1346.0501 SECTION 501 GENERAL.

Subpart 1. **Section 501.3.** IMC section 501.3 is amended to read as follows:

501.3 Exhaust discharge. The air removed by every mechanical exhaust system shall be discharged outdoors at a point where it will not cause a nuisance and not less than the distances specified in IMC section 501.3.1. The air shall be discharged to a location from which it cannot again be readily drawn in by a ventilating system. Air shall not be exhausted into an attic or crawl space and the exhaust system shall be equipped with a backdraft damper at the point of discharge.

Exception: Commercial cooking recirculating systems.

IMC subsections 501.3.1, 501.3.1.1, and 501.3.2 still apply.

Subp. 2. **Section 501.4.** IMC section 501.4 is amended and subsections added 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 units. Makeup air quantity for new dwelling units shall be determined by using IMC 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, 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 IMC 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 IMC 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 IMC 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 m^3/s) and greater shall be introduced to the dwelling 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 appliance 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, subject 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 appliances.

501.4.3 Additions, alterations, or installations of mechanical systems in existing dwelling 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 section 501.4.2, makeup air quantity shall be determined by using IMC Table 501.4.1 and shall be supplied according to 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 Table 501.4.1 and shall be supplied in accordance with 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 Table 501.4.1 and shall be supplied according to 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 m^3/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 Table 501.4.3(1) and shall be supplied according to 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 m^3/s) is installed in a dwelling unit constructed prior to 1994, makeup air quantity shall be determined by using Table 501.4.3(2) and shall be supplied according to 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 Table 501.4.3(3) and shall be supplied according to 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, 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 Appliances in 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]
1. Use the Appropriate Column to Estimate House Infiltration				
a) 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]	_____	_____	_____	_____
2. Exhaust Capacity				
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 501.4.2

[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 Dwelling Units

Type of opening or system	One or multiple power vent or direct vent appliances or no combustion appliances[A] (cfm)	One or multiple fan-assisted appliances and power vent or direct vent appliances[B] (cfm)	One atmospher-ically vented gas or oil appliance or one solid fuel appliance[C] (cfm)	Multiple appliances that are atmospher-ically vented gas or oil appliances or solid fuel appliances[D] (cfm)	Passive makeup air opening duct diameter[E,F,G] (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 Appliances in Existing Dwelling Units

(Refer to item 4 in section 501.4.3 to determine applicability of this table)

	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]
1. Use the Appropriate Column to Estimate House Infiltration				
a) 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 501.4.2

[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 Appliances in Existing Dwelling Units

(Refer to item 5 in section 501.4.3 to determine applicability of this table)

	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]
1. Use the Appropriate Column to Estimate House Infiltration				
a) 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)	_____	_____	_____	_____
Estimated 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 501.4.2

[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 Appliances in Existing Dwelling Units

(Refer to item 6 in section 501.4.3 to determine applicability of this table)

	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 atmospher-ically 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]
1. Use the Appropriate Column to Estimate House Infiltration				
a) 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)	_____	_____	_____	_____
Estimated House Infiltration (cfm): [1c x 1d]	_____	_____	_____	_____
2. Exhaust Capacity				
a) clothes dryer (cfm)	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 with exhaust)				
c) 80% of next largest exhaust rating (cfm)	Not applicable	_____	_____	_____
(not applicable if recirculating system or if powered makeup air is electrically interlocked with exhaust)				
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 501.4.2

[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.

Statutory Authority: *MS s 16B.59; 16B.61; 16B.64; 326B.02; 326B.101; 326B.106; 326B.13*

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