IRC — Mechanical

2021 GROUP A PUBLIC COMMENT AGENDA

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PITTSBURGH, PA

ICC
INTERNATIONAL CODE COUNCIL®

2021 Public Comment Agenda

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RM1-21

Proposed Change as Submitted

Proponents: David C Bixby, ACCA, representing ACCA (bixster1953@yahoo.com)

2021 International Residential Code

Add new text as follows:

M1305.1.2.2 Permanent service access.
Where equipment or appliances requiring routine service (including, but not limited to, the changeout of filters) are located in an Attic, a permanent means of access shall be provided. Attic access shall be provided by pulldown stairs or other permanent steps to allow for removal of the largest appliance. Such service access shall not require the use of portable ladders.

Exception: Attics that already have existing appliances installed and maintained.

Reason: Section M1305.1.2 provides specifications for the size of the minimum clear and unobstructed opening and passageway to allow removal of the largest appliance. However, the need for a safe and secure energy efficient access is not specified, and should be added for the safety of personnel and consumers. For consumers, replacement of filters is recommended maintenance and access to the attic should be as safe as possible. Attic stairs often include proven energy savings through verifiable factory energy performance ratings. The proposal also reflects the intent of Section M1202.3, Maintenance, which requires mechanical systems, both existing and new, to be maintained in proper operating condition and in a safe condition. The proposal is also consistent with Section 306.5 in the International Mechanical Code which requires providing safe and reasonable access for servicing appliances. It should be noted that the proposal is similar to an amendment to the Georgia building code that became effective January 1, 2020.

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction. ACCA estimates the cost will be about $700 for new construction. Although the proposal exempts attics that already have existing appliances installed and maintained, ACCA estimates the cost to move appliances into an existing home's attic (appliances not previously there) could be about $1,900.

RM1-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: Increasing cost is not justified. Would require stair access even when another access point is available at the same level of the equipment. Limits access to raise a piece of equipment into an attic or to remove a piece of equipment. The attic will be used for storage when it isn't designed as such. (11-0)

RM1-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1305.1.2.2

Proponents: David Bixby, representing ACCA (bixster1953@yahoo.com) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

M1305.1.2.2 Permanent service access . ~~Where equipment or appliances requiring routine service (including, but not limited to, the changeout of filters) are located in an Attic, a permanent means of access shall be provided. Attic access shall be provided by pulldown stairs or other permanent steps to allow for removal of the largest appliance. Such service access shall not require the use of portable ladders.~~ For new construction, a

permanent means of access without the use of a portable ladder shall be provided in order to comply with M1305.1. Such means shall include the use of either pulldown stairs or other permanent steps acceptable to the authority having jurisdiction.

Exception: ~~Attics that already have existing appliances installed and maintained.~~ Existing construction.

Commenter's Reason: The proposed code change has been modified to clarify that it applies ONLY to the new construction market, in order to comply with M1305.1 which is shown below*. Again, the need is for NEW homes to be constructed to take care of future service, repair, replacement and overall general safety for all including the homeowner, contractors, insurance representatives, regular structural pest control inspections, especially first responders and anyone else who may need to access to this part of the home in the future. Existing homes should not be asked to make changes they cannot afford or do not want unless it falls within some other type of health, safety, fire code issues. We are not suggesting that existing homes anywhere in the country change their existing access to a stair/ladder access when they change their heating and cooling equipment or any other items in their attics.
Although the committee cited cost as one reason for rejection, a more realistic estimate is that attic stairs/ladders may add $250-$350 to a new home cost, but the savings in safety over time is significantly overcome and justified. Permanent attic access is needed as part of a complete system for ongoing sustainable property maintenance and occupant safety.

Another committee reason for rejection was that the stairs would limit access to raise a piece of equipment into an attic or to remove a piece of equipment. The bigger issue with mechanical equipment hoist/lifting equipment to and from attics is the fact that many openings in existing homes most likely will have to be dismantled and reinstalled due to equipment being larger than the existing openings. Hence one of the reasons new homes should have an opening as large as any appliance in the attic and the stairs or ladder access is for safety of anyone going to service the equipment in the attic.

The committee was also concerned that if stairs were available to the owner, the attic would be used for storage when it isn't designed as such, and adversely affect the existing insulation. No equipment, appliance, or home appendage should be installed in any attic area without adequate walk board/platforms to allow for safe access to the items for service, repair or replacement. If that is the case then the insulation will be properly protected, and home owners will always use their attic for storage regardless. This is already happening whether there are permanent stairs or not.

Another committee reason for rejection was that the original wording might require stair access even when another access point is available at the same level of the equipment for servicing such as filter changes. It should be noted that only 1-inch filters can be put in return air grills and a significant amount of homes are changing to the larger more efficient air filtration systems which do not allow for wall or ceiling mount filter changes.

***M1305.1 Appliance access for inspection service, repair and replacement.** *Appliances* shall be located to allow for access for inspection, service, repair and replacement without removing permanent construction, other *appliances*, or any other piping or ducts not connected to the *appliance* being inspected, serviced, repaired or replaced. A level working space not less than 30 inches deep and 30 inches wide (762 mm by 762 mm) shall be provided in front of the control side to service an *appliance.*

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
The modified proposal will result in an increase in the cost of construction. It is estimated that the cost of installing pull-down stairs will add about $250 to $350 to the cost of building a new home.

Public Comment# 2818

RM3-21

Proposed Change as Submitted

Proponents: Emily Toto, ASHRAE, representing ASHRAE (etoto@ashrae.org)

2021 International Residential Code

Revise as follows:

M1401.1 Installation. Heating and cooling *equipment* and *appliances* shall be installed in accordance with the manufacturer's instructions , ~~and~~ the requirements of this code, and ASHRAE 15.2.

Add new standard(s) as follows:

ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta, GA 30329

15.2—2020 Safety Standard for Refrigeration Systems in Residential Applications

Reason: ASHRAE is developing a new standard, ASHRAE 15.2, which will cover the application requirements for residential air conditioning and heat pump systems. This standard has completed a second Publication Public Review (PPR2) and expected to be completed in first quarter of 2021. This proposal adds a reference to the anticipated newly published standard into the IRC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal provides new safety requirements for use of new systems with flammable refrigerants but does not introduce additional requirements that would impact cost to existing air conditioners or heat pumps.

Staff Analysis: A review of the standards proposed for inclusion in the code, ASHRAE 15.2—2020: Safety Standard for Refrigeration Systems in Residential Applications, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before March 20, 2021.

RM3-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The standard isn't completed. Manufacturers will provide installation information. The added language is cumbersome and overcomplicates. (11-0)

RM3-21

Individual Consideration Agenda

Public Comment 1:

Proponents: Emily Toto, representing ASHRAE (etoto@ashrae.org) requests As Submitted

Commenter's Reason: ASHRAE 15.2 is a new standard under development that will establish application guidelines for residential air conditioning systems serving individual dwelling units. Requirements for these systems currently reside in both the ASHRAE 15 and UL 60335-2-40 standards. However, ASHRAE recognized the need for a simplified set of application requirements, that focus on only residential installations, and can be readily found in one location. Once ASHRAE 15.2 publishes, equipment manufacturers will require compliance with this standard in their installation instructions.

Bibliography: ASHRAE 15.2—2020 : Safety Standard for Refrigeration Systems in Residential Applications

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction

This code change proposal in of itself will not increase or decrease the cost of construction. However, the cost of residential air conditioning systems will likely increase over the next several years as a result of increasing energy efficiency requirements and the transition to lower global warming potential refrigerants.

Staff Analysis: In accordance with Section 3.6.3.1 of ICC Council Policy 28, the new referenced standard ASHRAE 15.2—2020: Safety Standard for Refrigeration Systems in Residential Applications, must be completed and readily available prior to the Public Comment Hearing in order for this public comment to be considered.

Public Comment# 2438

RM8-21

Proposed Change as Submitted

Proponents: Guy McMann, representing Colorado Association of Plumbing and Mechanical Officials (CAPMO) (gmcmann@jeffco.us)

2021 International Residential Code

Add new text as follows:

1502.6 Makeup air.
Installations exhausting more than 200 cfm (0.09 3/s) shall be provided with make up air. Where a closet is designated for the installation of a clothes dryer, an opening having a area of not less than 100 sq. inches (0.o645 m2) for make up air shall be provided in the closet enclosure, or make up air shall be provided by other approved means.

Reason: This language does not appear in Section M1502 for dryer exhaust and is a logical location for the makeup air requirements for residential clothes dryers. This is the same language found in the IMC.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
IRC-1502.6……..This IMC extraction should not increase the cost of construction as no new materials are required to provide and opening in a wall. A louvered door is over and above what the code calls for but would be an option and not a requirement possibly increasing cost.

RM8-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The language is inconsistent and confusing with the use of the term "makeup air", which is undefined in the IRC. It is not clear what is needed, make-up air or transfer air, for the appliance. The term "designated" should be changed to "intended" when referring to the closet's intended use for a dryer. (11-0)

RM8-21

Individual Consideration Agenda

Public Comment 1:

IRC: (New), M1502.6 (New), M1502.6.1 (New), M1503.6, M1503.6.1

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com) requests As Modified by Public Comment

Replace as follows:

2021 International Residential Code

AIR, MAKEUP . Any combination of outdoor and transfer air intended to replace exhaust air and exfiltration.

AIR, OUTDOOR . Ambient air that enters a building through a ventilation system, through intentional openings for natural ventilation, or by infiltration.

AIR, TRANSFER . Air moved from one indoor space to another.

M1502.6 Makeup air . Installations exhausting more than 200 cfm (0.09 m^3/s) shall be provided with makeup air.

M1502.6.1 Closet Installation . Where a closet is designed for the installation of a clothes dryer, makeup air shall be provided in accordance with the dryer manufacturer's installation instructions. If the manufacturer installation instructions do not include specifications for provision of makeup air, one or more permanent openings having a total area of not less than 100 square inches (645 mm^2) shall be provided in the closet enclosure, or makeup air shall be provided by other approved means.

M1503.6 Makeup air required . Where one or more gas, liquid or solid fuel-burning *appliance* that is neither direct-vent nor uses a mechanical draft

venting system is located within a dwelling unit's air barrier, each exhaust system capable of exhausting in excess of 400 cubic feet per minute (0.19 m^3/s) shall be mechanically or passively provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not fewer than one outdoor air duct and damper complying with Section M1503.6.2.

Exception: Makeup air is not required for exhaust systems installed for the exclusive purpose of space cooling and intended to be operated only when windows or other air inlets are open.

M1503.6.1 Location . Kitchen exhaust makeup air that is ducted from the outdoors shall be discharged into the same room in which the exhaust system is located or into rooms or *duct systems* that communicate through one or more permanent openings with the room in which such exhaust system is located. Such permanent openings shall have a net cross-sectional area not less than the required area of the makeup air supply openings.

Commenter's Reason: This PC represents a consensus position between proponents and opponents of RM8 that addresses the committee's concerns while establishing minimum and reasonable requirements for clothes dryer makeup air. It was also reviewed and approved by the PMGCAC. The PC borrows from the makeup air requirements of Section 504.7 of the IMC and Section G2439.5 of the IRC Fuel Gas chapter, recognizes the primacy of manufacturer installation instructions (similar to how clothes dryer exhaust duct equivalent length is addressed in Section M1502.4.6.2), and introduces definitions of makeup air, transfer air, and outdoor air that are also copied from the IMC. In the case that manufacturer instructions do not provide specifications for the provision of makeup air, the text and accompanying definitions clarify that transfer air can be used to meet makeup air requirements for clothes dryers in closets or that makeup air could be directly ducted from the outdoors to the clothes dryer closet, at the builder's discretion.

To ensure that the cross-walked definitions are compatible with other makeup air requirements in the IRC, slight modifications have been made to the kitchen range hood makeup air section. These modifications clarify that, where required by M1503.6, a kitchen range hood makeup air system shall have at least one outdoor air duct to provide makeup air. This modification is made to preserve the intent of Section M1503.6 when introducing the definition of makeup air to the IRC.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
In most cases, this language should not increase the cost of construction as it permits transfer air to serve as makeup air for clothes dryers and recognizes manufacturer instructions as the primary path for determining makeup air requirements for clothes dryers.

Public Comment# 2328

RM9-21

Proposed Change as Submitted

Proponents: Mike Moore, Stator LLC, representing Broan-NuTone (mmoore@statorllc.com)

2021 International Residential Code

Revise as follows:

M1503.3 Exhaust discharge. Domestic cooking exhaust equipment shall discharge to the outdoors through a duct. The duct shall have a smooth interior surface, shall be airtight, shall be equipped with a backdraft damper and shall be independent of all other exhaust systems. Ducts serving domestic cooking exhaust equipment shall not terminate in an attic or *crawl space* or areas inside the building.

Exception: ~~Where installed in accordance with the manufacturer's instructions, and where mechanical or natural *ventilation* is otherwise provided, *l* L*isted* and *labeled* ductless range hoods shall not be required to discharge to the outdoors~~ , provided that the installation complies with all of the following:

1. The equipment is installed in accordance with the manufacturer's instructions.
2. Mechanical or natural ventilation is otherwise provided in the cooking area.
3. The equipment is installed in an existing kitchen not having an existing range hood exhaust duct to the outdoors.

Reason: Cooking is typically the largest source of indoor air pollution in homes, with concentrations of key pollutants frequently exceeding U.S. National Ambient Air Quality Standards. Over time, exposure to these pollutants has been shown to reduce duration and quality of life. Research has demonstrated that provision of kitchen ventilation is needed to comply with the Section 101.3 purpose of the IRC to "establish minimum requirements to safeguard the public safety, health and general welfare through ...ventilation." Unless captured at the source and exhausted to the exterior, cooking pollutants spread rapidly through a home and deposit on surfaces, only to be released again into the breathing zone when disturbed at a later time. This proposal adds one more condition to the two conditions within this section that are required to approve ductless range hoods: the installation of the ductless range hood must be in an existing kitchen that does not have an existing range hood exhaust duct to the outdoors. This will ensure that where installed within new construction, range hoods will be exhausted to the exterior. The exception permitting ductless range hoods for existing construction is provided in recognition of the high costs that could otherwise be associated with retrofitting a duct to the exterior. Within new construction, requiring a range hood to be ducted can be a very low-cost item with high returns in terms of occupant health. Please see the cost statement for more information.

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Cost Impact: The code change proposal will increase the cost of construction
There is no increase in construction costs for existing homes.

Where homes of new construction are already provided with range hoods ducts, there will not be any increase in construction cost.

Where new construction homes are not currently provided with ducts for their range hoods, this proposal would increase the cost of construction. Installed duct costs can be estimated at ~ $7.10 per linear foot for 6" diameter galvanized steel duct (Mechanical Costs with RS Means Data. 2020. Section 23 31 13.16.5420), and a damper would cost about $25 retail.

RM9-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The range hood is not required. Removes the option for a recirculation hood. Would be problematic for townhomes where the range hood is not typically on an exterior wall. (11-0)

RM9-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1503.3

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

M1503.3 Exhaust discharge . Domestic cooking exhaust equipment shall discharge to the outdoors through a duct. The duct shall have a smooth interior surface, shall be airtight, shall be equipped with a backdraft damper and shall be independent of all other exhaust systems. Ducts serving domestic cooking exhaust equipment shall not terminate in an attic or *crawl space* or areas inside the building.

Exception: *Listed* and *labeled* ductless range hoods shall not be required to discharge to the outdoors, provided that the installation complies with all of the following:

1. The equipment is installed in accordance with the manufacturer's instructions.
2. ~~Mechanical or natural ventilation~~ Local exhaust is otherwise provided in the ~~cooking area.~~ kitchen in accordance with Section M1505, or the equipment is installed in an *existing building's* kitchen where mechanical or natural ventilation is otherwise provided.
3. ~~The equipment is installed in an existing kitchen not having an existing range hood exhaust duct to the outdoors.~~

Commenter's Reason: As cited in the reason statement for the original proposal, the negative health effects associated with pollutant concentrations that occur when cooking pollutants are not exhausted has been well documented (see original bibliography). However, there continues to be market resistance to proposals that require range hoods to exhaust to the exterior. In response to this opposition, this PC provides more flexibility than the original proposal. For existing buildings, the PC makes no effective change to the current IRC language (recirculating range hoods are permitted where natural or mechanical ventilation is otherwise provided). For all other buildings, the PC only permits recirculating range hoods where local exhaust is otherwise provided (note that local exhaust is now required by Section R303.4 for all buildings and dwelling units complying with Section N1102.4.1, so no new construction complying with Chapter 11 and Section R303.4 of the IRC will be affected by this PC). The PC gives existing buildings a "pass" on mechanically exhausting a kitchen because retrofitting an exhaust duct can be prohibitively expensive. In new construction, however, costs to install ducting are much lower (see cost impact statement). Relying on natural ventilation alone is an insufficient means to provide required ventilation because it requires pressure differentials that may or may not exist, and when they exist, the pressure differential could be just as likely to spread the pollutant throughout the dwelling unit and neighboring units (in the case of attached dwelling units) as it would be to exhaust the pollutant directly to the outdoors. Further, studies have shown that occupants often do not operate windows for ventilation, even in temperate climates.[1,2,3] Concerns with window operation include security and discomfort (including severe draft in winter). For

these reasons, the proposal requires that when recirculating hoods are provided in other than existing construction, some other form of local exhaust must also be provided.

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3. F. J. Offermann, J. Robertson, D. Springer, S. Brennan, and T. Woo. 2008. Window Usage, Ventilation, and Formaldehyde Concentrations in New California Homes: Summer Field Sessions. ASHRAE IAQ 2007 Conference, Baltimore, MD. http://www.iee-sf.com/pdf/OffermannPaper.pdf.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
There is no increase in construction costs for existing buildings. There is also no increase in construction costs for new construction that meets the requirements of Section R303.4 and Chapter 11 of the IRC.

New construction that does not comply with these sections of the IRC and that does not already provide a local mechanical exhaust system in the kitchen would experience an increase in the cost of construction if they elect to install a recirculating hood. In such cases, this proposal would increase the cost of construction. Installed duct costs can be estimated at ~ $7.10 per linear foot for 6" diameter galvanized steel duct (Mechanical Costs with RS Means Data. 2020. Section 23 31 13.16.5420), and a termination would cost about $35 retail.

Public Comment# 2702

RM12-21

Proposed Change as Submitted

Proponents: Joseph Summers, representing Chair of PMGCAC (PMGCAC@iccsafe.org)

2021 International Residential Code

Revise as follows:

M1504.3 Exhaust openings. Air exhaust openings shall terminate as follows:

1. Not less than 3 feet (914 mm) from property lines.
2. Not less than 3 feet (914 mm) from gravity air intake openings, operable windows and doors.
3. Not less than 10 feet (3048 mm) from mechanical air intake openings except where the either of the following apply:

   3.1. The exhaust opening is located not less than 3 feet (914 mm) above the air intake opening.

   3.2 The exhaust opening is part of an approved factory-built intake/exhaust combination termination fitting installed in accordance with the manufacturer's instructions, and the exhaust air is drawn from a living space.

4. Openings shall comply with Sections R303.5.2 and R303.6.

Reason: Intake/exhaust combination terminations are regularly installed with heating and energy recovery ventilators (H/ERVs) used for dwelling units. Their use reduces building penetrations, labor, and associated system costs. By reducing the number of penetrations, air leakage can also be reduced, resulting in space conditioning energy savings. Further, the durability of the structure can be improved through reducing entry pathways for bulk water. Manufacturer tests conducted by Natural Resources Canada (NRC) have demonstrated that use of intake/exhaust combination terminations results in minimum cross-contamination of airflows(i.e., not exceeding 4%; see NRC report A1- 007793). These results are aligned with ASHRAE 62.2 approval of such devices, which limits cross-contamination to 10%, as verified by the manufacturer. If approved, this proposed modification to the IRC would limit application of intake/exhaust combination terminations to “approved”, “factory-built” units. Approval of this proposed modification is expected to result in more affordable and architecturally flexible terminations. Note: The IRC defines living space as, “space within a dwelling unit utilized for living, sleeping, eating, cooking, bathing, washing and sanitation purposes”.
This proposal is submitted by the ICC Plumbing/Mechanical/Gas Code Action Committee (PMG CAC). The PMG CAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2020, the PMG CAC has held several virtual meetings open to any interested party. Numerous interested parties attended the committee meetings and offered their input. Related documentation and reports are posted on the PMG CAC website at: https://www.iccsafe.org/products-and-services/i-codes/code-development-process/pmg-code-action-committee-pmgcac/ Reference PMGCAC Working Document Item 7.

Bibliography: Ouazia, B. 2016. Evaluation of a dual hood performance in term of contaminant re-entrainment from exhaust to supply. A1-007793. National Research Council Canada. For a copy of the report, please contact the proponent at the email address provided. Additional reports are available from the proponent upon request.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal will not increase the cost of construction because no additional labor, materials, equipment, appliances or devices are mandated beyond what is currently required by the code.

RM12-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: The Committee agreed with the published reason statement. (11-0)

RM12-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1504.3

Proponents: Joseph J. Summers, representing Chair of PMGCAC (pmgcac@iccsafe.org) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

M1504.3 Exhaust openings . Air exhaust openings shall terminate as follows:

1. Not less than 3 feet (914 mm) from property lines.
2. Not less than 3 feet (914 mm) from gravity air intake openings, operable windows and doors.
3. Not less than 10 feet (3048 mm) from mechanical air intake openings except where the either of the following apply:

    3.1. The exhaust opening is located not less than 3 feet (914 mm) above the air intake opening.

    3.2 The exhaust opening is part of ~~an approved~~ a factory-built intake/exhaust combination termination fitting installed in accordance with the fan manufacturer's instructions, and the exhaust air is drawn from a living space.

4. Openings shall comply with Sections R303.5.2 and R303.6.

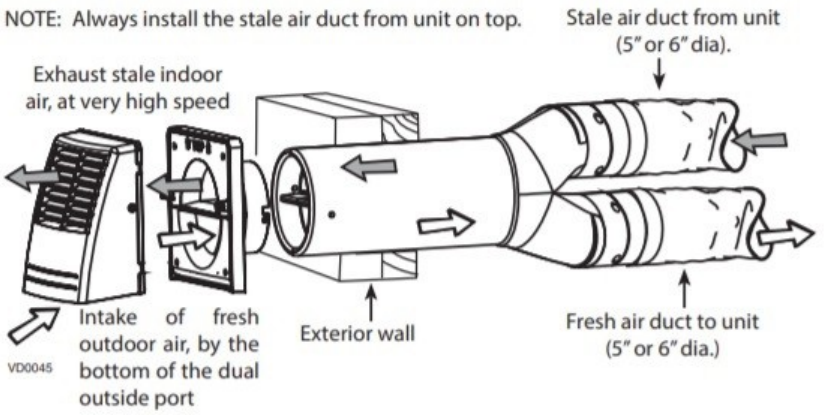
Commenter's Reason: This comment modifies language approved by the IRC Mechanical committee to align with the IMC Committee's action on M16.
Factory-built intake/exhaust combination termination fittings are regularly provided by fan manufacturers and installed by builders to separate mechanical air intakes from mechanical exhaust serving dwelling unit or sleeping unit mechanical ventilation systems. The included image from a fan manufacturer's installation instructions provides an example of a typical fitting serving this purpose.

The IRC Mechanical committee's approval of RM12 as submitted aligned with the 2018 IMC's Sections 401.4 and 501.3.1 approval of the use of "*approved* factory-built intake/exhaust combination termination fittings" to separate the air streams associated with mechanical intake air openings and living space exhaust air, when the fitting is provided in accordance with the fan manufacturer's instructions. Similarly, Section G2407.1 of the Fuel Gas Code (see below for reference) approves the use of concentric vent termination fittings to separate combustion air from flue gases provided that such fittings are installed “in accordance with the appliance manufacturer’s instructions”; the primary difference between the 2018 IMC and the Fuel Gas Code in this respect is that the Fuel Gas Code does not require special approval for concentric vent termination fittings.

By approving M16 as submitted, the IMC Committee removed the requirement for factory-built intake/exhaust combination termination fittings to be "approved" when such terminations are installed in accordance with the "appliance" manufacturer's instructions (based on feedback received since the hearings, a PC will be submitted to M16 to change the word "appliance" to "fan" to better clarify that such terminations must be recognized by the fan manufacturer to be provided without special approval). This action aligned the 2024 IMC requirements for factory-built intake/exhaust combination termination fittings with the Fuel Gas Code's treatment of concentric vent termination fittings (i.e., no special approval is required when installed in accordance with the appliance/fan manufacturer's instructions). Approval of this public comment to RM12 and approval of M16 as modified with the PMGCAC's public comment will align the 2024 IRC, 2024 IMC, and 2024 FGC in this regard.

Fuel Gas Code reference: "G2407.1 (304.1) General. ...Direct-vent appliances, gas appliances of other than natural draft design, vented gas appliances not designated as Category I and appliances equipped with power burners, shall be provided with combustion, ventilation and dilution air in accordance with the appliance manufacturer’s instructions."

Installation



Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
Removing requirements for special approval of factory-built intake/exhaust combination termination fittings can be expected to reduce labor costs for builders, contractors, and code officials.

Public Comment# 2253

RM15-21

Proposed Change as Submitted

Proponents: Mike Moore, Stator LLC, representing Broan-NuTone (mmoore@statorllc.com)

2021 International Residential Code

Revise as follows:

M1505.4.3 Mechanical ventilation rate. The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate not less than that determined in accordance with Table M1505.4.3(1) or not less than that determined by Equation 15-1.

Ventilation rate in cubic feet per minute = {air leakage factor x [(0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)]} **(Equation 15-1)**

where the air leakage factor is determined in accordance with Table M1505.4.3(3)

Exceptions:

1. Ventilation rate credit. The minimum mechanical ventilation rate determined in accordance with Table M1505.4.3(1) or Equation 15-1 shall be reduced by 30 percent, provided that both of the following conditions apply:

   1.1. A ducted system supplies ventilation air directly to each bedroom and to one or more of the following rooms:

      1.1.1. Living room.

      1.1.2. Dining room.

      1.1.3. Kitchen.

   1.2. The whole-house ventilation system is a balanced ventilation system.

2. Programmed intermittent operation. The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate prescribed in Table M1505.4.3(1), by Equation 15-1 or by Exception 1 is multiplied by the factor determined in accordance with Table M1505.4.3(2).

TABLE M1505.4.3(1) CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIRFLOW RATE REQUIREMENTS

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0–1	2–3	4–5	6–7	> 7
	Airflow in CFM				
	Dwelling Unit Design Air Leakage Rate (ACH50)[a]				
~~< 1,500~~	~~30~~	~~45~~	~~60~~	~~75~~	~~90~~
~~1,501–3,000~~	~~45~~	~~60~~	~~75~~	~~90~~	~~105~~
~~3,001–4,500~~	~~60~~	~~75~~	~~90~~	~~105~~	~~120~~
~~4,501–6,000~~	~~75~~	~~90~~	~~105~~	~~120~~	~~135~~
~~6,001–7,500~~	~~90~~	~~105~~	~~120~~	~~135~~	~~150~~
~~> 7,500~~	~~105~~	~~120~~	~~135~~	~~150~~	~~165~~
5 ACH50					
< 1500	35	50	70	85	105
1,501-2,500	40	55	75	90	110
2,501-3,500	45	60	85	105	120
3,501-4,500	50	70	90	115	135
4,501-5,500	60	75	100	120	140
5,501-6,500	65	85	110	130	150
6,501-7,500	75	90	115	140	160
> 7,500	80	100	120	145	170
4 ACH50					
< 1500	45	55	75	90	110
1,501-2,500	50	65	85	100	120
2,501-3,500	65	80	100	120	135
3,501-4,500	80	95	115	135	155
4,501-5,500	95	115	135	150	170
5,501-6,500	110	130	150	170	185
6,501-7,500	130	145	165	185	205
> 7,500	145	160	180	200	220
3 ACH50					
< 1500	50	65	80	95	110
1,501-2,500	60	75	90	110	125
2,501-3,500	85	95	115	130	145
3,501-4,500	105	120	135	155	170
4,501-5,500	125	140	160	175	195
5,501-6,500	150	160	180	200	215
6,501-7,500	170	185	200	220	235
> 7,500	190	205	225	240	260
2 ACH50					
< 1500	55	70	85	100	115
1,501-2,500	70	80	95	110	130
2,501-3,500	95	110	125	140	155
3,501-4,500	120	135	150	165	180
4,501-5,500	150	160	175	195	210
5,501-6,500	175	185	205	220	235
6,501-7,500	200	215	230	245	260

> 7,500	225	240	255	270	290
DWELLING UNIT FLOOR AREA (square feet)	**NUMBER OF BEDROOMS**				
	1 ACH50 **0–1**	**2–3**	**4–5**	**6–7**	**> 7**
< 1500	60	70	**Airflow in CFM** 85	100	115
1,501-2,500	75	85	100	115	130
2,501-3,500	105	115	130	145	160
3,501-4,500	130	145	160	175	190
4,501-5,500	160	170	190	205	220
5,501-6,500	190	200	215	230	245
6,501-7,500	220	230	245	260	275
> 7,500	250	260	275	290	305

a. ACH50 = dwelling unit design air leakage rate at 50 Pascals of pressure, found as the lesser of the value specified by the builder or design professional, where applicable, and the maximum air leakage permitted by Section N1102.4.1.2.

For SI: 1 square foot = 0.0929 m^2, 1 cubic foot per minute = 0.0004719 m^3/s.

Add new text as follows:

TABLE M1505.4.3(3) WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIR LEAKAGE FACTOR

ACH50[a]	5	4	3	2	1
Air Leakage Factor	1	1.3	1.7	1.7	1.8

a. ACH50 = dwelling unit design air leakage rate at 50 Pascals of pressure, found as the lesser of the value specified by the builder or design professional, where applicable, and the maximum air leakage permitted by Section N1102.4.1.2.

Reason: Requirements for whole-house mechanical ventilation are developed with the objective of achieving an annual average number of air changes per hour, where fresh, outdoor air replaces indoor air. In practice, ventilation is achieved by a combination of natural (via leakage through the building envelope) and mechanical means. The leakier a home is, the more natural ventilation is available. The tighter a home is, the more mechanical ventilation is needed to achieve the same number of air changes. To support access to acceptable indoor air quality in any home, regardless of how tightly it is constructed, the IRC's whole-house mechanical ventilation rates should be determined as a function of the air leakage rate of the home -- with tighter homes requiring more mechanical ventilation than leaky homes. Currently, the IRC requires the same whole-house mechanical ventilation rate for a home, regardless of whether its leakage rate is 5 ACH50 or 1 ACH50; this is not reasonable and results in far fewer air changes (and likely poorer IAQ) for the tight, energy-efficient home with a 1 ACH50 leakage rate.
ASHRAE Standard 62.2 provides a method for determining a home's mechanical ventilation rate as a function of its natural ventilation rate. Within 62.2, the natural ventilation rate is determined as a function of the measured leakage rate of a home (i.e., air changes per hour at 50 Pascals, aka "ACH50"), the weather shielding factor (varies by the severity of the local climate with respect to wind and annual ambient temperature), the height of the home, and the percent of the building envelope surface area that is not attached to garages or other dwelling units. The 62.2 method can be fairly complicated for builders; so this proposal offers a simplified and more prescriptive method for achieving reasonably comparable results by using a simple table or equation. The net effect of this proposal is to provide the same annual average fresh air changes for a home - regardless of whether its air leakage rate of is 1 ACH50 or 5 ACH50. For reasons of practicality, the mechanical ventilation rate is proposed to be determined based on the design air leakage rate and not the tested air leakage rate. Where there is no design air leakage rate, the leakage rate is assumed to be equal to the leakage limit permitted by IRC Section N1102.4.1.2.

Method and assumptions used in deriving the table and equation:

The contribution of natural ventilation to the total annual average ventilation rate was calculated using ASHRAE 62.2-2019 Equation 4-3. The average weather and shielding factor selected was 0.56, which is the average across all weather stations listed in ASHRAE 62.2-2019. Home height is a function of number of stories, with each story contributing 9 feet to the height above grade and the number of stories determined by 10-year average U.S. Census data weightings (i.e., 44% for one-story, 51% for two-story, and 5% for three-story). One hundred percent of the building envelope area is assumed to be adjacent to the exterior (maximizing the natural ventilation credit). The mechanical ventilation rate provided in Table M1505.4.3(1) is calculated using the average floor area and average number of bedrooms of the corresponding range (for example, for a home with a floor area of 2500-3500 sqft and 4-5 bedrooms, the ventilation rate was calculated assuming a floor area of 3000 sqft and 4.5 bedrooms). The "air leakage factor" was determined empirically by recording, for each building envelope air leakage rate, the multiple of the existing Equation 15-1 that was associated with the most typical combinations of rooms and floor area.

Cost Impact: The code change proposal will increase the cost of construction
For dwelling units that have a design leakage rate of 5 ACH50 or higher, there may be no increase in construction costs, as the mechanical ventilation rates proposed are very close to those that are currently required by this section for many cases. For other dwelling units, this proposal may increase the cost of construction, but this is not always the case. For example, builders specifying an exhaust or supply fan for the outdoor air ventilation system could use a multi- or variable speed fan that will accommodate multiple flow rate settings (e.g., 50/80/110 cfm are typical for exhaust fans; supply fans typically have even higher flow rate settings), with no additional construction costs for selecting a higher speed and airflow rate.

For the typical case of a 3 ACH50, 2500 ft2 home with 4-5 bedrooms, the ventilation rate required by this proposal's modification to Table M1505.4.3(1) would be 90 cfm, which is 15 cfm higher than the 75 cfm currently required by the IRC for this same home. If the builder is already using a nominal, single-speed 110 cfm exhaust fan or multi-speed exhaust fan to provide WHMV, there is no additional cost. If the builder previously used a single-speed 80 cfm exhaust fan and transitioned to a single-speed 110 cfm exhaust fan, the additional cost would be about $10-$20 retail.

RM15-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The increased ventilation rates will result in excessive indoor humidity resulting in a need for dehumidification. The method uses a blower door test to establish the ventilation rate.

RM15-21

Individual Consideration Agenda

Public Comment 1:

IRC: TABLE M1505.4.3(3)

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

TABLE M1505.4.3(3) WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIR LEAKAGE FACTOR

ACH50[a]	5	4	3	2	1
Air Leakage Factor	~~1~~ 1.2	~~1.3~~ 1.4	1.7	~~1.7~~ 1.8	~~1.8~~ 1.9

a. ACH50 = dwelling unit design air leakage rate at 50 Pascals of pressure, found as the lesser of the value specified by the builder or design professional, where applicable, and the maximum air leakage permitted by Section N1102.4.1.2.

Commenter's Reason: The committee's statement that this proposal requires a blower door test is incorrect. The method is based on a *design* air leakage rate that does not require a blower door test. If no design air leakage rate is provided by the builder or design professional, the design air leakage rate defaults to what is specified in Chapter 11 (see footnote a to the proposed Table M1505.4.3(1) for more information. Tightening a home's envelope without simultaneously increasing ventilation will inevitably increase the concentration of pollutants generated indoors. To maintain acceptable indoor air quality (IAQ), the minimum ventilation rate should therefore increase as a home's leakage rate decreases. As pointed out during the committee action hearings, it is unfortunate that maintaining acceptable IAQ generally requires energy use for conditioning and sometimes for dehumidification. However, the code's purpose is to "establish minimum requirements to provide a reasonable level of safety, health and general welfare", even when such measures require energy.
The committee requested more information be provided regarding the affect of airflow rates on health and welfare. Studies that have shown better health outcomes for building occupants as a function of higher ventilation rates include:

1. Sundell[1]: Sick building syndrome declines as ventilation rate increases.

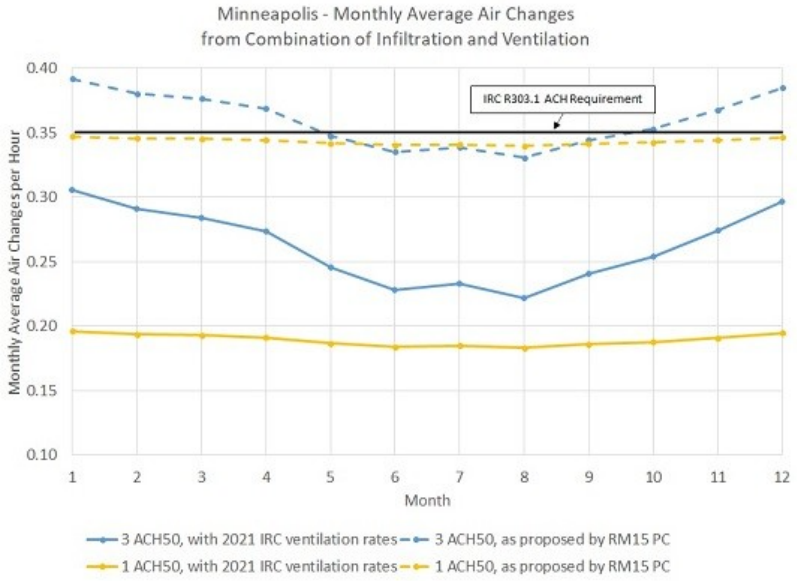
2. Milton[2]: Sick leave decreases as ventilation rate increases.

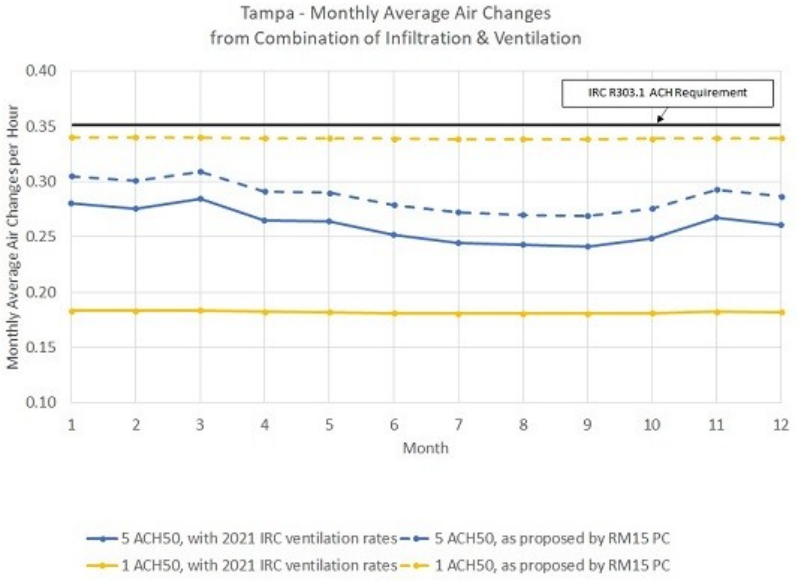
3. Bornehag[3]: Risk of asthma for children increases with decreasing ventilation rate in homes.

4. Seppänen[4]: Productivity decreases with decreasing ventilation rate.

While most of these studies were conducted in commercial buildings, LBNL's[5] analysis of residential studies concluded that, “Just over half of (residential) studies report one or more statistically significant health benefits of increased ventilation rates.” LBNL noted that, “The findings of research on how ventilation rates in homes affect health are mixed,” but that “overall… the number of reported statistically significant improvements in health with increased ventilation rates far exceeded the anticipated chance improvements in health.”

In addition to noting the research that has associated higher ventilation rates with improved performance, reduced sick leave, and various improved health outcomes, it is informative to compare the IRC's ventilation rates with international ventilation rates. As a point of reference, the IRC M1505.4.3 mechanical ventilation rate for a 2,000 ft^2, 3-bedroom home with 8-foot ceilings is 0.19 air changes per hour (found by applying the Equation 15-1 rate of 50 cfm to volume of 16,000 ft^3). This rate is 60% lower than the average of the European rates reported Brelih and Seppänen[6]. The IRC M1505.4.3 rate is also 46% lower than the IRC ventilation rate required in Section R303.1.1 for habitable rooms without glazing. If we know the building leakage rate (ACH50) and the mechanical ventilation airflow rate, we can use ASHRAE's Handbook of Fundamentals[6] to determine the total air changes as a function of outdoor weather conditions. Following are graphs that show the average monthly combined infiltration and ventilation air change rates that can be expected for a typical home in Minneapolis and in Tampa as a function of building envelope leakage -- when following the current M1505.4.3 ventilation requirements (solid lines) and when following the modified rates proposed by this PC to RM15 (dashed lines). Note that the ventilation factors were corrected based on an error that was identified during the PC review process. The spreadsheet used to calculate these values is available upon request.





To keep concentrations of indoor air pollutants in check, ventilation rates should increase as homes get tighter. Studies have shown improvements in health outcomes with increasing ventilation rates. The ventilation rate required by the IRC M1505.4.3 is far lower than European rates, ASHRAE 62.2 rates, and even the rate required by IRC Section 301.1.1. Approval of RM15 as modified by this public comment will provide a rational and scalable air change rate for tightly constructed homes.

Bibliography: 1. Sundell et al. 1994. Sick Building Syndrome (SBS) in Office Workers and Facial Skin Symptoms among VDT-Workers in Relation to Building and Room Characteristics: Two Case-Referent Studies. Indoor Air, 4: 83-94.
2. Milton et al. 2000. Risk of Sick Leave Associated with Outdoor Air Supply Rate, Humidification, and Occupant Complaints. Indoor Air, 10:212-221.
3. Bornehag, C & Sundell, Jan & Hägerhed, Linda. (2003). Asthma and allergy among children and the association to ventilation rate at home, a case control study. Epidemiology. 14. 10.1097/00001648-200309001-00224.
4. Seppänen, O. A., and W. Fisk. 2006. Some quantitative relations between indoor environmental quality and work performance or health. HVAC&R Research 12 (4):957–73. doi:10.1080/10789669.2006.10391446.
5. Lawrence Berkeley National Laboratory. Indoor Air Quality Scientific Findings Resource Bank. Building Ventilation. Accessed May 6, 2021. https://iaqscience.lbl.gov/vent-summary#:~:text=Just%20over%20half%20of%20studies,improve%20with%20increased%20ventilation%20rates.
6. ASHRAE. 2017. Handbook of Fundamentals. 16.24, Enhanced Model with associated assumptions.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
Please refer to the original cost impact statement.

Public Comment# 2895

Public Comment 2:

Proponents: Dan Buuck, representing National Association of Home Builders (dbuuck@nahb.org) requests Disapprove

Commenter's Reason: The proposal does not provide evidence of issues in homes built to meet the current ventilation rates and building tightness criteria. However, the added ventilation would increase energy use and lead to issues with indoor relative humidity. An analysis of increased ventilation rates showed that the added humid air would require supplemental dehumidification in homes located as far north as Virginia, D.C., and Maryland. Supplemental dehumidification is expensive and onerous to install and to maintain. In cold climates, the added ventilation will lead to low indoor relative humidity during the heating season and will trigger the need for supplemental humidification, which can be similarly expensive and onerous to install and to maintain. If not monitored optimally, the supplemental humidification can lead to moisture issues due to increased vapor drive through the exterior envelope. The increased energy use is the result of the additional demand for sensible heat (cooling/heating), latent heat (relative humidity control), and fan energy.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 2613

Public Comment 3:

Proponents: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing Myself (joe@buildingscience.com) requests Disapprove

Commenter's Reason: The premise that as the houses get tighter they need more code ventilation is incorrect. The current ventilation rate specified in the IRC and IMC assumes no infiltration. That is why there is no code difference between 5 ach@50 and 3 ach@50, etc. The reason is that infiltration is unpredictable and cannot be relied upon. That is why no major code anywhere (ie. Canada and Europe) provides a credit for infiltration.

A blower door test and the ASHRAE ventilation model is extremely unreliable - it has been shown to be widely inaccurate - it over estimates the contribution by infiltration by 30 to 100 percent in the tracer gas testing in the published literature. The reason is that the blower door test does not tell you the distribution of holes and the actual pressures acting on them. The pressures are dominated by indoor/outdoor temperature differences and wind…. which vary seasonally and by climate zone. Hence the necessity to ignore infiltration and give it no credit and have a uniform rate in all climate zones.

Varying ventilation rate by tightness sends exactly the wrong message…that tight construction results in IAQ issues…and that message will discourage better construction.

Increasing the ventilation rate by up to 80 percent in code houses will lead to excessive humidity issues in hot humid and mixed humid climates. We already see this with the ASHRAE 62.2 rate which is 50 percent higher than the code rate. The higher rates require dehumidifiers and high end a/c systems to address the “part-load” humidity issue.

In cold climates it leads to excessive dryness and a need for “energy recovery ventilators” (ERV’s) to preserve indoor humidity and avoid humidifiers.

The changes will lead to significantly increased operating costs (energy) and significantly increased construction costs (dehumidifiers, higher moisture removal a/c, and energy recovery ventilators (ERV’s).

If the issue of concern is IAQ and a lack of ventilation then the correct approach is to increase the ventilation rate requirement for all houses in all climates the same amount. That of course would have to be justified by real indoor contaminant data and real health studies. The proponent should come back with a proposal that does that.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
No change to code.

Public Comment# 2712

RM16-21

Proposed Change as Submitted

Proponents: Mike Moore, Stator LLC, representing Broan-NuTone (mmoore@statorllc.com)

2021 International Residential Code

Delete without substitution:

~~**[MP] BALANCED VENTILATION.** Any combination of concurrently operating mechanical exhaust and mechanical supply whereby the total mechanical exhaust airflow rate is within 10 percent of the total mechanical supply airflow rate.~~

Revise as follows:

[MP] BALANCED VENTILATION SYSTEM. A ventilation system where the total mechanical supply airflow and total mechanical exhaust airflow are simultaneously within 10 percent of their average~~s~~. The balanced ventilation system airflow is the average of the mechanical supply and mechanical exhaust airflows.

M1505.4.3 Mechanical ventilation rate. The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate not less than that determined in accordance with Table M1505.4.3(1) or not less than that determined by Equation 15-1.

Ventilation rate in cubic feet per minute = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)] **(Equation 15-1)**

Exceptions:

1. Ventilation rate credit. The minimum mechanical ventilation rate determined in accordance with Table M1505.4.3(1) or Equation 15-1 shall be reduced by 30 percent, provided that both of the following conditions apply:

   1.1. A ducted system supplies ventilation air directly to each bedroom and to one or more of the following rooms:

      1.1.1. Living room.

      1.1.2. Dining room.

      1.1.3. Kitchen.

   1.2. The whole-house ventilation system is a *balanced ventilation system*.

2. Programmed intermittent operation. The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate prescribed in Table M1505.4.3(1), by Equation 15-1 or by Exception 1 is multiplied by the factor determined in accordance with Table M1505.4.3(2).

Reason: The 2021 versions of the IMC and IRC introduced a 30% ventilation rate credit for dwelling units with systems providing balanced ventilation. Because these changes were based on the approval of multiple proposals, their approval resulted in different definitions for *balanced ventilation* and *balanced ventilation system* across the IRC and IMC. This proposal and its companion proposal to the IMC are correlation proposals that will align the terminology, definitions, and their application across both codes. This proposal deletes the term "*balanced ventilation*", which is not used within the IRC, and modifies the term "*balanced ventilation system*" to incorporate the relevant components of "*balanced ventilation*". The proposed definition for "balanced ventilation system" is also proposed within the companion proposal to the IMC. The change that is proposed in Section M1505.4.3 exception 1.2 is italicizing the phrase "*balanced ventilation system*" so that the user is directed to the corresponding definition.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change is editorial and therefore will not increase or decrease the cost of construction.

RM16-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: The committee agreed with the published reason statement. (11-0)

Individual Consideration Agenda

Public Comment 1:

IRC: SECTION 202

Proponents: Joseph J. Summers, representing Chair of PMGCAC (pmgcac@iccsafe.org) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

[MP] BALANCED VENTILATION SYSTEM . ~~A ventilation system where the total mechanical supply airflow and total mechanical exhaust airflow are simultaneously within 10 percent of their average. The balanced ventilation system airflow is the average of the mechanical supply and mechanical exhaust airflows.~~
A ventilation system that simultaneously supplies outdoor air to and exhausts air from a space, where the mechanical supply airflow rate and the mechanical exhaust airflow rate are each within 10% of the average of the two airflow rates.

Commenter's Reason: The PMGCAC worked with the proponent to revise the language in response to the IMC Committee's comments on M23, which is the coordinating proposal to align definitions across the IMC and IRC. All parties agree that this definition better clarifies the meaning of the current term. The PMGCAC and the proponent are submitting a coordinating public comment to revise the IMC definition under M23.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This change is a non-substantive clarification of an existing definition.

Public Comment# 2453

RM17-21

Proposed Change as Submitted

Proponents: Glenn Mathewson, BuildingCodeCollege.com, representing Self (glenn@glennmathewson.com)

2021 International Residential Code

Add new text as follows:

M1506
LOCAL EXHAUST RATES

Revise as follows:

~~M1505.4.4~~ M1506.1 ~~Local exhaust rates~~ General. *Local exhaust* systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table ~~M1505.4.4.~~ M1506.1

TABLE ~~M1505.4.4~~ M1506.1 MINIMUM REQUIRED LOCAL EXHAUST RATES ~~FOR ONE- AND TWO-FAMILY DWELLINGS~~

AREA TO BE EXHAUSTED	EXHAUST RATES[a]
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 inch water column = 0.2488 kPa.

a. The listed exhaust rate for bathrooms-toilet rooms shall equal or exceed the exhaust rate at a minimum static pressure of 0.25 inch water column in accordance with Section M1505.3.

M1503.5 Kitchen exhaust rates. Where domestic kitchen cooking *appliances* are equipped with ducted range hoods or down-draft exhaust systems, ~~the fans shall be sized in accordance with Section M1505.4.4.~~ the minimum exhaust rate shall be in accordance with Section M1506.1

Reason: 1) Local exhaust rates for kitchens and bathrooms should not be a subsection of whole house mechanical ventilation. This proposal creates a new subsection 305.5 "Local Exhaust Rates"

2) There is no reason to state "one and two-family dwellings" unless this is meant to not apply to dwelling units in a townhouse. Technically (by definition), a townhouse contains "dwelling units" and is not a "dwelling". There is no reason this would not also apply to dwelling units in townhouses.
3) The reference to the minimum kitchen exhaust rate should be about exhaust rates, not "sizing of fans".

Cost Impact: The code change proposal will not increase or decrease the cost of construction
1) Striking out the term “for one- and two-family dwellings” will not change the cost of construction, because the provisions in the table are already applied to “dwelling units” in “townhouses” in industry standard practice. The IRC scope is only for one- and two-family dwellings and townhouses, and since the provisions in this table apply to all of those, there is no necessity to describe the building types in the table heading.

2) Moving Table M1506.1 into its own section does not change the application of the table and thus does not affect the cost of construction. It is simply a reorganization, as local exhaust rates are not directly associated with whole-house ventilation systems.

3) Changing the phrase “the fans” to “exhaust rate” used in Section M1503.5 to reference Table M1504.4 so that the object of the reference matches the title and purpose of the table (exhaust rate) will have no cost impact on construction.

RM17-21

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

~~M1506.1~~ M1505.5 ~~General~~ Local exhaust rates. *Local exhaust* systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table ~~M1506.1~~ M1505.5

TABLE ~~M1506.1~~ M1505.5 MINIMUM REQUIRED LOCAL EXHAUST RATES

AREA TO BE EXHAUSTED	EXHAUST RATES[a]
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 inch water column = 0.2488 kPa.

a. The listed exhaust rate for bathrooms-toilet rooms shall equal or exceed the exhaust rate at a minimum static pressure of 0.25 inch water column in accordance with Section M1505.3.

M1503.5 Kitchen exhaust rates. Where domestic kitchen cooking *appliances* are equipped with ducted range hoods or down-draft exhaust systems, the exhaust rate shall equal or exceed the airflow required in Table M1505.5 at one or more speed settings. ~~the minimum exhaust rate shall be in accordance with Section M1506.1~~

Committee Reason: For the modification: It clears up the language of the original proposal by applying the highest setting to the minimum requirement, which was the intent of the original proposal.
For the proposal as modified: It provides clarity for the minimum requirements. (7-4)

RM17-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1506, TABLE M1505.5, M1503.5, M1505.5

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com); Glenn Mathewson, representing Self (glenn@glennmathewson.com) requests As Modified by Public Comment

Further modify as follows:

2021 International Residential Code

~~**M1506**~~

~~**LOCAL EXHAUST RATES**~~

TABLE M1505.5 MINIMUM REQUIRED LOCAL EXHAUST RATES

AREA TO BE EXHAUSTED	EXHAUST RATES[a]
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	~~Mechanical exhaust capacity of~~ 50 cfm intermittent or 20 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 inch water column = 0.2488 kPa.

a. The listed exhaust rate for bathrooms-toilet rooms shall equal or exceed the exhaust rate at a minimum static pressure of 0.25 inch water column in accordance with Section M1505.3.

M1503.5 Kitchen exhaust rates . Where domestic kitchen cooking *appliances* are equipped with ducted range hoods or down-draft exhaust systems, the exhaust rate shall equal or exceed the airflow required in Table M1505.5 at one or more speed settings.

M1505.5 Local exhaust rates . *Local exhaust* systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table ~~M1505.5.~~ M1505.5 at one or more speed settings.

Commenter's Reason: Section 1506 has no text in it and should be stricken.
The text "mechanical exhaust capacity of" in Table M1505.5 is unnecessary because this table is located within the "Mechanical Ventilation" section, and it is understood that the local exhaust rates in Table M1505.5 are mechanical exhaust airflow rates. The text, "at one or more speed settings" should be included in M1505.5 to align with action that the committee took on M1503.5 and the intention that the minimum airflow rate required by Table M1505.5 be provided by at least one speed setting of the exhaust equipment. This text clarifies that single speed units can comply when the single speed provides an airflow rate no less than the relevant table value and that variable and multiple speed units can comply when at least one speed setting provides an airflow rate no less than the relevant table value.

This clarification is needed to ensure that popular bathroom exhaust fans with multiple speed settings (e.g., 30, 50, and 80 cfm) can be approved, and permits builders to order one SKU across multiple projects that can be customized as necessary to satisfy the targeted ventilation rate (e.g., Table M1505.5's 50 cfm intermittent or 20 cfm continuous). This modification also permits smart range hoods to comply with this section; smart range hoods can detect and respond to pollutant concentrations during cooking events by increasing airflows to 300-400 cfm on high speed as needed but can also throttle back to intermittent airflows of less than 100 cfm following a cooking event when lower airflows and quieter operation are desired to exhaust residual pollutant concentrations in the kitchen.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This proposal and public comment clarify the current requirements of the code.

Public Comment# 2199

RM19-21

Proposed Change as Submitted

Proponents: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, Building Science Corporation, representing Myself (joe@buildingscience.com)

2021 International Residential Code

Revise as follows:

M1602.2 Return air openings. Return air openings for heating, *ventilation* and air-conditioning systems shall comply with all of the following:

1. Openings shall not be located less than 10 feet (3048 mm) measured in any direction from an open combustion chamber or draft hood of another *appliance* located in the same room or space.
2. The amount of return air taken from any room or space shall be not greater than the flow rate of supply air delivered to such room or space.
3. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, Manual D or the design of the *registered design professional*.
4. Where return air is taken from a closet smaller than 30 ft2 (2.8 m2) the return air shall be no more than 30 cfm (15 l/s), shall serve only the closet, and shall not require a dedicated supply duct.
5. Where return air is taken from a closet smaller than 30 ft2 (2.8 m2) the closet door shall be undercut a minimum of 1.5 inches (38 mm) or the closet shall include a louvered door or transfer grille with a minimum net free area of 30 inch2 (194 cm2).

4 6. Return air shall not be taken from a ~~closet,~~ bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.
3. Return air taken from closets shall serve only the closet and may shall be permitted to be taken from closets that have no dedicated supply duct.

5 7. For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified,

6 8. Taking return air from an unconditioned *crawl space* shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the *crawl space* enclosure shall not be prohibited.

7 9. Return air from one *dwelling unit* shall not be discharged into another *dwelling unit*.

Reason: Mold growth is now common in closets due to higher interior moisture loads and less heat gain in closets. Allowing a limited amount of return air provides a means of controlling closet moisture levels. Providing supply air to a closet exacerbates the problem by making closet surfaces colder.
This is one of six separate proposed changes related to controlling mold in closets, bathrooms and mechanical room. The six changes fix problems caused by an increase in code thermal resistance over the past several code cycles.

For a more detailed explanation see:

https://www.buildingscience.com/documents/building-science-insights/bsi-109-how-changing-filters-led-condensation-and-mold-problem

Cost Impact: The code change proposal will increase the cost of construction
The code change proposal increases the cost of construction. The cost is the cost of adding the return duct. However, this code change is not a requirement. It gives builders an option to solve and avoid problems.

Staff Analysis: Multiple proposals RM18-21, RM19-21 and RM20-21 propose changes to M1602.2. Proposals RM18-21, RM19-21 and RM20-21 comply with CP2 #28 3.3.3 because they address different subject matter within Section M1602.2. RM18-21 addresses bathrooms. RM19-21

addresses closets. RM20-21 addresses boiler rooms and mechanical closets.

RM19-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The supporting document indicated that ASHRAE needs to continue looking at the issue. The proposed language is confusing. (7-4)

RM19-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1602.2

Proponents: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing Myself (joe@buildingscience.com) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

M1602.2 Return air openings . Return air openings for heating, *ventilation* and air-conditioning systems shall comply with all of the following:

1. Openings shall not be located less than 10 feet (3048 mm) measured in any direction from an open combustion chamber or draft hood of another *appliance* located in the same room or space.
2. The amount of return air taken from any room or space shall be not greater than the flow rate of supply air delivered to such room or space.
3. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, Manual D or the design of the *registered design professional*.

~~4. Where return air is taken from a closet smaller than 30 ft2 (2.8 m2) the return air shall be no more than 30 cfm (15 l/s), shall serve only the closet, and shall not require a dedicated supply duct.~~

~~5. Where return air is taken from a closet smaller than 30 ft2 (2.8 m2) the closet door shall be undercut a minimum of 1.5 inches (38 mm) or the closet shall include a louvered door or transfer grille with a minimum net free area of 30 inch2 (194 cm2).~~

4. Where return air is taken from a closet the return air shall be no more than 30 cfm (15 l/s), shall serve only the closet, shall not require a dedicated supply duct and the closet door shall be undercut a minimum of 1.5 inches (38 mm) or the closet shall include a louvered door or transfer grille with a minimum net free area of 30 inch2 (194 cm2).

5. ~~6.~~ Return air shall not be taken from a bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.
3. Return air taken from closets shall serve only the closet ~~and may shall~~ and ~~may~~ shall be permitted to be taken from closets that have no dedicated supply duct.

6. ~~7.~~ For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified,

7. ~~8.~~ Taking return air from an unconditioned *crawl space* shall not be accomplished through a direct connection to the return side of a forced-

air furnace. Transfer openings in the *crawl space* enclosure shall not be prohibited.

8. ~~9.~~ Return air from one *dwelling unit* shall not be discharged into another *dwelling unit*.

Commenter's Reason: Modify the text to be less confusing and remove an unneeded restriction on the closet size.
The return openings are sized so as to not produce negative pressure in the closet.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
The code change proposal increases the cost of construction. The cost is the cost of adding the return duct. However, this code change is not a requirement. It gives builders an option to solve and avoid problems.

Public Comment# 2714

RM20-21

Proposed Change as Submitted

Proponents: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing Myself (joe@buildingscience.com)

2021 International Residential Code

Revise as follows:

M1602.2 Return air openings. Return air openings for heating, *ventilation* and air-conditioning systems shall comply with all of the following:

1. Openings shall not be located less than 10 feet (3048 mm) measured in any direction from an open combustion chamber or draft hood of another *appliance* located in the same room or space.
2. The amount of return air taken from any room or space shall be not greater than the flow rate of supply air delivered to such room or space. Return air taken from mechanical rooms shall serve only the mechanical room and shall be permitted to be taken from mechanical rooms that have no dedicated supply duct.
3. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, Manual D or the design of the *registered design professional*.
4. Where return air is taken from a mechanical room with combustion appliances only sealed combustion appliances shall be permitted within the mechanical room.
5. Where return air is taken from a mechanical room the pressure differential across the mechanical room door shall be limited to 0.01 inch WC (2.5 pascals) or less by undercutting the door, or installing a louvered door or transfer grille, or by some other means.

~~4~~ 6. Return air shall not be taken from a closet, bathroom, toilet room, kitchen, garage, ~~mechanical room, boiler room, furnace room~~ or unconditioned attic.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.

~~5~~ 7. For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified,

~~6~~ 8. Taking return air from an unconditioned *crawl space* shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the *crawl space* enclosure shall not be prohibited.

~~7~~ 9. Return air from one *dwelling unit* shall not be discharged into another *dwelling unit*.

Reason: Mold growth is now common in boiler rooms, furnace rooms or mechanical rooms due to higher interior moisture loads and less heat gain in such rooms. Allowing a limited amount of return air provides a means of controlling room moisture levels. Providing supply air to such a space exacerbates the problem by making room surfaces colder.
This is one of six separate proposed changes related to controlling mold in closets, bathrooms and mechanical room. The six changes fix problems caused by an increase in code thermal resistance over the past several code cycles.

For a more detailed explanation see:

https://www.buildingscience.com/documents/building-science-insights/bsi-109-how-changing-filters-led-condensation-and-mold-problem

https://www.buildingscience.com/documents/building-science-insights-newsletters/bsi-006-no-good-deed-shall-go-unpunished

Cost Impact: The code change proposal will increase the cost of construction
The code change proposal increases the cost of construction. The cost is the cost of adding the return duct. However, this *code change is not a requirement. It gives builders an option to solve and avoid problems.*

Staff Analysis: Multiple proposals RM18-21, RM19-21 and RM20-21 propose changes to M1602.2. Proposals RM18-21, RM19-21 and RM20-21 comply with CP2 #28 3.3.3 because they address different subject matter within Section M1602.2. RM18-21 addresses bathrooms. RM19-21 addresses closets. RM20-21 addresses boiler rooms and mechanical closets.

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The proposed language is confusing. For example, the statement about return air taken from the mechanical room shall serve only the mechanical room. There is a contradiction in Item 5. The Committee agreed with the intent of the proposal but the language needs more work. The Committee would like to see this brought back in public comment. (8-3)

RM20-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1602.2

Proponents: Craig Conner, representing self (craig.conner@mac.com); Joseph Lstiburek, representing Myself (joe@buildingscience.com) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

M1602.2 Return air openings . Return air openings for heating, *ventilation* and air-conditioning systems shall comply with all of the following:

1. Openings shall not be located less than 10 feet (3048 mm) measured in any direction from an open combustion chamber or draft hood of another *appliance* located in the same room or space.
2. The amount of return air taken from any room or ~~space~~ space except mechanical rooms, boiler rooms or furnace rooms shall be not greater than the flow rate of supply air delivered to such room or space. Return air taken from mechanical rooms , boiler rooms or furnace rooms shall serve only the mechanical room and shall be permitted to be taken from mechanical rooms that have no dedicated supply duct.
3. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, Manual D or the design of the *registered design professional*.
4. Where return air is taken from a mechanical room, boiler room or furnace room with combustion appliances only sealed combustion appliances shall be permitted within the mechanical room.
5. Where return air is taken from a mechanical room, boiler room or furnace room the pressure differential across the mechanical ~~room door~~ room ~~door~~ , boiler room or furnace room door shall be limited to 0.01 inch WC (2.5 pascals) or less by undercutting the door, or installing a louvered door or transfer grille, or by some other means.
6. Return air shall not be taken from a closet, bathroom, toilet room, kitchen, garage, or unconditioned attic.

   Exceptions:

   1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
   2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.

7. For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified,
8. Taking return air from an unconditioned *crawl space* shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the *crawl space* enclosure shall not be prohibited.
9. Return air from one *dwelling unit* shall not be discharged into another *dwelling unit*.

Commenter's Reason: Mold growth is now common in boiler rooms, furnace rooms or mechanical rooms due to higher interior moisture loads and less heat gain in such rooms. Allowing a limited amount of return air provides a means of controlling room moisture levels. Providing supply air to such a space exacerbates the problem by making room surfaces colder.

https://www.buildingscience.com/documents/building-science-insights/bsi-109-how-changing-filters-led-condensation-and-mold-problem

https://www.buildingscience.com/documents/building-science-insights-newsletters/bsi-006-no-good-deed-shall-go-unpunished

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
The code change proposal increases the cost of construction. The cost is the cost of adding the return duct. However, this code change is not a requirement. It gives builders an option to solve and avoid problems.

Public Comment# 2719

RM26-21

Proposed Change as Submitted

Proponents: Mike Moore, Stator LLC, representing Broan-NuTone (mmoore@statorllc.com)

2021 International Residential Code

Revise as follows:

M1505.4.4 Local exhaust rates. *Local exhaust* systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table M1505.4.4. The listed exhaust airflow rate for bathrooms-toilet rooms shall equal or exceed the exhaust airflow rate in Table M1505.4.4 at a minimum static pressure of 0.25 inch wc in accordance with Section M1505.3.

TABLE M1505.4.4 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS

AREA TO BE EXHAUSTED	EXHAUST RATES[a]
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 inch water column = 0.2488 kPa.

~~a. The listed exhaust rate for bathrooms-toilet rooms shall equal or exceed the exhaust rate at a minimum static pressure of 0.25 inch water column in accordance with Section M1505.3.~~

Reason: Traditionally, airflow rates for bathroom-toilet room fans have been listed and reported at 0.1 inch wc; this is still common practice. However, engineering calculations, field measurements, and research have shown that higher static pressures are generally needed to achieve an airflow of 50 cfm through typical exhaust duct configurations. For this reason, Footnote A to Table M1505.4.4 of the IRC has established 0.25 inch wc as the minimum static pressure at which a bathroom-toilet room exhaust fan must achieve a minimum airflow of 50 cfm. An exhaust fan that is listed to provide 50 cfm at 0.1 inch wc may only exhaust 10-30 cfm when installed with a typical exhaust duct configuration. To ensure that builders are selecting fans that can be expected to achieve the required 50 cfm in the field, Footnote A should be moved to the main section.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is editorial only and does not increase or decrease the cost of construction.

RM26-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: The committee agreed that moving the requirement from the table footnote to the section text was a better location this information. (9-2)

RM26-21

Individual Consideration Agenda

Public Comment 1:

IRC: M1505.4.4

Proponents: Mike Moore, representing Broan-NuTone (mmoore@statorllc.com) requests As Modified by Public Comment

Modify as follows:

2021 International Residential Code

M1505.4.4 Local exhaust rates . *Local exhaust* systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table ~~M1505.4.4. The~~ M1505.4.4 at one or more speed settings . The listed exhaust airflow rate for ~~bathrooms-toilet rooms shall~~ a bathroom or toilet room exhaust fan shall equal or exceed the exhaust airflow rate in Table M1505.4.4 at a minimum static pressure of 0.25 inch wc at one or more speed settings in accordance with Section M1505.3.

Commenter's Reason: Adding the phrase "at one or more speed settings" is needed to align RM26 with the committee's action on RM17 as modified by Mathewson 2. This phrase clarifies that variable speed and multiple speed fans may be used, provided that such fans have at least one speed setting that has "the capacity to exhaust the minimum airflow rate." This clarification is needed to ensure that popular bathroom exhaust fans with multiple speed settings (e.g., 30, 50, and 80 cfm) can be approved, and permits builders to order one SKU across multiple projects that can be customized as necessary to satisfy the targeted ventilation rate (e.g., Table M1505.4.4's 50 cfm intermittent or 20 cfm continuous).
The text is also modified to clarify that the listed airflow rate is a listing associated with the exhaust fan and not with a bathroom or toilet room.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This proposal clarifies a current requirement and will therefore neither decrease nor increase the cost of construction.