IMC

2021 GROUP A PUBLIC COMMENT AGENDA

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ICC
INTERNATIONAL CODE COUNCIL®

2021 Public Comment Agenda

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M3-21

Proposed Change as Submitted

Proponents: Tim Earl, representing The Gypsum Association (tearl@gbhinternational.com)

2021 International Mechanical Code

Add new definition as follows:

GYPSUM BOARD. A type of gypsum panel product consisting of a noncombustible core primarily of gypsum with paper surfacing.

GYPSUM WALLBOARD. A gypsum board used primarily as an interior surfacing for building structures.

Reason: This defines terms already used in the code, using definitions already in the IBC and proposed for several other I-Codes this cycle that are also harmonized to ASTM and the industry.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This is a simple terminology update with no impact on cost.

M3-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee felt that terms currently defined in other I-codes should be revised in the code of origin before being duplicated in this code. The change should come back after that is accomplished. (Vote: 8-3)

M3-21

Individual Consideration Agenda

Public Comment 1:

Proponents: Tim Earl, representing The Gypsum Association (tearl@gbhint.com) requests As Submitted

Commenter's Reason: These terms are used in the IMC and should be defined there. Some committee members questioned the harmonization of the terms across the I-codes. However, as one committee member pointed out, some of those terms are in sections to be addressed in Group B. In order to achieve complete harmonization across the codes, this change must be approved first, to match already drafted changes for Group B codes.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This is a terminology update with no impact on cost.

Public Comment# 2322

NOTE: M4-21 PART I DID NOT RECEIVE A PUBLIC COMMENT AND IS REPRODUCED FOR INFORMATIONAL PURPOSES ONLY

M4-21 Part I

Proposed Change as Submitted

Proponents: Joseph J. Summers, Chair of the PMGCAC, representing Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

THIS IS A TWO PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL/PLUMBING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES

2021 International Mechanical Code

Delete and substitute as follows:

~~**HEAT PUMP.** A refrigeration system that extracts heat from one substance and transfers it to another portion of the same substance or to a second substance at a higher temperature for a beneficial purpose.~~

HEAT PUMP. A refrigeration system or factory-made appliance that utilizes refrigerant to transfer heat into a space or substance.

Reason: There are two different definitions in the I-codes for “heat pump”. The IRC definition identifies heat pumps as an appliance, and the IMC identifies heat pumps as are refrigeration system. This definition is clarifying that a heat pump could be either an appliance or a refrigeration system. This definition is also simplified that a heat pump is transferring heat into a space or substance. The reference to “beneficial purpose” in the IMC is commentary. The proposed new common definition is closely aligned with the term used in the two refrigeration standards referenced in the I-codes, ASHRAE 15 and UL 60335-2-40.
For information purposes, the following are the other definitions:

From the IRC: [MP] HEAT PUMP. An appliance having heating or heating and cooling capability and that uses refrigerants to extract heat from air, liquid or other sources.

From the IMC: HEAT PUMP. A refrigeration system that extracts heat from one substance and transfers it to another portion of the same substance or to a second substance at a higher temperature for a beneficial purpose.

From ASHRAE 15: HEAT PUMP a refrigerating system used to transfer heat into a space or substance.
From UL 60335-2-40: HEAT PUMP appliance which takes up heat at a certain temperature and releases heat at a higher temperature

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal will not increase or decrease the cost of construction. This proposal provides clarity and consistency for the use of this term throughout the I-codes.

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: The committee agrees this is editorial. Based on the reason statement, the definition is clarifying and is closely aligned with the term used in the two refrigeration standards referenced in the I-codes (ASHRAE 15 and UL 60335-2-40). (Vote: 6-5)

M4-21 Part II

Proposed Change as Submitted

Proponents: Joseph J. Summers, representing Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

THIS IS A TWO PART CODE CHANGE. PART 1 WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART 2 WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL/PLUMBING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES

2021 International Residential Code

Delete and substitute as follows:

~~**[MP] HEAT PUMP.** An *appliance* having heating or heating and cooling capability and that uses refrigerants to extract heat from air, liquid or other sources.~~

[MP] HEAT PUMP.
A refrigeration system or factory-made appliance that utilizes refrigerant to transfer heat into a space or substance.

Reason: There are two different definitions in the I-codes for “heat pump”. The IRC definition identifies heat pumps as an appliance, and the IMC identifies heat pumps as are refrigeration system. This definition is clarifying that a heat pump could be either an appliance or a refrigeration system. This definition is also simplified that a heat pump is transferring heat into a space or substance. The reference to “beneficial purpose” in the IMC is commentary. The proposed new common definition is closely aligned with the term used in the two refrigeration standards referenced in the I-codes, ASHRAE 15 and UL 60335-2-40.
For information purposes, the following are the other definitions:

From the IRC: [MP] HEAT PUMP. An appliance having heating or heating and cooling capability and that uses refrigerants to extract heat from air, liquid or other sources.

From the IMC: HEAT PUMP. A refrigeration system that extracts heat from one substance and transfers it to another portion of the same substance or to a second substance at a higher temperature for a beneficial purpose.

From ASHRAE 15: HEAT PUMP a refrigerating system used to transfer heat into a space or substance.
From UL 60335-2-40: HEAT PUMP appliance which takes up heat at a certain temperature and releases heat at a higher temperature

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This code change proposal will not increase or decrease the cost of construction. This proposal provides clarity and consistency for the use of this term throughout the I-codes.

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The definition is not consistent for the consumer trying to do construction, which may be the homeowner. (6-5)

Individual Consideration Agenda

Public Comment 1:

Proponents: Joseph J. Summers, representing Chair of PMGCAC (pmgcac@iccsafe.org) requests As Submitted

PART 2 WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

PART 2 WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

Commenter's Reason: M4-21 Part I was approved as submitted. For consistency between the IRC mechanical and the IMC. A term that is used throughout the I-codes should have the same definition. This proposal needs to be approved for consistency. There was no opposing testimony on this proposal.
The PMGCAC is puzzled by the Committee's published reason statement for disapproval. We do not understand why "consumers" or "homeowners" would be confused by the revised definition in a *code*. Code definitions are only for support of the code text where that defined term is used.

One committee member mentioned that the revised definition does not meet the "Websters" definition... Here is Webster's definition (note the underline):

": an apparatus for heating or cooling (such as a building) by transferring heat by mechanical means from or to an external reservoir (such as the ground, water, or outside air)"

From the Energy.gov webpage on Heat Pumps:

"For climates with moderate heating and cooling needs, heat pumps offer an energy-efficient alternative to furnaces and air conditioners. Like your refrigerator, heat pumps use electricity to move heat from a cool space to a warm space, making the cool space cooler and the warm space warmer. During the heating season, heat pumps move heat from the cool outdoors into your warm house and during the cooling season, heat pumps move heat from your cool house into the warm outdoors. Because they move heat rather than generate heat, heat pumps can provide equivalent space conditioning at as little as one quarter of the cost of operating conventional heating or cooling appliances."

We urge the voters to approve this proposal to make terminology consistent across the codes and in agreement with other standards.

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

Public Comment# 2443

M16-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

401.4 Intake opening location. Air intake openings shall comply with all of the following:

1. Intake openings shall be located not less than 10 feet (3048 mm) from lot lines or buildings on the same lot.
2. Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as vents, streets, alleys, parking lots and loading docks, except as specified in Item 3 or Section 501.3.1. Outdoor air intake openings shall be permitted to be located less than 10 feet (3048 mm) horizontally from streets, alleys, parking lots and loading docks provided that the openings are located not less than 25 feet (7620 mm) vertically above such locations. Where openings front on a street or public way, the distance shall be measured from the closest edge of the street or public way.
3. Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening. Separation is not required between intake air openings and living space *exhaust air* openings of an individual *dwelling unit* or *sleeping unit* where a~~n approved~~ factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the *appliance* manufacturer's instructions.
4. Intake openings on structures in flood hazard areas shall be at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant *equipment*.

501.3.1 Location of exhaust outlets. The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

1. For ducts conveying explosive or flammable vapors, fumes or dusts: 30 feet (9144 mm) from property lines; 10 feet (3048 mm) from operable openings into buildings; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls and operable openings into buildings that are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.
2. For other product-conveying outlets: 10 feet (3048 mm) from the property lines; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from operable openings into buildings; 10 feet (3048 mm) above adjoining grade.
3. For all *environmental air* exhaust: 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable openings into buildings for all *occupancies* other than Group U; and 10 feet (3048 mm) from mechanical air intakes. Such exhaust shall not be considered hazardous or noxious. Separation is not required between intake air openings and living space *exhaust air* openings of an individual *dwelling unit* or *sleeping unit* where a~~n approved~~ factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the *appliance* manufacturer's instructions.
4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above the elevation required by Section 1612 of the International Building Code for utilities and attendant *equipment*.
5. For specific systems, see the following sections:

    5.1. Clothes dryer exhaust, Section 504.4.

    5.2. Kitchen hoods and other kitchen exhaust *equipment*, Sections 506.3.13, 506.4 and 506.5.

    5.3. Dust, stock and refuse conveying systems, Section 511.2.

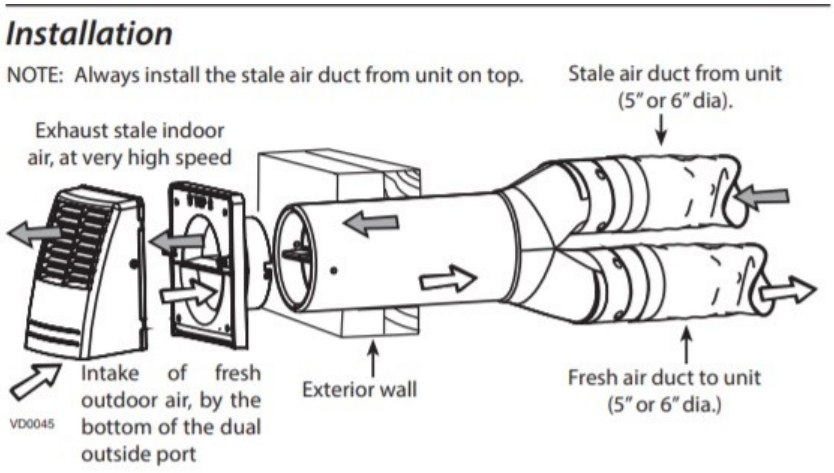
    5.4. Subslab soil exhaust systems, Section 512.4.

    5.5. Smoke control systems, Section 513.10.3.

    5.6. Refrigerant discharge, Section 1105.7.

    5.7. *Machinery room* discharge, Section 1105.6.1.

Reason: Factory-built intake/exhaust combination termination fittings are regularly provided by 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 ventilation system manufacturer's installation instructions provides an example of a typical fitting serving this purpose.



IMC Sections 401.4 and 501.3.1 approve 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 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”. Like the Fuel Gas Code's treatment of concentric vent termination fittings, no special approval should be required for factory-built intake/exhaust combination termination fittings when installed in accordance with appliance manufacturer's instructions.

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."

Cost Impact: The 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.

M16-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: This proposal was approved as submitted based on the proponent reason statement. Factory-built intake/exhaust combination termination fittings are regularly provided by manufacturers and installed by builders to separate mechanical air intakes from mechanical exhaust serving dwelling unit or sleeping unit mechanical ventilation systems. Special approval should not be required for these types of fittings when installed in accordance with the manufacturer installation instructions. (Vote: 6-5)

M16-21

Individual Consideration Agenda

Public Comment 1:

IMC: 401.4, 501.3.1

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

Modify as follows:

2021 International Mechanical Code

401.4 Intake opening location . Air intake openings shall comply with all of the following:

1. Intake openings shall be located not less than 10 feet (3048 mm) from lot lines or buildings on the same lot.
2. Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as vents, streets, alleys, parking lots and loading docks, except as specified in Item 3 or Section 501.3.1. Outdoor air intake openings shall be permitted to be located less than 10 feet (3048 mm) horizontally from streets, alleys, parking lots and loading docks provided that the openings are located not less than 25 feet (7620 mm) vertically above such locations. Where openings front on a street or public way, the distance shall be measured from the closest edge of the street or public way.
3. Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening. Separation is not required between intake air openings and living space *exhaust air* openings of an individual *dwelling unit* or *sleeping unit* where a factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the ~~*appliance*~~ fan manufacturer's instructions.
4. Intake openings on structures in flood hazard areas shall be at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant *equipment*.

501.3.1 Location of exhaust outlets . The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

1. For ducts conveying explosive or flammable vapors, fumes or dusts: 30 feet (9144 mm) from property lines; 10 feet (3048 mm) from operable openings into buildings; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls and operable openings into buildings that are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.
2. For other product-conveying outlets: 10 feet (3048 mm) from the property lines; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from operable openings into buildings; 10 feet (3048 mm) above adjoining grade.
3. For all *environmental air* exhaust: 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable openings into buildings for all *occupancies* other than Group U; and 10 feet (3048 mm) from mechanical air intakes. Such exhaust shall not be considered hazardous or noxious. Separation is not required between intake air openings and living space *exhaust air* openings of an individual *dwelling unit* or *sleeping unit* where a factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the ~~*appliance*~~ fan manufacturer's instructions.
4. Exhaust outlets serving structures in flood hazard areas shall be installed at or above the elevation required by Section 1612 of the International Building Code for utilities and attendant *equipment*.
5. For specific systems, see the following sections:

    5.1. Clothes dryer exhaust, Section 504.4.

    5.2. Kitchen hoods and other kitchen exhaust *equipment*, Sections 506.3.13, 506.4 and 506.5.

    5.3. Dust, stock and refuse conveying systems, Section 511.2.

    5.4. Subslab soil exhaust systems, Section 512.4.

    5.5. Smoke control systems, Section 513.10.3.

    5.6. Refrigerant discharge, Section 1105.7.

    5.7. *Machinery room* discharge, Section 1105.6.1.

Commenter's Reason: The PMGCAC believes that use of the word "fan" instead of "appliance" will better clarify the intent of this proposal that factory-built intake/exhaust combination terminations are approved when recognized for use by the manufacturer of the connected ventilation fan. In the case that a voter is not familiar with these terminations, which were first approved in the 2021 IMC, 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. Approval of this proposed modification is expected to result in an easier path to approval for these more affordable and architecturally flexible terminations.

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.

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
This PC is aligned with the intent of the original proposal that was approved by the committee and can decrease the cost of construction for the same reasons provided in the original proposal.

Public Comment# 2321

M18-21

Proposed Change as Submitted

Proponents: Joseph J. Summers, Chair of the PMGCAC, representing Plumbing, Mechanical and Fuel Gas Code Action Committee (PMGCAC@iccsafe.org)

2021 International Mechanical Code

Revise as follows:

SUPPLY AIR SYSTEM. An assembly of connected ducts,*plenums*, fittings, registers and grilles through which air, ~~heated or cooled~~ conditioned or unconditioned is conducted from the supply unit to the space or spaces to be ~~heated or cooled~~ conditioned or unconditioned (see also Return air system).

403.1 Ventilation system. Mechanical ventilation shall be provided by a method of supply air and return or *exhaust air* ~~except that mechanical ventilation air requirements for Group R-2, R-3 and R-4 *occupancies* shall be provided by an exhaust system, supply system or combination thereof~~. The amount of supply air shall be approximately equal to the amount of return and *exhaust air*. The system shall not be prohibited from producing negative or positive pressure. The system to convey *ventilation air* shall be designed and installed in accordance with Chapter 6.

Exception: Systems that are in accordance with Section 403.3.2.1.

403.3.2.1 Outdoor air for dwelling units. An outdoor air ventilation system consisting of a mechanical exhaust system, supply system or combination thereof shall be installed for each *dwelling unit*. Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system. The outdoor air ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

$$Q_{OA} = 0.01 A_{floor} + 7.5(N_{br} + 1)$$ **(Equation 4-9)**

where:

Q_{OA} = outdoor airflow rate, cfm

A_{floor} = floor area, ft^2

N_{br} = number of bedrooms; not to be less than one

Exceptions:

1. The outdoor air ventilation system is not required to operate continuously where the system has controls that enable operation for not less than 1 hour of each 4-hour period. The average outdoor airflow rate over the 4-hour period shall be not less than that prescribed by Equation 4-9.
2. The minimum mechanical ventilation rate determined in accordance with Equation 4-9 shall be reduced by 30 percent provided that both of the following conditions apply:

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

      2.1.1. Living room.

      2.1.2. Dining room.

      2.1.3. Kitchen.

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

Reason: Section 1020.5 of the IBC prohibits corridors from serving as “ventilation air ducts”. However, changes to the 2012 IMC introduced approval of mechanical ventilation systems that do not comply with this requirement. Specifically, when an exhaust-only ventilation system is specified to provide outdoor air for a dwelling unit whose entrance door is not located on an exterior wall (i.e., a dwelling unit opening onto a corridor that is not open to the atmosphere, referred to as a “corridor” within this rationale), we can expect much of the ventilation air to be conveyed through the corridor. This claim is supported by a study showing that for recently constructed dwelling units, approximately 40% of dwelling unit leakage area is to the corridor.* Operating an exhaust-only outdoor air ventilation system in a dwelling unit with an entrance door located on a corridor can be expected to establish a pressure differential with respect to the corridor, forcing a large percentage of the dwelling unit ventilation air to be conveyed by the corridor, in violation of IBC Section 1020.5. To coordinate IBC Section 1020.5 with IMC Sections 403.3.2.1 and 403.1, this proposal reestablishes the pre-2012 requirement for mechanical ventilation systems to supply outdoor ventilation air to the dwelling units without using the

corridor to convey the outdoor ventilation air.
This proposal also modifies the IMC definition of “supply air system” to ensure that it can apply to ventilation systems as well as heating and cooling systems. The term “supply air system” is used only once within the body of the 2021 IMC, and its use is not italicized; so the definition of “supply air system” does not currently apply anywhere within the IMC and its modification would not affect any other section (see the Preface section of the IMC for more information on use of italicized terms).

This proposal coordinates the IBC Section 1020.5 requirements with the IMC while maintaining the ability to use exhaust-only ventilation systems for provision of outdoor air for a dwelling unit whose entrance door is located on an exterior wall. The IBC defines an Exterior Wall as follows: “EXTERIOR WALL. A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a fire wall, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.”

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 34.

Bibliography: Bohac D., and Sweeney L. 2020. Energy Code Field Studies: Low-Rise Multifamily Air Leakage Testing. Prepared by the Center for Energy and Environment, Ecotope, and The Energy Conservatory. Prepared for the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy. https://www.energycodes.gov/sites/default/files/documents/LRMF_AirLeakageTesting_FinalReport_2020-07-06.pdf. [See Table 45, which shows average leakage to “common” area of 42%. The report also notes, “for buildings in this study, “common areas” are made up almost completely of corridors and a few small rooms such as mechanical closets and elevator rooms.]

Cost Impact: The code change proposal will not increase or decrease the cost of construction
IBC Section 1020.5 prohibits corridors from serving as “ventilation air ducts”. So presumably, the more restrictive provision of this section of the IBC would prevail over the permissive language in IMC 403.3.2.1 that permits the use of an exhaust system for provision of outdoor air for any Group R-2, R-3, or R-4 dwelling unit. Because this change only coordinates IMC requirements with what the (more restrictive) IBC already requires, no additional material or labor costs are associated with this proposal.

M18-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Modification:

Committee Reason: The committee finds the proposal is confusing as written with respect to the definition of supply air systems and its relationship to the definition of return air systems. (Vote: 10-1)

M18-21

Individual Consideration Agenda

Public Comment 1:

IMC: 403.1, 403.3.2.1

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

Replace as follows:

2021 International Mechanical Code

403.1 Ventilation system . Mechanical ventilation shall be provided by a method of supply air and return or *exhaust air* ~~except that mechanical ventilation air requirements for Group R-2, R-3 and R-4 *occupancies* shall be provided by an exhaust system, supply system or combination thereof~~. The amount of supply air shall be approximately equal to the amount of return and *exhaust air*. The system shall not be prohibited from

producing negative or positive pressure. The system to convey *ventilation air* shall be designed and installed in accordance with Chapter 6.

Exception: Systems that are in accordance with Section 403.3.2.1 and Chapter 6.

403.3.2.1 Outdoor air for dwelling units . For each dwelling unit where all entrance doors are located on an exterior wall, ~~A~~ an outdoor air ventilation system consisting of a mechanical exhaust system, supply system, or ~~combination thereof~~ balanced ventilation system shall be installed ~~for each *dwelling unit*~~. For other dwelling units, an outdoor air ventilation system consisting of a mechanical supply system or balanced ventilation system shall be installed to supply outdoor air directly to the dwelling unit in accordance with Section 601.2. Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system. The outdoor air ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

$$Q_{OA} = 0.01 A_{floor} + 7.5(N_{br} + 1)$$ **(Equation 4-9)**

where:

Q_{OA} = outdoor airflow rate, cfm

A_{floor} = floor area, ft^2

N_{br} = number of bedrooms; not to be less than one

Exceptions:

1. The outdoor air ventilation system is not required to operate continuously where the system has controls that enable operation for not less than 1 hour of each 4-hour period. The average outdoor airflow rate over the 4-hour period shall be not less than that prescribed by Equation 4-9.
2. The minimum mechanical ventilation rate determined in accordance with Equation 4-9 shall be reduced by 30 percent provided that both of the following conditions apply:

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

      2.1.1. Living room.

      2.1.2. Dining room.

      2.1.3. Kitchen.

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

Commenter's Reason: This PC replaces the original proposal, so the modifications that are shown are modifications to the 2021 IMC. Operating an exhaust-only outdoor air ventilation system in a dwelling unit with an entrance door located on a corridor can be expected to establish a pressure differential with respect to the corridor, drawing a large percentage of the dwelling unit ventilation air from the corridor (see the bibliography for more information), in violation of IBC Section 1020.5 and IMC 601.2. To coordinate IBC Section 1020.5 and IMC 601.2 with IMC Sections 403.3.2.1 and 403.1, this proposal reestablishes the pre-2012 IMC requirement for mechanical ventilation systems to supply outdoor air to dwelling units without using the corridor. The IMC committee rejected the original proposal because it did not agree with the modifications to the definition of supply air system. To resolve the committee's concerns, these modifications have been removed from this public comment.

Bibliography: Bohac D., and Sweeney L. 2020. Energy Code Field Studies: Low-Rise Multifamily Air Leakage Testing. Prepared by the Center for Energy and Environment, Ecotope, and The Energy Conservatory. Prepared for the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy. https://www.energycodes.gov/sites/default/files/documents/LRMF_AirLeakageTesting_FinalReport_2020-07-06.pdf. [See Table 45, which shows average leakage to “common” area of 42% for 211 tightly-constructed dwelling units in 20 buildings of new construction located in 6 states. The report also notes, “for buildings in this study, “common areas” are made up almost completely of corridors and a few small rooms such as mechanical closets and elevator rooms. The 42% leakage did not include leakage around the door separating a dwelling unit from the corridor, which would have further increased this value.]

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
IBC Section 1020.5 and IMC Section 601.2 prohibit corridors from serving as “ventilation air ducts”. So presumably, the more restrictive provision of these sections of the IBC and IMC would prevail over the language in IMC 403.3.2.1 that permits the use of an exhaust system for provision of outdoor air for any Group R-2, R-3, or R-4 dwelling unit. Because this change only coordinates IMC 403.3.2.1 requirements with what the (more restrictive) IBC and IMC sections already require, no additional material or labor costs are associated with this proposal.

Public Comment# 2256

M19-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

403.3.1 Other buildings intended to be occupied. The design of local exhaust systems and ventilation systems for outdoor air for *occupancies* other than Group R-2, R-3 and R-4 ~~three stories and less above grade plane~~ shall comply with Sections 403.3.1.1 through 403.3.1.4.

403.3.2 Group R-2, R-3 and R-4 occupancies~~, three stories and less~~. The design of local exhaust systems and ventilation systems for outdoor air in Group R-2, R-3 and R-4 *occupancies* ~~three stories and less in height above grade plane~~ shall comply with Sections 403.3.2.1 through 403.3.2.5.

403.3.2.1 Outdoor air for dwelling units. An outdoor air ventilation system consisting of a mechanical exhaust system, supply system or combination thereof shall be installed for each*dwelling unit*. Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system. The outdoor air ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

$$Q_{OA} = 0.01 A_{floor} + 7.5(N_{br} + 1) \quad \textbf{(Equation 4-9)}$$

where:

Q_{OA} = outdoor airflow rate, cfm

A_{floor} = conditioned floor area, ft^2

N_{br} = number of bedrooms; not to be less than one

Exceptions:

1. The outdoor air ventilation system is not required to operate continuously where the system has controls that enable operation for not less than 1 hour of each 4-hour period. The average outdoor airflow rate over the 4-hour period shall be not less than that prescribed by Equation 4-9.
2. The minimum mechanical ventilation rate determined in accordance with Equation 4-9 shall be reduced by 30 percent provided that both of the following conditions apply:

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

        2.1.1. Living room.

        2.1.2. Dining room.

        2.1.3. Kitchen.

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

Reason: Prior to 2015, the IMC used the same mechanical ventilation outdoor airflow rate calculation procedure for all R-2, R-3, and R-4 dwelling units. Beginning in 2015, a new calculation procedure was introduced in the IMC for low-rise R-2, R-3, and R-4 dwelling units. This 2015 calculation procedure was based on the airflow equation used in ASHRAE 62.2-2010, which was developed for leaky, detached, single-family homes (bad assumption!). Applying this ventilation equation and associated assumptions to tight, attached, low-rise R-2, R-3, and R-4 dwelling units results in extremely low flow rates that are a fraction of what was previously required by the IMC (1/3 less), what is currently required by ASHRAE 62.2 (1/3 less), and what is currently required by ASHRAE 62.1 (1/2 less).
Since 2015, ASHRAE 62.2 has revised its airflow rate calculation procedure for attached dwelling units, based on infiltration assumptions that are relevant to attached dwelling units, and the result is much closer to that required by required by the 2012 IMC for all private dwelling units and by the 2021 IMC for all private dwelling units that are not in low-rise R-2, R-3, and R-4 buildings. The rate required for IMC low-rise R-2, R-3, and R-4 dwelling units should also be revised to avoid under-ventilation that can lead to poor IAQ and negative health outcomes. Avoiding under-ventilating is especially important for IAQ in high-density multifamily dwelling units.

Following are calculations showing the outdoor airflow rate (QOA) required by various methods and demonstrating the deficiency of the ventilation

rates for IMC low-rise R-2, R-3, and R-4 dwelling units. The rate calculated is for a 2-bedroom, 800 ft2 apartment with 8 ft ceilings (volume = 6400 ft3)

Method A: 2015-2021 IMC, dwelling units in low-rise R-2, R-3, and R-4 buildings (same equation used in ASHRAE 62.2-2010):

QOA = 0.01 cfm/ft2*ConditionedFloorArea + 7.5*(NumberBedrooms + 1)

= 0.01*800 + 7.5*(2+1)

= 8 + 22.5

= 30.5 cfm [This rate is 1/3 less than the 2012 IMC, 1/3 less than ASHRAE 62.2-2019, and ½ less than ASHRAE 62.1-2019]

Method B: 2012 IMC, all private dwelling units (same equation used in 2021 IMC for all private dwelling units that are not in low-rise R-2, R-3, and R-4 buildings):

QOA = Max [0.35 ACH, (15 cfm/person)*(2 persons for first bedroom and 1 person for second bedroom)]

= Max [0.35ACH*(6400 ft3)*(1-hr/60-min), 45]

= Max [37, 45]

= 45 cfm

Method C: ASHRAE 62.2-2019, all non-transient vertically attached dwelling units

QOA = 0.03 cfm/ft2*ConditionedFloorArea + 7.5*(NumberBedrooms + 1)

= 0.03*800 + 7.5*(2+1)

= 24 + 22.5

= 46.5 cfm [This method is proposed within this proposal. Note that this method produces values that are very close to those in Method B (i.e., the 2012 IMC for all private dwelling units and the 2021 IMC for all private dwelling units that are not in low-rise R-2, R-3, and R-4 buildings]

Method D: ASHRAE 62.1-2019, all transient dwelling units:

QOA = 0.06 cfm/ft2*ConditionedFloorArea + (5 cfm/person)*(2 persons for first bedroom and 1 person for second bedroom)

= 0.06*800 + 5*3

= 0.06*800 + 5*3

= 48 + 15

= 63 cfm

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 38.

Cost Impact: The code change proposal will increase the cost of construction

An increase in required ventilation rate could, in some situations, require a “step up” to the next size of ventilation equipment or a “step up” to the next duct size in some parts of systems. Generally, next size “step-ups” will have some increased material costs but this would not always be the case for every project.

M19-21

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

403.3.2.1Outdoor air for dwelling units.
An outdoor air ventilation system consisting of a mechanical exhaust system, supply system or combination thereof shall be installed for each *dwelling unit*. Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system. The outdoor air ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

Q_{OA}= ~~0.01~~ 0.03 A_{floor} +7.5(N_{br}+1) **(Equation 4-9)**
where:

Q_{OA} = outdoor airflow rate, cfm

A_{floor} = conditioned floor area, ft^2

N_{br} = number of bedrooms; not to be less than one

Exceptions:

1. The outdoor air ventilation system is not required to operate continuously where the system has controls that enable operation for not less than 1 hour of each 4-hour period. The average outdoor airflow rate over the 4-hour period shall be not less than that prescribed by Equation 4-9.
2. The minimum mechanical ventilation rate determined in accordance with Equation 4-9 shall be reduced by 30 percent provided that both of the following conditions apply:

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

      2.1.1. Living room.

      2.1.2. Dining room.

      2.1.3. Kitchen.

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

Committee Reason: The proposal has passed as modified as the language is trying to align with ASHRAE 62.2 to avoid underventilation of spaces. (Vote: 7-4)

M19-21

Individual Consideration Agenda

Public Comment 1:

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# 2615

Public Comment 2:

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

Commenter's Reason: Current dwelling units are not under ventilated. There are no indoor contaminant data studies that baseline existing conditions in Code compliant buildings. Nor are there health studies linking residential occupancy health to ventilation rates. Changing Equation 4-9 results in a huge increase in ventilation of 60 percent of greater. Increasing the ventilation rate by 60 percent or greater will lead to excessive humidity issues in hot humid and mixed humid climates. We already see this with the ASHRAE 62.2 rate in single family detached dwellings 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 to increase the ventilation rate requirement would have to be justified by real indoor contaminant data and real health studies.

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 cost.

Public Comment# 2723

M23-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

BALANCED VENTILATION SYSTEM. ~~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.~~ 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.

403.3.2.1 Outdoor air for dwelling units. An outdoor air ventilation system consisting of a mechanical exhaust system, supply system or combination thereof shall be installed for each *dwelling unit*. Local exhaust or supply systems, including outdoor air ducts connected to the return side of an air handler, are permitted to serve as such a system. The outdoor air ventilation system shall be designed to provide the required rate of outdoor air continuously during the period that the building is occupied. The minimum continuous outdoor airflow rate shall be determined in accordance with Equation 4-9.

$$Q_{OA} = 0.01 A_{floor} + 7.5(N_{br} + 1)$$ **(Equation 4-9)**

where:

Q_{OA} = outdoor airflow rate, cfm

A_{floor} = floor area, ft^2

N_{br} = number of bedrooms; not to be less than one

Exceptions:

1. The outdoor air ventilation system is not required to operate continuously where the system has controls that enable operation for not less than 1 hour of each 4-hour period. The average outdoor airflow rate over the 4-hour period shall be not less than that prescribed by Equation 4-9.
2. The minimum mechanical ventilation rate determined in accordance with Equation 4-9 shall be reduced by 30 percent provided that both of the following conditions apply:

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

      2.1.1. Living room.

      2.1.2. Dining room.

      2.1.3. Kitchen.

   2.2. The whole-house ventilation system is a *balanced ventilation* ~~system~~ *system*.

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 IRC are correlation proposals that will align the terminology, definitions, and their application across both codes. The change that is proposed in Section 403.3.2.1 is italicizing the word "system" within 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.

M23-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The proposal is poorly worded using words such as "average". It is not clearly defined text and is confusing, implying that air force rate should be within 10% of their average. (Vote: 11-0)

M23-21

Individual Consideration Agenda

Public Comment 1:

IMC: SECTION 202

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

Modify as follows:

2021 International Mechanical Code

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. 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 IRC definition under RM16.

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# 2452

M25-21

Proposed Change as Submitted

Proponents: Mark Lessans, Johnson Controls, representing Johnson Controls (mark.lessans@jci.com)

2021 International Mechanical Code

SECTION 403
MECHANICAL VENTILATION

Add new text as follows:

403.4 Clean Air Delivery Capability.
Each mechanical system shall meet the requirements in 403.4.1. Each occupiable space shall meet the requirements in 403.4.2.

Exception: Occupiable spaces where 100% of the supply air meets High-efficiency Particulate Air filtration.

403.4.1 Airflow for Increased Filtration.
Mechanical systems shall be sized to accommodate a design airflow at a total static pressure drop which assumes the utilization of a supply air filter with a Minimum Efficiency Reporting Value of no less than 13.

403.4.2 Zonal Filtration or Disinfection Capability.
Each occupiable space shall have 120-volt receptacles which provide at least 0.2 watts per square foot of occupiable space above the requirements of the National Electrical Code to support supplemental air cleaning devices.

Exception: Rooms with less than 500 square feet of occupiable space.

Reason: This proposal seeks to "ready" buildings for retrofits and other changes if indoor clean air delivery needs to be increased – such as in response to mitigating an airborne contaminant – per ASHRAE and CDC guidance on reopening buildings during the COVID-19 pandemic. If the mechanical system is not designed with a MERV 13 filter, it would at least be sized to accommodate the use of one later on without having to redesign or replace the system. This is important, as MERV 13 filters are often at the balance point between filtration effectiveness and energy efficiency. However, these filters are thicker and have a larger airflow resistance when compared to conventional filters, and often existing systems cannot accommodate them. This proposal also requires that occupiable spaces be equipped with the electrical infrastructure needed to increase clean air delivery at the zonal level, such as using a HEPA room air cleaning machine.

Cost Impact: The code change proposal will increase the cost of construction
These additional requirements will result in a modest increase in construction costs, but this cost pales in comparison to the burden of adding them post-construction.

M25-21

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

APPENDIX D Clean Air Delivery

~~403.4~~ D101 Clean Air Delivery Capability.
Each mechanical system shall meet the requirements in ~~403.4.1~~ Section D101.1. Each occupiable space shall meet the requirements in ~~403.4.2~~ Section D101.2.
Exceptions:
1. Group R occupancies.
2. Occupiable spaces where 100% of the supply air meets High-efficiency Particulate Air filtration.
3. Rooms with less than 500 square feet of occupiable space.

~~403.4101.1~~ D101.1 Airflow for Increased Filtration.
Mechanical systems shall be sized to accommodate a design airflow at a total static pressure drop which assumes the utilization of a supply air filter with a Minimum Efficiency Reporting Value of no less than 13.

~~403.4.2~~ D101.2 Zonal Filtration or Disinfection Capability.
Each occupiable space greater than 500 square feet shall have at least one 125-volt, single-phase, 15- or 20-ampere receptacle outlet installed in an accessible location for the cord-and-plug connection of a supplemental air cleaning appliance. One additional receptacle outlet shall be installed for each additional 1000 square feet of occupiable space. The installation shall comply with NFPA 70. ~~shall have 120-volt receptacles which provide at least 0.2 watts per square foot of occupiable space above the requirements of the National Electrical Code to support supplemental air cleaning devices.~~ which provide at least 0.2 watts per square foot of occupiable space above the requirements of the National Electrical Code to support supplemental air cleaning devices.

Committee Reason: The committee has appropriately agreed that current code language must be clarified between residential and commercial in the appendix, Exempt Group 8 and electrical equipment. This proposal also requires that occupiable spaces be equipped with the electrical infrastructure needed to increase clean air delivery at the zonal level. The modifications further clarify acceptable industry practices and gives opportunities for jurisdictions. (Vote: 6-5)

M25-21

Individual Consideration Agenda

Public Comment 1:

IMC: D101, D101.2

Proponents: John Catlett, representing BOMA International (catlettcodeconsulting@gmail.com) requests As Modified by Public Comment

Further modify as follows:

2021 International Mechanical Code

D101 Clean Air Delivery Capability . Each mechanical system shall meet the requirements in D101.1. ~~Each occupiable space shall meet the requirements in D101.2.~~

Exceptions:

1. Group R occupancies.
2. Occupiable spaces where 100% of the supply air meets High-efficiency Particulate Air filtration.

~~**D101.2 Zonal Filtration or Disinfection Capability .** Each occupiable space greater than 500 square feet shall have at least one 125-volt, single-phase, 15- or 20-ampere receptacle outlet installed in an accessible location for the cord-and-plug connection of a supplemental air cleaning appliance. One additional receptacle outlet shall be installed for each additional 1000 square feet of occupiable space. The installation shall comply with NFPA 70.~~

Commenter's Reason: BOMA supported the proposal as originally written as long as it was an appendix item. It provides good guidance to building owners who may choose to prepare for future pandemic needs or could be adopted locally by choice.
BOMA is deeply involved with the ICC Pandemic Task Force. It has been made clear that not all diseases that could potentially rise to pandemic status can be treated the same. So the proposal provides an option to consider for new or altered buildings.

However, a floor modification was added at the last minute that added the proposed deleted language.

The additional electrical outlet is not needed. Period. If it were, it should be added to the NEC, not the mechanical code.

The consumption associated with individual room air filtration systems is no more than normal cord and plug connected appliances that are already covered under the general load calculation found in the NEC. No evidence was provided to support the need. Portable heaters, small desk refrigerators, fans and similar devices do not require additional load calculation as they are assumed in the general calculation. The only benefit of the proposal is to the electrical manufacturing, suppliers, and installers.

The cost/benefit is just not there. We ask that the proposal be modified to remove the electrical outlets and additional calculation.

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
This public comment will decrease the cost of compliance. The additional electrical outlet will serve no purpose other than a cost increase. Should there be a consideration of the actual need for the dedicated outlets, this should be considered by the appropriate NFPA 70 committee and not the ICC Mechanical Code Committee.

Public Comment 2:

IMC: D101

Proponents: Jeffrey Shapiro, representing IIAR (jeff.shapiro@intlcodeconsultants.com) requests As Modified by Public Comment

Further modify as follows:

2021 International Mechanical Code

D101 Clean Air Delivery Capability. ~~Each~~ In Groups A, B, E and I occupancies, each mechanical system shall meet the requirements in D101.1. Each occupiable space in such occupancies shall meet the requirements in D101.2.

~~Exceptions~~ Exception:

1. ~~Group R occupancies.~~
2. ~~.~~ Occupiable spaces where 100% of the supply air meets High-efficiency Particulate Air filtration.

Commenter's Reason: The proposed requirements are an over-reach for factory, storage, high-hazard, industrial, mercantile, and utility occupancies and should not apply in any case, even though they are already relegated to an optional appendix. Residential occupancies were already exempted, so this public comment just retained that exemption.

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
Reducing the scope of application for this appendix will result in cost savings for occupancies that are not included.

Public Comment 3.:

Proponents: Mary Koban, representing AHRI (mkoban@ahrinet.org) requests As Submitted

Commenter's Reason: AHRI supports the committee recommendation for the approval of M25 as modified.
AHRI supports the submitter in the floor modification to remove residential occupancies.

Based on the floor modification to exempt residential occupancies from this proposal, the technical committee agree that the code language was appropriate.

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
This change is expected to have a cost impact. Our comment was to support the technical committee's modification of M25 which removed residential occupancies. If anything our comment would reduce the cost of construction.

M26-21

Proposed Change as Submitted

Proponents: Mark Lessans, Johnson Controls, representing Johnson Controls (mark.lessans@jci.com)

International Mechanical Code

2021 International Mechanical Code

Add new text as follows:

405.2 Demand Control Ventilation.
Each occupiable space shall be equipped with a carbon dioxide sensor which meets the requirements in 405.2.1 and 405.2.3. Mechanical equipment serving each zone(s) shall be equipped with controls which meet the requirements in 405.2.2.

405.2.1 Carbon Dioxide Sensor Performance Specifications.
Each carbon dioxide sensor installed in accordance with Section 405.2 shall meet the following carbon dioxide measurement specifications as certified by the equipment manufacturer:

1. Range lower bound less than or equal to 400 parts per million
2. Range upper bound greater than or equal to 2,000 parts per million
3. Accuracy within ±75 parts per million at a reading of 1,000 parts per million
4. Output resolution less than or equal to 5 parts per million

405.2.2 Mechanical System Controls.
Controls installed in accordance with Section 405.2 shall:

1. Receive data from the carbon dioxide sensor in the occupiable zone(s) at least once per 5 minutes
2. Be calibrated to provide pre-established outdoor airflow rates, or be equipped with the necessary instrumentation to measure outdoor airflow
3. Be capable of adjusting the outdoor airflow in response to an adjustable outdoor airflow setpoint
4. Increase the amount of outdoor air provided to each occupiable zone until the carbon dioxide level in each occupiable zone falls below a maximum threshold as defined by the user

405.2.3 Ventilation Rate Alarming.
When carbon dioxide levels are above a maximum level as defined by the user, sensors installed in accordance with Section 405.2 shall alert the occupants with a visual and audible indication in the zone or through a building monitoring system.

405.2.3.1 Default Carbon Dioxide Threshold Level.
The threshold level for carbon dioxide measurement above which triggers an alert in accordance with Section 405.2.3 shall be set to 1,100 parts per million by default.

Reason: Several recently published studies[1,2] have demonstrated that a large portion of indoor occupied spaces to not meet minimum requirements for ventilation as set in ASHRAE Standard 62.1, and have documented the impacts on occupant health, comfort, and productivity. Additionally, providing adequate ventilation is the most effective first step in mitigating the transmission of viruses carried by airborne particulates, an issue that has been highlighted during the COVID-19 pandemic.

This proposal seeks to ensure building occupants have access to adequate ventilation by bringing Demand Control Ventilation (DCV) to each occupiable zone and managing carbon dioxide levels – the best proxy we have for determining inadequate ventilation and/or above-normal occupancy. The proposal requires that every occupiable zone have a basic CO2 sensor, that the CO2 sensor communicate with the building mechanical system, and that the mechanical system be capable of adjusting airflow rates to keep CO2 levels (and therefore ventilation adequacy) within acceptable levels. It also requires that the CO2 sensor notify either the occupants, or the building manager, when ventilation is inadequate. This can be especially helpful first step in helping building occupants understand when indoor may be at unhealthy levels and take mitigating action.

If successfully deployed, this proposal would go a long way toward maintaining adequate ventilation, as well as assist in saving energy by preventing overventilation of spaces.

Bibliography: [1]University of California at Davis, Ventilation rates in California classrooms: Why many recent HVAC retrofits are not delivering sufficient ventilation, January 2020
[2]United States Government Accountability Office, School Districts Frequently Identified Multiple Building Systems Needing Updates or Replacement, June 2020

Cost Impact: The code change proposal will increase the cost of construction
This proposal will increase the cost of construction as additional sensors will be required.

M26-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The proponent references studies tied to school facilities only. Providing demand control ventilation to each occupiable space is too broad. (Vote: 11-0)

M26-21

Individual Consideration Agenda

Public Comment 1:

IMC: 405.2, 405.2.1, 405.2.2, 405.2.3, 405.2.3.1, Appendix D (New), (New), D101 (New), D101.1 (New), D101.2 (New), D101.3 (New), D101.4 (New)

Proponents: Mark Lessans, representing Johnson Controls (mark.lessans@jci.com) requests As Modified by Public Comment

Modify as follows:

2021 International Mechanical Code

~~**405.2 Demand Control Ventilation.**~~
~~Each occupiable space shall be equipped with a carbon dioxide sensor which meets the requirements in 405.2.1 and 405.2.3. Mechanical equipment serving each zone(s) shall be equipped with controls which meet the requirements in 405.2.2.~~

~~**405.2.1 Carbon Dioxide Sensor Performance Specifications.**~~
~~Each carbon dioxide sensor installed in accordance with Section 405.2 shall meet the following carbon dioxide measurement specifications as certified by the equipment manufacturer:~~

1. ~~Range lower bound less than or equal to 400 parts per million~~
2. ~~Range upper bound greater than or equal to 2,000 parts per million~~
3. ~~Accuracy within ±75 parts per million at a reading of 1,000 parts per million~~
4. ~~Output resolution less than or equal to 5 parts per million~~

~~**405.2.2 Mechanical System Controls.**~~
~~Controls installed in accordance with Section 405.2 shall:~~

1. ~~Receive data from the carbon dioxide sensor in the occupiable zone(s) at least once per 5 minutes~~
2. ~~Be calibrated to provide pre-established outdoor airflow rates, or be equipped with the necessary instrumentation to measure outdoor airflow~~
3. ~~Be capable of adjusting the outdoor airflow in response to an adjustable outdoor airflow setpoint~~
4. ~~Increase the amount of outdoor air provided to each occupiable zone until the carbon dioxide level in each occupiable zone falls below a maximum threshold as defined by the user~~

~~**405.2.3 Ventilation Rate Alarming.**~~
~~When carbon dioxide levels are above a maximum level as defined by the user, sensors installed in accordance with Section 405.2 shall alert the occupants with a visual and audible indication in the zone or through a building monitoring system.~~

~~**405.2.3.1 Default Carbon Dioxide Threshold Level.**~~
~~The threshold level for carbon dioxide measurement above which triggers an alert in accordance with Section 405.2.3 shall be set to 1,100 parts per million by default.~~

Appendix D
Clean Air Delivery

User Note .
The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.
About this appendix: *Appendix D provides criteria for an increased protection level for occupant health by delivering and monitoring clean air in occupied areas of the certain buildings.*

D101 Demand control ventilation .
Group A, B, E and I occupancies shall be equipped with a minimum of one carbon dioxide sensor for every 500 square feet of occupiable space. Carbon dioxide sensors installed in accordance with this section shall meet the requirements in Sections D101.1 and D101.3. Mechanical equipment serving each zone(s) shall be equipped with controls which meet the requirements in Section D101.2.

Exception: Occupiable zones less than 500 square feet.

D101.1 Carbon dioxide sensor performance specifications .
Each carbon dioxide sensor installed in accordance with Section D101 shall meet the following carbon dioxide measurement specifications as certified by the equipment manufacturer:

1. Range lower bound less than or equal to 400 parts per million
2. Range upper bound greater than or equal to 2,000 parts per million
3. Accuracy within ±75 parts per million at a reading of 1,000 parts per million
4. Output resolution less than or equal to 20 parts per million

D101.2 Mechanical system controls .
Controls for the mechanical equipment installed in accordance with Section D101 shall:

1. Receive data from the carbon dioxide sensor in the occupiable zone(s) at least once per 5 minutes
2. Be calibrated to provide pre-established outdoor airflow rates, or be equipped with the necessary instrumentation to measure the outdoor airflow rate
3. Be capable of adjusting the outdoor airflow rate in response to an adjustable outdoor airflow setpoint
4. Increase the amount of outdoor air provided to each occupiable zone until the carbon dioxide level in each occupiable zone falls below a maximum threshold as defined by the user

D101.3 Carbon dioxide detection threshold level .
The default detection threshold level for carbon dioxide measurement above which triggers an alert in accordance with Section D101.4 shall be set to 1,100 parts per million. The end user can modify the detection threshold level based on specific operations and needs.

D101.4 Carbon dioxide detection threshold level exceeded .
When carbon dioxide levels exceed the detection threshold level established in Section D101.3, the mechanical equipment shall modify the outdoor airflow rate as required in Section D101.2. When the carbon dioxide concentration remains above the detection threshold level for a period of 30 minutes or more, the occupants in the zone shall be alerted by approved audible and visual notification devices or through a building monitoring system.

Commenter's Reason: The code development committee disapproved this proposal because it was too broad in its application. This Public Comment contains revisions to address the committee's concerns in addition to clarifications.
First, the committee agreed with moving this proposal to a new Appendix D. Appendix D is created along with renumbering of sections as appropriate. The standard appendix note is added indicating that as an appendix chapter, these provisions will only apply when specifically referenced in the adopted ordinance.

Second, this Public Comment limits application of these requirements. The requirements are only applicable to Groups A, B, E and I occupancies. These occupancies fall into similar characteristics for level of hazard and occupant density. Industrial type facilities such as Groups F, H and S are not included. Additionally, the exception eliminates the requirements for occupiable spaces where the air handling zone is less than 500 square feet.

Third, a revision is added to limit the number of carbon dioxide sensing devices to one per 500 square feet. This eliminates the need for a device in every room or space.

Fourth, clarification is added in Section D101.4 as far the actions required when excess levels of carbon dioxide are detected.

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

This Public Comment moves the code change proposal into an Appendix, thus making the requirements not mandatory, and not increasing or decreasing the cost of construction.

Public Comment# 2213

M27-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Add new text as follows:

SECTION 408
PROCESSING AND EXTRACTION FACILITIES

408.1 General.
Plant processing or extraction facilities shall comply with this section, the International Building Code and Chapter 39 of the International Fire Code. The extraction process includes the act of extraction of the oils and fats by use of a solvent, desolventizing of the raw material, production of the miscella, distillation of the solvent from the miscella and solvent recovery. Post-extraction processing includes winterization, solvent recovery, distillation, decarboxylation, isolation, chromatography and similar processes. The use, storage, transfilling and handling of hazardous materials in these facilities shall comply with this code, the International Building Code and the International Fire Code.

408.2 Existing buildings or facilities.
Existing buildings or facilities used for the processing of plants shall comply with this code, the International Building Code and the International Fire Code. Existing extraction processes where the medium of extraction or solvent is changed shall comply with this section.

408.3 Mechanical ventilation.
Natural ventilation shall not be permitted. Mechanical ventilation shall be designed and installed in accordance with Section 403 in this code and Chapter 39 of the International Fire Code. The exhaust airflow rate shall be provided in accordance with the requirements of 408.3.1 through 408.3.4.

408.3.1 Extraction processes using flammable gases or flammable liquids.
Continuous mechanical exhaust ventilation shall provide a minimum airflow rate of not less than 5 cfm/ft2 (0.0038 m3/(s*m2)) of floor area to prevent an accumulation of flammable vapors from exceeding 25 percent of the lower explosive limit (LEL). Recirculation of such air shall be prohibited.

Exception: Where the registered design professional demonstrates that an engineered mechanical exhaust ventilation system design will prevent the maximum concentration of contaminants from exceeding 25% of the LEL, the minimum required rate of exhaust shall be reduced in accordance with such engineered system design.

408.3.2 Extraction processes using compressed asphyxiant or inert gases.
Continuous mechanical exhaust ventilation shall be provided in accordance with Chapter 39 of the International Fire Code. Recirculation of such air shall be prohibited.

408.3.3 Post-extraction processes using flammable or combustible liquids or gases.
Where flammable liquids, combustible liquids heated above their flashpoint, or flammable gases are used in post-extraction processing, the room or area shall be provided with continuous mechanical exhaust in accordance with Chapter 39 of the International Fire Code.

408.3.4 Interlocks.
Electrical equipment and appliances used in processes that generate flammable vapors or gases shall be interlocked with ventilation fans so that the equipment cannot be operated unless the exhaust ventilation fans are in operation.

408.4 Exhaust fan discharge.
Exhaust fans shall be positioned so that the discharge will not impinge on the roof, other equipment or appliances or parts of the structure. A vertical discharge fan shall be manufactured with an approved drain outlet at the lowest point of the housing to permit drainage of oils or byproducts to an approved location.

408.5 Exhaust fan mounting.
Upblast fans serving plant processing or extraction facilities and installed in a vertical or horizontal position shall be hinged, supplied with a flexible weatherproof electrical cable to permit inspection and cleaning and shall be equipped with a means of restraint to limit the swing of the fan on its hinge. The ductwork shall extend not less than 18 inches (457 mm) above the roof surface.

408.6 Clearances.
Exhaust equipment serving a plant processing or extraction facilities shall have a clearance to combustible construction of not less than 18 inches (457 mm).

Exception: Factory-built exhaust equipment installed in accordance with Section 304.1 and listed for a lesser clearance.

408.7 Termination location.
The outlet of exhaust equipment serving plant processing or extraction facilities shall be in accordance with Section 501.3 of this code.

Exception: The minimum horizontal distance between vertical discharge fans and parapet-type building structures shall be 2 feet (610 mm), provided that such structures are not higher than the top of the fan discharge opening.

408.8 Ducts.
Exhaust duct construction shall comply with Chapter 6.

408.9 Hazardous Exhaust Systems.
When the exhaust system is determined to be a hazardous exhaust system by this code, the International Building Code or the International Fire Code, that system shall be installed in accordance with Section 510 of this code.

502.21 Processing and Extraction Facilities.
Processing and extraction Facilities shall be provided with an exhaust system in accordance with of Section 408 of this code and Chapter 39 of the International Fire Code.

502.21.1 Operation.
The exhaust system for processing and extraction Facilities shall have controls that operate the system continuously when the space is occupied.

502.21.2 Post-processing.
Post-processing operations, including dispensing of flammable liquids between containers, shall be performed within a hazardous exhaust fume hood rated for exhausting flammable vapors and listed in accordance with UL 1805. Electrical equipment used within the hazardous exhaust fume hood shall be rated for use in flammable atmospheres.

Exception: A hazardous exhaust fume hood shall not be required where an approved exhaust system is installed in accordance with NFPA 91.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

1805-2002	Standard for Laboratory Hoods and Cabinets (Ed.1)

Reason: These facilities are becoming common in numerous states and these requirements are based of best practices and ensure basic fire and life safety measures. The requirements in this section provide requirements for hazardous and non-hazardous facilities. The development of these requirements was done in collaboration with the PMGCAC and FCAC. Most of these requirements are existing in current code we are only creating sections that provide an understandable path for compliance.

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 10.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
These requirements already exist in the IBC and IFC. Adding these requirements to the IMC only provides guidance for the design and installation of systems that comply with existing code requirements. As such, this proposal does not require additional material or labor costs that would impact the cost of construction.

Staff Analysis: A review of the standards proposed for inclusion in the code, UL 1805-2002: Standard for Laboratory Hoods and Cabinets, with regard to some of the key ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before March 20, 2021.

M27-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee agrees that existing building provisions will cause correlation problems with IBC. (Vote: 11-0)

Individual Consideration Agenda

Public Comment 1:

IMC: 408.2

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

Modify as follows:

2021 International Mechanical Code

~~**408.2 Existing buildings or facilities .** Existing buildings or facilities used for the processing of plants shall comply with this code, the International Building Code and the International Fire Code. Existing extraction processes where the medium of extraction or solvent is changed shall comply with this section.~~

Commenter's Reason: The Committee didn't like this section in the proposal so we removed it. We agree as the IEBC first needs to address when some (or all) of these provisions are applicable for the different alteration levels. Proposals to the IEBC can be accomplished in the next development cycle after this major section is in place for new construction. The main focus of the proposal was to establish provisions for new construction moving forward.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
This public comment only removes existing buildings from the scope of the provisions. Overall, the original proposal's reason for increasing the cost of construction stands. Adding provisions where none existed previously will add more material and labor cost to facilities involving these processes.

Public Comment# 2576

M32-21

Proposed Change as Submitted

Proponents: John Williams, Chair, representing Healthcare Committee (ahc@iccsafe.org)

2021 International Mechanical Code

Revise as follows:

505.3 Exhaust ducts. Domestic cooking exhaust equipment shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls, shall be airtight and shall be equipped with a backdraft damper. Installations in Group I-1 and I-2 *occupancies* shall be in accordance with ~~the *International Building Code* and Section 904.14 of the International Fire Code~~ this section and Section 505.7 or 505.8.

Exceptions:

1. ~~In other than Groups I-1 and I-2, where~~ Where installed in accordance with the manufacturer's instructions and where mechanical or natural ventilation is otherwise provided in accordance with Chapter 4, *listed* and *labeled* ductless range hoods shall not be required to discharge to the outdoors.
2. Ducts for domestic kitchen cooking *appliances* equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

   2.1. The duct shall be installed under a concrete slab poured on grade.

   2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.

   2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.

   2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.

   2.5. The PVC ducts shall be solvent cemented.

Add new text as follows:

505.7 Group I-1 Occupancies.
In Group I-1 occupancies, hood installations over domestic cooking equipment shall be installed in accordance with one of the following:

1. Domestic hoods over cooktops and ranges installed in accordance with Section 420.9 of the International Building Code shall comply with the following:

   1.1. Protection from fire shall be in accordance with Section 904.14 of the International Fire code.

   1.2. Mechanical ventilation shall be provided to the rooms or spaces containing the cooking facility in accordance with Section 403.3.1.

   1.3. Hood systems shall have a minimum air flow of 500 cfm (14,000 L/min).

   1.4. Listed and labeled ductless range hoods shall have a charcoal filter to reduce smoke and odors.

2. Commercial kitchen hoods complying with Section 507 shall be provided over cooktops and ranges serving greater than 30 care recipients.

505.8 Group I-2 Occupancies.
In Group I-2 Occupancies, Hood installations over domestic cooking equipment shall be installed in accordance with one of the following:

1. Domestic hoods over cooktops and ranges installed in accordance with Section 407.2.7 of the International Building Code shall comply with the following:
   1.1. Protection from fire shall be in accordance with Section 904.14 of the International Fire code.

   1.2. Mechanical ventilation shall be provided to the rooms or spaces containing the cooking facility in accordance with Section 407.

   1.3. Hood systems shall have a minimum air flow of 500 cfm (14,000 L/min).

   1.4. Listed and labeled ductless range hoods shall have a charcoal filter to reduce smoke and odors.

2. Commercial kitchen hoods complying with Section 507 shall be provided over cooktops and ranges serving greater than 30 care recipients.

Reason: In I-1 and I-2 Occupancies, Section 407.2.6 and 420.8 set up a number of safeguards that allow for meal preparation for up to 30 care recipients. These cooking operations are on a lower scale than commercial cooking facilities and do not generate the same level of smoke and

vapors. The aroma of food cooking is beneficial to the care recipients who live in I-1 and I-2 occupancies as it stimulates appetite and signals them that mealtime is near.
The hoods in question are not your standard domestic range hood. Hoods for I-1 and I-2 Occupancies must comply with Section 904.14 of the *International Fire Code*. This section requires hoods that are listed and labeled per UL 300A, have fire suppression built in, and have an interlock that cuts the fuel or power source upon activation of the extinguishing system. Stovetops must also have a timer that automatically turns off the cooking device after 120 minutes, preventing unattended cooking.

Federal Guidelines that govern I-2 Occupancies permit recirculating hoods with a charcoal filter and also require a higher airflow rate. This added language is being added to allow equivalent facilitation.

For commercial cooking facilities, compliance with NFPA 96 is required. However, NFPA 96 (Chapter 13) allows for the use of re-circulating hoods in commercial cooking operations, there is no justification to prohibit the use in these domestic uses.The issue at hand is that sometimes, especially in a renovation of a multi-story building, it can be impractical or impossible to run an exhaust duct to the outside. By requiring a vented hood, it would prevent many communities from being able to provide better food quality and a social experience that can be critical to quality of life.

The CHC was established by the ICC Board to evaluate and assess contemporary code issues relating to healthcare facilities. This is a joint effort between ICC and the American Society for Healthcare Engineering (ASHE), a subsidiary of the American Hospital Association, to eliminate duplication and conflicts in healthcare regulation. In 2020 the CHC held several virtual meeting, which included members of the committees as well as any interested parties, to discuss and debate the proposed changes. Information on the CHC, including: meeting agendas; minutes; reports; resource documents; presentations; and all other materials developed in conjunction with the CHC effort can be downloaded from the CHC website at CHC.

Cost Impact: The code change proposal will decrease the cost of construction
The cost of a domestic hood is less than a commercial hood and associate duct work.

M32-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The committee agrees that the the proposal language as written is problematic in this section and is missing the option of ducted installations for domestic hoods provided over cook tops. (Vote: 11-0)

M32-21

Individual Consideration Agenda

Public Comment 1:

IMC: 505.3, 505.7 (New), 505.8 (New)

Proponents: John Williams, representing Healthcare Committee (ahc@iccsafe.org) requests As Modified by Public Comment

Replace as follows:

2021 International Mechanical Code

505.3 Exhaust ducts . Domestic cooking exhaust equipment shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls, shall be airtight and shall be equipped with a backdraft damper. Installations in Group I-1 and I-2 *occupancies* shall be in accordance with the *International Building Code* and Section 904.14 of the International Fire Code and Section 505.7 or 505.8.

Exceptions:

1. ~~In other than Groups I-1 and I-2, where~~ Where installed in accordance with the manufacturer's instructions and where mechanical or natural ventilation is otherwise provided in accordance with Chapter 4, *listed* and *labeled* ductless range hoods shall not be required to discharge to the outdoors.
2. Ducts for domestic kitchen cooking *appliances* equipped with downdraft exhaust systems shall be permitted to be constructed of

Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

2.1. The duct shall be installed under a concrete slab poured on grade.

2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.

2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.

2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.

2.5. The PVC ducts shall be solvent cemented.

505.7 Group I-1 Occupancies . In Group I-1 Occupancies, hood installations over domestic cooking equipment installed in accordance with Section 420.9 of the International Building Code shall comply with the following:

1. Range hoods shall have a minimum air flow rate of 500 cfm. (14,000 L/min).
2. Mechanical ventilation shall be provided to the rooms or spaces containing the domestic cooking equipment in accordance with Section 403.3.1.
3. Range hood exhaust shall discharge to the outdoors.

Exception : A listed and labeled ductless range hood shall be permitted where a charcoal filter is provided in the hood to reduce smoke and odors.

505.8 Group I-2 Occupancies . In Group I-2 Occupancies, hood installations over domestic cooking equipment installed in accordance with Section 407.2.7 of the International Building Code shall comply with the following:

1. Range hoods shall have a minimum air flow rate of 500 cfm. (14,000 L/min).
2. Mechanical ventilation shall be provided to the rooms or spaces containing the domestic cooking equipment in accordance with Section 403.3.1.
3. Range hood exhaust shall discharge to the outdoors.

Exception : A listed and labeled ductless range hood shall be permitted where a charcoal filter is provided in the hood to reduce smoke and odors.

Commenter's Reason: The intent of this code change is to allow listed and labeled ductless domestic range hoods, that meet specific criteria, over domestic cooking appliances in limited applications for I-1 and I-2 Occupancies. This Public Comment proposal addresses the comments the CHC heard from the committee and opponents:
First, we were told it was confusing to bring the language referencing commercial kitchen hoods into Section 505, which only addresses domestic cooking, so we have removed that language. This doesn't change any requirements when using commercial appliances, or prevent a designer from choosing to provide a type 1 hood over a domestic range.

Secondly, we heard that it was not clear in the initial proposal that it was a choice between ducting to the outdoors OR using a ductless (re-circulating) exhaust hood in these applications. For this reason, we have changed the ductless hood to be an exception to the requirement to vent to the outdoors. There are some conditions that arise, that make it difficult, or impossible, to vent a hood to the outdoors. We feel that this proposal is providing the adequate levels of safety for I-1 and I-2 care recipients, whether vented or ductless.

Please keep in mind that, by referencing Section 420.9 and Section 407.2.7 of the International Building Code, the range hoods in question are used only over domestic cooking appliances (cooktops and ranges) and are located either within individual dwelling units (I-1 only), in kitchens serving 30 or fewer care recipients, or in areas like a Physical Therapy or staff break room. The sections referenced also require additional safeguards like staff access to turn on the appliance and a timer that shuts off the appliance after 120 minutes, if not attended. These cooking provisions have been in the Codes since 2015, for nursing homes.

Further, the reference to the International Fire Code points to the requirement for fire suppression to be built into the hood, with manual activation and interconnection that turns off the cooking appliance. As I-1 and I-2 Occupancies are already required to be sprinkled, this brings another level of safety. NFPA data, NIST Special Report 1066 and further research by NIST (TN 1969), has shown that a single residential sprinkler head can extinguish a cooking oil fire in a skillet.

The addition of the charcoal filter in the ductless hood was meant to address the concerns from opponents on smoke, vapors and particulate matter being circulated through the space. This charcoal filtration matches the requirements in NFPA 96 for ductless (re-circulating) Commercial Kitchen hoods. NFPA 96 does allow for ductless hoods in commercial cooking applications. Keep in mind that the application this proposal addresses is only serving up to 30 residents total, which is at a much lower rate of meal service than a typical restaurant or other commercial application.

Setting the airflow requirement through the hood at 500 cfm, this matches the federal guidelines for this type of cooking operation and does a better

job of capturing any fumes, grease laden vapors, etc from cooking operations. Standard domestic range hoods typically only provide 220 – 375 cfm so this is a significant increase. Several research studies have shown that higher air flow rates result in higher capture efficiencies and provide better indoor air quality.

Further, per Section 505.4, any exhaust hood over 400 cfm is required to be provided with equivalent make-up air systems. This ensures that sufficient fresh air is being brought into the space to offset impacts of cooking operations. The requirement in this text for mechanical ventilation, not natural ventilation, reinforces this requirement and ensures that adequate ventilation will be provided to mitigate air quality concerns.

This is the last part of a package of code changes around cooking that recognize what has been “done for years” in I-1 Assisted Living and I-2 Nursing Home occupancies but to get it in the codes as a consistent and safe application nationwide and so that AHJ’s have one set of rules that are easier to enforce. The Center for Medicare and Medicaid Services (CMS), who oversee Hospitals, Nursing Homes and Ambulatory Care Occupancies has allowed these cooking applications with re-circulating domestic range hoods since 2012. The CHC was established to work towards bringing the I-Codes in line with the Federal Guidelines and enable the I-codes to stand as an equivalent option. This code change is a needed piece to this equivalency status.

Example kitchen

Example kitchen

Range with timer control and grease collecting hood.

Bibliography: Singer, Brett C. 2011 Experimental Evaluation of Installed Cooking Exhaust Fan Performance, Lawrence Berkeley National Lab, LBNL-4183E
EPA website: https://www.epa.gov/indoor-air-quality-iaq/improving-indoor-air-quality

EPA Indoor Air Plus Program: https://www.epa.gov/sites/production/files/2018-03/documents/indoor_airplus_fillable_verification_checklist.pdf

Cost Impact: The net effect of the public comment and code change proposal will decrease the cost of construction
The cost of a domestic hood is less than a commercial hood and associate duct work.

Public Comment# 2621

M33-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

505.3 Exhaust ducts. Domestic cooking exhaust equipment shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls, shall be airtight and shall be equipped with a backdraft damper. Installations in Group I-1 and I-2 *occupancies* shall be in accordance with the *International Building Code* and Section 904.14 of the International Fire Code.

Exceptions:

1. In other than Groups I-1 and I-2~~, where installed in accordance with the manufacturer's instructions and where mechanical or natural ventilation is otherwise provided in accordance with Chapter 4,~~ *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:

   1.1. The equipment is installed in accordance with the manufacturer's instructions.

   1.2. Natural ventilation or a mechanical exhaust system is otherwise provided in the cooking area in accordance with Chapter 4.

   1.3. The installation is in an existing kitchen not having an existing range hood exhaust duct to the outdoors.

2. Ducts for domestic kitchen cooking *appliances* equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

   2.1. The duct shall be installed under a concrete slab poured on grade.

   2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.

   2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.

   2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.

   2.5. The PVC ducts shall be solvent cemented.

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 public nuisance and not less than the distances specified in 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, or be directed onto walkways.

Exceptions:

1. Whole-house ventilation-type attic fans shall be permitted to discharge into the attic space of *dwelling units* having private attics.
2. Commercial cooking recirculating systems.
3. ~~Where installed in accordance with the manufacturer's instructions and where mechanical or *natural ventilation* is otherwise provided in accordance with Chapter 4, *l*~~ *Listed* and *labeled* domestic ductless range hoods shall not be required to discharge to the outdoors , when provided in accordance with Exception 1 to Section 505.3.

Reason: Cooking is typically the largest source of indoor air pollution in dwelling units, 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 in dwelling units is needed to comply with the Section 101.3 purpose of the IMC to "establish minimum requirements to provide a reasonable level of safety, health, property protection and general welfare." Unless captured at the source and exhausted to the exterior, cooking pollutants spread rapidly through a dwelling unit and deposit on surfaces, only to be released again into the breathing zone when disturbed at a later time. Like the current language in this section, this proposal does not permit ductless domestic range hoods to be installed in Group I-1 and I-2. In other occupancies, this proposal adds one more condition to the two conditions within this section that are required to approve ductless domestic range hoods: the installation of the ductless domestic 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, domestic 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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Zhao H, Chan WR, Singer BC, Delp WW, Tang H, Walker IS. Factors impacting range hood use in California houses and low-income apartments. International Journal of Environmental Research in Public Health. Submitted 05-Sep-2020.

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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 dwelling units.

Where new construction dwelling units are already provided with a range hood duct, there will not be any increase in construction cost.

Where new construction dwelling units 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.

M33-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The proposal requirements are overreaching and would inappropriately cause loss of use of ductless range hoods in commercial applications. (Vote: 11-0)

M33-21

Individual Consideration Agenda

Public Comment 1:

IMC: 505.3

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

Modify as follows:

505.3 Exhaust ducts . Domestic cooking exhaust equipment shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls, shall be airtight and shall be equipped with a backdraft damper. Installations in Group I-1 and I-2 *occupancies* shall be in accordance with the *International Building Code* and Section 904.14 of the International Fire Code.

Exceptions:

1. In other than Groups I-1 and I-2 *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:

   1.1. The equipment is installed in accordance with the manufacturer's instructions.

   1.2. ~~Natural ventilation or a~~ A mechanical exhaust system is otherwise provided in the ~~cooking area~~ kitchen in accordance with Chapter 4 , or the equipment is installed in an existing building's kitchen where mechanical or *natural ventilation* is otherwise provided in accordance with Chapter 4.

   ~~1.3. The installation is in an existing kitchen not having an existing range hood exhaust duct to the outdoors.~~

2. Ducts for domestic kitchen cooking *appliances* equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

   2.1. The duct shall be installed under a concrete slab poured on grade.

   2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.

   2.3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface.

   2.4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building.

   2.5. The PVC ducts shall be solvent cemented.

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 domestic 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 IMC language (recirculating range hoods are permitted where natural or mechanical ventilation is otherwise provided in accordance with Chapter 4). For all other buildings, the PC only permits recirculating range hoods where mechanical exhaust is otherwise provided (note that mechanical exhaust is now required by Section R401.2 for all dwelling units complying with the IECC or ASHRAE 90.1, so for these dwelling units, this PC also makes no effective change to the current IMC language).
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 mechanical exhaust must also be provided.

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 dwelling units of new construction that meet the requirements of the IECC or ASHRAE 90.1. Other new construction using a recirculating domestic range hood that does not already provide a separate mechanical exhaust system would experience an increase in the cost of construction.

Where additional ducting would be required for new construction, 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# 2708

M38-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

506.3.2.5 Grease duct test. A field test shall be performed ~~Prior~~ prior to the use or concealment of any portion of a grease duct system~~, a leakage test shall be performed~~. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides. The permit holder shall be responsible to provide the necessary *equipment* and perform the grease duct leakage test. ~~A light test shall be performed to determine that all welded and brazed joints are liquid tight. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls.~~ A test shall be performed for the entire duct system, including the hood-to-duct connection. The duct work shall be permitted to be tested in sections, provided that every joint is tested. For *listed* factory-built grease ducts, this test shall be limited to duct joints assembled in the field and shall exclude factory welds. The test shall be performed in accordance with either Section 506.3.2.5.1 or Section 506.3.2.5.2.

Add new text as follows:

506.3.2.5.3.1 Light test.
A duct test shall be performed by passing a lamp having not less than 1600 lumens, through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A successful test shall be where the light from the lamp is not visible at any point on the exterior of the duct.

506.3.2.5.2 Water spray test.
A duct test shall be performed by simulating a cleaning operation, of the interior of the duct. A water pump, capable of a flowing outlet pressure of not less than 1200 psi (8,274 kPa) shall be used, along with any necessary hoses and spray nozzles, to apply high pressure water to the inside surfaces of the duct. A successful test shall be where there is no evidence of cleaning water at any point on the exterior of the duct.

Reason: There are several reasons for this proposal.
Some installers are using LED lamps for testing and such lamps are not rated, in terms of light output, in watts of power but instead in lumens of visible light. LED lamps are more rugged that incandescent lamps and are often preferred for field use.
The ASHRAE 154 (Ventilation for Commercial Cooking Standard) committee is moving away from light testing of grease ducts to simulated duct cleaning using water. Actual duct cleaning in the future should not result in water damage to the structure or to any materials that are used to wrap the duct. Furthermore, if a water leak is present, then almost certainly, grease will be present on the exterior of the duct. Grease on the exterior of a duct presents a fire hazard.

The installer has a choice as to which test to use.

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 14.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The proposal adds an alternative for testing grease ducts. Although the alternative for water spray testing would cost more to perform than the light test, the alternative will not be mandated by the code and therefore, the proposal does not add any labor or material to impact the cost of construction.

M38-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: This proposal was approved as submitted because, as opposed to M37-21, it helps give better directive and tools to use with respect to testing of Grease Ducts. (Vote: 7-4)

M38-21

Individual Consideration Agenda

Public Comment 1:

Proponents: Nancy Swearengin, representing Self requests As Submitted

Commenter's Reason: 506.3.2.5.3.1 Light Test: Allowing the use of LED lights for grease duct testing would be a welcome addition in the field. Most mechanical contractors are only using LED lights on site, this addition to the code would allow inspections to be completed using equipment readily available. LED lights are brighter, more durable and operate at much cooler temperatures reducing the potential for harm to personnel performing the test. Vote to approve.
506.3.2.5.2 Water Spray Test: While the intent to provide more options for grease duct testing is admirable this method should not be allowed. Introducing water onto a job site presents many problems. Often times water is not available, testing is done in the winter with cold temperaturs (below freezing), power to the area is being supplied through temporary wiring and other personnel not involved in the testing are working in the same area. On all job sites any spills are supposed to be immediately cleaned up to prevent slips and falls, intentionally spraying water goes against all normal safety protocols. Testing of grease ducts is often done in sections, not after the entire system has been installed. In the real world of testing, during the rough phase of construction, it would almost impossible to truly simulate duct cleaning as described in this proposal. Vote to disapprove.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
506.3.2.5.3.1 Light Test will not increase the cost of construction.

506.3.2.5.2 Water Spray Test will increase the cost of construction due to the equipment required, cost of water and the time spent for clean up.

Public Comment# 2823

Public Comment 2:

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

Commenter's Reason: Water testing grease ducts in new construction is a terrible idea weather its an option or not. Many systems are built in sections making water testing impractical. When water is present on the outside of the duct it will be impossible to distinguish where exactly it came from due to gravity and the inability to see in tight places. There is a time factor also in the time the leak occurred and the ability to see it. The proponent indicated there will be no additional cost but there certainly will be just in renting the machine alone, the water and the clean up. Water may be the answer to duct cleaning but has no place in duct testing in new construction. There may be no water available also depending on the location. Some jurisdictions will require water testing because they can and having this as an option will permit that unfortunate behavior. We urge the membership to disapprove this code change.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
If this change is approved the cost will increase in renting the equipment and associated clean up. No change to code.

Public Comment# 2437

M50-21

Proposed Change as Submitted

Proponents: Jane Malone, American Association of Radon Scientists and Technologists, representing American Association of Radon Scientists and Technologists; Thomas Bowles, representing EPA (bowles.thomas@epa.gov); Ruth Mcburney, representing CRCPD (rmcburney@crcpd.org); Jonathan Wilson, National Center for Healthy Housing, representing National Center for Healthy Housing (jwilson@nchh.org); Kevin Stewart, American Lung Association, representing American Lung Association (Kevin.Stewart@Lung.org); Tobie Bernstein, representing Environmental Law Institute (bernstein@eli.org); David Kapturowski, representing Spruce Environmental Technologies, Inc. (dave@spruce.com)

2021 International Mechanical Code

Revise as follows:

512.1 General. Where a subslab soil exhaust system is provided, ~~the duct shall conform to the requirements of this section.~~ the system shall comply with ANSI/AARST CC1000.

Delete without substitution:

~~**512.2 Materials.** Subslab soil exhaust system duct material shall be air duct material *listed* and *labeled* to the requirements of UL 181 for Class 0 air ducts, or any of the following piping materials that comply with the *International Plumbing Code* as building sanitary drainage and vent pipe: cast iron; galvanized steel; copper or copper-alloy pipe and tube of a weight not less than type DWV; and plastic piping.~~

~~**512.3 Grade.**~~
~~Exhaust system ducts shall not be trapped and shall have a minimum slope of one-eighth unit vertical in 12 units horizontal (1-percent slope).~~

~~**512.4 Termination.**~~
~~Subslab soil exhaust system ducts shall extend through the roof and terminate not less than 6 inches (152 mm) above the roof and not less than 10 feet (3048 mm) from any operable openings or air intake.~~

~~**512.5 Identification.**~~
~~Subslab soil exhaust ducts shall be permanently identified within each floor level by means of a tag, stencil or other *approved* marking.~~

Add new standard(s) as follows:

AARST

The American Association of Radon Scientists and Technologists
527 N Justice Street
Hendersonville, NC 28739
USA

ANSI/AARST CC-1000-2018
Soil Gas Control Systems in New Construction of Buildings

Reason: The purpose of this proposed change is to update the legacy code language for soil exhaust systems in section 512 to the relevant consensus standard for soil gas exhaust systems, which includes additional specifications for materials, grade/slope, termination, and identification in the existing language as well as other essential components of soil gas control that are not now included in section 512.
The standard included in this proposal has been vetted and approved by EPA, multiple regulatory states, and HUD. It can be viewed for free at https://standards.aarst.org/CC-1000-2018/index.html In 2020, an addendum to ASHRAE 189.1 - 2017 was approved to incorporate a requirement for ANSI-AARST CC-1000 to replace the standard's existing soil gas requirement.

Cost Impact: The code change proposal will increase the cost of construction
This proposal does not add a requirement to install a radon control system. The proposal will add incremental cost to construction where radon control systems are installed if the builder is not already following the standard practice.
According to the Home Innovation Research Labs' Radon-Resistant Construction Practices in New U.S. Homes, the average reported per-unit installation cost of an active radon system in a multifamily dwelling in 2018 was $845, lower than $865 in 2017 but higher than $757 in 2016. The same paper indicates that in 2018 the average multifamily dwelling had an average selling price of $229,260. The cost of a system for a nonresidential commercial building will range from $2500 to higher depending on the footprint, volume and type of HVAC system.

Staff Analysis: A review of the standards proposed for inclusion in the code, AARST CC 1000-2018: Soil Gas Control Systems in New Construction of Buildings, with regard to some of the key ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before March 20, 2021.

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The standard is more stringent but is questionable whether it's enforceable by removing the material requirements of Section 512.2 and the slope requirements of Section 512.3, which do not specifically appear in the reference standard. (Vote: 11-0)

M50-21

Individual Consideration Agenda

Public Comment 1:

IMC: SECTION 512, 512.1

Proponents: Jane Malone, representing American Assocation of Radon Scientists and Technologists; David Kapturowski, representing Spruce Environmental Technologies, Inc.; Jonathan Wilson, representing National Center for Healthy Housing (jwilson@nchh.org); Kevin Stewart, representing American Lung Association (kevin.stewart@lung.org); Thomas Bowles, representing Indoor Environments Division (bowles.thomas@epa.gov); Warren Friedman, representing Office of Lead Hazard Control and Healthy Homes (warren.friedman@hud.gov); Ruth McBurney, representing CRCPD (rmcburney@crcpd.org) requests As Modified by Public Comment

Replace as follows:

2021 International Mechanical Code

SECTION 512
SUBSLAB SOIL EXHAUST SYSTEMS

512.1 General . Where a subslab soil exhaust system is provided, the ~~duct shall conform to the requirements of this section~~ system shall be designed and constructed such that all occupiable spaces inside the structure contain radon levels below 4 picocuries per liter (pCi/L).

Commenter's Reason:
This comment is responsive to the Mechanical Committee's concern about the proposed removal of the material requirements of Section 512.2 and the slope requirements of Section 512.3. A performance based requirement is added.

Cost Impact: The net effect of the public comment and code change proposal will increase the cost of construction
This proposal does not add a requirement to install a radon control system. The proposal will add incremental cost to construction where radon control systems are installed if the builder is not already achieving radon levels below the EPA action level.

Public Comment# 2762

M52-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

601.5 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. Return air shall not be taken from a hazardous or insanitary location or a refrigeration room as defined in this code.
3. 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.
4. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, ACCA Manual D or the design of the registered design professional.
5. Return air taken from one *dwelling unit* shall not be discharged into another *dwelling unit*.
6. Taking return air from a 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. Return air shall not be taken from a closet, ~~bathroom,~~ toilet room, kitchen, garage, boiler room, furnace room or unconditioned attic.
8. Return air shall not be taken from indoor swimming pool enclosures and associated deck areas.

Exceptions:

1. Where the air from such spaces is dehumidified in accordance with Section 403.2.1, Item 2.
2. Dedicated HVAC systems serving only such spaces.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
2. Taking return air from a kitchen is not prohibited in a *dwelling unit* where the kitchen and living spaces are in a single room and the cooking *appliance* is electric and located not less than 5 feet (1524 mm) in any direction from the return air intake opening.
3. Dedicated forced air systems serving only the garage shall not be prohibited from obtaining return air from the garage.

Reason: Return air from bathrooms is necessary to control bathroom moisture levels during cooling periods.
Increasing air change with the rest of the occupied space results in lower moisture levels in the bathroom and allows the air conditioning system to remove moisture. Relying on bathroom exhaust fans exhausting to the exterior to control bathroom moisture does not effectively reduce bathroom moisture levels. Exhaust ventilation in bathrooms should be used to control odors not moisture. Exhaust ventilation results in increasing air change in the entire occupied space and increasing moisture loads due to infiltration of exterior humid air throughout the occupied space. This higher air change rate (infiltration) supplies more moisture than the air conditioning system can remove. Odors are still controlled by bathroom exhaust fans exhausting air to the exterior. These bathroom exhaust fans do not have to operate continuously to control odors. Only providing supply air to bathrooms exacerbates the problem by making roof 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.

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: This proposal is disapproved. The committee felt that this could allow 100% of the air from the bathroom to be recirculated and this would not be preferred. Furthermore, the committee felt the return air in the bathroom was necessary as passive return air occurs when the bathroom door is open. (Vote: 10-0)

M52-21

Individual Consideration Agenda

Public Comment 1:

IMC: 601.5

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 Mechanical Code

601.5 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. Return air shall not be taken from a hazardous or insanitary location or a refrigeration room as defined in this code.
3. 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.
4. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, ACCA Manual D or the design of the registered design professional.
5. Return air taken from one *dwelling unit* shall not be discharged into another *dwelling unit*.
6. Taking return air from a 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. Return air shall not be taken from a closet, <u>bathroom,</u> toilet room, kitchen, garage, boiler room, furnace room or unconditioned attic.
8. Return air shall not be taken from indoor swimming pool enclosures and associated deck areas.

Exceptions:

1. Where the air from such spaces is dehumidified in accordance with Section 403.2.1, Item 2.
2. Dedicated HVAC systems serving only such spaces.
3. <u>Return air can be taken from a bathroom that also contains a toilet room .</u>

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
2. Taking return air from a kitchen is not prohibited in a *dwelling unit* where the kitchen and living spaces are in a single room and the cooking *appliance* is electric and located not less than 5 feet (1524 mm) in any direction from the return air intake opening.
3. Dedicated forced air systems serving only the garage shall not be prohibited from obtaining return air from the garage.

4. Taking return air is not prohibited from a bathroom that also contains a toilet room.

Commenter's Reason: Modify the language to apply only to bathrooms also containing “Toilet Rooms”.
Toilet rooms contain an exhaust fan that exhausts to the exterior to control odors in the toilet room. Toilet room exhaust is insufficient to address moisture problems in bathrooms containing bathtubs, showers, spas or similar bathing fixtures. Increasing ventilation rates in bathrooms to address moisture problems creates part load humidity (moisture) in the rest of the dwelling by increasing the infiltration of hot humid air throughout the dwelling. Allowing return air from the bathroom reduces the moisture load in the bathroom by diluting (lowering) the bathroom moisture by distributing the moisture to the rest of the dwelling allowing the existing a/c to remove this moisture without creating an additional moisture load.

Passive return air is insufficient to provide distribution and dilution of bathroom moisture as has been shown in current code constructed dwellings in hot humid and mixed humid climates.

It is significant to note that as dwellings become more and more efficient the part load moisture load will continue to migrate to cooler climate regions.

2021 IMC - Definitions
Toilet Room. A room containing a water closet and, frequently, a lavatory but not a bathtub, shower, spa or similar bathing fixture.

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.

Public Comment# 2724

M54-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

601.5 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. Return air shall not be taken from a hazardous or insanitary location or a refrigeration room as defined in this code.
3. 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.
4. Return and transfer openings shall be sized in accordance with the *appliance* or *equipment* manufacturer's installation instructions, ACCA Manual D or the design of the registered design professional.
5. Return air taken from one *dwelling unit* shall not be discharged into another *dwelling unit*.
6. Taking return air from a 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. Return air shall not be taken from a closet, bathroom, toilet room, kitchen, garage, boiler room, furnace room or unconditioned attic.

   Exception: Taking return air from a boiler room, furnace room or mechanical room shall be permitted provided that the return air serves only those rooms, the combustion equipment is sealed combustion, and the pressure differential across the room is limited to 0.01 inch WC (2.5 pascals) or less by undercutting the door, installing a louvered door, a transfer grille, or by some other means. A dedicated supply duct shall not be required for those rooms.

8. Return air shall not be taken from indoor swimming pool enclosures and associated deck areas.

   Exceptions:

   1. Where the air from such spaces is dehumidified in accordance with Section 403.2.1, Item 2.
   2. Dedicated HVAC systems serving only such spaces.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen and are located not less than 10 feet (3048 mm) from the cooking *appliances*.
2. Taking return air from a kitchen is not prohibited in a *dwelling unit* where the kitchen and living spaces are in a single room and the cooking *appliance* is electric and located not less than 5 feet (1524 mm) in any direction from the return air intake opening.
3. Dedicated forced air systems serving only the garage shall not be prohibited from obtaining return air from the garage.

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.

M54-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: This proposal was disapproved based on the committee disbelief of the ability to transfer this application equally between residential and commercial spaces. (Vote: 8-3)

M54-21

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 Submitted

Commenter's Reason: Mold growth is now common in boiler, furnace or mechanical rooms due to higher interior moisture loads and less heat gain in those rooms. Allowing a limited amount of return air provides a means of controlling room moisture levels.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This provides an option, not a requirement. In some cases this option might lower costs.

Public Comment# 2727

M56-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Revise as follows:

602.2 Construction of plenums. ~~*Plenum* enclosure construction materials that are exposed to the airflow shall comply with the requirements of Section 703.3 of the International Building Code or such materials shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84 or UL 723.~~ Plenums shall be constructed in accordance with Section 602.2.1 and Section 602.2.2. The use of gypsum boards to form *plenums* shall be limited to systems where the air temperatures do not exceed 125ºF (52ºC) and the building and mechanical system design conditions are such that the gypsum board surface temperature will be maintained above the airstream dew-point temperature. Supply air *plenums* formed by gypsum boards shall not be incorporated in air-handling systems utilizing *direct evaporative cooling* systems.

Add new text as follows:

602.2.1 Plenum materials. .
Plenum enclosure construction materials that are exposed to the airflow shall comply with the requirements of Section 703.3 of the International Building Code or such materials shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84 or UL 723.

Exception: Stud cavity and joist space plenums

Revise as follows:

~~**602.3**~~ **602.2.2 Stud cavity and joist space plenums.** Stud wall cavities and the spaces between solid floor joists to be utilized as air*plenums* shall comply with the following conditions:

1. Such cavities or spaces shall not be utilized as a *plenum* for supply air.
2. Such cavities or spaces shall not be part of a required fire-resistance-rated assembly.
3. Stud wall cavities shall not convey air from more than one floor level.
4. Stud wall cavities and joist space *plenums* shall comply with the floor penetration protection requirements of the *International Building Code*.
5. Stud wall cavities and joist space *plenums* shall be isolated from adjacent concealed spaces by *approved* fireblocking as required in the *International Building Code*.
6. Stud wall cavities in the outside walls of building envelope assemblies shall not be utilized as air *plenums*.

Reason: The intent of this code proposal is to provide clarity as to how plenums are permitted to be constructed under specific conditions. The current Sections 602.2 and 602.3 are requirements for the constructing the plenum, and thus the current Section 602.3 should be a subsection of Section 602.2. The text struck in 602.2 was moved in its entirety to the new 602.2.1. The language regarding the use of gypsum board in plenums was left in the charging paragraph, because it is a general requirement that applies to all plenums.
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 32.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal is purely editorial for the purposes of clarifying existing requirements by better organizing the text. Material or labor to comply with the requirements are not different and as such, there is no impact on the cost of construction.

M56-21

Public Hearing Results

Committee Action: **Disapproved**

Committee Modification:

Committee Reason: This proposal was disapproved because there is clarification of text already regarding plenums in M55-21. (Vote: 11-0)

M56-21

Individual Consideration Agenda

Public Comment 1:

Proponents: Joseph J. Summers, representing Chair of PMGCAC (pmgcac@iccsafe.org) requests As Submitted

Commenter's Reason: Proposal M55-21 was a section reorganization ONLY, There was no intent to change or clarify the technical content of 602.2 or 602.3. A committee reason that "dismisses" M56-21 by stating that M55-21 already addresses this subject matter is not correct. Testimony reminded the Committee that Type I and Type II construction will *automatically* have noncombustible framing. For building types that *are* allowed to have wood framing (stud and joist) members, what is the increased *fire hazard* for the building if a stud or joist cavity is used as a plenum? All of the framing in the building can be of wood construction anyhow. We do not see evidence that supports the need for making sure that these plenums need the fire resistance. Decades of wood-framed buildings have had stud and joist cavity plenums and to our knowledge, there hasn't been a problem.

Opposing testimony indicated that if wood-framed cavities were to be used for plenums, then Fire Resistant Treated Wood needed to be used in these areas. Note that FRTW is required to be structurally de-rated (IBC 2303.2.5.) A derating may result in more framing needed. It is also implied that floor sheathing over the cavity would also need to the FRTW.

We believe that requiring stud and joist (plenum) cavity construction to comply with 25/50 is creating a need for solution for a problem that doesn't exist.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This proposal is only a clarification.

Public Comment# 2447

M60-21

Proposed Change as Submitted

Proponents: Cory Wasniewski, Roberts Environmental Control Corp, representing Roberts Environmental Control Corp (CJW@RobertsHVAC.com)

2021 International Mechanical Code

Revise as follows:

604.3 Coverings and linings. Duct coverings ~~and linings~~, including adhesives where used, shall have a flame spread index not more than 25 and a smoke-developed index not more than ~~50~~ 450, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. ~~Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C).~~ Coverings shall be *listed* and *labeled*. Duct linings, including adhesives where used, shall have a flame spread index not more than 25 and a smoke-developed index not more than 50, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C). Linings shall be *listed* and *labeled*.

~~**Exception**~~ **Exceptions:**

1. Polyurethane foam insulation that is spray applied to the exterior of ducts in attics and crawl spaces shall be subject to all of the following requirements:
   1. The foam plastic insulation shall have a flame spread index not greater than 25 and a smoke-developed index not greater than 450, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231.
   2. The foam plastic insulation shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C).
   3. The foam plastic insulation complies with the requirements of Section 2603 of the International Building Code.
   4. The foam plastic insulation is protected against ignition in accordance with the requirements of Section 2603.4.1.6 of the International Building Code.
2. Ductwork coverings and linings, including adhesives where used, located in a plenum rated cavity, shall have a flame spread index not more than 25 and a smoke-developed index not more than 50, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C). Coverings and linings shall be *listed* and *labeled*.

Reason: ***Specific to ductwork insulation coverings not in Plenum-Rated Spaces.***

1. Ductwork coverings both indoors and outdoors, not located within a plenum rated space, are not in the air stream. They are in the same building space as all other construction materials.
2. Weatherproof and protective barriers that are atop of ductwork coverings (insulations) are required per section IMC 603.16, however, per IMC Sections 604.12 these barriers are not classified for a required flame and smoke index rating. This forces you to reference back to the IBC and NFPA 90A, allowing IBC Class A which defines a flame and smoke rating as ASTM E84 **25**/**450** equal to everything else in the building.
   1. *IBC allows all building insulation products, materials, and facings, again outside of a plenum-rated cavity, in its highest classification (Class A, I) to have an ASTM E84 rating of **25**/**450.** With the ONLY exception being materials within a plenum rated cavity.*
   2. *NFPA 90A Section 4.3.3.1.2 Specifically states the flame spread and smoke-developed index requirements of section 4.3.3.1.1 shall NOT apply to air duct weatherproof coverings where they are located entirely outside of a building, do not penetrate a wall or roof, and do not create an exposure hazard.*
3. There is a direct conflict of the NFPA 90A Section 4.3.3.1.2 allowing weather covering directly atop of the ductwork covering to meet ASTM E84 25/**450.** But then per IMC 604.3 not allowing the covering itself to meet the same specifications of ASTM E84 25/**450**. The covering and the weatherproof barrier would become the same assembly but then have conflicting requirements.
4. There is a conflict of the IBC allowing all interior and exterior to the building materials (with the only exception being materials within a plenum space) to meet the IBC Class A, I specification of ASTM E84 **25**/**450**. But the IMC section 604.3 ductwork coverings, that are in the same building space, do not follow the same NFPA and IBC specifications.

Bibliography:

- IBC
- IMC

- NFPA 90A

Cost Impact: The code change proposal will decrease the cost of construction

- Closed Cell (polyisocyanurates) foams that meet IBC Class A/I and NFPA specifications (ASTM E84 **25**/**450**) for use in ductwork coverings would reduce costs and improve energy efficiencies.
- Closed Cell (polyisocyanurates) foams have some of the highest R-values per inch and the lowest costs in the current markets when compared to other board insulations.
- Closed Cell (polyisocyanurates) foams are Green Building, GreenGuard, and LEED qualified building materials.
- Closed Cell (polyisocyanurates) foams when compared to equivalent R-Value Fiber Board insulations are not only more cost-effective, they have a 50% or more reduced weight load.
- Achieving a R-6.5 @ 1", R-9.8 @ 1.5", R-13.1 @ 2"
- Closed Cell (polyisocyanurates) foams weigh significantly less leading to installation cost savings.
- Closed Cell (polyisocyanurates) foams meet equivalent R-Values to FIber Board are 50% thickness. Saving space, time, and efficiency during construction.

M60-21

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

Revise as follows:

604.3Coverings and linings.

Duct coverings and linings, including adhesives where used, shall have a flame spread index not more than 25 and a smoke-developed index not more than ~~450~~ 50, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C). Coverings and linings ~~Linings~~ shall be listed and labeled.

~~Duct linings, including adhesives where used, shall have a flame spread index not more than 25 and a smoke-developed index not more than 50, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C). Linings shall be *listed* and *labeled*.~~

Exceptions:

1. Polyurethane foam insulation that is spray applied to the exterior of ducts in attics and crawl spaces shall be subject to all of the following requirements:
   1. The foam plastic insulation shall have a flame spread index not greater than 25 and a smoke-developed index not greater than 450, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231.
   2. The foam plastic insulation shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C).
   3. The foam plastic insulation complies with the requirements of Section 2603 of the International Building Code.
   4. The foam plastic insulation is protected against ignition in accordance with the requirements of Section 2603.4.1.6 of the International Building Code.
2. ~~Ductwork~~ Duct coverings added to the outside of ducts and not contained in plenums ~~and linings~~, including adhesives where used, ~~located in a plenum rated cavity,~~ shall have a flame spread index not more than 25 and a smoke-developed index not more than 450 ~~50~~, when tested in accordance with ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. Duct coverings ~~and linings~~ shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C). Coverings ~~and linings~~ shall be *listed* and *labeled*.

Committee Reason: This is necessary for fire safety in duct coverings, linings and plenums. Coverings that are not plenums are treated like other building materials. The modification appropriately places the allowance for the higher smoke development (450) in the exception and the lower smoke development (50) in the base requirement. (Vote: 10-1)

Individual Consideration Agenda

Public Comment 1:

Proponents: Charles Haack, representing NAIMA requests Disapprove

Commenter's Reason: NAIMA opposes the adoption of the changes included in proposal M60-21 Mod-Hirshler-3.
First and foremost, NAIMA believes that this code revision places occupant safety below competing priorities including job site space restrictions and efficiency requirements (R-values). Current code-implemented life safety measures should not be relaxed or made less stringent without relevant written justification from the proponent.

Second, the language included in this code proposal is unclear on how insulation in double wall duct systems is handled and whether it is considered a duct lining or a duct covering for the purpose of meeting FSI/SDI requirements. To maintain occupant safety provisions contained in the current code, M60 Mod-Hirshler-3 needs to be clarified to ensure that double wall duct systems are not infiltrated with significant amounts of smoke from products exceeding an SDI of 50 during a fire event.

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# 2861

NOTE: M66-21 PART I DID NOT RECEIVE A PUBLIC COMMENT AND IS REPRODUCED FOR INFORMATIONAL PURPOSES ONLY

M66-21 Part I

Proposed Change as Submitted

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

THIS IS A TWO PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL/PLUMBING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES

2021 International Mechanical Code

Revise as follows:

1006.6 Safety and relief valve discharge. Safety and relief valve discharge pipes shall be of rigid pipe that is *approved* for the temperature of the system. High-pressure-steam safety valves shall be vented to the outside of the structure. The discharge piping serving pressure relief valves, temperature relief valves and combinations of such valves shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air break located in the same room as the *appliance*.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air break.
4. Serve a single relief device and shall not connect to piping serving any other relief device or *equipment*.
5. Discharge to the floor, to the pan serving the boiler or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. ~~Not terminate~~ Terminate not more than 6 inches (152 mm) and not less than two times the discharge pipe diameter above the floor or flood level rim of the waste receptor.

11. Not have a threaded connection at the end of such piping.

12. Not have valves or tee fittings.

13. Be constructed of those materials listed in Section 605.4 of the *International Plumbing Code* or materials tested, rated and approved for such use in accordance with ASME A112.4.1.

Reason: Part I REASONING: The text for the requirements for a discharge pipe from any pressure (or temperature) relief valve should be identical between all the codes that have such requirements. It doesn't matter what the relief valve is protecting. Uniformity across the codes on these requirements will improve compliance.
PART II REASONING: Oddly, Section M2002.4 has minimal requirements for pressure relief valve discharge pipes. A boiler doesn't "know" what type of building it is located in. The requirements for a pressure relief valve discharge pipe should be identical to what is in the IMC for the same application. Uniformity across the codes on these requirements will improve compliance.

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 31.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The relief valve piping already has to be installed and if relief valve manufacturers' instructions are being followed, many of these requirements are already being followed.

M66-21 Part I

Public Hearing Results

Committee Action: **As Modified**

Committee Modification:

1006.6Safety and relief valve discharge.
Safety and relief valve discharge pipes shall be of rigid pipe that is
approved for the temperature of the system. High-pressure-steam safety valves shall be vented to the outside of the structure. The discharge piping serving pressure relief valves, temperature relief valves and combinations of such valves shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air break located in the same room as the *appliance*.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air break.
4. Serve a single relief device and shall not connect to piping serving any other relief device or *equipment*.
5. Discharge to the floor, to the pan serving the boiler or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Terminate not more than 6 inches (152 mm) ~~and not less than two times the discharge pipe diameter~~ above the floor or flood level rim of the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.

13. Be constructed of those materials listed in Section 605.4 of the *International Plumbing Code* or materials tested, rated and approved for such use in accordance with ASME A112.4.1.

Committee Reason: The committee agreed that the text for the requirements for a discharge pipe from any pressure (or temperature) relief valve should be identical between all the codes that have such requirements. It doesn't matter what the relief valve is protecting. Uniformity across the codes on these requirements will improve compliance. The modification further clarifies acceptable industry practices. (Vote: 11-0)

M66-21 Part II

Proposed Change as Submitted

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

THIS IS A TWO PART CODE CHANGE. PART 1 WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART 2 WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL/PLUMBING CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2021 International Residential Code

Revise as follows:

M2002.4 Pressure relief valve. Boilers shall be equipped with pressure relief valves with minimum rated capacities for the equipment served. Pressure relief valves shall be set at the maximum rating of the boiler. ~~Discharge shall be piped to drains by gravity to within 18 inches (457 mm) of the floor or to an open receptor.~~

M2002.4.1 Requirements for discharge pipe. . The discharge piping serving a pressure relief valve, temperature relief valve or combination valve shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the boiler.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed to flow by gravity.
10. Terminate not more than 6 inches (152 mm) and not less than two times the discharge pipe diameter above the floor or waste receptor flood level rim.
11. Not have a threaded connection at the end of the piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials indicated in Section P2906.5 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief-valve outlet, where the relief-valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.
15. The end of the discharge pipe shall be cut at a 45-degree angle.

Reason: Part I REASONING: The text for the requirements for a discharge pipe from any pressure (or temperature) relief valve should be identical between all the codes that have such requirements. It doesn't matter what the relief valve is protecting. Uniformity across the codes on these requirements will improve compliance.
PART II REASONING: Oddly, Section M2002.4 has minimal requirements for pressure relief valve discharge pipes. A boiler doesn't "know" what type of building it is located in. The requirements for a pressure relief valve discharge pipe should be identical to what is in the IMC for the same application. Uniformity across the codes on these requirements will improve compliance.

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 31.

Cost Impact: The code change proposal will not increase or decrease the cost of construction
The relief valve piping already has to be installed and if relief valve manufacturers' instructions are being followed, many of these requirements are already being followed.

M66-21 Part II

Public Hearing Results

Committee Action: **Disapproved**

Committee Reason: The air gap verses the air break is confusing. It doesn't make sense that the boiler relief valve discharges to a water heater pan. (10-1)

M66-21 Part II

Individual Consideration Agenda

Public Comment 1:

IRC: M2002.4.1

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

Modify as follows:

2021 International Residential Code

M2002.4.1 Requirements for discharge pipe. . The discharge piping serving a pressure relief valve, temperature relief valve or combination valve shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air ~~gap located gap~~ break located in the same room as the boiler.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air ~~gap. gap~~ break .
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the ~~water heater~~ boileror storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed to flow by gravity.
10. Terminate not more than 6 inches (152 mm) ~~and not less than two times the discharge pipe diameter~~ above the floor or waste receptor flood level rim.
11. Not have a threaded connection at the end of the piping.

12. Not have valves or tee fittings.
13. Be constructed of those materials indicated in Section P2906.5 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.

~~14. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.~~

~~15. The end of the discharge pipe shall be cut at a 45-degree angle.~~

PART 2 WILL BE HEARD BY THE INTERNATIONAL RESIDENTIAL MECHANICAL COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

Commenter's Reason: This public comment corrects Committee identified problems and also makes small changes to correlate the text with Part I of this proposal, As Modified.

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This public comment is only a clarification of the original proposal.

Public Comment# 2451

M73-21

Proposed Change as Submitted

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

2021 International Mechanical Code

Add new definition as follows:

Refrigerant Designation. The unique identifying alphanumeric value or refrigerant number assigned to an individual refrigerant and published in ASHRAE Standard 34.

Delete and substitute as follows:

~~**1101.7 Change in refrigerant type.** The type of refrigerant in refrigeration systems having a refrigerant circuit containing more than 220 pounds (99.8 kg) of Group A1 or 30 pounds (13.6 kg) of any other group refrigerant shall not be changed without prior notification to the code official and compliance with the applicable code provisions for the new refrigerant type.~~

1101.7 Changing Refrigerant. Changes of refrigerant in an existing system to a refrigerant with a different refrigerant designation shall only be allowed where in accordance with the following:

1. The change of refrigerant shall be approved by the owner.
2. The change in refrigerant shall be in accordance with one of the following.
   - 2.1 Written instructions of the original equipment manufacturer.
   - 2.2 An evaluation of the system by a registered design professional or by an approved agency that validates safety and suitability of the replacement refrigerant.
   - 2.3 Approved by the code official.
3. Where the replacement refrigerant is classified into the same safety group, requirements that were applicable to the existing system shall continue to apply.
4. Where the replacement refrigerant is classified into a different safety group, the system shall comply with the requirements of this standard for a new installation, and the change of refrigerant shall require code official approval.

~~**1102.2.1 Mixing.** Refrigerants, including refrigerant blends, with different designations in ASHRAE 34 shall not be mixed in a system.~~

~~**Exception:** Addition of a second refrigerant is allowed where permitted by the *equipment* or *appliance* manufacturer to improve oil return at low temperatures. The refrigerant and amount added shall be in accordance with the manufacturer's instructions.~~

1102.2.1 Mixing.
Refrigerants with different refrigerant designations shall only be mixed in a system in accordance with both of the following:

1. The addition of a second refrigerant is allowed by the equipment manufacturer and is in accordance with the manufacturer's written instructions.
2. The resulting mixture does not change the refrigerant safety group.

Reason: With the onset of flammable refrigerants, the need to address change of refrigerant from one safety class to another was identified. ASHRAE published addendum e to ASHRAE 15-2016 to address this concern (which is now part of the ASHRAE 15-2019 version, Section 5.3).

Bibliography: 1. ANSI/ASHRAE 15-2019, Safety Standard for Refrigeration Systems
2. ANSI/ASHRAE 34-2019, Designation and Safety Classification of Refrigerants

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This proposal provides a clarification to address the use of new systems but does not introduce any additional requirements that would impact cost.

M73-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: This proposal was passed as submitted because it provides clear criteria of what will be required in changing of refrigerants in this code and ASHRAE15 to be used. (Vote: 10-1)

M73-21

Individual Consideration Agenda

Public Comment 1:

IMC: 1101.7

Proponents: Emily Toto, representing ASHRAE (etoto@ashrae.org) requests As Modified by Public Comment

Modify as follows:

2021 International Mechanical Code

1101.7 Changing Refrigerant . Changes of refrigerant in an existing system to a refrigerant with a different refrigerant designation shall only be allowed where in accordance with the following:

1. ~~The change of refrigerant shall be approved by the owner. owner.~~ The owner or the owner's authorized agent shall be notified prior to making a change of refrigerant, and the change of refrigerant shall not be made where the owner objects to the change.
2. The change in refrigerant shall be in accordance with one of the following.

   2.1 Written instructions of the original equipment manufacturer.

   2.2 An evaluation of the system by a registered design professional or by an approved agency that validates safety and suitability of the replacement refrigerant.

   2.3 Approved by the code official.

3. Where the replacement refrigerant is classified into the same safety group, requirements that were applicable to the existing system shall continue to apply.
4. Where the replacement refrigerant is classified into a different safety group, the system shall comply with the requirements of this standard for a new installation, and the change of refrigerant shall require code official approval.

Commenter's Reason: The intent of notifying the owner or owner's agent is to ensure the owner of the building is aware of the change and can address any consequences to the building or occupancy that might be tied to the change of refrigerant. The owner notification can be made by the designer, contractor, installer or any other party involved in the proposed refrigerant change. This modification to the originally submitted language is more appropriate than requiring owner "approval."

Bibliography: ANSI/ASHRAE 15-2019, Safety Standard for Refrigeration Systems

Cost Impact: The net effect of the public comment and code change proposal will not increase or decrease the cost of construction
This proposal provides a clarification to address the use of new systems but does not introduce any additional requirements that would impact cost.

Public Comment# 2436

Public Comment 2:

Proponents: Mary Koban, representing AHRI (mkoban@ahrinet.org) requests As Submitted

Commenter's Reason: AHRI support the committee recommendation for the approval of M73 as submitted
AHRI supports the committee recommendation to approve the code change proposal noted in M73 as the change aligns the mechanical code with ANSI/ASHRAE 15 and newer refrigerants now listed in ANSI/ASHRAE 34. The modifications provide a criteria of what is required to change refrigerants in the mechanical code.

·As systems can now include new safety classes, the need to address the change of refrigerant from one safety class to another was identified.

·Addendum e to ASHRAE 15-2016 was published to address this concern (which is now part of the ANSI/ASHRAE 15-2019 version, Section5.3).

Bibliography: ANSI/ASHRAE 15: 2019
ANSI/ASHRAE 34: 2019

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

Public Comment# 2568

M80-21

Proposed Change as Submitted

Proponents: Brad Campbell, Titeflex Corp., representing Gastite (brad.campbell@gastite.com)

2021 International Mechanical Code

Revise as follows:

PIPING. Where used in this code, “piping” refers to either pipe or tubing, or both.
Pipe.

A rigid conduit of iron, steel, copper, copper-alloy, or plastic , or multilayer composite aluminum and plastic.

Tubing.

Semirigid conduit of copper, copper-alloy, aluminum, plastic, or steel , or multilayer composite aluminum and plastic.

TABLE 1107.4 REFRIGERANT PIPE

PIPING MATERIAL	STANDARD
Aluminum tube	ASTM B210/ASTM B210M, ASTM B491/B491M
Brass (copper alloy) pipe	ASTM B43
Copper linesets	ASTM B280, ASTM B1003
Copper pipe	ASTM B42, ASTM B302
Copper tube[a]	ASTM B68, ASTM B75, ASTM B88, ASTM B280, ASTM B819
Steel pipe[b]	ASTM A53, ASTM A106
Steel tube	ASTM A254, ASTM A334
Polyethylene of raised temperature / aluminum / polyethylene of raised temperature (PERT/AL/PERT) linesets	ASTM FXXXX

a. Soft annealed copper tubing larger than $1^{3}/_{8}$ inch (35 mm) O.D. shall not be used for field-assembled refrigerant piping unless it is protected from mechanical damage.

b. ASTM A53, Type F steel pipe shall not be used for refrigerant lines having an operating temperature less than -20°F (-29°C).

Add new text as follows:

1108.10 PERT/AL/PERT pipe.
Joints between PERT/AL/PERT pipe or fittings shall be mechanical or press-connect joints conforming to Section 1108.3.

Revise as follows:

1109.4.1 Piping material. Piping material for Group A2, A3, B2 or B3 refrigerant located inside the building, except for *machinery rooms*, shall be copper pipe, brass pipe or steel pipe. Multilayer composite PERT/AL/PERT pipe may be used for Group A2 refrigerant. Pipe joints located in areas other than the *machinery room* shall be welded. Self-contained *listed* and *labeled equipment* or *appliances* shall have piping material based on the listing requirements.

Exception: PERT/AL/PERT pipe joints located in areas other than the machinery room shall be mechanical or press-connect joints.

Add new text as follows:

ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

ASTM FXXXX	Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PERT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems

Reason: PERT/AL/PERT pipe material is not listed in the IMC 1107 Refrigeration Piping Materials section. This type of composite pipe has primarily been used for water conveyance applications but if the pipe is designed and tested to the new ASTM FXXXX Standard for "Polyethylene of Raised Temperature / Aluminum / Polyethylene of Raised Temperature (PERT/AL/PERT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems" it will be a comparable Line Set option. This new ASTM FXXXX standard will be finalized and published in the next 30 days.

Bibliography: ASTM FXXX approved PERT/AL/PERT lineset pipes have been tested and proven to be an excellent refrigeration piping material option. This standard was designed with dimensional tables that are ID controlled to match that of ACR Copper lineset tube so that the flowrate and volume of the pipe remains the same. This specification also has high pressure performance tables so that the pipe satisfies the wide range of refrigerant pressures. The new ASTM standard covers the following test evaluations:

- Dimensional evaluation to allowed standard (ASTM D2122)
- Adhesion testing (visual and peel) to verify the bonding between the various layers
- Ring pull testing to ensure a strong and effective weld seam
- Elongation and tensile testing of the aluminum alloy used in the pipe construction to ensure that only top performing alloys are used for this application (ASTM E8/E8M)
- Burst pressure testing to verify the listed design pressure (ASTM D1599)
- Sustained pressure testing to ensure the pipe will handle continuous high pressure values at elevated temperatures (ASTM1598)
- Vibration testing after specified refrigerant exposure to pipe and fitting assembly (UL1963 Sec. 58.10)
- Pull testing after specified refrigerant exposure to pipe and fitting assembly (UL1963 Sec.58.11)
- Burst or Fatigue testing after specified refrigerant exposure to pipe and fitting assembly (Fatigue Method UL207 Sec. 14)

- Hydrostatic burst testing to evaluate the fitting connection to the pipe (ASTM 1599)
- Hydrostatic sustained pressure testing to evaluate the fitting connection to the pipe (ASTM1598)
- Thermocycling testing to evaluate the fitting connection to the pipe

This product has also been tested and evaluated for refrigerant and oil exposure to ASHRAE G38 "Guideline for Using Metal Pressure Vessels to Test Materials Used in Refrigeration Systems" where the physical properties of the inner PERT wall were evaluated both before and after exposure testing.

Cost Impact: The code change proposal will decrease the cost of construction
The use of an ASTM FXXXX approved PERT/AL/PERT lineset pipe will provide a decrease in the cost of construction due to cost effective raw materials that are used to make up the multilayer pipe. Most importantly the PERT, adhesive, and aluminum layer construction maintains better price stability than that of the commonly used refrigeration piping materials today which are very volatile and can not be held for any period of time. The product is light weight and can be sold in larger easily handled coils that can be straightened and formed for quicker installation in the field saving time and money. The overall structure of the pipe provides a lower risk of kinking than that of traditional lineset pipes which helps prevent unnecessary installation scrap and rework. Also this type of pipe is less likely to be stolen at job sights due to nature of the material.

Staff Analysis: A review of the standards proposed for inclusion in the code, ASTM FXXXX: Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PERT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems, with regard to some of the key ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before March 20, 2021.

M80-21

Public Hearing Results

Committee Action: **As Submitted**

Committee Reason: There was some concern about the use of the word "may" as it is permissive and subjective. However, the proposal has passed as submitted because composite aluminum piping is approved under ASTM standards and is an appropriate option for refrigerant piping. (Vote: 7-4)

M80-21

Individual Consideration Agenda

Public Comment 1:

Proponents: Julius Ballanco, representing Mueller Industries (jbengineer@aol.com) requests Disapprove

Commenter's Reason: This code change should not have been accepted since there is no ASTM standard listed. How can on even evaluate a change when the standard is listed as FXXXX? In addition to this failure to comply with the procedures, there are many other reasons that this change should not be accepted.
There is no indication that the draft ASTM standard evaluates the piping material to the pressure found in refrigeration systems. For example, R410A routinely operates a pressure above 400 psi. The pressure can reach over 600 psi in certain operating conditions. R32, one of the low GWP A2L refrigerants operates at even higher pressures.

There is no associated fitting standard proposed for this plastic pipe. Section 1108.10 requires the joints and fittings to be mechanical or press, yet there is no standard to evaluate these fittings. There is also no standard for the press joints. Refrigerant press connect fittings for copper tube are evaluated to UL 207 which is a robust standard. As written, any water press connect fittings could be used. This will result in failure of the joints and fittings.

Refrigerant piping installed in the field is typically located both indoors and outside. There is no indication in the proposal as to whether this new material would be resistant to the UV exposure over the life of the refrigeration system. Testing needs to verify that the plastic pipe will not fail when exposed to long periods of UV radiation.

ASHRAE has recently completed a rewrite of the entire refrigerant piping section in ASHRAE 15. PERT-AL-PERT is not listed as an acceptable material in ASHRAE 15. Before the Mechanical Code accepts a new unproven material, there should first be acceptance by ASHRAE. All of the current piping requirements for refrigeration system are based on ASHRAE 15.

Interestingly, the change proposed in Section 1109.4.1 would allow a plastic pipe for Group A2 refrigerants. Plus, the text uses permissive language with the word "may." The code does not currently allow copper tube and aluminum tube to be used in field piping for Group A2 refrigerants. In essence, the change is listing plastic refrigerant pipe as being better than copper tube or aluminum tube which has not been proven.

More importantly, this change would introduce a combustible piping material for the first time in refrigeration systems. Combustible pipe has traditionally not been permitted for indoor installations for refrigerant piping, fuel gas piping, and fuel oil piping. This would be the first attempt without providing any technical documentation or research on the impact of a fire. The reason combustible pipe has not been used in refrigerant piping, fuel gas piping, and fuel oil piping is because of the additional eminent hazard that results during a fire. Refrigerant can easily escape during a fire. In addition to the asphyxiation properties of refrigerant, burning refrigerant results in deadly gases. These gases can readily pass through a building and cause harm away from the fire location. As we transition to Group A2L refrigerants, there is a higher combustibility rate of the refrigerant compared to Group A1 refrigerants. Yet, no research has been done on the impact of using this material.

The refrigerant industry has spent millions of dollars investigating the fire impact of low GWP refrigerants. In all of the fire tests, noncombustible piping material was used on the refrigeration systems. A switch to plastic pipe would change the results perhaps significantly. However, without such research we will never know.

Before such a drastic change in piping materials is ever accepted, there needs to be extensive research and testing on the impact during all possible conditions including fire. New piping material should be evaluated to UL 207 and so listed. One cannot simply come by and say I have a new plastic pipe for refrigerant systems, why don't you approve it. This change must be disapproved.

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.

Staff Analysis: In accordance with Section 3.6.3.1 of ICC Council Policy 28, the new referenced standard ASTM FXXX Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PERT) line sets, must be completed and readily available prior to the Public Comment Hearing in order for this public comment to be considered.

Public Comment# 2815

Public Comment 2:

Proponents: Gregg Gress, representing Retired (greggagress@gmail.com) requests Disapprove

Commenter's Reason: The new definitions state that plastic composite tube is both a tubing and a pipe. Materials are one or the other, not both. ASTM F3506 states that it does not address safety concerns with the material. The very common refrigerant 410A will have a high-side pressure of over 400 psig at a 90 F ambient temperature (120 F condensing temp). Is plastic/aluminum composite tube appropriate for such pressures? Refrigerant lines for cooling and heat pump applications are exposed to extreme temperatures. ASTM F3506 appears to test for temperature duty classes of 140 F or 180 F. Plastics can soften or become brittle at high and low temperatures. Does the PE-RT/AL/PE-RT tube depend on the inner and outer layers of plastic to hold the pressures? If not, and the aluminum alone will hold the pressures, then what is the purpose of the plastic layers? Why not just use plain aluminum tubing? Assuming that all component layers of the composite pipe are necessary to contain the pressures, what happens when the tubing is exposed to a fire condition? Traditional plastic/aluminum tube has employed the aluminum layer as a means of holding the tube in whatever shape it is bent. However, it seems that now the welded seam aluminum layer is depended upon as a pressure containing tube. The fittings for plastic composite tube rely on elastomeric O-rings. How will the O-ring fittings respond to fire exposure? Does ASTM F3506 test for fire exposure? Section 1108.3.3 of the IMC prohibits solder joints for all refrigerant classes except A1 and Section 1109 requires copper, brass or steel pipe with welded joints for classes A2, A3 B2 and B3. The proposed revision to this section would allow plastic/aluminum composite tubing for A2 flammable refrigerants. That is quite a leap! The proposed new text in Section 1109.4.1 is permissive (may) and is actually an exception that should be written as an exception. The codes have always specified metallic line sets because of the danger of releasing refrigerants into a fire. Such release endangers the occupants and firefighters. Copper line sets have an indefinite life span, but plastic composite pipe has a service life of 50 years. How does aging affect the properties of the tubing? Has ASHRAE 15 standard (safety standard for refrigeration systems) changed to permit plastic composite line sets? Section 1109.2 of the IMC limits where metallic refrigerant piping can be located in a building. Should these limitations be revisited if plastic composite tubing is allowed? Refrigerants have huge global warming potential as greenhouse gases and releases to atmosphere must be held to an absolute minimum. Plastic composite tubing with O-ring joints?? Call me old school, or just old, but I have many safety and environmental concerns over the use of plastic tubing of any type for refrigerants.

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.

Staff Analysis: In accordance with Section 3.6.3.1 of ICC Council Policy 28, the new referenced standard ASTM FXXX Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PERT) line sets, must be completed and readily available prior to the Public Comment Hearing in order for this public comment to be considered.

Public Comment 3:

Proponents: Jonathan Roberts, representing UL LLC (jonathan.roberts@ul.com) requests Disapprove

Commenter's Reason: The proposed standard, ASTM F3506, does not address a number of significant factors that need to be considered for permanent piping or tubing that will contain flammable gas. Those factors include:

- Flammability
- Crush resistance
- UV resistance
- Puncture resistance
- Durability
- Aging

In addition, ASTM F3506 references UL 1963 for the vibration and pull tests, which is not applicable for permanently installed refrigeration piping and tubing. UL 1963 is the standard for refrigerant recovery and recycling equipment. It is only for temporary use, while attended by the service technician. The standard was not intended for permanent installations. The following are the definitions of recovery and recycling equipment, from UL 1963:

- 3.27 RECOVERY EQUIPMENT – An appliance that transfers refrigerant in any condition from a product to an external container without necessarily testing or processing the refrigerant.
- 3.28 RECYCLING EQUIPMENT – An appliance that extracts refrigerant from a product and cleans the refrigerant for reuse.

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.

Staff Analysis: In accordance with Section 3.6.3.1 of ICC Council Policy 28, the new referenced standard ASTM FXXX Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PERT) line sets, must be completed and readily available prior to the Public Comment Hearing in order for this public comment to be considered.

Public Comment 4:

Proponents: CP28 Administration

Commenter's Reason: The administration of ICC Council Policy 28 (CP28) is not taking a position on this code change. This public comment is being submitted to bring a procedural requirement to the attention of the ICC voting membership. In accordance with Section 3.6.3.1.1 of ICC Council Policy 28 (partially reproduced below), the new referenced standard(s) ASTM FXXXX WK74677 must be completed and readily available prior to the Public Comment Hearing in order for this public comment to be considered.
(CP28) 3.6.3.1.1 Proposed New Standards. In order for a new standard to be considered for reference by the Code, such standard shall be submitted in at least a consensus draft form in accordance with Section 3.4. If the proposed new standard is not submitted in at least consensus draft form, the code change proposal shall be considered incomplete and shall not be processed. The code change proposal shall be considered at the Committee Action Hearing by the applicable code development committee responsible for the corresponding proposed changes to the code text. If the committee action at the Committee Action Hearing is either As Submitted or As Modified and the standard is not completed, the code change proposal shall automatically be placed on the Public Comment Agenda with the recommendation stating that in order for the public comment to be considered, the new standard shall be completed and readily available prior to the Public Comment Hearing.