the minimum required by Sections 403.4.2 and 403.4.3. 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 shall be posted in the residential unit in accordance with Section 403.4.6.7.

403.4.7 Local Exhaust

403.4.7.2 Local Exhaust Fans

Exhaust fans [and systems](#) shall meet the following criteria.

1. Exhaust fans shall be [laboratory](#) tested and rated in accordance with HVI 915, HVI 916, and HVI 920 or equivalent.
2. ~~Fan airflow rating and duct~~The system shall be designed and installed [in accordance with manufacturers' instructions](#) to deliver at least the exhaust airflow required by Table 403.4.7. The airflows required refer to the delivered airflow of the system as installed and [field verified in accordance with Section 403.4.7.2.1](#)~~tested using a flow hood, flow grid, or other airflow measurement device. Local exhaust systems shall be tested 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.~~
- 4.3. Intermittent local exhaust [system fans](#) 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.
- 5.4. Continuous local exhaust [system fans](#) 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.

EXCEPTIONS:

1. ~~The installed airflow is not required to be field verified where 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.~~
- 2.1. 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 feet (1 m) of ductwork between the fan and the intake grille.

403.4.7.2.1 Duct length.

[The length of local exhaust ducts shall comply with not less than one of the following.](#)

1. Duct length shall not be limited where the airflow rate of the installed ventilating equipment is field verified by the installer or approved third party to be not less than that required by Table 403.4.7. Field verification shall be performed using a flow hood, flow grid, or other airflow measuring device.
2. Duct length shall not exceed 25 feet, provided that the following conditions are met:
 - 2.1.1 There are no more than three elbows.
 - 2.1.2 The rated airflow used to comply with Table 403.4.7 is determined at not less than 0.25 in. w.c.
 - 2.1.3 The equivalent diameter of the duct is not less than that determined using Table 403.4.7.2 at the rated airflow used to comply with Table 403.4.7.
 - 2.1.4 Where flex duct is used, it shall be fully extended, and any flex duct bends shall have a bend radius to duct diameter ratio of not less than 1.0.
3. Where a kitchen range hood's rated nominal installed airflow, determined in accordance with HVI 920, is used to comply with Table 403.4.7.3, a duct length of 10 feet shall be permitted, provided that there are not more than two elbows and that the equivalent diameter of the duct is not less than the equivalent diameter of the rating.

TABLE 403.4.7.2 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.

<u>Fan Airflow Rating, CFM, at static pressure \geq 0.25 in. w.c.</u>	<u>≤ 50</u>	<u>≤ 80</u>	<u>≤ 100</u>	<u>≤ 125</u>	<u>≤ 150</u>	<u>≤ 175</u>	<u>≤ 200</u>	<u>≤ 250</u>	<u>≤ 350</u>	<u>≤ 400</u>	<u>≤ 450</u>	<u>≤ 700</u>	<u>≤ 800</u>
<u>Duct Type</u>	<u>Minimum Equivalent Diameter, in. ^{a, b, e, f, g}</u>												
<u>Rigid duct</u>	<u>4^d</u>	<u>5</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>7</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>10</u>	<u>12</u>	<u>12^c</u>
<u>Flex duct</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>7</u>	<u>7</u>	<u>8</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>NP</u>	<u>NP</u>	<u>NP</u>

- a. For circular ducts, the equivalent diameter, D_e , is equal to the duct diameter. For rectangular ducts with cross-sectional dimensions a and b, $D_e = \sqrt{4(ab)/\pi}$.
b. NP = application of the prescriptive table is not permitted for this scenario.
c. For this scenario, use of elbows is not permitted.
d. For this scenario, 4 in. oval duct shall be permitted, provided the minor axis of the oval is not less than 3 in. (75 mm).
e. 3.25" x 10" rectangular duct shall be permitted as a substitute for circular duct diameters up to 6".
f. 3.25" x 14" rectangular duct shall be permitted as a substitute for circular duct diameters up to 7".
g. 4.5" x 18" rectangular duct shall be permitted as a substitute for circular duct diameters up to 10".

403.4.7.3 Local Intermittent Kitchen Exhaust System

Local intermittent 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

HOOD OVER ELECTRIC RANGE	HOOD OVER COMBUSTION RANGE
65% CE or 160 cfm	80% CE or 250 cfm

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 ~~Section Table~~ 403.4.7.3 and shall be field verified in accordance with the following procedures ~~below to confirm the model is rated by HVI or AHAM to comply with the following requirements:~~

1. Where an airflow rate is used to comply with Section 403.4.7.3, and the airflow rate is field verified in accordance with Item 1 of Section 403.4.7.2.1, the field test shall also comply with the following requirements. 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.
 - 1.1 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.
 - 1.2 Testing for a kitchen exhaust systems that requires mechanical makeup air in accordance with Section 505.4 shall include verifying that the mechanical makeup air opening is open and ~~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.
 - 1.3 Testing for a kitchen exhaust systems that does not require mechanical makeup air in accordance with Section 505.4 and that are-is exempt from pressurize equalization per Section 501.4 shall be tested conducted with operable openings manually opened unless design exhaust airflow can be achieved with all operable openings closed.
 - 1.4 ~~1.1~~ 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 403.4.7.2.~~

2. The Field verification shall utilize certified rating data from HVI Publication 911, AHAM-Certified Range Hood Directory, or another directory of certified product performance ratings approved by the code official for determining compliance. The field 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, AHAM, or equivalent directory.
 - 2.3 The rated airflow value or capture efficiency value, as applicable, listed in the HVI, AHAM, or equivalent directory.
 - 2.4 The sound rating value listed in the HVI, AHAM, or equivalent directory.
 - 2.5 If the value for the rated airflow or capture efficiency 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 sound rating given in the directory is less than or equal to the sound rating requirements specified in Section 403.4.7.2, then the local intermittent kitchen exhaust system complies, otherwise the local intermittent kitchen exhaust system does not comply.

Chapter 15 REFERENCED STANDARDS

HVI

920 (2024)

Product Performance Certification and Surveillance Procedure Including Verification and Challenge

403.4.6.1, 403.4.6.2, 403.4.7.2, 403.4.7.2.1

- 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.

This proposal does the following. A companion proposal has also been submitted to coordinate these modifications with the Residential Code.

1. Simplifies ventilation duct sizing criteria by incorporating the table and the conditions used in ASHRAE 62.2-2022 Addendum O (i.e., airflow rating at a static pressure not less than 0.25 in. w.c., no more than 25 feet, no more than three elbows, etc.). This table is proposed to replace the duct sizing tables that are currently in Chapter 15 of the Residential Code (i.e., Table M1504.2 and Table M1505.4.4.2) as well as Table 403.4.7.2 of the Mechanical Code. Coordinating this modification across codes will simplify compliance.
 2. Provides an option to use a nominal installed airflow rating, developed in accordance with HVI 920, to comply with the duct length criteria in Section 403.4.7.2 of the Mechanical code (and Section M1504.2 of the residential code). This rating is found as the intersection of a nominal duct curve having two elbows, an exhaust termination fitting, and 10 feet of smooth duct, with a kitchen range hood's laboratory tested fan curve. This metric was developed by HVI within the latest version of 920 to assist designers with developing better estimates for minimum airflows in actual field installations.
 3. Clarifies where field testing and verification is required and where laboratory testing and rating is required.
 4. References the latest version of HVI 920.
- 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: This proposal updates duct sizing requirements using the latest criteria from ASHRAE 62.2 and HVI 920. Based on the flexibility of the measures provided for compliance, no increase in costs is expected.

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.

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

\$Click here to enter text./square foot

(For residential projects, also provide \$Click here to enter text./ dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

- c. **Code Enforcement.** List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:
- d. **Small Business Impact.** Describe economic impacts to small businesses:
- e. **Housing Affordability.** Describe economic impacts 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:

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.