



STATE OF WASHINGTON
STATE BUILDING CODE COUNCIL

Log No. 24-GP1-137 Ver. 2
Proponent Revision 11/20/24

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):

Definitions, Sections 403.4.4.1, 403.4.4.2

Title:

Distributed whole-house ventilation system

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

Proponent: Mike Moore, Stator LLC, representing Broan-NuTone

Title: Principal Consultant

Date: July 25, 2024; [Revised November 20](#)

3. Designated Contact Person:

Name: Mike Moore, Stator LLC, representing Broan-NuTone

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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)** Chapter 2, Section 403.4.4.1, and Section 403.4.4.2

Enforceable code language must be used.

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

DISTRIBUTED WHOLE-HOUSE VENTILATION SYSTEM. A whole-house ventilation system shall be considered distributed where it supplies outdoor air directly (not transfer air) to each dwelling or sleeping unit bedroom, den, and office and to not less than one of the following rooms: living room, dining room, or kitchen habitable space (living room, den, office, ~~interior adjacent room, interior adjoining spaces or bedroom~~) and exhausts air from all kitchens and bathrooms directly outside.

NOT DISTRIBUTED WHOLE-HOUSE VENTILATION SYSTEM. A whole-house ventilation system that is not a distributed whole-house ventilation system shall be considered not distributed where either the supply system or the exhaust system is not distributed. Supply systems are not distributed where a habitable space is supplied with outdoor air to ventilate an interior adjacent room or an interior adjoining space. Exhaust systems are not distributed where all bathrooms and kitchens are not exhausted by the whole house ventilation system. If either the supply system or the exhaust system is not distributed, then the ventilation quality adjustment system coefficient adjustment is required in accordance with Section C403.4.3.

403.4.4.1 Whole-house ventilation in Group R-2 occupancies.

Residential dwelling and sleeping unit whole-house ventilation systems in Group R-2 occupancies shall include supply and exhaust fans and be balanced whole-house ventilation systems in accordance with Section 403.4.6.3. The system shall include a heat or energy recovery ventilator with sensible heat recovery effectiveness as prescribed in Section C403.3.6 or selected as an option of R406 of the Washington State Energy Code. The whole-house ventilation system shall operate continuously at the minimum ventilation rate determined in accordance with Section 403.4. The whole-house supply fan shall be a distributed ventilation system ~~provide ducted outdoor ventilation air to each habitable space within the residential unit.~~

Exceptions:

- ~~Interior adjoining spaces that are ventilated from another habitable space are not required to have outdoor air ducted directly to the adjoining space. These systems are considered not distributed whole-house ventilation systems and shall use the "not distributed" quality adjustment system coefficient in accordance with Section 403.4.3.~~
- ~~Interior adjacent rooms that are ventilated from another habitable space are not required to have outdoor air ducted directly to the interior adjacent room. These systems are considered not distributed whole-house ventilation systems and shall use the "not distributed" quality adjustment system coefficient in accordance with Section 403.4.3. Where ~~T~~the interior adjacent room is ventilated from an adjacent~~

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ventilated space, the system shall be considered a *not distributed whole-house ventilation system*, and the interior adjacent room shall be provided with not less than one of the following:

a. ~~a~~ transfer fan with a minimum airflow rate of 30 cfm. ~~Transfer fans that ventilate interior adjacent rooms shall meet the sone rating in Section 403.4.6 and shall have whole-house ventilation controls in accordance with Section 403.4.5.~~

b. ~~or with~~ relief air inlet with a minimum airflow of 20 cfm that is connected to the exhaust relief air inlet of an ERV/HRV whole-house ventilation system. ~~Transfer fans that ventilate interior adjacent rooms shall meet the sone rating in Section 403.4.6 and shall have whole-house ventilation controls in accordance with Section 403.4.5.~~

~~a-c.~~ A transfer opening, not less than 30 in², connecting the interior adjacent room to the ventilated space.

403.4.4.2 Whole-house ventilation for other than Group R-2 occupancies.

Residential dwelling and sleeping units in other than Group R-2 occupancies, including Group I-I Condition 2 occupancies, shall have a whole-house mechanical ventilation system with supply and exhaust fans in accordance with Section 403.4.6.1, 403.4.6.2, 403.4.6.3 or 403.4.6.4. The whole-house ventilation system shall operate continuously at the minimum ventilation rate determined in accordance with Section 403.4.2 unless configured with intermittent off controls in accordance with Section 403.4.6.5. The whole-house supply fan shall be a *distributed ventilation system* provide ducted outdoor ventilation air to each habitable space within the residential unit.

Exceptions:

~~1. Interior adjoining spaces that are ventilated from another habitable space are not required to have outdoor air ducted directly to the adjoining space. These systems are considered not distributed whole-house ventilation systems and shall use the "not distributed" quality adjustment system coefficient in accordance with Section 403.4.3.~~

~~1. Interior adjacent rooms that are ventilated from another habitable space are not required to have outdoor air ducted directly to the interior adjacent room. These systems are considered not distributed whole-house ventilation systems and shall use the "not distributed" quality adjustment system coefficient in accordance with Section 403.4.3. Where ~~T~~the interior adjacent room is ventilated from an adjacent ventilated space, the system shall be considered a *not distributed whole-house ventilation system*, and the interior adjacent room shall be provided with not less than one of the following:~~

~~a. ~~a~~ transfer fan with a minimum airflow rate of 30 cfm. ~~Transfer fans that ventilate interior adjacent rooms shall meet the sone rating in Section 403.4.6 and shall have whole-house ventilation controls in accordance with Section 403.4.5.~~~~

~~b. ~~or with~~ relief air inlet with a minimum airflow rate of 20 cfm that is connected to the exhaust/relief air inlet of an ERV/HRV whole-house ventilation system. ~~Transfer fans that ventilate interior adjacent rooms shall meet the sone rating in Section 403.4.6 and shall have whole-house ventilation controls in accordance with Section 403.4.5.~~~~

~~a-c.~~ A transfer opening, not less than 30 in², connecting the interior adjacent room to the ventilated space.

5. Briefly explain your proposed amendment, including the purpose, benefits and problems addressed.

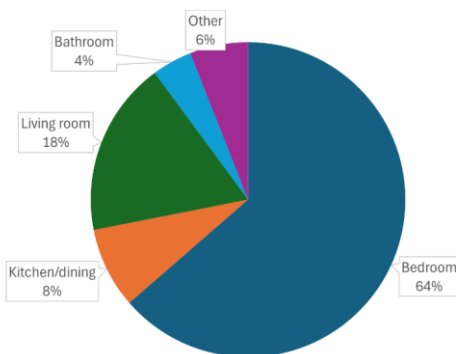
Specifically note any impacts or benefits to business, and specify construction types, industries and services that would be affected. Finally, please note any potential impact on enforcement such as special reporting requirements or additional inspections required.

Section 403.4.3 assesses a ventilation rate coefficient for whole-house ventilation systems that are *not distributed* and that are *not balanced*. The definition of *not distributed* is as follows:

NOT DISTRIBUTED WHOLE-HOUSE VENTILATION. A whole-house ventilation system shall be considered not distributed where either the supply system or the exhaust system is not distributed. Supply systems are not distributed where a habitable space is supplied with outdoor air to ventilate an interior adjacent room or an interior adjoining space. Exhaust systems are not distributed where all bathrooms and kitchens are not exhausted by the whole-house ventilation system. If either the supply system or the exhaust system is not distributed, then the ventilation quality adjustment system coefficient adjustment is required in accordance with Section C403.4.3.

As written, the definition of *not distributed whole-house ventilation* applies to all unitary whole-house ventilation systems required by Sections 403.4.4.1 and 403.4.4.2, because Section 501.2 requires kitchen exhaust to be ducted “independent of all other systems.” As soon as the kitchen exhaust is ducted separately from the unitary whole-house ventilation system in compliance with Section 501.2, “all bathrooms and kitchens are not exhausted by the whole-house ventilation system,” and therefore the system is considered *not distributed*. This seems like an unintended consequence of the definition, and the reference to kitchen exhaust should be removed for this reason. A second reason to remove the reference to kitchen exhaust from the definition of not distributed is that encouraging kitchen exhaust to be part of the whole-house ventilation system disincentivizes designers from specifying intermittent kitchen exhaust with high capture efficiency. If a designer fails to specify kitchen exhaust with high capture efficiency, it can be expected to increase the cook’s exposure to cooking contaminants. For these reasons, the reference to kitchens should be removed from the definition of *distributed whole-house ventilation* and *not distributed whole-house ventilation*.

The primary objective of distributing ventilation is to provide outdoor air to the occupants within a dwelling unit. Combining EPA data¹, Gallup poll data², and independent survey data^{3,4}, a reasonable estimate for the percent of time that occupants spend in different rooms is as follows:



The model code (both the IRC and IMC) characterizes distributed ventilation as the supply of outdoor air to each bedroom and to either the living room, kitchen, or dining room. Based on the previously referenced

¹ Klepeis, Neil & Tsang, Andy & Behar, Joseph. (1996). Analysis of the National Human Activity Pattern Survey (NHAPS) Respondents from a Standpoint of Exposure Assessment - Final EPA Report. Final Rpt EPA. https://www.researchgate.net/publication/242014860_Analysis_of_the_National_Human_Activity_Pattern_Survey_NHAPS_Respondents_from_a_Standpoint_of_Exposure_Assessment_-_Final_EPA_Report.

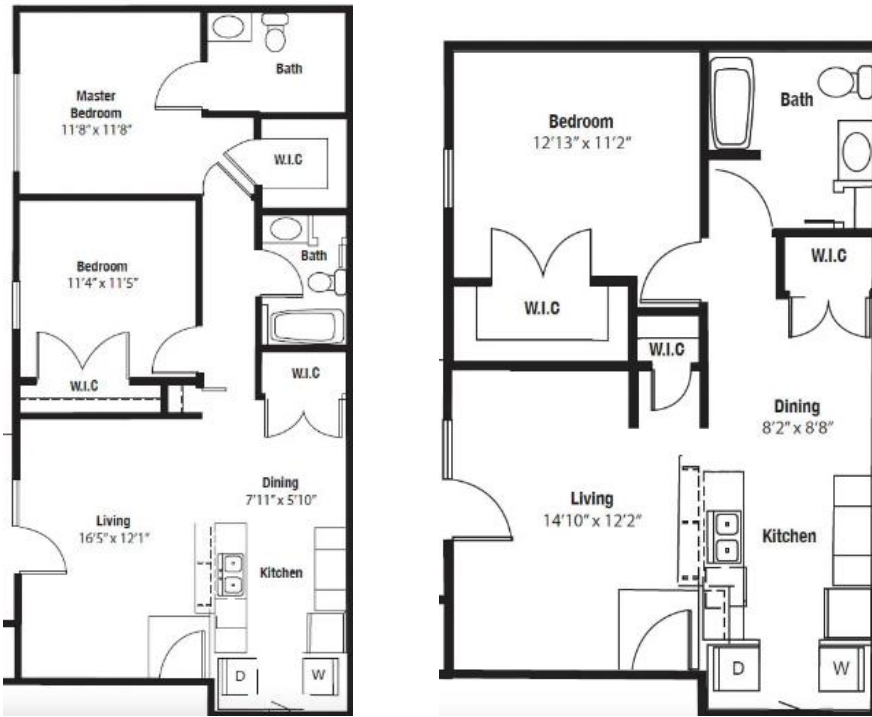
² Jones, J. December 19, 2013. In U.S., 40% Get Less Than Recommended Amount of Sleep. Gallup. <https://news.gallup.com/poll/166553/less-recommended-amount-sleep.aspx>. Sourced July 30, 2024.

³ American Freight. Unpacking How Americans Spend Their Time at Home. <https://www.americanfreight.com/c/how-long-americans-spend-at-home>. Accessed July 30, 2024.

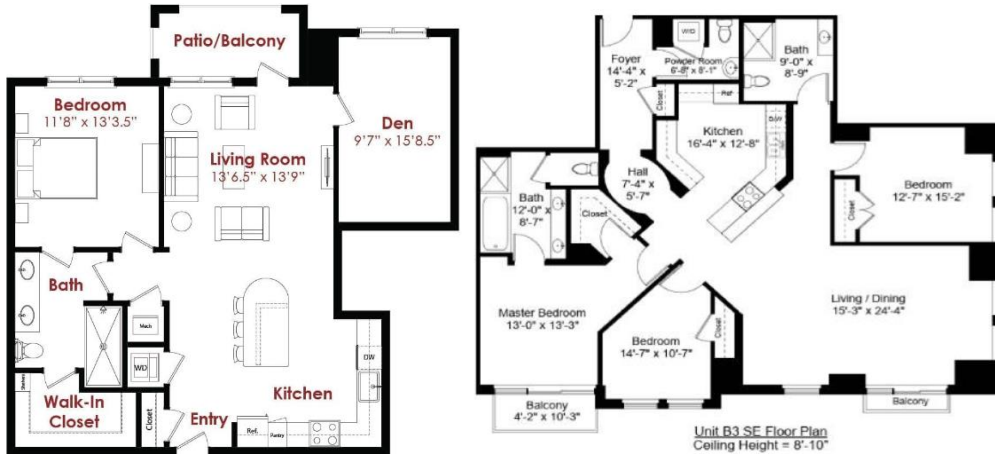
⁴ Crawford, Jaelyn. October 6, 2021. "Study Reveals The State Of Home Offices In 2021." CraftJack. <https://craftjack.com/toolbox/remote-work-from-home-statistics-2021/>. Accessed July 30, 2024.

occupant-location data, about 90% of the time,⁵ a whole-house ventilation system supplying outdoor air to each bedroom and to either the living room, kitchen, or dining room (i.e., considered as distributed by the 2021 IRC [M1505.4.3 Exception 1.1] and the 2021 IMC [Section 403.3.2.1, Exception 2]) can be expected to provide outdoor air to a room that is occupied. Another 4% of the time, occupants could be expected to be in a bathroom, where the code already requires local exhaust ventilation to be provided. Revising the Washington State definition of distributed ventilation to address bedrooms, dens, offices, and either the kitchen, living room, or dining room should result in delivery to supply air to a room that is occupied about 96% of the time (assuming that the “other” category in the pie graph represents an office or a den).

Following are some floor plans for apartments showing that ventilation provided to each bedroom, den, and office and to either the living room, kitchen, or dining room (i.e., distributed ventilation as proposed in the revised definition) should achieve excellent distribution within a typical apartment.



⁵ This estimate assumes that the kitchen is open-concept and connected to the living room. If the kitchen is enclosed (very rarely specified in new construction), the percent of time that outdoor air can be expected to be delivered to a room that is occupied is 72-82%.



While the model code method for qualifying distribution is simplistic and effective, Washington’s requirement for supply systems to supply outdoor air directly to all “habitable” spaces to be considered *distributed whole-house ventilation* is unnecessarily complex and introduces opportunities for misinterpretation. The Washington State Mechanical Code does not define “habitable space.” A definition is provided in the Washington State Residential Code, but this appears to be overridden by the parenthetical explanation of the term contained in the definition of *distributed whole-house ventilation*, as follows: “(living room, den, office, *interior adjacent room*, *interior adjoining spaces* or bedroom).”

The definition of *interior adjacent room* is as follows: “an enclosed room without exterior windows or openings to the outdoors located within a dwelling or sleeping unit that does not have interior unobstructed openings required for an interior adjoining space.” Considering this definition, the inclusion of *interior adjacent rooms* within the description of habitable space could lead an AHJ to require a supply system (or supply side of an HRV or ERV) to provide outdoor air to all interior bathrooms, laundry rooms, mechanical rooms, and closets to be considered distributed. This cannot be the intention of Washington State’s definitions. Contrast this with the IMC’s criteria that are easier to interpret, implement, and enforce; and which ensure that outdoor air is provided to the areas where people are likely to spend most of their time: bedrooms and not less than one common room (i.e., kitchen, living room, or dining room). For these reasons, please align the definitions of *distributed whole-house ventilation* and *not-distributed whole-house ventilation* with the model code.

Section 403.4.3, Section 403.4.4.1, and Section 403.4.4.2 reference *distributed whole-house ventilation system* not *distributed whole-house ventilation* as used in the definition. For consistency, the definition should be revised to also use “system.” Finally, to avoid confusion between trying to fully define both *distributed whole-house ventilation system* and *not distributed whole-house ventilation system*, simply define non-distributed as a system that is not distributed.

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.

This proposal will not increase costs. The proposal could reduce costs by reducing the number of habitable spaces requiring direct supply of outdoor air, in alignment with the model code. Potential savings would vary widely based on the application and are not estimated here. If required by the subcommittee, an estimate could be provided for a representative configuration.

- 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.