

ADVISORY COMMITTEE COMMENT FORM FOR PROPOSED CODE CHANGES

(This form must be submitted electronically)

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1346 IMC #24

Proposed Code Change - Language

Please provide your proposed code change in strikeout/underline format. Provide the *specific* language you would like to see changed, with new words underlined and words to be deleted should be ~~stricken~~. Also, state whether the language contained in your proposal is from a code book or from an amendment currently found in Minnesota Rule. (You may provide the language (electronically) on a separate, attached sheet).

Amendment to IMC Section 501.4 is amended to read as follows:

501.4 Pressure equalization. Mechanical exhaust systems shall be sized and operated to remove the quantity of air required by this chapter. If a greater quantity of air is supplied by a mechanical ventilating supply system than is removed by a mechanical exhaust system for a room, adequate means shall be provided for the natural exit of the excess air supplied.

501.4.1 Makeup air in new ~~dwelling~~dwelling units. Makeup air quantity for new ~~dwelling~~dwelling units shall be determined by using Table 501.4.1 and shall be supplied in accordance with IMC Section 501.4.2.

Exception. Makeup air provisions of IMC Section 501.4.1 are not required when any of the following are demonstrated:

1. A test is performed according to ASTM Standard E1998-02 ~~(2007)~~, *Standard Guide for Assessing Depressurization-Induced Backdrafting and Spillage from Vented Combustion Appliances*, and documentation is provided that the vented combustion appliances continue to operate within established parameters of the test.

2. A test approved by the building official verifies proper operation of vented combustion appliances.

501.4.2 Makeup air supply. Makeup air shall be provided by one of the following methods:

1. Passive makeup air shall be provided by passive openings according to the following:

- 1.1 Passive makeup air openings from the outdoors shall be sized according to Table 501.4.2.

- 1.2 Barometric dampers are prohibited in passive makeup air openings when any atmospherically vented appliance is installed.

- 1.3 Single passive openings larger than 8 inches (204 mm) diameter, or equivalent, shall be provided with a motorized damper that is electrically interlocked with the largest exhaust system.

2. Powered makeup air shall be provided if the size of a single opening or multiple openings exceeds 11 inches (280 mm) diameter, or equivalent, when sized according to Table 501.4.2. Powered makeup air shall comply with the following:

- 2.1 Powered makeup air shall be electrically interlocked with the largest exhaust system.

- 2.2 Powered makeup air shall be matched to the airflow of the largest exhaust system.

3. Makeup air shall be provided by a combination of passive openings and powered means according to Table 501.4.2 and the following:

- 3.1 Passive makeup air openings shall comply with Item 1.

- 3.2 Powered makeup air shall be supplied for the quantity of airflow in excess of the passive makeup air opening provided, and it shall be electrically interlocked with the exhaust system.

501.4.2.1 Makeup air ducts. Makeup air ducts shall be constructed and installed according to IMC Chapter 6 and Section 501.4.2.

501.4.2.2 Makeup air intake. Makeup air intake openings shall be located to avoid intake of exhaust air in accordance with IMC Section 401.4 and IFGC Section 503.8, and shall be covered with corrosion resistant screen of not less than 1/4 inch (6.4 mm) mesh. Makeup air intake openings shall be located at least 12 inches (305 mm) above adjoining grade level.

501.4.2.3 Makeup air location. Makeup air requirements of 175 cubic feet per minute (cfm) (0.084 m³/s) and greater shall be introduced to the dwelling unit in one of the following locations:

1. In the space containing the vented combustion appliances.
2. In the space containing the exhaust system.
3. In a space that is freely communicating with the exhaust system and is approved by the building official.

501.4.2.4 Makeup air termination restriction. A makeup air opening shall not terminate in the return air plenum of a forced air heating system unless it is installed according to the heating equipment manufacturer's installation instructions.

501.4.2.5 Separate makeup air and combustion air openings. When both makeup air and combustion air openings are required, they shall be provided through separate openings to the outdoors. Refer to IFGC Section 304, to determine requirements for air for combustion and ventilation.

Exception: Combination makeup air and combustion air systems may be approved by the building official where they are reasonably equivalent in terms of health, safety, and durability.

501.4.2.6 Makeup air effectiveness. The makeup air shall not reduce the effectiveness of exhaust systems or performance of vented combustion appliances, and makeup air shall not adversely affect the heating or cooling capability of the mechanical equipment.

501.4.3 Additions, alterations, or installations of mechanical systems in existing dwellingsdwelling units. Makeup air shall be supplied to existing dwelling units when any of the following conditions occur:

1. If a dwelling unit was constructed after 2003 using the makeup air provisions of IMC Section 501.4.2, makeup air quantity shall be determined by using Table 501.4.1 and shall be supplied according to IMC Section 501.4.2 when any of the following conditions occur:

1.1 A vented combustion appliance, including a solid fuel appliance, is installed or replaced.

1.2 An exhaust system is installed or replaced.

Exception: If powered makeup air is electrically interlocked and matched to the airflow of the exhaust system, additional makeup air is not required.

2. If a dwelling unit was constructed after 1999 using the provisions of the Minnesota Energy Code, Minnesota Rules, chapter 7672, makeup air quantity shall be determined by using IMC Table 501.4.1 and shall be supplied in accordance with IMC Section 501.4.2 when any of the following conditions occur:

2.1 A vented combustion appliance, including a solid fuel appliance, is installed or replaced.

2.2 An exhaust system is installed or replaced.

Exception: If powered makeup air is electrically interlocked and matched to the airflow of the exhaust system, additional makeup air is not required.

3. When a solid fuel appliance is installed in a dwelling unit constructed during or after 1994 under the Minnesota Energy Code, Minnesota Rules, chapter 7670, makeup air quantity shall be determined by using IMC Table 501.4.1 and shall be supplied according to IMC Section 501.4.2.

Exception. If a closed combustion solid fuel burning appliance is installed with combustion air in accordance with the manufacturer's installation instructions, additional makeup air is not required.

4. When an exhaust system with a rated capacity greater than 300 cfm (0.144 m³/s) is installed in a dwelling unit constructed during or after 1994 under the Minnesota Energy Code, Minnesota Rules, chapter 7670, makeup air quantity shall be determined by using IMC Table 501.4.3(1) and shall be supplied according to IMC Section 501.4.2.

Exception: If powered makeup air is electrically interlocked and matched to the airflow of the exhaust system, additional makeup air is not required.

5. When an exhaust system with a rated capacity greater than 300 cfm (0.144 m³/s) is installed in a dwelling unit constructed prior to 1994, makeup air quantity shall be determined by using IMC Table 501.4.3(2) and shall be supplied according to IMC Section 501.4.2.

Exception: If powered makeup air is electrically interlocked and matched to the airflow of the exhaust system, additional makeup air is not required.

6. When a solid fuel appliance is installed in a dwelling unit constructed prior to 1994, makeup air quantity shall be determined by using IMC Table 501.4.3(3) and shall be supplied according to IMC Section 501.4.2.

Exception: If a closed combustion solid fuel burning appliance is installed with combustion air in accordance with the manufacturer's installation instructions, additional makeup air is not required.

Exception: Makeup air is not required in Items 1 to 6 when any of the following are demonstrated:

1. A test is performed according to ASTM Standard E1998-02 (2007), *Standard Guide for Assessing Depressurization-Induced Backdrafting and Spillage from Vented Combustion Appliances*, and documentation is provided that the vented combustion appliances continue to operate within established parameters of the test.
2. A test approved by the building official verifies proper operation of vented combustion appliances.

Table 501.4.1
Procedure to Determine Makeup Air Quantity for Exhaust Equipment in ~~Dwellings~~Dwelling Units
 Use the Appropriate Column to Estimate House Infiltration

	One or multiple power vent or direct vent appliances or no combustion appliances ^A	One or multiple fan-assisted appliances and power vent or direct vent appliances ^B	One atmospherically vented gas or oil appliance or one solid fuel appliance ^C	Multiple appliances that are atmospherically vented gas or oil appliances or solid fuel appliances ^D
1a) pressure factor (cfm/sf)	0.15	0.09	0.06	0.03
b) conditioned floor area (sf) (including unfinished basements)				
Estimated House Infiltration (cfm): [1a x 1b]				
a) clothes dryer	135	135	135	135
b) 80% of largest exhaust rating (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked and matched to exhaust)				
c) 80% of next largest exhaust rating (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked and matched to exhaust)	not applicable			
Total Exhaust Capacity (cfm): [2a+2b+2c]				
3. Makeup Air Requirement				
a) Total Exhaust Capacity (from above)				
b) Estimated House Infiltration (from above)				
Makeup Air Quantity (cfm): [3a – 3b] (if value is negative, no makeup air is needed)				
4. For Makeup Air Opening Sizing, refer to Table 501.3.2				

- ^A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.
- ^B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.
- ^C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.
- ^D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliances.

**Table 501.4.2
 Makeup Air Opening Sizing Table for New and Existing Dwellings Dwelling Units**

	One or multiple power vent or direct vent appliances or no combustion appliances ^A	One or multiple fan-assisted appliances and power vent or direct vent appliances ^B	One atmospherically vented gas or oil appliance or one solid fuel appliance ^C	Multiple appliances that are atmospherically vented gas or oil appliances or solid fuel appliances ^D	Passive makeup air opening duct diameter ^{E,F,G}
Type of opening or system	(cfm)	(cfm)	(cfm)	(cfm)	(inches)
Passive Opening	1-36	1-22	1-15	1-9	3
Passive Opening	37-66	23-41	16-28	10-17	4
Passive Opening	67-109	42-66	29-46	18-28	5
Passive Opening	110-163	67-100	47-69	29-42	6
Passive Opening	164-232	101-143	70-99	43-61	7
Passive Opening	233-317	144-195	100-135	62-83	8
Passive Opening with Motorized Damper	318-419	196-258	136-179	84-110	9
Passive Opening with Motorized Damper	420-539	259-332	180-230	111-142	10
Passive Opening with Motorized Damper	540-679	333-419	231-290	143-179	11
Powered Makeup Air ^H	>679	>419	>290	>179	not applicable

- ^A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.
- ^B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.
- ^C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.
- ^D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliance(s).
- ^E An equivalent length of 100 feet of round smooth metal duct is assumed. Subtract 40 feet for the exterior hood and ten feet for each 90-degree elbow to determine the remaining length of straight duct allowable.
- ^F If flexible duct is used, increase the duct diameter by one inch. Flexible duct shall be stretched with minimal sags.
- ^G Barometric dampers are prohibited in passive makeup air openings when any atmospherically vented appliance is installed.
- ^H Powered makeup air shall be electrically interlocked with the largest exhaust system.

Table 501.4.3(1)
Procedure to Determine Makeup Air Quantity for Exhaust Equipment in Existing Dwellings
 (Refer to Item 4 in Section 501.3.3 to determine applicability of this table)

Use the Appropriate Column to Estimate House Infiltration

	One or multiple power vent or direct vent appliances or no combustion appliances ^A	One or multiple fan-assisted appliances and power vent or direct vent appliances ^B	One atmospherically vented gas or oil appliance or one solid fuel appliance ^C	Multiple appliances that are atmospherically vented gas or oil appliances or solid fuel appliances ^D
1a) pressure factor (cfm/sf)	0.15	0.09	0.06	0.03
b) conditioned floor area (sf)				
Estimated House Infiltration (cfm): [1a x 1b]				
2. Exhaust Capacity 80% of exhaust rating = Exhaust Capacity (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked and matched to exhaust)				
3. Makeup Air Requirement				
a) Exhaust Capacity (from above)				
b) Estimated House Infiltration (from above)				
Makeup Air Quantity (cfm): [3a – 3b] (if value is negative, no makeup air is needed)				
4. For Makeup Air Opening Sizing, refer to Table 501.3.2				

- ^A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.
- ^B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.
- ^C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.
- ^D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliances.

Table 501.4.3(2)
Procedure to Determine Makeup Air Quantity for Exhaust Equipment in Existing Dwellings
 (Refer to Item 5 in Section 501.3.3 to determine applicability of this table)

Use the Appropriate Column to Estimate House Infiltration

	One or multiple power vent or direct vent appliances or no combustion appliances ^A	One or multiple fan-assisted appliances and power vent or direct vent appliances ^B	One atmospherically vented gas or oil appliance or one solid fuel appliance ^C	Multiple appliances that are atmospherically vented gas or oil appliances or solid fuel appliances ^D
1a) pressure factor (cfm/sf)	0.25	0.15	0.10	0.05
b) conditioned floor area (sf) (including unfinished basements)				
Estimated House Infiltration (cfm): [1a x 1b] or				
Alternative Calculation (by using blower door test) ^E				
c) conversion factor	0.75	0.45	0.30	0.15
d) CFM50 value (from blower door test)				
Estimate House Infiltration (cfm): [1c x 1d]				
2. Exhaust Capacity 80% of exhaust rating = Exhaust Capacity (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked with exhaust)				
3. Makeup Air Requirement				
a) Exhaust Capacity (from above)				
b) Estimated House Infiltration (from above)				
Makeup Air Quantity (cfm): [3a – 3b] (if value is negative, no makeup air is needed)				
4. For Makeup Air Opening Sizing, refer to Table 501.3.2				

- ^A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.
- ^B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.
- ^C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.
- ^D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliances.
- ^E As an alternative, the Estimated House Infiltration may be calculated by performing a blower door test and multiplying the conversion factor by the CFM50 value.

Table 501.4.3(3)
Procedure to Determine Makeup Air Quantity for Exhaust Equipment in Existing Dwellings
 (Refer to Item 6 in Section 501.3.3 to determine applicability of this table)
 Use the Appropriate Column to Estimate House Infiltration

	One or multiple power vent or direct vent appliances or no combustion appliances ^A	One or multiple fan-assisted appliances and power vent or direct vent appliances ^B	One atmospherically vented gas or oil appliance or one solid fuel appliance ^C	Multiple appliances that are atmospherically vented gas or oil appliances or solid fuel appliances ^D
1a) pressure factor (cfm/sf)	0.25	0.15	0.10	0.05
b) conditioned floor area (sf) (including unfinished basements)				
Estimated House Infiltration (cfm): [1a x 1b] or				
Alternative Calculation (by using blower door test) ^E				
c) conversion factor	0.75	0.45	0.30	0.15
d) CFM50 value (from blower door test)				
Estimate House Infiltration (cfm): [1c x 1d]				
2. Exhaust Capacity				
a) continuous exhaust-only ventilation system (cfm) (not applicable to balanced ventilation systems)				
b) clothes dryer (cfm)	135	135	135	135
c) 80% of largest exhaust rating (cfm): (not applicable if recirculating system or if powered makeup air is electrically interlocked with exhaust)				
d) 80% of next largest exhaust rating (cfm) (not applicable if recirculating system or if powered makeup air is electrically interlocked with exhaust)	not applicable			
Total Exhaust Capacity (cfm): [2a+2b+2c+2d]				
3. Makeup Air Requirement				
a) Total Exhaust Capacity (from above)				
b) Estimated House Infiltration (from above)				
Makeup Air Quantity (cfm): [3a – 3b] (if value is negative, no makeup air is needed)				
4. For Makeup Air Opening Sizing, refer to Table 501.3.2				

- A Use this column if there are other than fan-assisted or atmospherically vented gas or oil appliances or if there are no combustion appliances.
- B Use this column if there is one fan-assisted appliance per venting system. Other than atmospherically vented appliances may also be included.
- C Use this column if there is one atmospherically vented (other than fan-assisted) gas or oil appliance per venting system or one solid fuel appliance.
- D Use this column if there are multiple atmospherically vented gas or oil appliances using a common vent or if there are atmospherically vented gas or oil appliances and solid fuel appliances.
- E As an alternative, the Estimated House Infiltration may be calculated by performing a blower door test and multiplying the conversion factor by the CFM50 value.

Proposed Code Change – Need and Reason

Please provide a thorough explanation of the need for this change and why this proposed code change is a reasonable change. During the rulemaking process, the Agency must defend the need and reasonableness of all its proposed changes. The Agency must submit evidence that it has considered all aspects of the proposal. (You may provide the need and reason (electronically) on a separate attached sheet).

This proposed amendment changes all of the terms “dwelling” to “dwelling unit” throughout Section 501.4, which contains requirements for makeup air in residential occupancies. In Section 202 of the 2012 IMC the term dwelling is defined as a building or portion thereof that contains not more than two dwelling units, while a dwelling unit is defined as a single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation. As a result, this change requires all dwelling units, including townhomes, condominiums and apartments, to have makeup air as required by this section. This amendment is necessary because all residential occupancies should be afforded the same protection against excessive depressurization that is required for one and two family dwellings. This amendment is reasonable because all residential occupancies have the same potential for hazards associated with excessive depressurization.

Proposed Code Change – Cost/Benefit Analysis

Please consider whether this proposed code change will increase/decrease costs or indicate that it will not have any cost implications and explain how it will not. If there is an increased cost, will this cost be offset somehow by a life safety or other benefit? If so, please explain. Are there any cost increases/decreases to enforce or comply with this proposed code change? If so, please explain. (You may provide the cost/benefit analysis (electronically) on a separate, attached sheet).

This code change will increase the cost of construction for other than one and two family dwellings that are required to have makeup air installed. However, the cost is usually minimal and the requirement for makeup air in residential occupancies is becoming more prevalent in other codes used throughout the country.

Other Factors to Consider Related to Proposed Code Change

1. Is this proposed code change meant to:

change language contained in a published code book? If so, list section(s).

Section 501.4

change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

delete language contained in a published code book? If so, list section(s).

delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

neither; this language will be new language, not found in the code book or in Minnesota Rule.

2. Is this proposed code change required by a Minnesota Statute or new legislation? If so, please provide the citation to the Statute or legislation.

No

3. Will this proposed code change impact other sections of a published code book or of an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.

No.

4. Will this proposed code change impact other parts of the Minnesota State Building Code? If so, please list the affected parts of the Minnesota State Building Code.

No.

5. Who are the parties affected or segments of industry affected by this proposed code change?

Builders and owners of townhomes, condominiums and multi-family structures.

6. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

7. Are you aware of any federal requirement or regulation related to this proposed code change? If so, please list the regulation or requirement.

No.