IMC

2024 GROUP A PROPOSED CHANGES TO THE I-CODES

April 7 – 16, 2024
Doubletree by Hilton
Universal Orlando - Orlando, FL

INTERNATIONAL CODE COUNCIL

First Printing

Publication Date: March 2024

PRINTED IN THE U.S.A.

2024 GROUP A – PROPOSED CHANGES TO THE INTERNATIONAL MECHANICAL CODE

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TENTATIVE ORDER OF DISCUSSION
2024 PROPOSED CHANGES TO THE
INTERNATIONAL MECHANICAL CODE

The following is the tentative order in which the proposed changes to the code will be discussed at the public hearings. Proposed changes which impact the same subject have been grouped to permit consideration in consecutive changes.

Proposed change numbers that are indented are those which are being heard out of numerical order. Indentation does not necessarily indicate that one change is related to another. Proposed changes may be grouped for purposes of discussion at the hearing at the discretion of the chair. Note that some M code change proposals may not be included on this list, as they are being heard by another committee.

- E1-24 Part IV
- G1-24 Part VII
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M1-24

IMC®: SECTION 202

Proponents: Kevin Gebke, DuctSox, DuctSox/Engineering Manager (kgebke@ductsox.com)

2024 International Mechanical Code

Revise as follows:

AIR DISPERSION SYSTEM. Any diffuser system designed to both convey air within a room, space or area and diffuse air into or out of that space while operating under positive or negative pressure. Systems are commonly constructed of, but not limited to, fabric or plastic film.

Reason: UL 2518 Standard for Air Dispersion Systems was updated and published on April 6, 2023. The update recognized that Air Dispersion Systems can be operated in both positive and negative pressure modes if the correct products are specified. This proposal looks to align the IMC and the UL 2518 standard.

Bibliography: UL 2518 Standard for Air Dispersion Systems - April 6, 2023

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal simply aligns the UL 2518 standard and the IMC and has no impact on cost of construction.

M1-24

M2-24

IMC®: CHAPTER 2, SECTION 202, CHAPTER 4, SECTION 403, 403.3.2, 403.3.2.1, 403.3.2.3, TABLE 403.3.2.3

Proponents: Gayathri Vijayakumar, Steven Winter Associates, Inc., Steven Winter Associates, Inc. (gayathri@swinter.com); Dylan Martello, Steven Winter Associates, Inc., Steven Winter Associates, Inc. (dmartello@swinter.com)

2024 International Mechanical Code

CHAPTER 2 DEFINITIONS

SECTION 202 GENERAL DEFINITIONS

BALANCED VENTILATION SYSTEM. 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 percent of the average of the two airflow rates.

CHAPTER 4 VENTILATION

SECTION 403 MECHANICAL VENTILATION

403.3.2 Group R-2, R-3 and R-4 occupancies. The design of local exhaust systems and ventilation systems for outdoor air in Group R-2, R-3 and R-4 *occupancies* 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.

$$Q_{OA} = 0.03A_{floor} + 7.5(N_{br} + 1)$$ **(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*.

Revise as follows:

403.3.2.3 Local exhaust. Local exhaust systems shall be provided in kitchens, bathrooms and toilet rooms and shall have the capacity to exhaust the minimum airflow rate determined in accordance with Table 403.3.2.3.

Exception: Where the outdoor air ventilation system is a *balanced ventilation system*, the minimum continuous kitchen exhaust rate shall be reduced to 25 cfm and the minimum continuous bathroom exhaust rate shall be reduced to 20 cfm.

TABLE 403.3.2.3 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR GROUP R-2, R-3 AND R-4 OCCUPANCIES

AREA TO BE EXHAUSTED	EXHAUST RATE CAPACITY
Kitchens	100 cfm intermittent or 50 cfm continuous
Bathrooms and toilet rooms	50 cfm intermittent or 25 cfm continuous

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

Attached Files

- **2027 IMC balanced dwelling unit ventilation examples.xlsx**
  https://www.cdpaccess.com/proposal/10566/30527/files/download/4344/

Reason: There is an exception 2.2 allowed in 403.3.2.1 which is impractical for use since there isn't a corresponding exception in 403.3.2.3. In a balanced system, if you reduce the supply air, you must also allow for a reduction in the exhaust air flows. This proposal creates that needed exception. The attached excel file demonstrates that these lower proposed continuous exhaust values (25cfm/kitchen and 20 cfm/bath) make the exception 2.2 more feasible.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no expected change in cost - maybe a cost decrease since it could reduce the capacity needed for the balanced ventilation system.

M2-24

M3-24

IMC®: SECTION 202 (New), CHAPTER 4, SECTION 405, 405.1, 405.2 (New)

Proponents: Jonathan Flannery, Pandemic Task Force Code Development Working Group, PTF CDWG (jflannery@aha.org)

2024 International Mechanical Code

Add new definition as follows:

BUILDING READINESS PLAN. A plan that documents the engineering controls that the facility mechanical systems will use for the facility to achieve its goals in non-normal mode.

CHAPTER 4 VENTILATION

SECTION 405
SYSTEMS CONTROL

405.1 General. Mechanical ventilation systems shall be provided with manual or automatic controls that will operate such systems whenever the spaces are occupied. Air-conditioning systems that supply required *ventilation air* shall be provided with controls designed to automatically maintain the required outdoor air supply rate during occupancy.

Add new text as follows:

405.2 Alternate Operation Capabilities. Where facilities are designed to operate in various modes in response to natural or manmade threat to/exposure of the building, the following shall be documented through an approved Building Readiness Plan (BRP). The BRP shall include the operations and maintenance (O&M) procedures involved in this operating mode, the mechanical equipment affected, final design drawings, critical asset inventory management plan, maintenance schedules, the maintenance requirements, frequencies, and establish a return to normal mode review period.

Reason: The Pandemic has demonstrated that it may be required to change operating mode of building mechanical ventilation systems under certain circumstances. These circumstances may include natural disasters such as forest fire, hurricane, pandemic, etc. or manmade such as terrorism, civil unrest, etc.

Building mechanical ventilation systems are now being built with different operating modes to reduce economic impact on the building and its occupant activities.

When such mode is created, they shall be documented for building operator to be aware of the capabilities available to operate the building.

The code does not mandate the need for alternative operating mode.

The ICC/NEHA Pandemic Task Force (PTF) was organized and tasked with researching the effects of the COVID-19 pandemic on the built environment and developing a roadmap and proposing needed resources – including guidelines, recommended practices, publications and updates to the International Codes® (I-Codes®) – that are necessary to overcome the numerous challenges that may be faced during future pandemics and to construct and manage safe, sustainable and affordable occupancy of the built environment. The ICC Pandemic Task Force Code Development Work Group (PTF CDWG) has conducted a comprehensive review of current code requirements as they relate to the prevention of the transmission of diseases and other serious health concerns and suggested revisions to current code requirements based on this assessment.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal documents alternate operational capabilities and does not impact construction.

M4-24

IMC®: SECTION 202

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

2024 International Mechanical Code

Revise as follows:

~~BRAZED~~ JOINT, BRAZED. A gastight joint obtained by the joining of metal parts with metallic mixtures or alloys that melt at a liquidus temperature above ~~1,000~~ 840°F (~~538~~ 450°C), but lower than the melting solidus ~~temperature~~ temperatures of the parts to be joined.

JOINT, SOLDERED. A gastight joint obtained by the joining of metal parts with metallic mixtures of alloys that melt at liquidus temperatures between 400°F (~~204~~ 205°C) and ~~1,000~~ 840°F (~~538~~ 450°C).

Reason: The updated definitions are better aligned with ASHRAE 15 and standards for welding. The previous temperature values would lead to a "dead zone" in the weld.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change only impacts welding settings; it does not change requirements related to construction costs.

M4-24

M5-24

IMC®: SECTION 202

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Revise as follows:

BOILER.
A closed heating *appliance* intended to supply *hot water* or steam for space heating, processing or power purposes. Low-pressure boilers operate at pressures less than or equal to 15 pounds per square inch (psi) (103 kPa) for steam and 160 psi (1103 kPa) for water. High-pressure boilers operate at pressures exceeding those pressures. Multipurpose or combination boilers indirectly heat potable water through a heat exchanger.

WATER HEATER.
Any heating *appliance* or *equipment* other than a *boiler* that heats potable water and supplies such water to the potable *hot water* distribution system. Water heaters operate at pressures less than or equal to 150 pounds per square inch (psi) (1035 kPa) and 210°F (99°C). Multipurpose or combination water heaters provide space heating using the *hot water* supplied.

Reason: Clarify distinction between boilers and water heaters. Align with IMC 1002.2.2 which permits dual purpose water heaters using potable water hot water system, and IPC 608.17.3 which permits indirect heating of potable water by boilers.

The addition of water heater operating parameters provides distinction with the boiler definition which provides analogous parameters and aligns with the values in IPC 504.5.

These definitions are based on the appliance function which correlates to the standard(s) to which the appliance is listed. It is not uncommon for an appliance to be dual listed to as complying with more than one standard, and to be able to be configured for different uses. As an example, a commercial appliance may be simultaneously listed as conforming to a water heater standard, a boiler standard, and a pool and spa heater standard. The definition of this example appliance when installed would depend on how it is configured and utilized within the mechanical and plumbing system.

While some jurisdictions require compliance with ASME BPVC above certain vessel sizes and input capacities (e.g. 200,000 BTU/H input capacity and 120 gallon tank size), the distinction between a water heater and boiler is not dependent upon these parameters. The scope and requirements of the applicable product standards do not make these distinctions, and the function and requirements of the appliance within the mechanical and plumbing systems under scope of the IMC and IPC do not change based on these parameters.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal only clarifies the distinction between boilers and WHs .

M5-24

M6-24

IMC®: SECTION 202 (New), 313.1 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Add new definition as follows:

CARBON DIOXIDE ENRICHMENT SYSTEM.
A system where carbon dioxide gas is intentionally introduced into an indoor environment, typically for the purpose of stimulating plant growth.

Add new text as follows:

313.1 Bulk CO2 Storage and Piping Systems. Bulk CO2 storage and piping systems containing more than 100 pounds which are serving carbon dioxide enrichment systems for plant growthand carbonated beverage systems shall be designed and installed in accordance with the provisions of Chapter 53 of the *International Fire Code.*

Reason: The recent popularity of indoor plant growing facilities across the country has led to a marked increase in the employment of compressed gasses for the enrichment of air within the growing area, with carbon dioxide in various types of indoor growing rooms. While CO2 exposure is vital to plant growth, in the wrong concentration, it can be lethal for an individual occupying the growing room space.

Inconsistent and unclear direction has led to a lack of uniform enforcement regarding these installations. Although Section 102.9 of the International Mechanical Code provides the code official with latitude to make decisions, which is not expressly covered in the code, this pointer would offer a clear path to a definitive procedure for compliance with a safe methodology.Some jurisdictions may utilize the Fire Service, Mechanical, Plumbing, or Building Inspectors for review and inspection of these systems. The IMC currently does not provide a clear procedure or reference to a standard by which such a piping and storage system is to be installed and tested. However, Chapter 53 of the International Fire Code provides such direction. The objective of this new section is to create a pointer to the International Fire Code for the installation of these systems.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is simply a correlation between codes.

M6-24

M7-24

IMC®: SECTION 202; IFGC: SECTION 202

Proponents: Marcelo Hirschler, GBH International, GBH International (mmh@gbhint.com)

2024 International Mechanical Code

Revise as follows:

COMBUSTIBLE MATERIAL. Any material not classified as a noncombustible material. ~~defined as noncombustible~~.

2024 International Fuel Gas Code

Revise as follows:

[M] COMBUSTIBLE MATERIAL. Any material not classified as a noncombustible material ~~defined as noncombustible~~.

Reason: ICC definitions should not contain requirements. The present IMC definition of "noncombustible material" does actually contain the requirement that the material passes ASTM E136. Therefore, this proposal recommends a change in language so that a combustible material is one that is not "classified" (rather than "defined") as a noncombustible material.

Section 703.3.1 of the IBC determines how to classify a material as noncombustible. If a material does not comply with those requirements it is not noncombustible. However,. the IBC does not define a material as noncombustible. This proposal addresses both the IMC and the IFGC definitions because the IFGC definition is shown as being under the responsibility of the IMC (as it is preceded by [M]).

Alternate proposals recommend that the IMC and IFGC replace their definitions of a noncombustible material by referencing section 703.3.1 of the IBC, and moving the requirements to be placed in Chapter 3, on general requirements.

IBC language:

703.3.1 Noncombustible materials. Materials required to be noncombustible shall be tested in accordance with ASTM E136. Alternately, materials required to be noncombustible shall be tested in accordance with ASTM E2652 using the acceptance criteria prescribed by ASTM E136.

Exception: Materials having a structural base of noncombustible material as determined in accordance with ASTM E136, or with ASTM E2652 using the acceptance criteria prescribed by ASTM E136, with a surfacing of not more than 0.125 inch (3.18 mm) in thickness having a flame spread index not greater than 50 when tested in accordance with ASTM E84 or UL 723 shall be acceptable as noncombustible.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This simply changes a definition.

M7-24

M8-24

IMC®: SECTION 202 (New), 403.1, 403.3.2.1

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

2024 International Mechanical Code

Add new definition as follows:

CORRIDOR. An enclosed *exit access* component that defines and provides a path of egress travel.

Revise as follows:

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 designed and installed in accordance with Section 403.3.2.1 and Chapter 6.

403.3.2.1 Outdoor air for dwelling units. Where a *dwelling unit* of new construction opens to a corridor, *outdoor air* shall be mechanically supplied directly to the *dwelling unit*. For other *dwelling units*,~~An~~ outdoor air ~~ventilation system consisting of a~~shall be provided using a ~~mechanical exhaust system~~ mechanical exhaust system, mechanical 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 components of such a system.
403.3.2.2 *Outdoor air* rate for *dwelling units.*

The *dwelling unit's* 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 air~~flow~~ rate shall be determined in accordance with Equation 4-9.

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

where:

Q_{OA} = outdoor air~~flow~~ 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 air~~flow~~ rate over the 4-hour period shall be not less than that prescribed by Equation 4-9.
2. The minimum ~~mechanical ventilation~~*outdoor air* 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*~~*outdoor 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~~*outdoor air* ventilation system is a *balanced ventilation system*.

Reason: Both ASHRAE 62.2 and the IMC require outdoor air to be provided to dwelling units. Research has demonstrated that a large percentage of the leakage area for attached dwelling units opening to enclosed corridors occurs across the corridor wall.[1] If an exhaust-only system is used to provide outdoor air for such units, we cannot realistically expect one unit of exhaust air to provide one unit of outdoor air. Increasing the exhaust airflow could potentially overcome the deficit, but this would also be expected to draw more air from the enclosed corridor, which is not permitted by IBC Section 1020.5 and IMC Section 601.2 (i.e., "Corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts."). To ensure that outdoor air is provided directly to dwelling units opening to corridors, 62.2 was recently amended to prohibit exhaust-only ventilation systems from providing the outdoor air required by the standard. Increasing the exhaust airflow rate could also draw more air from adjacent units. This proposal will align the IMC's requirements for ventilation of dwelling units that open to a corridor with the requirements of ASHRAE 62.2. For clarity, this proposal cross-walks the IBC definition for corridor to the IMC. There is no need to reference an "enclosed corridor" because the enclosed nature is part of the proposed definition of corridor.

Bibliography: 1. 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: Increase

Estimated Immediate Cost Impact:

$513

Estimated Immediate Cost Impact Justification (methodology and variables):

An entry-level supply fan serving a single unit would cost about $240 (retail pricing as of May 22, 2023 through www.supplyhouse.com). According to Gordian Mechanical Costs with RSMeans data, 6" insulated flex duct would cost about $10.29/linear foot (line 233346101940; price includes installed cost for material and labor with contractor O&P and builder markup of 10%). For 20 feet of duct (to carry the supply air from an exterior wall to a supply register above the dwelling unit entryway), the ductwork is estimated at $10.29*20 = $206. A supply register is $67: $33 for the part and $34 for labor, based on an average of two HVAC contractor estimates. This provides the combined cost of $240+$206+$67 = $513.

Estimated Life Cycle Cost Impact:

$961

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Assumes the supply fan is replaced after 15 years and a discount factor of 3% for a net present value of $154, but the ductwork and register do not need to be replaced. Assumes filter replacement twice per year at $15 each, for a net present value of $294. Combining the immediate cost and replacement cost: $513 + $154+$294 = $961

Note, however, that IMC Section 601.2 prohibits corridors from serving as "ventilation air ducts." Because the corridor is not permitted to provide the required volume of outdoor air to the dwelling unit, it is incumbent on the designer to demonstrate that an exhaust-only system has been engineered to deliver the volume of outdoor air required. The additional system components needed to do so (e.g., dedicated outdoor air inlets, exhaust fan with higher ventilation capacity and larger ducting, improved air sealing of the dwelling unit to the corridor, etc.) and associated energy costs to operate them, would help to offset the incremental cost incurred for the supply system. For example, a study (2025-T24-Final-CASE-Report-MF-IAQ.pdf (title24stakeholders.com)) found that compartmentalizing dwelling units to 0.3 cfm50/sf was approximately $450 and to 0.23 cfm50/sf was approximately $900, for an incremental sealing cost of $450 to reach the tightness required for exhaust-only systems to pull air through passive vents. (Although 0.23 cfm50/sf may not be tight enough, as discussed in Copy-of-Passive-vent-calculator-to-post-to-CARB-siteMACRO.xlsm (live.com). Assuming four passive vents at $50 each ($25 per vent, $25 for labor), an exhaust-only system has an immediate cost of approximately $450 + 4 x $50 = $650, similar to the supply-only system. Furthermore, exhaust-only systems introduce unfiltered particulate matter which can worsen IAQ, and drafts which cause discomfort to occupants.

M9-24

IMC®: SECTION 202 (New), 1104.2, 1106.3, 1106.4

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

2024 International Mechanical Code

Add new definition as follows:

EFFECTIVE DISPERSAL VOLUME.
The volume of a space or connected spaces in which leaked *refrigerant* will disperse.

EFFECTIVE DISPERSAL VOLUME CHARGE (EDVC).
The maximum *refrigerant* charge permitted for an *effective dispersal volume.*

Revise as follows:

1104.2 Machinery room. Except as provided in Sections 1104.2.1 and 1104.2.2, all components containing the refrigerant shall be located either outdoors or in a *machinery room* where the quantity of refrigerant in an independent circuit of a *refrigeration system* exceeds both of the following:

1. T~~t~~he amounts shown in Table 1103.1, and
2. The effective dispersal volume charge as calculated in accordance with ASHRAE 15.

For refrigerant blends not listed in Table 1103.1, the same requirement shall apply ~~where the amount for any blend component exceeds that indicated in Table 1103.1~~ for each~~that~~ component. ~~This~~These requirements shall also apply where the combined amount of the blend components exceeds a limit of 69,100 parts per million (ppm) by volume. *Machinery rooms* required by this section and containing only Group A1 or B1 refrigerants shall be constructed and maintained in accordance with Section 1105. ~~for Group A1 and B1 refrigerants and in accordance with Sections 1105 and 1106 for Group A2, B2, A3 and B3 refrigerants.~~ *Machinery rooms* required by this section and containing any Group A2, B2, A3, or B3 flammable refrigerants shall be constructed and maintained in accordance with Sections 1105 and 1106. *Machinery rooms* required by this section, containing any Group A2L or B2L flammable refrigerants and containing no Group A2, B2, A3, or B3 flammable refrigerants, shall be constructed and maintained in accordance with Section 1105 and Section 1106.4.1 through 1106.4.3.

Exceptions:

1. *Machinery rooms* are not required for *listed equipment* and *appliances* containing not more than 6.6 pounds (3 kg) of refrigerant, regardless of the refrigerant's safety classification, where installed in accordance with the *equipment's* or *appliance's* listing and the *equipment* or *appliance* manufacturer's installation instructions.
2. Piping in compliance with Section 1107 is allowed in other locations to connect components installed in a *machinery room* with those installed outdoors.

1106.3 Class 2 and 3 refrigerants. Where any flammable refrigerants of Groups A2, A3, B2 and B3 are used, the *machinery room* shall conform to the Class I, Division 2, *hazardous location* classification requirements of NFPA 70.

1106.4 Group A2L and B2L refrigerants. *Machinery rooms* ~~for~~containing any Group A2L ~~and~~or B2L refrigerants and containing no refrigerants of Group A2, A3, B2, or B3 shall comply with Sections 1106.4.1 through 1106.4.3.

Reason: This proposal harmonizes with Addendum q to ASHRAE 15-2019. The latest published language of ASHRAE 15-2022 was used as the basis for this update. The revisions clarify which requirements apply in cases where a machinery room contains refrigerants from multiple safety groups. The revisions also refer to ASHRAE 15 for EDVC calculations, with the updated requirements for refrigerant charge quantity limits, for determination of when a machinery room is required.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal will have no impact on the cost of construction. These changes for clarity are largely editorial in nature to better align the IMC with ASHRAE 15.

M9-24

M10-24

IMC®: CHAPTER 2, SECTION 202, CHAPTER 4, SECTION 401, 401.4, CHAPTER 5, SECTION 501, 501.3, 501.3.1

Proponents: Gayathri Vijayakumar, Steven Winter Associates, Inc., Steven Winter Associates, Inc. (gayathri@swinter.com)

2024 International Mechanical Code

CHAPTER 2 DEFINITIONS

SECTION 202
GENERAL DEFINITIONS

ENVIRONMENTAL AIR. Air that is conveyed to or from occupied areas through ducts that are not part of the heating or air-conditioning system, such as ventilation for human usage, domestic kitchen range exhaust, bathroom exhaust, domestic clothes dryer exhaust and parking garage exhaust.

CHAPTER 4 VENTILATION

SECTION 401
GENERAL

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 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.

CHAPTER 5 EXHAUST SYSTEMS

SECTION 501
GENERAL

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, *listed* and *labeled* domestic ductless range hoods shall not be required to discharge to the outdoors.

Revise as follows:

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, except where the exhaust opening is located not less than 1 foot (305 mm) above the gravity air intake opening into buildings for all *occupancies* other than Group U; and not less than 3 feet (914 mm) above mechanical air intakes where such intakes are located within 10 feet (3048 mm) of the exhaust termination ~~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 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 510.2.
   - 5.4. Subslab soil exhaust systems, Section 511.4.
   - 5.5. Smoke control systems, Section 512.10.3.
   - 5.6. Refrigerant discharge, Section 1105.7.
   - 5.7. *Machinery room* discharge, Section 1105.6.1.

Reason: This proposal seeks to align requirements in Chapter 4 and 5 for the minimum distance required between outdoor air intakes and terminations of environmental exhaust air. Specifically for dwelling units in multifamily, it seems the intent of the requirements is to maintain either 10 ft separation OR a minimum of 3 ft vertical distance between the dwelling unit exhaust from bathrooms and kitchens and their outdoor air intakes. The proposed edit in Chapter 5 uses language from Chapter 4 to create consistency.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no cost impact since the requirement in Chapter 5 is being revised to be consistent with the requirement in Chapter 4.

M10-24

M11-24

IMC®: SECTION 202 (New), 1104.5 (New)

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

2024 International Mechanical Code

Add new definition as follows:

GROUP CONTROLLER.
An electrical or electronic control system that monitors and responds to multiple distinct inputs from two or more appliances or refrigeration machinery units.

Add new text as follows:

1104.5 Group Controller Requirements. Utilization of a group controller for multiple refrigeration systems serving the same space or connected spaces shall comply with the following:

1. The refrigerant detection system for each refrigeration system shall provide a signal to notify the group controller when mitigation actions are required in accordance with ASHRAE 15.
2. Where a group controller determines that a signal comes from one or more specific refrigeration systems, it shall be permitted for the group controller to specify which refrigeration systems activate or deactivate mitigation actions in accordance with ASHRAE 15. Where a group controller cannot determine the specific source of a signal, the group controller shall require all of the refrigeration systems serving the same space or connected spaces to activate mitigation actions in accordance with ASHRAE 15.

Reason: This code change proposal is for correlation with proposed revisions within Addendum t, ASHRAE 15-2022. Addendum t has undergone three Publication Public Reviews (PPRs) and is expected to be published in advance of the Technical Committee meetings. The requirements around group controllers contained within Addendum t are vital for data center applications, and detail how group controllers interact with refrigeration system mitigation strategies.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

These changes will have no impact on the cost of construction. Use of a group controller is optional for refrigeration systems.

M11-24

M12-24

IMC®: SECTION 202

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

2024 International Mechanical Code

Revise as follows:

MACHINERY ROOM. ~~An enclosed space that is required by Chapter 11 to contain refrigeration *equipment* and to comply with Sections 1105 and 1106.~~
A designated space meeting the requirements of Sections 1105 and 1106 that contains one or more refrigerating systems or portions thereof.

Reason: The proposed change creates better language for a definition to avoid creating what looks like a requirement (to be enclosed), as that is better to do in the main text of Chapter 11.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Editorial only. We consider it editorial because the original takes information from 1105 and 1106 and includes it in the definition. We are not saying this information no longer applies, but that it's not appropriate for a definition. In other words, the definition should not say when a space is to be enclosed; that should be determined between 1105 and 1106.
"Enclosed space" is now a designated space that meets 1105 and 1106 (same compliance is expected as before).

"Contain refrigerant equipment" means to contain one or more refrigerating systems or portions thereof (same meaning but probably less possibility for gaming).

M12-24

M13-24

IMC®: SECTION 202, 202

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

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

Revise as follows:

Pipe. A rigid conduit of iron, steel, copper, copper-alloy, ~~or~~ plastic <u>or multilayer composite</u>. .

Tubing. Semirigid conduit of copper, copper-alloy, aluminum, plastic or steel.

Reason: Table 1202.4 of the IMC allows the use of multilayer composite pipes, such as those produced according to ASTM F1281 or F1282, or CSA B137.9 or B137.10, yet these types of approved piping materials are not included in the definition for pipe. Therefore, this code change will improve the definition for "pipe" to clarify that approved pipe materials produced using multilayer composite are included.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Table 1202.4 of the IMC allows the use of multilayer composite pipes, such as those produced according to ASTM F1281 or F1282, or CSA B137.9 or B137.10, yet these types of approved piping materials are not included in the definition for "pipe". Therefore, this proposal will improve the definition of "pipe" to clarify that approved pipe materials produced using multilayer composite are included.

M13-24

M14-24

IMC®: SECTION 202 (New), TABLE 403.3.1.1

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Add new definition as follows:

PRIVATE GARAGE.
A building or portion of a building in which motor vehicles used by the *owner* or tenants of the building or buildings on the premises are stored or kept, without provisions for repairing or servicing such vehicles for profit.

Revise as follows:

TABLE 403.3.1.1 MINIMUM VENTILATION RATES

Portions of table not shown remain unchanged.

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT[2 a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_a CFM/FT[2 a]	EXHAUST AIRFLOW RATE CFM/FT[2 a]
Private dwellings, single and multiple				
Private garages ~~Garages, common for~~ serving multiple units[b]	—	—	—	0.75

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 ton = 908 kg, 1 cubic foot per minute per square foot = 0.00508 $m^3/(s \times m^2)$, °C = [(°F) – 32]/1.8, 1 square foot = 0.0929 m^2.

a. Based on net occupiable floor area.

b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Item 3).

c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.

d. Ventilation systems in enclosed parking garages shall comply with Section 404.

e. Rates are per water closet, urinal or adult changing station. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

g. Mechanical exhaust is required and recirculation from such spaces is prohibited. For occupancies other than science laboratories, where there is a wheel-type energy recovery ventilation (ERV) unit in the exhaust system design, the volume of air leaked from the exhaust airstream into the outdoor airstream within the ERV shall be less than 10 percent of the outdoor air volume. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Items 2 and 4).

h. For nail salons, each manicure and pedicure station shall be provided with a source capture system capable of exhausting not less than 50 cfm per station. Exhaust inlets shall be located in accordance with Section 502.20. Where one or more required source capture systems operate continuously during occupancy, the exhaust rate from such systems shall be permitted to be applied to the exhaust flow rate required by Table 403.3.1.1 for the nail salon.

i. Outpatient facilities to which the rates apply are freestanding birth centers, urgent care centers, neighborhood clinics and physicians' offices, Class 1 imaging facilities, outpatient psychiatric facilities, outpatient rehabilitation facilities and outpatient dental facilities.

j. The requirements of this table provide for acceptable IAQ. The requirements of this table do not address the airborne transmission of airborne viruses, bacteria and other infectious contagions.

k. These rates are intended only for outpatient dental clinics where the amount of nitrous oxide is limited. They are not intended for dental operatories in institutional buildings where nitrous oxide is piped.

l. The occupiable floor area in warehouses shall not include the floor area of self-storage units, floor areas under rack storage or designated palletized storage floor areas.

Reason: There have been numerous instances where users of the code did not understand the existing language. A private garage serving a single unit does not require exhaust. However, where a private garage serves multiple units, exhaust is required.

The Private Garage definition comes from the IBC and is being added to the IMC to increase clarity of the term used in Table 403.3.1.1. The definition is intended to have a BG scoping.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Just to correlate the two codes.

M14-24

M15-24

IMC®: SECTION 202 (New), 917.3 (New), UL Chapter 15 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Mechanical Code

Add new definition as follows:

ROBOTIC COMMERICIAL KITCHEN EQUIPMENT. Cooking equipment with robotic or automatic systems intended to be used in lieu of, or in collaboration with, skilled commercial kitchen staff to perform cooking and /or motor-operated food preparing operations in commercial kitchens where they are not ordinarily accessed by the general public.

Add new text as follows:

917.3 Robotic Commercial Kitchen Equipment. *Robotic commercial kitchen equipment* shall be *listed* and *labeled* in accordance with UL 3320 and installed in accordance with the manufacturer's instructions.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

3320-2023 Outline of Investigation for Robotic Commercial Kitchen Equipment

Reason: Robotic kitchen equipment for commercial applications is an emerging technology. This proposal identifies UL 3320 as the standard requirements used for third party certification (listed and labeled) of robotic commercial kitchen equipment.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The cost for obtaining listed robotic kitchen equipment may or may not represent increased product costs over obtaining non-listed produc

Obtaining and maintaining a listing for listed robotic kitchen equipment involves both product investigation costs and costs for periodic ins

M15-24

M16-24

IMC®: 306.5

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Revise as follows:

306.5 Equipment or appliances on roofs or elevated structures. Where *equipment* requiring access or *appliances* are located on an elevated structure or the roof of a building such that personnel will have to climb higher than 16 feet (4877 mm) above grade to access such *equipment* or *appliances*, an interior or exterior means of access shall be provided.In buildings three or fewer stories above grade plane, the clear access opening dimensions for roof access shall be not less than 20 inches x 30 inches. In buildings four or more stories above grade plane, interior roof access openings and roof access hatches shall be sized and installed in accordance with the *International Building Code*.Such access shall not require climbing over obstructions greater than 30 inches (762 mm) in height or walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope). Such access shall not require the use of portable ladders. Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall.Permanent ladders installed to provide the required access shall comply with the following minimum design criteria:

1. The side railing shall extend above the parapet or roof edge or landing platform not less than 42 inches (1067 mm). .
2. Ladders shall have rung spacing not less than 10 inches (254 mm) and not to exceed 14 inches (356 mm) on center. The uppermost rung shall be not greater than 24 inches (610 mm) below the upper edge of the roof hatch, roof or parapet, as applicable.
3. Ladders shall have a toe spacing not less than 7 inches (178 mm) and not more than 12 inches (305 mm) deep.
4. There shall be not less than 16 inches (406 mm) between rails.
5. Rungs shall have a diameter not less than 0.75-inch (19.1 mm) and be capable of withstanding a 300-pound (136 kg) load.
6. Ladders over 30 feet (9144 mm) in height shall be provided with offset sections and landings capable of withstanding 100 pounds per square foot (488 kg/m^2). Landing dimensions shall be not less than 18 inches (457 mm) and not less than the width of the ladder served. A guard rail shall be provided on all open sides of the landing.
7. Climbing clearance. The distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be not less than 30 inches (762 mm) measured perpendicular to the rungs. This distance shall be maintained from the point of ladder access to the bottom of the roof hatch. A minimum clear width of 15 inches (381 mm) shall be provided on both sides of the ladder measured from the midpoint of and parallel with the rungs except where cages or wells are installed.
8. Landing required. The ladder shall be provided with a clear and unobstructed bottom landing area having a minimum dimension of 30 inches (762 mm) by 30 inches (762 mm) centered in front of the ladder.
9. Ladders shall be protected against corrosion by *approved* means.
10. Access to ladders shall be provided at all times.
11. Top landing required. The ladder shall be provided with a clear and unobstructed landing on the exit side of the roof hatch, having a minimum space of 30 inches (762 mm) deep and being the same width as the hatch.

Catwalks installed to provide the required access shall be not less than 24 inches (610 mm) wide and shall have railings as required for service platforms.

Exception: This section shall not apply to Group R-3 *occupancies*.

Reason: This clarifies the minimum size required for roof hatch openings. The proposed text replicates the minimum size requirements already identified in the IMC for attic access (IMC 306.3). The IBC already contains the provisions in relation to minimum size roof hatches for buildings 4 stories and more. These openings often impact service and access to the HVAC installations. This is merely a pointer to assist the mechanical/building designers and installers as to what is required if a roof hatch is utilized to access appliances and equipment.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The IMC covers roof access for where personnel will have to climb higher than 16 feet.
The IBC covers roof access where buildings are four or more stories above grade plane and a stairway is required (see IBC code sections below.)

2024 IBC

1011.12 Stairway to roof.

In *buildings* four or more *stories above grade plane*, one *stairway* shall extend to the roof surface unless the roof has a slope steeper than four units vertical in 12 units horizontal (33-percent slope).

> **Exception:** Other than where required by Section 1011.12.1, in *buildings* without an *occupiable roof* access to the roof from the top *story* shall be permitted to be by an *alternating tread device*, a ship's ladder or a permanent ladder.

1011.12.1 Stairway to elevator equipment.

Roofs and *penthouses* containing elevator equipment that must be accessed for maintenance are required to be accessed by a *stairway*.

1011.12.2 Roof access.

Where a *stairway* is provided to a roof, access to the roof shall be provided through a *penthouse* complying with Section 1511.2.

> **Exception:** In *buildings* without an *occupiable roof*, access to the roof shall be permitted to be a roof hatch or trap door not less than 16 square feet (1.5 m^2) in area and having a minimum dimension of 2 feet (610 mm).

M16-24

M17-24

IMC®: 306.5, DOL (New)

Proponents: MICHELE ORAS, LadderTech LLC DBA LadderPort, LadderTech LLC DBA LadderPort (michele@ladderport.com)

2024 International Mechanical Code

Revise as follows:

306.5 Equipment or appliances on roofs or elevated structures.
Where *equipment* requiring access or *appliances* are located on an elevated structure or the roof of a building such that personnel will have to climb higher than 16 feet (4877 mm) above grade to access such *equipment* or *appliances*, an interior or exterior means of access shall be provided. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) in height or walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope). Such access shall not require the use of portable ladders. Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall. Permanent ladders installed to provide the required access shall comply with the following minimum design criteria:

1. The side railing shall extend above the parapet or roof edge or landing platform not less than 42 inches (1067 mm). .
2. Ladders shall have rung spacing not less than 10 inches (254 mm) and not to exceed 14 inches (356 mm) on center. The uppermost rung shall be not greater than 24 inches (610 mm) below the upper edge of the roof hatch, roof or parapet, as applicable.
3. Ladders shall have a toe spacing not less than 7 inches (178 mm) and not more than 12 inches (305 mm) deep.
4. There shall be not less than 16 inches (406 mm) between rails.
5. Rungs shall have a diameter not less than 0.75-inch (19.1 mm) and be capable of withstanding a 300-pound (136 kg) load.
6. Ladders over 30 feet (9144 mm) in height shall be provided with offset sections and landings capable of withstanding 100 pounds per square foot (488 kg/m^2). Landing dimensions shall be not less than 18 inches (457 mm) and not less than the width of the ladder served. A guard rail shall be provided on all open sides of the landing.
7. Climbing clearance. The distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be not less than 30 inches (762 mm) measured perpendicular to the rungs. This distance shall be maintained from the point of ladder access to the bottom of the roof hatch. A minimum clear width of 15 inches (381 mm) shall be provided on both sides of the ladder measured from the midpoint of and parallel with the rungs except where cages or wells are installed.
8. Landing required. The ladder shall be provided with a clear and unobstructed bottom landing area having a minimum dimension of 30 inches (762 mm) by 30 inches (762 mm) centered in front of the ladder.
9. Ladders shall be protected against corrosion by *approved* means.
10. Access to ladders shall be provided at all times.
11. Top landing required. The ladder shall be provided with a clear and unobstructed landing on the exit side of the roof hatch, having a minimum space of 30 inches (762 mm) deep and being the same width as the hatch.

Catwalks installed to provide the required access shall be not less than 24 inches (610 mm) wide and shall have railings as required for service platforms.

~~Exception~~ <u>Exceptions</u>:

1. This section shall not apply to Group R-3 *occupancies*.
2. <u>An approved, permanent building-mounted ladder receiver which prevents the ladder from sliding sideways off the building or slipping backward and meets the ladder safety standard of OSHA regulation 29 CFR 1926.1053 (b)(1) shall be permitted as an interior or exterior means of access on buildings under 24 ft (7315 mm) in height above grade to access such equipment or appliances.</u>

Add new standard(s) as follows:

DOL

U.S. Department of Labor
Occupational Safety and Health Administration c/o Superintendent of Documents U.S. Government Printing Office
Washington
, DC 20210

29 CFR Part 1926.1053(b)(1) (2023) Ladders

Staff Analysis: New Referenced A review of the standard proposed for inclusion in the code, DOL CFR Part 1926.1053(b)(1)Ladders, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Attached Files

- **Ladder receiver power point.pdf**
  https://www.cdpaccess.com/proposal/9086/28211/files/download/3887/
- **TOC ITEMS 1-6.pdf**
  https://www.cdpaccess.com/proposal/9086/28211/files/download/3886/

Reason: Currently Section 306.5 of the code requires a permanent means of access when accessing a roof over 16'. "Where equipment requiring access or appliances are located on an elevated structure or the roof of a building such that personnel will have to climb higher than 16 feet (4877 mm) above grade to access such equipment or appliances, an interior or exterior means of access shall be provided". **LadderTech is requesting the following exception:**

An approved, permanent building-mounted ladder receiver which prevents the ladder from sliding sideways off the building or slipping backward and meets the ladder safety standard of OSHA regulations (Standard - 29 CFR) Ladders - 1926.1053 (b)(1) is acceptable as an interior or exterior means of access on buildings under 24' in height above grade to access such equipment or appliances.

In 2012, the Michigan Mechanical Code Council added the above exception for buildings up to 20'. **Amended in 2022 to include buildings less than 24'.**

An approved ladder receiver holding an extension ladder in place is safer to climb than a permanent vertical ladder, as your body leans forward.

An approved ladder receiver allows for ladder removal for greater building security.

In 2015, Hartland Deerfield Fire Marshal wrote a similar ordinance for all new unsprinkled buildings in the city 30' or under. In their jurisdiction, an authorized ladder receiver must be installed even if another means of access is present. Other fire departments in Michigan have followed suit. It is the opinion of the fire departments that authorized ladder receivers provide safer access to fire fighters and allow them to concentrate on fighting fires rather than holding ladders. They based this determination on the following:

Vertical ladders are difficult to climb with the amount and weight of the equipment fire fighters must wear and/or carry.

Ladder receivers negate the need for TWO fire fighters to hold the ladder in place while a third climbs to the roof, leaving two additional fire fighters to actually fight the fire.

Authorized Ladder Receiver Description

A permanently building mounted ladder receiver that securely holds an extension ladder in place, even when ice, wind or uneven ground is present. The side plates and hooks keep the ladder from falling to either side. Hooks are curved for easy ladder placement yet hold the ladder firmly in place. Grab bars with hand stops extend above the roof per OSHA requirements providing secure walk-through access on/off the roof, eliminating the dangerous transition around the ladder. An angled extension ladder held securely in place is much safer than a vertical ladder especially when carrying parts or tools to the roof. Several different models are available to accommodate multiple building facades. The different models are detailed in attached documentation.

Advantages of authorized ladder receivers vs permanent mount ladders:

P= Problem **S= Solution**

P: Permanent Mount Vertical Ladders make it almost impossible to safely carry items to the roof as one's body naturally falls away from the ladder.**S: A ladder receiver secures the extension ladder at the proper safe angle allowing for the natural tendency of one's body to lean toward the ladder.**

P: Permanent ladders provide roof access to anyone including children, vandals, and thieves. Even when gated, permanent ladders are scalable.**S: Ladder receivers can only be accessed with an extension ladder. When done remove the extension ladder and there is no easy access. Schools especially appreciate this as it removes the temptation for students to access the roof.**

P: OSHA requires a ladder tie-off, many buildings fail to provide any means to properly tie-off.

S: No need to tie-off with an authorized ladder receiver as the rungs and side plates prevent the ladder from moving.

P: An extension ladder must extend 36" above the roof line creating the dangerous "walk around the ladder to access the roof" routine.

S: Authorized ladder receivers provide comfortable, secure grab bars with hand stops, meeting OSHA requirements with a safe walk-through directly from the ladder to the roof, where many ladder fall accidents occur.

P: Ladders damage gutters and building facade.

S: Authorized ladder receivers protect building gutters and finishes while keeping ladders in assigned location away from pedestrian traffic for greater public safety and preventing costly repairs.

Additional Advantages:

Authorized ladder receivers are independently tested to meet the OSHA pull rate standard and comply with other OSHA regulations.

Authorized ladder receivers are Installed throughout the United States and Canada and are well field tested to rave reviews.

The current code is shown as an exception in the Michigan Mechanical Code Book for buildings up to 20' - the new exception for 24' is approved but the new book is not yet published.

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

The code change generally will lower the cost of the installation both in material costs and installation costs. In most cases the LadderPort ladder receiver is less expensive than a permanent mount vertical ladder, especially if a gate is required on the permanent ladder. Additionally, it is less expensive to install the LadderPort ladder receiver.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The cost impact will vary based as vertical ladders with security gates have a wide price range. Vertical ladders can range in price from $ 700 ish to $ 5000+ based on many variables. Ladder receivers currently do not exceed

$ 1000, based on variables, and average $ 739 give or take.

The request for this exception does not remove the need for safe access from the ground up rather allows an additional approved method for this access,. which means the cost impact difference is solely based on which model vertical ladder is purchased. Again, vertical ladders tend to be higher in price than a ladder receiver.

Attached are examples of the cost of a ladder receiver vs. a vertical ladder of similar attributes.

Estimated Immediate Cost Impact Justification (methodology and variables):

Ladder Receiver Example (See attached doc for links to pricing)

Ladder Receiver $ 739

Total $ 739

Vertical Ladder w/ Security Gate Example (See attached doc for links to pricing)

16' Vertical Ladder $ 761.99

Security Gate $ 485.95

Total **$ 1,247.94**

Estimated Life Cycle Cost Impact:

Life cycle of both the ladder receiver and vertical ladder is approximately the same amount as they are both made of steel and should have same life cycle.

The impact of the life cycle cost for a ladder receiver lies in its increased safety and deterent to vandals and theives, which cannot easily be put into a dollar amount.

A ladder receiver has the following benefits over a vertical ladder:

1. It is safer to climb an extension ladder held by a ladder receiver as the body leans forward vs. the backward tendency of a body climbing a vertical ladder.

2. OSHA requires 7" mounting extensions on vertical ladders, even with a security gate vandals can climb the vertical ladder using those extensions.

3. A security gate can be vandalized and removed leaving a vertical ladder to climb - vandals can take advantage of that. Once a person is finished using the ladder receiver the extension ladder is removed, leaving no easy roof access.

4. Security gates are often left unlocked due to employee error. When using a ladder receiver there is no worry about leaving a gate unlocked.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Since both items are made of steel they require the same maintenance and have the same life time cycle.

If both the ladder receiver and the vertical ladder are coated in the same material (i.e. galvanized or powder coated) the life cycle should be identical.

M17-24

M18-24

IMC®: 307.2.1.1; IPC: [M] 314.2.1.1

Proponents: James Richardson, City of Columbus (Ohio), City of Columbus (Ohio) (jarichardson@columbus.gov)

2024 International Mechanical Code

Revise as follows:

307.2.1.1 Condensate discharge. Condensate drains shall not directly connect to any plumbing drain, waste or vent pipe. Condensate drains shall not discharge into a plumbing fixture other than a floor sink, floor drain, trench drain, mop sink, hub drain, standpipe, utility sink or laundry sink. ~~Condensate drain connections to a lavatory wye branch tailpiece or to a bathtub overflow pipe shall not be considered as discharging to a plumbing fixture.~~ Condensate drains shall be installed in accordance with Section 802.1.5 of the International Plumbing Code. Except where discharging to grade outdoors, the point of discharge of condensate drains shall be located within the same occupancy, tenant space or dwelling unit as the source of the condensate.

2024 International Plumbing Code

Revise as follows:

[M] 314.2.1.1 Condensate discharge.
Condensate drains shall not directly connect to any plumbing drain, waste or vent pipe. Condensate drains shall not discharge into a plumbing fixture other than a floor sink, floor drain, trench drain, mop sink, hub drain, standpipe, utility sink or laundry sink. ~~Condensate drain connections to a lavatory wye branch tailpiece or to a bathtub overflow pipe shall not be considered as discharging to a plumbing fixture.~~ Condensate drains shall be installed in accordance with Section 802.1.5.Except where discharging to grade outdoors, the point of discharge of condensate drains shall be located within the same occupancy, tenant space or dwelling unit as the source of the condensate.

Reason: This proposal is intended to correct an issue that was created by an approved proposal in the IMC. The IMC should never dictate what fixtures are permitted to receive waste or to supersede requirements already in place in the IPC. The allowance by the IMC to connect condensate discharge to a lavatory tailpiece or a bathtub overflow, this proposal was intended to get around requirements in the IPC. The IPC provides all direction necessary to deal with waste discharge including condensate. The stricken language allows for condensate discharge to connect to lavatory tailpiece as well as bathtub overflow connections, these are the two primary fixture to experience blockages due to hair clogs. Striking the language will prevent unintended flooding that would result from such a clog. A blockage wouldn't need to be a complete blockage, it would only need to be sufficient to keep the drain from keeping up with the4 condensate discharge produced by the equipment. Adding "**Condensate drains shall be installed in accordance with IPC 802.1.5."** provides a more correct path for compliance with the requirements in the IPC.

Bibliography: See reason statement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Condensate disposal is already required, if anything this proposal will eliminate potential costs associated to damage that could be the result of the portion removed.

M18-24

M19-24

IMC®: 307.2.2

Proponents: Robert Sterling, Robert, Robert Sterling

2024 International Mechanical Code

Revise as follows:

307.2.2 Drain pipe materials and sizes.
Components of the condensate disposal system shall be ABS, cast iron, copper and copper alloy, CPVC, cross-linked polyethylene, galvanized steel, stainless steel, PE-RT, polyethylene, polypropylene, PVC or PVDF pipe or tubing. Components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 of the International Plumbing Code relative to the material type. Condensate waste and drain line size shall be not less than $^3/_4$-inch pipe size and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with Table 307.2.2.

Reason: 307.2.2 of the 2024 edition of the International Mechanical Code allows specific materials for condensate drains, but overlooks Stainless Steel as an allowable material even though this is required in many food and pharma processing applications. This proposal seeks to add "stainless steel" after the words "galvanized steel" in section 307.2.2 to ensure that the use of stainless steel is permitted.

Bibliography: International Mechanical Code, 2024 Edition, Paragraph 307.2.2

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The choice of drain material remains in the hands of the designer. The change proposal seeks to expand the allowable materials, and does not force the use of any one material.

M19-24

M20-24

IMC®: TABLE 308.4.2

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Revise as follows:

TABLE 308.4.2 CLEARANCE REDUCTION METHODS[a, b, c]

TYPE OF PROTECTIVE ASSEMBLY[~~a~~ b]	REDUCED CLEARANCE WITH PROTECTION (inches)[~~a~~ b]							
	Horizontal combustible assemblies located above the heat source				Horizontal combustible assemblies located beneath the heat source and all vertical combustible assemblies			
	Required clearance to combustibles without protection (inches)[~~a~~ b]				Required clearance to combustibles without protection (inches)			
	36	18	9	6	36	18	9	6
Galvanized sheet steel, having a minimum thickness of 0.0236 inch (No. 24 gage), mounted on 1-inch glass fiber or mineral wool batt reinforced with wire on the back, 1 inch off the combustible assembly	18	9	5	3	12	6	3	3
Galvanized sheet steel, having a minimum thickness of 0.0236 inch (No. 24 gage), spaced 1 inch off the combustible assembly	18	9	5	3	12	6	3	2
Two layers of galvanized sheet steel, having a minimum thickness of 0.0236 inch (No. 24 gage), having a 1-inch airspace between layers, spaced 1 inch off the combustible assembly	18	9	5	3	12	6	3	3
Two layers of galvanized sheet steel, having a minimum thickness of 0.0236 inch (No. 24 gage), having 1 inch of fiberglass insulation between layers, spaced 1 inch off the combustible assembly	18	9	5	3	12	6	3	3
0.5-inch inorganic insulating board, over 1 inch of fiberglass or mineral wool batt, against the combustible assembly	24	12	6	4	18	9	5	3
3 $^1/_2$-inch brick wall, spaced 1 inch off the combustible wall	—	—	—	—	12	6	6	6
3 $^1/_2$-inch brick wall, against the combustible wall	—	—	—	—	24	12	6	5

For SI: 1 inch = 25.4 mm, °C = [(°F) – 32]/1.8, 1 pound per cubic foot = 16.02 kg/m^3, 1.0 Btu × in/(ft^2 × h × °F) = 0.144 W/m^2 × K.

a. Reduction of clearances from *combustible materials* shall not interfere with *combustion air*, draft hood clearance and relief, and accessibility of servicing.

~~a~~ b. Mineral wool and glass fiber batts (blanket or board) shall have a minimum density of 8 pounds per cubic foot and a minimum melting point of 1,500°F. Insulation material utilized as part of a clearance reduction system shall have a thermal conductivity of 1.0 Btu × in/(ft^2 × h × °F) or less. Insulation board shall be formed of noncombustible material.

~~b~~ c. For limitations on clearance reduction for solid fuel-burning appliances, masonry chimneys, connector pass-throughs, masonry fireplaces and kitchen ducts, see Sections 308.4.2.1 through 308.4.2.5.

Reason: The reduction of clearance tables in the IFGC (Table 308.2) and in the IRC (Tables M1306.2 and G2409.2) contain the footnote that the reduction of clearances shall not interfere with combustion air, draft hood clearance and relief, and accessibility of servicing. This footnote should also apply to the same table in the mechanical code.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifies requirements and aligns with the other reduction of clearance tables in the IRC (Mechanical and Fuel Gas) and IFGC.

M20-24

M21-24

IMC®: SECTION 202, SECTION 313 (New), 313.1 (New), 313.2 (New)

Proponents: Marcelo Hirschler, GBH International, GBH International (mmh@gbhint.com)

2024 International Mechanical Code

Delete without substitution:

~~**NONCOMBUSTIBLE MATERIAL.** A material that passes ASTM E136.~~

Add new text as follows:

SECTION 313 NONCOMBUSTIBLE MATERIALS

313.1 Testing. Noncombustible materials shall be those materials that comply with Section 703.3.1 of the International Building Code.

313.2 Inherently noncombustible materials. Inherently noncombustible materials, such as concrete and steel, shall not be required to be tested to be acceptable as noncombustible materials.

Reason: The definition contained in the 2024 IMC is actually a requirement rather than a definition and ICC definitions should not contain requirements.

In the area of material regulation, materials that pass ASTM E136 have long been considered to be those that are noncombustible materials, and that concept is consistent with the definition presently in the IMC but that "definition" is actually a requirement, which should be moved out of Chapter 2. Chapter 3 is the chapter for general requirements.

Note that ASTM E136 is one of the very few ASTM fire test standards that has acceptance criteria. The acceptance criteria are different from the theoretical definition of a noncombustible material.

Unless a requirement exists, experience indicates that some material manufacturers have claimed that their material is noncombustible when it simply exhibits improved fire performance. When searching the internet, multiple web sites offer materials or products that are alleged to be noncombustible when that claim is incorrect. There is often a confusion in the public mind when considering a material that performs better than typical combustible materials, but should not be considered noncombustible.

This proposal recommends including a correct requirement for what materials shall be considered noncombustible materials and it is to comply with the IBC section 703.3.1. A second section states that a requirement for what is a noncombustible material does not mean that clearly noncombustible materials, such as steel, concrete, or masonry, need to be tested, for example to ASTM E136.

Equivalent proposals are being submitted to the IFC (by FCAC), the IPC, and the IFGC, all of which use noncombustible materials.

Another proposal revises the definitions of "combustible material" in the IMC and IFGC to clarify that the whether a material is or is not noncombustible is the result of a classification. The IBC does not "define" a noncombustible material but contains requirements for such materials.

The language in section 703.3.1 of the IBC reads as follows:

703.3.1 Noncombustible materials. Materials required to be noncombustible shall be tested in accordance with ASTM E136. Alternately, materials required to be noncombustible shall be tested in accordance with ASTM E2652 using the acceptance criteria prescribed by ASTM E136.

Exception: Materials having a structural base of noncombustible material as determined in accordance with ASTM E136, or with ASTM E2652 using the acceptance criteria prescribed by ASTM E136, with a surfacing of not more than 0.125 inch (3.18 mm) in thickness having a flame spread index not greater than 50 when tested in accordance with ASTM E84 or UL 723 shall be acceptable as *noncombustible.*

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This simply moves a requirement from a definition into a section where it can be actually applied, without changing the content.

M21-24

M22-24

IMC®: 401.1, 401.2, SECTION 403, 403.1, 403.3, 403.3.1, 403.3.2, 403.3.2.1, 403.3.2.2, 403.3.2.3, TABLE 403.3.2.3

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

2024 International Mechanical Code

401.1 Scope. This chapter shall govern the ventilation of spaces within a *building* intended to be occupied. Mechanical exhaust systems, including exhaust systems serving clothes dryers and cooking *appliances*; hazardous exhaust systems; dust, stock and refuse conveyor systems; subslab soil exhaust systems; smoke control systems; energy recovery ventilation systems and other systems specified in Section 502 shall comply with Chapter 5.

Revise as follows:

401.2 Ventilation required. ~~Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403.~~ *Dwelling units* complying with the air leakage requirements of the *International Energy Conservation Code* or ASHRAE 90.1 shall be ventilated by mechanical means in accordance with Section 403. Ambulatory care facilities and Group I-2 *occupancies* shall be ventilated by mechanical means in accordance with Section 407. Enclosed parking garages shall be ventilated by mechanical means in accordance with Section 404. Every other occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403.

SECTION 403
MECHANICAL VENTILATION

Revise as follows:

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 *dwelling units* in 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.

403.3 Outdoor air and local exhaust airflow rates. *Dwelling units* in Group R-2, R-3 and R-4 occupancies ~~three stories and less in height above grade plane~~ shall be provided with outdoor air and local exhaust in accordance with Section 403.3.2. Other spaces within *buildings* intended to be occupied shall be provided with outdoor air and local exhaust in accordance with Section 403.3.1.

Exceptions:

1. Enclosed parking garages complying with Section 404.
2. Spaces in ambulatory care facilities and Group I-2 occupancies complying with Section 407.

403.3.1 Spaces other than dwelling units in Group R-2, R-3, and R-4 occupancies~~Other buildings intended to be occupied~~. The design of local exhaust systems and ventilation systems for outdoor air for spaces ~~*occupancies*~~other than *dwelling units* in Group~~s~~ R-2, R-3 and R-4 occupancies shall comply with Sections 403.3.1.1 through 403.3.1.4.

403.3.2 Dwelling units in Group R-2, R-3 and R-4 occupancies. The design of local exhaust systems and ventilation systems for outdoor air for *dwelling units* in Group R-2, R-3 and R-4 *occupancies* 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.

$$Q_{OA} = 0.03A_{floor} + 7.5(N_{br} + 1) \quad \textbf{(Equation 4-9)}$$

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~~ <u>outdoor air</u> ventilation system is a *balanced ventilation system*.

Delete without substitution:

~~**403.3.2.2 Outdoor air for other spaces.** Corridors and other common areas within the conditioned space shall be provided with outdoor air at a rate of not less than 0.06 cfm per square foot [0.0003 $m^3/(s \times m^2)$] of floor area.~~

Revise as follows:

~~**403.3.2.3**~~ **<u>403.3.2.2</u> Local exhaust.** Local exhaust systems shall be provided in kitchens, bathrooms and toilet rooms and shall have the capacity to exhaust the minimum airflow rate determined in accordance with Table 403.3.2.~~3~~<u>2</u>.

TABLE ~~403.3.2.3~~ <u>403.3.2.2</u> MINIMUM REQUIRED LOCAL EXHAUST RATES FOR <u>DWELLING UNITS IN</u> GROUP R-2, R-3 AND R-4 OCCUPANCIES

AREA TO BE EXHAUSTED	EXHAUST RATE CAPACITY
Kitchens	100 cfm intermittent or 50 cfm continuous
Bathrooms and toilet rooms	50 cfm intermittent or 25 cfm continuous

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

Reason: These modifications are needed to clarify ventilation requirements for sleeping units, dwelling units, and other spaces within Group R-2, R-3, and R-4 occupancies. A summary of the results of the proposed modifications is as follows:

1. All dwelling units in Group R-2, R-3, and R-4 occupancies shall comply with Section 403.3.2. This is consistent with the prior IMC cycle's action on proposal M19-21.

2. Where provided with mechanical ventilation, all spaces other than dwelling units in Group R-2, R-3, and R-4 occupancies shall comply with Section 403.3.1 (this is meant to parallel the scope divisions of ASHRAE 62.2 and ASHRAE 62.1), with the exception of enclosed parking garages, ambulatory care facilities, and Group I-2 occupancies are addressed elsewhere.

Section 403.3.2 should be restricted to dwelling units because it is based on ASHRAE 62.2 (whose scope is restricted to dwelling units) and is poorly equipped to address spaces in Group R-2, R-3, and R-4 occupancies that are not dwelling units (e.g., dormitory sleeping units, public bathrooms, public laundry rooms, exercise rooms, meeting rooms, etc.). There is currently a subsection to address outdoor air requirements for "corridors and other common areas" within Section 403.3.2, but it is not clear how to apply this section to the myriad of spaces that are better addressed in Section 403.3.1.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal primarily clarifies existing requirements for ventilation.

M22-24

M23-24

IMC®: 401.2, SECTION 407, 407.1

Proponents: Jeff O'Neil, Chair, Committee on Healthcare (ahc@iccsafe.org)

2024 International Mechanical Code

Revise as follows:

401.2 Ventilation required. Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403. *Dwelling units* complying with the air leakage requirements of the *International Energy Conservation Code* or ASHRAE 90.1 shall be ventilated by mechanical means in accordance with Section 403. Ambulatory care facilities , ~~and~~ Group I-1 and Group I-2 *occupancies* shall be ventilated ~~by mechanical means~~ in accordance with ~~Section 407~~ this code, ASHRAE/ASHE 170 and NFPA 99.

Delete without substitution:

~~SECTION 407~~
~~AMBULATORY CARE FACILITIES AND GROUP I-2 OCCUPANCIES~~

~~**407.1 General.** Mechanical ventilation for ambulatory care facilities and Group I-2 *occupancies* shall be designed and installed in accordance with this code, ASHRAE/ASHE 170 and NFPA 99.~~

Reason: Currently, the code requires in Section 401.2 that ambulatory care facilities and Group I-2 occupancies are only to be ventilated by mechanical means. Both ASHRAE/ASHE 170 and NFPA 99 have been revised to permit ventilation by natural means under specific conditions. The ventilation for these facilities and occupancies are unique, which is why the references to both ASHRAE/ASHE 170 and NFPA 99. By requiring compliance in Section 401.2 to those two standards, Section 407 is not needed.

Adding Group I-1 for required compliance with ASHRAE/ASHE and NFPA 99 aligns the code with the requirements for licensing of these health care facilities for numerous years.

This proposal is submitted by the ICC Committee for Healthcare (CHC).

The Committee on Healthcare (CHC) was established by the ICC Board of Directors in 2011 to pursue opportunities to study and develop effective and efficient provisions for Hospital, Nursing Homes, Assisted Living and Ambulatory Care Facilities. This committee was formed in cooperation with the American Society for Healthcare Engineering (ASHE). In July of 2017, the ICC Board made CHC a standing committee. In 2023 the CHC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the CHC website at CHC webpage.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Healthcare facilities, both I-1 and I-2, have already had to comply with ASHRAE/ASHE 170 and NFPA 99 for numerous years. By providing an option for hybrid ventilation in certain applications (i.e. natural assisted by mechanical ventilation) can reduce the costs of installation.

M23-24

M24-24

IMC®: 401.2, SECTION 407, 407.1, ASHRAE Chapter 15 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Emily Toto, ASHRAE, ASHRAE (etoto@ashrae.org)

2024 International Mechanical Code

Revise as follows:

401.2 Ventilation required. Every occupied space shall be ventilated by natural means in accordance with Section 402or by mechanical means in accordance with Section 403. *Dwelling units* complying with the air leakage requirements of the *International Energy Conservation Code* or ASHRAE 90.1 shall be ventilated by mechanical means in accordance with Section 403. Ambulatory care facilities and Group I-1 and I-2 *occupancies* shall be ventilated ~~by mechanical means~~ in accordance with ~~Section 407~~ this code, ASHRAE/ASHE 170 and NFPA 99.

Delete without substitution:

~~SECTION 407~~
~~AMBULATORY CARE FACILITIES AND GROUP I-2 OCCUPANCIES~~

~~**407.1 General.** Mechanical ventilation for ambulatory care facilities and Group I-2 *occupancies* shall be designed and installed in accordance with this code, ASHRAE/ASHE 170 and NFPA 99.~~

Add new standard(s) as follows:

ASHRAE

ASHRAE
180 Technology Parkway
Peachtree Corners, GA 30092

ANSI/ASHRAE/ASHE 170-2021 Ventilation of Health Care Facilities with addenda c, d, e, f, g, h, and j

Reason: [BEVIS]: Currently, the code requires in Section 401.2 that ambulatory care facilities and Group I-2 occupancies are only to be ventilated by mechanical means. Both ASHRAE/ASHE 170 and NFPA 99 have been revised to permit ventilation by natural means under specific conditions. The ventilation for these facilities and occupancies are unique, which is why the references to both ASHRAE/ASHE 170 and NFPA 99. By requiring compliance in Section 401.2 to those two standards, Section 407 is not needed.

Adding Group I-1 for required compliance with ASHRAE/ASHE and NFPA 99 aligns the code with the requirements for licensing of these health care facilities for numerous years.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

[TOTO]:

The ventilation for ambulatory care facilities and Group I-2 occupancies are unique. Different ventilation means are identified in ASHRAE 170 and NFPA 99, including a modified method of both natural and mechanical means of ventilation. ASHRAE 170 is jointly published with ASHE. Establishing a separate section in the beginning of Chapter 4 specifically for these facilities and occupancies provides clarity as to what types of ventilation is required.

Ventilation design for health care spaces is a combination of tasks that leads to a set of documents used in construction. One such task requires medical planners to develop departmental programs of spaces. These programs include space names that suggest the use for which the space is intended, and health care ventilation designers depend upon these names to determine the ventilation parameters for their designs. This standard provides these ventilation parameters.

Without high-quality ventilation in health care facilities, patients, health care workers, and visitors can become infected through normal respiration of particles in the air. Poorly ventilated health care facilities are places where the likelihood of pathogenic particles occurring in the air is quite high. These air-transmitted pathogens can be found everywhere in poorly ventilated health care facilities, and although most individuals can cope using their healthy immune systems, some patients are susceptible to these pathogens or even to normal environmental air-borne organisms such as fungal spores. Because these organisms are found in higher concentrations in hospitals, additional care must be taken in design of the ventilation systems.

Bibliography: ANSI/ASHRAE/ASHE 170—2021: Ventilation of Health Care Facilities, with addenda c, d, e, f, g, h, and j (available online: https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda)

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

[BEVIS]: Healthcare facilities, both I-1 and I-2, have already had to comply with ASHRAE/ASHE 170 and NFPA 99 for numerous years. By providing an option for hybrid ventilation in certain applications (i.e. natural assisted by mechanical ventilation) can reduce the costs of installation.

[TOTO]: This change provides clarity about existing requirements that are already covered in the design and installation standards referenced in this code.

M24-24

M25-24 Part I

IMC®: 401.2.1 (New), 502.21 (New), 502.21.1 (New), 502.21.2 (New), 502.21.3 (New), 502.21.4 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICALCODE COMMITTEE. PART II WILL BE HEARD BY THE IFC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Add new text as follows:

401.2.1 Hazardous materials processes. Natural ventilation shall not be permitted for manufacturing where hazardous materials are used. Mechanical ventilation shall be designed and installed in accordance with Section 403 and the International Fire Code.

502.21 Plant processing or plant extraction facilities. Plant processing or plant extraction facilities shall comply with Sections 502.21.1 through 502.21.4.

502.21.1 Processes using flammable gases or flammable liquids. Plant extraction processes using flammable gases or flammable liquids shall be provided with continuous mechanical exhaust. An airflow rate of not less than 5 cfm/ft2 (0.0038 m3/(s*m2)) of floor area shall be provided. The mechanical exhaust system shall 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 a registered design professional demonstrates that an engineered mechanical exhaust 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.

502.21.2 Processes using compressed asphyxiant or inert gases. Mechanical exhaust systems for plant extraction processes using compressed asphyxiant or inert gases shall operate continuously. Recirculation of such air shall be prohibited.

502.21.3 Interlocks. Electrical equipment and appliances used in plant extraction processes shall be interlocked with ventilation fans so that the equipment cannot be operated unless the exhaust and ventilation systems are in operation.

502.21.4 Fire interlock prohibited. Exhaust systems used in plant extraction processes shall not be interlocked with the fire alarm system and shall remain in operation during a fire alarm condition.

M25-24 Part I

M25-24 Part II

IFC: 2311.8.8, 5705.3.7.5.1; IMC®: [F] 502.16.2, [F] 502.9.5.4

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Fire Code

Revise as follows:

2311.8.8 Exhaust ventilation system.
Repair garages used for the repair of CNG, LNG, or other lighter-than-air motor fuels other than hydrogen shall be provided with an *approved* mechanical ventilation system. The mechanical exhaust ventilation system shall be in accordance with the *International Mechanical Code* and Sections 2311.8.8.1 and 2311.8.8.2.

~~**Exception:** Where *approved* by the *fire code official*, natural ventilation shall be permitted in lieu of mechanical exhaust ventilation.~~

5705.3.7.5.1 Ventilation.
Continuous mechanical ventilation shall be provided at a rate of not less than 1 cfm per square foot [0.00508 $m^3/(s \times m^2)$] of floor area over the design area. Provisions shall be made for introduction of makeup air in such a manner to include all floor areas or pits where vapors can collect. Local or spot ventilation shall be provided where needed to prevent the accumulation of hazardous vapors. Ventilation system design shall comply with the *International Building Code* and *International Mechanical Code*.

~~**Exception:** Where natural ventilation can be shown to be effective for the materials used, dispensed or mixed.~~

2024 International Mechanical Code

Revise as follows:

[F] 502.16.2 Exhaust ventilation system. Repair garages used for the repair of compressed natural gas, liquefied natural gas or other lighter-than-air motor fuel, other than hydrogen, shall be provided with an *approved* mechanical exhaust ventilation system. The mechanical exhaust ventilation system shall be in accordance with this code and Sections 502.16.2.1 and 502.16.2.2.

~~**Exception:** Where *approved* , *natural ventilation* shall be an alternative to mechanical exhaust *ventilation*.~~

[F] 502.9.5.4 Use, dispensing and mixing. Continuous mechanical ventilation shall be provided for the use, dispensing and mixing of flammable and combustible liquids in open or closed systems in amounts exceeding the maximum allowable quantity per control area and for bulk transfer and process transfer operations. The ventilation rate shall be not less than 1 cfm/ft^2 [0.00508 $m^3/(s \times m^2)$] of floor area over the design area. Provisions shall be made for the introduction of *makeup air* in a manner that will include all floor areas or pits where vapors can collect. Local or spot ventilation shall be provided where needed to prevent the accumulation of hazardous vapors.

~~**Exception:** Where *natural ventilation* can be shown to be effective for the materials used, dispensed or mixed.~~

Reason: These requirements are based on best practices and ensure basic fire and life safety measures. This section provides requirements for hazardous facilities and has been established in collaboration with the PMGCAC and FCAC. These requirements provide an understandable path for compliance.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

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.

M25-24 Part II

M26-24

IMC®: 401.5, 501.3.2

Proponents: Amanda Hickman, The Hickman Group, Air Movement and Control Association International, Inc. (AMCA) (amanda@thehickmangroup.com)

2024 International Mechanical Code

Revise as follows:

401.5 Intake opening protection. Air intake openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles. Openings in louvers, grilles and screens shall be sized in accordance with Table 401.5, and shall be protected against local weather conditions. Louvers that protect air intake openings in structures located in hurricane-prone regions, as defined in the *International Building Code*, shall be *listed* to indicate compliance~~comply~~ with AMCA 550. Outdoor air intake openings located in exterior walls shall meet the provisions for exterior wall opening protectives in accordance with the *International Building Code* .

501.3.2 Exhaust opening protection. Exhaust openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles. Openings in screens, louvers and grilles shall be sized not less than $^{1}/_{4}$ inch (6.4 mm) and not larger than $^{1}/_{2}$ inch (12.7 mm). Openings shall be protected against local weather conditions. Louvers that protect exhaust openings in structures located in hurricane-prone regions, as defined in the *International Building Code*, shall be *listed* to indicate compliance ~~comply~~ with AMCA ~~Standard~~ 550. Outdoor openings located in exterior walls shall meet the provisions for exterior wall opening protectives in accordance with the *International Building Code*.

Reason:

The IMC already requires compliance with AMCA 550. However, to ensure code officials are able to enforce this provision, the revised language to require a *listing* is being proposed. Additionally, including a *listing* requirement will ensure that products will perform as designed and meet the performance requirements for the specified application.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Because listing is common practice, especially for wind driven rain resistant louvers and the fact that the cost to list/certify a product is incurred by the manufacturer and divided across multiple projects, there is no cost increase associated with this proposal.

M26-24

M27-24

IMC®: 403.2

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

2024 International Mechanical Code

Revise as follows:

403.2 Outdoor air required. The minimum outdoor airflow rate shall be determined in accordance with Section 403.3 or with the Section 6.3 Indoor Air Quality Procedure of ASHRAE 62.1.

> ~~**Exception:** Where the *registered design professional* demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design.~~

Staff Analysis: The proposed referenced standard, ASHRAE 62.1, is currently referenced in the IMC.

Reason: The International Mechanical Code (IMC) offers to pathways for determining the minimum outdoor airflow. The first pathway is a reference to Section 403.3, which involves computing minimum outdoor airflow per prescriptive ventilation rates provided in TABLE 403.3.1.1. The second pathway, currently listed as an exception, involves computing minimum outdoor airflow per an “engineered ventilation system design”. An “engineered ventilation system design” is not explicitly defined anywhere in the code language. However, it is defined in the commentary of the code. The commentary states that:

1. An engineered ventilation system design is more of a direct method of controlling air quality and would be classified as an “Indoor Air Quality Procedure” in ASHRAE 62.1

2. The exception to this section could certainly be viewed as allowing the indoor air quality (IAQ) method of that standard [ASHRAE 62.1] as one of the possible means of complying with the exception.The commentary to the exception provides the critical information on what the intent of the exception is and how it should be applied. As such, it is recommended to include a direct reference to the ASHRAE 62.1 IAQP within the body of the code. Additionally, the change aligns the IMC with ASHRAE Standard 62.1 – 2022.

We would also like to propose the following changes to the IMC commentary:

~~Section 403 represents an indirect method of control- ling air quality by diluting contaminants (ventilation rate procedure) to an acceptable level by introducing outdoor air. Although an engineered ventilation system may be approved by the code official as an alter- native design in accordance with Section 105, the exception to this section provides a direct reference to such an alternative design in this section. An engineered ventilation system is more of a direct method of controlling air quality and would be classified as an “Indoor Air Quality Procedure” in ASHRAE 62.1. ASHRAE 62.1, as a whole, is not a referenced standard in the code (with the exception of a limited reference in Section 403.3.1.1.2.3.2), but, the exception to this section could certainly be viewed as allowing the indoor air quality (IAQ) method of that standard as one of the possible means of complying with the exception. The design professional is responsible for demonstrating to the code official that a proposed engineered system will result in air quality at least equivalent to that achievable by the ventilation rate method of Section 403. A demonstration of equivalence would involve detailed analysis of at least the following: the anticipated contaminants of concern in the space to be ventilated; the anticipated sources and concentrations of the contaminants of concern; the acceptable occupant exposure limits or concentration levels for those contaminants; and the means and methods to control the contaminants. The design documentation should include all criteria and assumptions regarding occupancy conditions, equipment/system performance and contaminants. An engineered ventilation system would be allowed to supply outdoor air at any rate essential to the performance of the design.~~
The IAQP is a performance-based procedure. Rather than prescribing rates based on occupancy categories, rates are calculated based on contaminant source emission rates and desired indoor concentrations. The IAQP allows designers to take credit for source-control and removal measures, such as selection of low-emitting materials and air-cleaning devices.

Cost Impact: Increase

Estimated Immediate Cost Impact:

The only cost of using the IAQP is the cost of air cleaning technologies that may be used to clean indoor air and the nominal cost to do post start-up IAQ testing. IAQ testing for a typical office building is $2,500-$10,000 inclusive of equipment, labor, and lab analysis. As noted above, when air cleaning systems are installed with new HVAC systems, the cost of the air cleaning system is often offset by cost savings from a downsized HVAC system. This makes the IAQP approach lower cost than the VRP approach. Where existing HVAC systems sized based on a VRP design are retrofitted with an air cleaning systems to enable a reduction in outside air according to the IAQP, there is an added cost for the retrofit that includes the cost of the air cleaning system(s) and installation costs, which are typically mechanical, electrical, and controls related. These costs are paid back from the ongoing energy savings realized by conditioning less outside air.

Estimated Immediate Cost Impact Justification (methodology and variables):

Air cleaning systems that may be used to comply with the IAQP range in cost depending on the manufacturer and product type. A typical range is from $0.50-$1.00 per ft2. Installation costs are building specific and are impacted by access to power to run the air cleaning system, the need for ducting to and from the air cleaning system (not always required), and some light controls integration work to ensure the air cleaning system(s) only run when the building is occupied and not in economizer mode.

Estimated Life Cycle Cost Impact:

According to a recent study https://enverid.com/resources/learning/iaqpcarbonstudy/ on the carbon reduction potential of the IAQP, the annual thermal load per 1,000 CFM of outdoor airflow can be reduced by up to 90,000 kBtu when using the IAQP for retrofits depending. For new construction, the reduction per 1,000 CFM reduced can be up to 50,000 kBtu. Results vary significantly by climate zone. See figures 3 and 4 in the report referenced in the last section to see these figures by climate zone broken out for heating and cooling.

These thermal load reductions lead to ongoing energy savings from the following sources:

- Cooling / heating energy usage
- Electric peak “demand” charges
- Pump and fans energy consumption
- Water consumption

When new equipment is installed, reducing the thermal load leads to capital cost savings opportunities in the following areas:

- Smaller airside systems (lower tonnage RTU/AHU/DOAS)
- Smaller chillers and cooling towers
- Smaller boilers or electric heat systems
- Smaller onsite renewable systems (e.g., solar and geothermal)
- Eliminate the need or size requirements for energy recovery (ERV can be eliminated under Standard 90.1 when the outside air requirement can be reduced to <10%)
- Eliminate the need for DCV (the IAQP can deliver greater savings with less cost)
- Reduce piping and exhaust duct sizes

Estimated Life Cycle Cost Impact Justification (methodology and variables):

In good applications, the ongoing energy savings and any first cost savings from new equipment more than offset maintenance costs and first costs, respectively, of the air cleaning system used with the IAQP.

- According to GSA’s Published Findings from a Green Proving Ground evaluation of sorbent air cleaning technology, which can be used to remove gaseous contaminants from indoor air to comply with the IAQP, savings across climate zones average 1.17 kBtu/sf/yr for cooling and 1.19 kBtu/sf/yr for heating. The GSA also found that sorbent air cleaning technology delivers July peak savings of 9% on average across climate zones. The GSA Published Finding can be found at https://www.gsa.gov/climate-action-and-sustainability/center-for-emerging-building-technologies/completed-assessments/hvac/sorbent-air-cleaning.

- According to a recent study of the energy and carbon impacts of different ventilation strategies to meet the new Standard 241 ECAi targets, the most energy efficient, cost-effective compliance pathway for many buildings is to use the IAQP with MERV 13 filters for particles and pathogen control and sorbent filters for gaseous contaminant control. This study was summarized in an ASHRAE Journal article published in Sept. 2023, which can be accessed at https://www.nxtbook.com/nxtbooks/ashrae/ashraejournal_UUVCDE/index.php#/p/18. See especially Figure 2 and Table 3.

M27-24

M28-24

IMC®: CHAPTER 4, SECTION 403, 403.3, 403.3.1, TABLE 403.3.1.1, 403.3.2, 403.3.2.1, 403.3.2.2, 403.3.2.3, TABLE 403.3.2.3, 403.3.2.4, 403.3.2.5

Proponents: Gayathri Vijayakumar, Steven Winter Associates, Inc., Steven Winter Associates, Inc. (gayathri@swinter.com)

2024 International Mechanical Code

CHAPTER 4 VENTILATION

SECTION 403
MECHANICAL VENTILATION

Revise as follows:

403.3 Outdoor air and local exhaust airflow rates. Group R-2, R-3 and R-4 *occupancies* ~~three stories and less in height above grade plane~~ shall be provided with outdoor air and local exhaust in accordance with Section 403.3.2. Other *occupancies* ~~*buildings* intended to be occupied~~ shall be provided with outdoor air and local exhaust in accordance with Section 403.3.1.

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 Groups R-2, R-3 and R-4 shall comply with Sections 403.3.1.1 through 403.3.1.4.

Revise as follows:

TABLE 403.3.1.1 MINIMUM VENTILATION RATES

Portions of table not shown remain unchanged.

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT[2 a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_a CFM/FT[2 a]	EXHAUST AIRFLOW RATE CFM/FT[2 a]
Hotels, motels, and resorts ~~and dormitories~~				
Bathrooms/toilet—private[g]	—	—	—	25/50[f]
Kitchens - private[b]	—	—	—	50/100[f]
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
~~Dormitory sleeping areas~~	~~20~~	~~5~~	~~0.06~~	~~—~~
Gambling casinos	120	7.5	0.18	—
Laundry rooms, central	10	5	0.12	—
~~Laundry rooms within dwelling units~~	~~10~~	~~5~~	~~0.12~~	~~—~~
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	5	0.06	—
~~**Private dwellings, single and multiple**~~				
~~Garages, common for multiple units[b]~~	~~—~~	~~—~~	~~—~~	~~0.75~~
~~Kitchens[b]~~	~~—~~	~~—~~	~~—~~	~~50/100[f]~~
~~Living areas[e]~~	~~Based on number of bedrooms. First bedroom, 2; each additional bedroom, 1~~	~~0.35 ACH but not less than 15 cfm/person~~	~~—~~	~~—~~
~~Toilet rooms and bathrooms[g]~~	~~—~~	~~—~~	~~—~~	~~25/50[f]~~

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 ton = 908 kg, 1 cubic foot per minute per square foot = 0.00508 $m^3/(s \times m^2)$, °C = [(°F) – 32]/1.8, 1 square foot = 0.0929 m^2.

a. Based on net occupiable floor area.

b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Item 3).

c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.

d. Ventilation systems in enclosed parking garages shall comply with Section 404.

e. Rates are per water closet , urinal or adult changing station. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

g. Mechanical exhaust is required and recirculation from such spaces is prohibited. For occupancies other than science laboratories, where there is a wheel-type energy recovery ventilation (ERV) unit in the exhaust system design, the volume of air leaked from the exhaust airstream into the outdoor airstream within the ERV shall be less than 10 percent of the outdoor air volume. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Items 2 and 4).

h. For nail salons, each manicure and pedicure station shall be provided with a source capture system capable of exhausting not less than 50 cfm per station. Exhaust inlets shall be located in accordance with Section 502.20. Where one or more required source capture systems operate continuously during occupancy, the exhaust rate from such systems shall be permitted to be applied to the exhaust flow rate required by Table 403.3.1.1 for the nail salon.

i. Outpatient facilities to which the rates apply are freestanding birth centers, urgent care centers, neighborhood clinics and physicians' offices, Class 1 imaging facilities, outpatient psychiatric facilities, outpatient rehabilitation facilities and outpatient dental facilities.

j. The requirements of this table provide for acceptable IAQ. The requirements of this table do not address the airborne transmission of airborne viruses, bacteria and other infectious contagions.

k. These rates are intended only for outpatient dental clinics where the amount of nitrous oxide is limited. They are not intended for dental operatories in institutional buildings where nitrous oxide is piped.

l. The occupiable floor area in warehouses shall not include the floor area of self-storage units, floor areas under rack storage or designated palletized storage floor areas.

403.3.2 Group R-2, R-3 and R-4 occupancies. The design of local exhaust systems and ventilation systems for outdoor air in Group R-2, R-3 and R-4 *occupancies* shall comply with Sections 403.3.2.1 through 403.3.2.5.

Revise as follows:

403.3.2.1 Outdoor air for dwelling units <u>and sleeping units</u>. An outdoor air ventilation system consisting of a mechanical exhaust system, supply system or combination thereof shall be installed for each *dwelling unit* <u>and *sleeping unit*</u>. 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.

$$Q_{OA} = 0.03A_{floor} + 7.5(N_{br} + 1) \quad \textbf{(Equation 4-9)}$$

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~~ outdoor air ventilation system is a *balanced ventilation system*.

403.3.2.2 Outdoor air and local exhaust for other spaces. Spaces other than *dwelling units* and *sleeping units* shallcomply with Sections 403.3.1.1 through 403.3.1.4~~Corridors and other common areas within the conditioned space shall be provided with outdoor air at a rate of not less than 0.06 cfm per square foot [0.0003 $m^3/(s \times m^2)$] of floor area~~.

403.3.2.3 Local exhaust for dwelling units and sleeping units. Local exhaust systems shall be provided in kitchens, bathrooms and toilet rooms and shall have the capacity to exhaust the minimum airflow rate determined in accordance with Table 403.3.2.3.

TABLE 403.3.2.3 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR GROUP R-2, R-3 AND R-4 OCCUPANCIES

AREA TO BE EXHAUSTED	EXHAUST RATE CAPACITY
Kitchens	100 cfm intermittent or 50 cfm continuous
Bathrooms and toilet rooms	50 cfm intermittent or 25 cfm continuous

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

Revise as follows:

403.3.2.4 System controls. Where provided within a *dwelling unit*or *sleeping unit*, controls for outdoor air ventilation systems shall include text or a symbol indicating the system's function.

403.3.2.5 Ventilating equipment. Fans providing exhaust or outdoor air shall be *listed* and *labeled* to provide the minimum required air flow in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.

Reason: For Residential Group R-2, R-3 and R-4, 2024 IMC made an important change to have the same ventilation and exhaust requirements, regardless of building height.

However, it is not clear by the charging language in R403.3 and R403.3.1 what ventilation requirements are if the building exceeds 3 stories. It seems that R403.3.2 is intended to apply to all R-2, R-3 and R-4, regardless of building height, so this proposal makes that intent more explicit.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is not intended to change stringency of requirements, but rather clarify the current requirements for all the occupancies within a multifamily building, regardless of building height.

M28-24

M29-24

IMC®: TABLE 403.3.1.1

Proponents: Micheal Anderson, Nelson Rudie & Associates, self

2024 International Mechanical Code

Revise as follows:

TABLE 403.3.1.1 MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT^{2} [a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_aCFM/FT^{2} [a]	EXHAUST AIRFLOW RATE CFM/FT^{2} [a]
Animal facilities				
Animal exam room (veterinary office)	20	10	0.12	—
Animal imaging (MR/CT/PET)	20	10	0.18	0.9
Animal operating rooms	20	10	0.18	3.00
Animal postoperative recovery room	20	10	0.18	1.50
Animal preparation rooms	20	10	0.18	1.50
Animal procedure room	20	10	0.18	2.25
Animal surgery scrub	20	10	0.18	1.50
Large-animal holding room	20	10	0.18	2.25
Necropsy	20	10	0.18	2.25
Small-animal cage room (static cages)	20	10	0.18	2.25
Small-animal cage room (ventilated cages)	20	10	0.18	1.50
Correctional facilities				
Booking/waiting	50	7.5	0.06	—
Cells				
without plumbing fixtures	25	5	0.12	—
with plumbing fixtures[g]	25	5	0.12	1.0
Day room	30	5	0.06	—
Dining halls(see “Food and beverage service”)	—	—	—	—
Guard stations	15	5	0.06	—
Dry cleaners, laundries				
Coin-operated dry cleaner	20	15	—	—
Coin-operated laundries	20	7.5	0.12	—
Commercial dry cleaner	30	30	—	—
Commercial laundry	10	5	0.12	—
Storage, pick up	30	7.5	0.12	—
Education				
Art classroom[g]	20	10	0.18	0.7
Auditoriums	150	5	0.06	—
Classrooms (ages 5–8)	25	10	0.12	—
Classrooms (age 9 plus)	35	10	0.12	—
Computer lab	25	10	0.12	—
Corridors (see “Public spaces”)	—	—	—	—
Day care (through age 4)	25	10	0.18	—
Lecture classroom	65	7.5	0.06	—
Lecture hall (fixed seats)	150	7.5	0.06	—
Locker/dressing rooms[g]	—	—	—	0.25
Media center	25	10	0.12	—
Multiuse assembly	100	7.5	0.06	—
Music/theater/dance	35	10	0.06	—
Science laboratories[g]	25	10	0.18	1.0
Smoking lounges[b]	70	60	—	—
Sports locker rooms[g]	—	—	—	0.5
Wood/metal shops[g]	20	10	0.18	0.5
Food and beverage service				
Bars, cocktail lounges	100	7.5	0.18	—
Break rooms	25	5	0.06	—
Cafeteria, fast food	100	7.5	0.18	—
Coffee stations	20	5	0.06	—
Corridors	—	—	0.06	—
Dining rooms	70	7.5	0.18	—
Kitchens (cooking)[b]	20	7.5	0.12	0.7
Occupiable storage rooms for liquids or gels	2	5	0.12	—
Hotels, motels, resorts and dormitories				
Bathrooms/toilet—private[g]	—	—	—	25/50[f]
Bedroom/living room	10	5	0.06	—

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/FT	EXHAUST AIRFLOW RATE CFM/FT
Conference/meeting	50	5	0.06	—
Dormitory sleeping areas	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Laundry rooms, central	10	5	0.12	—
Laundry rooms within dwelling units	10	5	0.12	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	5	0.06	—
Offices				
Break rooms	50	5	0.12	—
Conference rooms	50	5	0.06	—
Main entry lobbies	10	5	0.06	—
Occupiable storage rooms for dry materials	2	5	0.06	—
Office spaces	5	5	0.06	—
Reception areas	30	5	0.06	—
Telephone/data entry	60	5	0.06	—
Outpatient healthcare facilities[i, j]				
Birthing room	15	10	0.18	—
Class 1 imaging room	5	5	0.12	—
Dental operatory[k]	20	10	0.18	—
General examination room	20	7.5	0.12	—
Other dental treatment areas	5	5	0.06	—
Physical therapy exercise area	7	20	0.18	—
Physical therapy individual room	20	10	0.06	—
Physical therapeutic pool area	—	—	0.48	—
Prosthetics and orthotics room	20	10	0.18	—
Psychiatric consultation room	20	5	0.06	—
Psychiatric examination room	20	5	0.06	—
Psychiatric group room	50	5	0.06	—
Psychiatric seclusion room	5	10	0.06	—
Speech therapy room	20	5	0.06	—
Urgent care examination room	20	7.5	0.12	—
Urgent care observation room	20	5	0.06	—
Urgent care treatment room	20	7.5	0.18	—
Urgent care triage room	20	10	0.18	—
Private dwellings, single and multiple				
Garages, common for multiple units[b]	—	—	—	0.75
Kitchens[b]	—	—	—	50/100[f]
Living areas[c]	Based on number of bedrooms. First bedroom, 2; each additional bedroom, 1	0.35 ACH but not less than 15 cfm/person	—	—
Toilet rooms and bathrooms[g]	—	—	—	25/50[f]
Public spaces				
Corridors	—	—	0.06	—
Courtrooms	70	5	0.06	—
Elevator car	—	—	—	1.0
Legislative chambers	50	5	0.06	—
Libraries	10	5	0.12	—
Museums (children’s)	40	7.5	0.12	—
Museums/galleries	40	7.5	0.06	—
Places of religious worship	120	5	0.06	—
Room with adult changing station	—	—	—	50/70[e]
Shower room (per shower head)[g]	—	—	—	50/20[f]
Smoking lounges[b]	70	60	—	—
Toilet rooms — public[g]	—	—	—	50/70[e]
Retail stores, sales floors and showroom floors				
Dressing rooms	—	—	—	0.25
Mall common areas	40	7.5	0.06	—
Sales	15	7.5	0.12	—
Shipping and receiving	2	10	0.12	—
Smoking lounges[b]	70	60	—	—
Storage rooms	—	—	0.12	—
Warehouses (see “Storage”)	—	10	0.06	—
Specialty shops				
Automotive motor fuel-dispensing stations[b]	—	—	—	1.5
Banks or lobbies	15	7.5	0.06	—
Barber	25	7.5	0.06	0.5
Beauty salons[b]	25	20	0.12	0.6
Embalming room[b]	—	—	—	2.0
Nail salons[b, h]	25	20	0.12	0.6
Pet shops (animal areas)[b]	10	7.5	0.18	0.9
Supermarkets	8	7.5	0.06	—

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/FT	EXHAUST AIRFLOW RATE CFM/FT
Sports and amusement				
Bowling alleys (seating areas)	40	10	0.12	—
Disco/dance floors	100	20	0.06	—
Game arcades	20	7.5	0.18	—
Gym, stadium, arena (play area)	7	20	0.18	—
Health club/aerobics room	40	20	0.06	—
Health club/weight room	10	20	0.06	—
~~Ice arenas without combustion engines~~	~~—~~	~~—~~	~~0.30~~	~~0.5~~
Spectator areas	150	7.5	0.06	—
Swimming pools (pool and deck area)	—	—	0.48	—
Storage				
Refrigerated warehouses/freezers (< 50°F)	—	10	—	—
Repair garages, enclosed parking garages[b, d]	—	—	—	0.75
Warehouses [f]	—	10	0.06	—
Theaters				
Auditoriums (see “Education”)	—	—	—	—
Lobbies	150	5	0.06	—
Stages, studios	70	10	0.06	—
Ticket booths	60	5	0.06	—
Transportation				
Platforms	100	7.5	0.06	—
Transportation waiting	100	7.5	0.06	—
Workrooms				
Bank vaults/safe deposit	5	5	0.06	—
Computer (without printing)	4	5	0.06	—
Copy, printing rooms	4	5	0.06	0.5
Darkrooms	—	—	—	1.0
Manufacturing where hazardous materials are not used	7	10	0.18	—
Manufacturing where hazardous materials are used (excludes heavy industrial and chemical processes)	7	10	0.18	—
Meat processing[c]	10	15	—	—
Pharmacy (prep. area)	10	5	0.18	—
Photo studios	10	5	0.12	—
Sorting, packing, light assembly	7	7.5	0.12	—
Telephone closets	—	—	0.00	—

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 ton = 908 kg, 1 cubic foot per minute per square foot = 0.00508 $m^3/(s \times m^2)$, °C = [(°F) – 32]/1.8, 1 square foot = 0.0929 m^2.

a. Based on net occupiable floor area.

b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Item 3).

c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.

d. Ventilation systems in enclosed parking garages shall comply with Section 404.

e. Rates are per water closet , urinal or adult changing station. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

g. Mechanical exhaust is required and recirculation from such spaces is prohibited. For occupancies other than science laboratories, where there is a wheel-type energy recovery ventilation (ERV) unit in the exhaust system design, the volume of air leaked from the exhaust airstream into the outdoor airstream within the ERV shall be less than 10 percent of the outdoor air volume. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Items 2 and 4).

h. For nail salons, each manicure and pedicure station shall be provided with a source capture system capable of exhausting not less than 50 cfm per station. Exhaust inlets shall be located in accordance with Section 502.20. Where one or more required source capture systems operate continuously during occupancy, the exhaust rate from such systems shall be permitted to be applied to the exhaust flow rate required by Table 403.3.1.1 for the nail salon.

i. Outpatient facilities to which the rates apply are freestanding birth centers, urgent care centers, neighborhood clinics and physicians' offices, Class 1 imaging facilities, outpatient psychiatric facilities, outpatient rehabilitation facilities and outpatient dental facilities.

j. The requirements of this table provide for acceptable IAQ. The requirements of this table do not address the airborne transmission of airborne viruses, bacteria and other infectious contagions.

k. These rates are intended only for outpatient dental clinics where the amount of nitrous oxide is limited. They are not intended for dental operatories in institutional buildings where nitrous oxide is piped.

l. The occupiable floor area in warehouses shall not include the floor area of self-storage units, floor areas under rack storage or designated palletized storage floor areas.

Reason: I am proposing the row in the ventilation table (table 403.3.1.1) labeled Ice arenas without combustion engines to be deleted.

Reason for removal: The requirement / row has been removed from ASHRAE 62.1 since the 2013 addition. As well as the values currently required in the current code do not make sense. The ventilation rate for the ice surface on an area basis is 0.30 cfm/sf which is higher than gym play area which is at 0.18 cfm/sf. My understanding of the ventilation rate for area is to account for off gassing of materials, and ice off gasses water vapor where a gym floor would be much worse and yet ventilation rate is higher for ice. As the row indicates this requirement is for ice arenas without combustion engines so I do not understand why there is a requirement for exhaust, this requirement would more be for an ice arena with combustion engines.

Cost Impact: Decrease

- **cdpAccess Ice Arena Code Change Savings.xlsx**
  https://www.cdpaccess.com/proposal/9413/28499/documentation/134102/attachments/download/4623/

Estimated Immediate Cost Impact:

Assuming desiccant style dehumidification units are used which are industry standard there would be a savings of $50,000 to $100,000 savings per ice rink. Desiccant style dehumidification units are much more expensive per unit airflow than a typical DX unit.

Estimated Immediate Cost Impact Justification (methodology and variables):

A typical NHL size ice sheet is 16,400sqft in area. If the "Ice Arenas without Combustion Engines" was removed and the ice would now fall under "Gym, Stadium, Arena (play area)", the airflow per square foot goes from 0.30 to 0.18 cfm/sf. This is a reduction close to 2,000 cfm. Ice arenas need to be positively pressurized to control humidity so if the exhaust rate is taken into account and dropped from 0.5 to 0.18, this would reduce the required airflow around 5,000 cfm. Ice arenas required dew points below what standard DX systems can supply so more expensive desiccant type dehumidification units are used.

Estimated Life Cycle Cost Impact:

Depending on controls and design conditions there is a chance to save $7,000 to $20,000 over the 15 year life of the desiccant unit, majority being fan energy but there is some gas savings.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

It is difficult to quantify the life cycle savings, the savings come from not having to condition 2,000 to 5,000 cfm for the life of the equipment and what are the outside conditions of the building. As well as most of these systems are ran with demand control ventilation or scheduled only full ventilation when there is a high occupancy event. A high school hockey team will have 8-15 home hockey games and typically have at least 2 teams (mens and womens) call the rink home ice, with high occupancy games happening between November and February with playoffs happening in March of every year. . A college hockey team will have about 20 home hockey games and typically have at least 2 teams (mens and womens) call the rink home ice, with high occupancy games happening between October and March with playoffs happening in March/April of every year. I will be using 20 events per season for calc, more event will lead to more cost savings. Life expectancy for a gas regen desiccant unit is around 15 years. The unit is ran as a constant volume unit unit supply airflow is equal to the requires outside airflow rate, so if the requires outside airflow rate can be reduced the supply airflow can be reduced saving fan energy.

M29-24

M30-24

IMC®: 403.3.2.1

Proponents: Diana Burk, Energy Solutions, Energy Solutions (dburk@energy-solution.com)

2024 International Mechanical Code

Revise as follows:

403.3.2.1 Outdoor air for dwelling units. An outdoor air ventilation system shall comply with one of the following:

1. In Climate Zones 0 through 5, an outdoor 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.
2. In Climate Zones 6, 7, and 8, an outdoor ventilation system shall be a *balanced ventilation system* in compliance with the residential provisions of the *International Energy Conservation Code*.

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.

$$Q_{OA} = 0.03A_{floor} + 7.5(N_{br} + 1) \quad \textbf{(Equation 4-9)}$$

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: This proposal is intended to align the residential ventilation requirements in the mechanical code with the energy efficiency requirements in the 2024 IECC. Public draft #2 of the 2024 IECC requires the use of an energy recovery ventilator or heat recovery ventilator in Climate Zones 6 through 8 which are both balanced ventilation systems.

Section 403.3.2.1 of the 2024 IMC explicitly allows the use of supply-only, exhaust-only or balanced ventilation systems in low-rise multifamily buildings. This proposal is intended to clarify that supply-only and exhaust-only ventilation systems are only allowed in Climate Zones 0 through 5 and balanced ventilation systems are required in Climate Zones 6 through 8.

Bibliography: THE INTERNATIONAL RESIDENTAIL CODE-CHAPTER 11 ENERGY EFFICIENCY PUBLIC COMMENT DRAFT #2 https://www.iccsafe.org/wp-content/uploads/PCD2-IRC-CHAP-11.pdf

REPI-93-21 https://energy.cdpaccess.com/proposal/443/1236/preview/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There are no increased costs for this proposal, as it is simply a coordination proposal. Increased costs due to the ERV/HRV requirements have been addressed as part of the development process of the IECC-R.

M30-24

M31-24

IMC®: 403.3.2.1

Proponents: Armin Rudd, AB Systems LLC, National Association of Home Builders (arudd@absystems.us)

2024 International Mechanical Code

Revise as follows:

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} = 0.03~~ Q_{OA} = 0.01A_{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*.

Reason: The goal of this proposal is roll-back the mechanical ventilation rate for Group R-2, R-3 and R-4 occupancies to the previous 2021 rate.

The 2024 IMC residential ventilation rate is too high. Too much ventilation airflow wastes energy and causes humidity control difficulties and inefficiencies in warm-humid summers and cold-dry winters.

The 2024 IMC increase from (0.01*A_{floor} + 7.5*(Nbdrm+1)) to (0.03*A_{floor} to 7.5*(Nbdrm+1)) was presented as an attempt to align the IMC with ASHRAE Standard 62.2. However, 62.2 allows for an infiltration credit to reduce the ventilation rate, the 2024 IMC does not. 62.2 allows for an air filtration credit to reduce the ventilation rate, the 2024 IMC does not. As such, the effective 2024 IMC ventilation rate is greater than the ASHRAE 62.2 rate and the IMC rate change should be reversed.

Behind that is the fact that the 2013 increase in the ASHRAE 62.2 ventilation rate did not come about due to any health-based data or studies. It came about due to committee leadership maneuvering to split up a standing change proposal that involved a combined change to eliminate the default infiltration credit[1] (infiltration credit would have to be measured in the future) and to find consensus on what the ventilation rate should be based on human health data. Because the committee leadership wanted to bifurcate the change proposal, the proponents were promised that if the proposal was withdrawn, and the default infiltration credit was eliminated, the committee would act in good faith to base the new ventilation rate requirement on health-based studies rather than the current ventilation rate status which was based on qualitative judgement of the committee membership. Since the proposal had been mired in process for a long time, the proponents agreed to what the committee leadership promised and withdrew the proposal. After that, there was a swift dispensing of the default infiltration credit followed by a large ventilation rate increase without presentation of any health data studies to support it.

Fast forward a decade and there is still no health-based data or study to support the ASHRAE Standard 62.2 residential ventilation rate quantitatively. Rather, indoor air quality research, using the Disability Adjusted Life Years (DALY) analysis approach, has shifted away from concern over dilution of chemical contaminants by ventilation air exchange to fine particle filtration in the indoor environment.

Fine particle (PM2.5) filtration is now presented as the most significant indoor air health issue, being about 10 times more important than the next closest indoor air contaminant of concern which is formaldehyde, and formaldehyde is best limited by limiting the material source. As such, the primary contaminant of concern in residential indoor environments has shifted largely away from chemical compounds to fine particles. Fine particulate matter is ameliorated by air filtration, not dilution with outdoor air, since outdoor concentrations often exceed indoor concentrations[2,3,4].

Therefore, the residential ventilation rate should not have been increased in the 2024 IMC due to the following:

1. The effective 2024 IMC ventilation rate is greater than the ASHRAE Standard 62.2 rate because the 2024 IMC does not allow the credits against ventilation rate that ASHRAE 62.2 allows; and
2. There is no health-based data to support the prior or the new IMC ventilation rate, and there has been an order of magnitude shift in the indoor air quality research community to the importance of fine particle filtration over chemical dilution.

Ventilation excess compared to ASHRAE Standard 62.2:

By not allowing a measured infiltration credit against the ventilation rate per ASHRAE Standard 62.2, the IMC's current ventilation rate requirement is about 12 CFM or 14% higher than even the ASHRAE 62.2 rate for a 2400 ft^2, 3 bedroom, 3 ACH50 leakage dwelling-unit in Baltimore with a reference-case exhaust-only ventilation system. For the same dwelling-unit with a balanced ventilation system, the IMC's current ventilation rate requirement is about 36 CFM or 53% higher than the ASHRAE 62.2 rate. The excess ventilation rate translates to excess energy use and indoor humidity control issues.

[1] The default infiltration credit was a presumption that infiltration contributed 2 CFM per 100 ft^2 of floor area to outdoor air exchange for all dwelling units.

[2] A Method to Estimate the Chronic Health Impact of Air Pollutants in U.S. Residences. Jennifer M. Logue, Phillip N. Price, Max H. Sherman, and Brett C. Singer. Environmental Energy Technologies Division, Lawrence Berkeley National Lab, Berkeley, California, USA. Environmental Health Perspectives, volume 120, number 2, February 2012.

[3] Inhalable Particulate Matter and Health (PM2.5 and PM10), California Air Resources Board. https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health (accessed 11/22/2023)

[4] Relationships of Indoor, Outdoor, and Personal Air (RIOPA). Part I. Collection Methods and Descriptive Analyses. Weisel CP, Zhang J, Turpin BJ, Morandi M, Colome S, Stock T, et al. 2005. HEI Research Report 130; NUARTC Research Report 7. Boston:Health Effects Institute.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Equipment: The proposed decrease in required ventilation rate will generally result in cost savings due to reduced size of ventilation fan equipment and reduced size of ducts. Smaller ventilation system components will generally result in reduced material costs but that can depend on the specifics of each ventilation system.

Energy Use: Energy modeling of residential ventilation systems show the following impacts.

For an exhaust-only ventilation system in a 2467 ft^2, 3 bedroom, 3 ACH50 dwelling unit in Washington DC, annual energy savings due to the reduced ventilation rate can be expected as follows:

89% savings for the ventilation fan energy itself;

20% or $161 savings for total HVAC system energy; and

10% or $161 savings for total dwelling unit energy including HVAC, hot water, appliances, and miscellaneous loads.

For an ERV ventilation system in the same dwelling unit and location, annual energy savings due to the reduced ventilation rate can be expected as follows:

90% savings for the ventilation fan energy itself;

10% or $76 savings for total HVAC system energy; and

5% or $76 savings for total dwelling unit energy including HVAC, hot water, appliances, and miscellaneous loads.

Estimated Immediate Cost Impact Justification (methodology and variables):

	Electric, Cooling Season					Dehum.		Gas, Heating Season				Gas, DHW		Elec. Appl.		House Totals			Difference	
Location and Ventilation System	Outdoor Unit (kWh)	Indoor Unit (kwh)	Vent Fan (kWh)	Sub Total (kWh)	Sub Total ($)	(kWh)	($)	(Therm)	Furnace Fan (kWh)	Vent. Fan (kWh)	Sub Total ($)	(Therm)	($)	(kWh)	($)	(kWh)	(Therm)	($)	($)	(%)
Wash DC-Reagan (CZ 4)																				
Vent1-Exh (0.01*A_{floor})	1586	323	80	1989	230	87	10	438.4	238	96	561	133.0	158	5508	637	7918	571.4	1595	--	--
Vent1-Exh (0.03*A_{floor})	1755	355	144	2254	260	240	28	519.6	287	189	674	133.0	158	5508	637	8478	652.6	1756	161	10.1
Vent3-Bal ERV (0.01*A_{floor})	1540	316	162	2018	233	55	6	412.6	226	189	539	133.0	158	5508	637	7996	545.6	1573	--	--
Vent3-Bal ERV (0.03*A_{floor})	1599	326	301	2226	257	68	8	436.0	242	365	589	133.0	158			8409	569.0	1649	76	4.8
Notes:																				
Appliance and lighting heat gain was by the HERS 2006 Reference schedule within EnergyGuageUSA.																				

M31-24

M32-24

IMC®: 403.3.2.1

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

2024 International Mechanical Code

Revise as follows:

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.

$$Q_{OA} = 0.03A_{floor} + 7.5(N_{br} + 1)$$ **(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

Exception~~s~~:

~~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: ASHRAE 62.2 is the basis for this proposal.

ASHRAE 62.2 does not have this reduction for distribution or balanced systems.

For balanced systems in single-family applications ASHRAE 62.2 uses a calculation procedure to combine natural infiltration with mechanical ventilation. This procedure results in smaller air flow requirements for balanced systems compared to unbalanced systems. However, this is not fixed at 30% and depends on building envelope leakage levels and weather. This calculation is not allowed for multifamily buildings in ASHRAE 62.2 because no credit is given for natural infiltration in multifamily applications. ASHRAE 62.2 does not allow infiltration credit in multifamily buildings because infiltration calculations are very difficult to perform for multifamily buildings (note that the infiltration calculations used in ASHRAE 62.2 only apply to single zone buildings and were developed for single family dwellings - see the ASHRAE Handbook of Fundamentals Chapter 16) plus concerns about giving credit for flow from other units and adjacent spaces for which there is a substantial supporting literature.

ASHRAE 62.2 does not have this reduction for systems that supply air to specified rooms.

There are multiple reasons for this. Firstly, residences, unlike commercial buildings, are not zoned from an air flow perspective and there is insufficient advantage from delivering air to specific locations in a home to justify a 30% reduction in ventilation rates. This is for a host of reasons, primarily because other factors such as open or closed doors, magnitude and location of building envelope leakage and natural infiltration, and operation of central forced air HVAC systems, obscure any differences in ventilation system type. The bibliography has a list of several publications address these issues. Secondly, it is bad practice to supply air to kitchens. Kitchens are a major source of indoor contaminants from cooking and to prevent transfer of these contaminants to the rest of the dwelling ASHRAE 62.2 and other ventilation standards all require exhaust ventilation from kitchens.

Bibliography: Eklund, K., Kunkle, R., Banks, A. and Hales, D. 2014. Ventilation Effectiveness Study Final Report. Northwest Energy Efficiency Alliance. Olympia Washington.

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Sherman, M.H. and Walker, I.S. (2009). “Measured Air Distribution Effectiveness for Residential Mechanical Ventilation Systems”. ASHRAE HVAC&R Research Journal. Vol. 15, No.2, March 2009, ASHRAE, Atlanta, GA. LBNL 303E.

Townsend A, A. Rudd, J. Lstiburek. 2009a. “A Calibrated Multi-Zone Airflow Model for Extension of Ventilation System Tracer Gas Testing.” *ASHRAE Transactions, Vol. 115, pt. 2, pp. 924-942. ASHRAE, Atlanta, GA.*

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Walker, I., Less, B., Lorenzetti, D., and Sohn, M. (2022). Analysis of Zoned Residential Ventilation Systems. Proc. AIVC/ASHRAE IAQ 2020 Conference, Athens, Greece.

Walker, I. Less, B. Lorenzetti, D. Sohn, M. (2021). Development of Advanced Smart Ventilation

Controls for Residential Applications. Energies 2021, 14, 5257. https:// doi.org/10.3390/en14175257

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The code change proposal would have a minor, if any, change the cost of construction. Balanced and distributed systems already have additional installation costs and the current language attempts to offset this by requiring a smaller capacity system. In practical terms, however, systems come in a limited number of individual capacities. For example manufacturers offer residential ventilation fans in fixed capacities, or offer a single unit to cover a range of flow. A 30% reduction does not always result in an upfront equipment or installation costs savings.

M32-24

M33-24

IMC®: TABLE 403.3.1.1

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

2024 International Mechanical Code

Revise as follows:

TABLE 403.3.1.1 MINIMUM VENTILATION RATES

Portions of table not shown remain unchanged.

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT[2 a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_a CFM/FT[2 a]	EXHAUST AIRFLOW RATE CFM/FT[2 a]
Animal facilities				
Animal exam room (veterinary office)	20	10	0.12	—
Animal imaging (MR/CT/PET)	20	10	0.18	0.9
Animal operating rooms	20	10	0.18	3.00
Animal postoperative recovery room	20	10	0.18	1.50
Animal preparation rooms	20	10	0.18	1.50
Animal procedure room	20	10	0.18	2.25
Animal surgery scrub	20	10	0.18	1.50
Large-animal holding room	20	10	0.18	2.25
Necropsy	20	10	0.18	2.25
Small-animal cage room (static cages)	20	10	0.18	2.25
Small-animal cage room (ventilated cages)	20	10	0.18	1.50
Correctional facilities				
Booking/waiting	50	7.5	0.06	—
Cells				
without plumbing fixtures	25	5	0.12	—
with plumbing fixtures[g]	25	5	0.12	1.0
Day room	30	5	0.06	—
Dining halls(see “Food and beverage service”)	—	—	—	—
Guard stations	15	5	0.06	—
Dry cleaners, laundries				
Coin-operated dry cleaner	20	15	—	—
Coin-operated laundries	20	7.5	0.12	—
Commercial dry cleaner	30	30	—	—
Commercial laundry	10	5	0.12	—
Storage, pick up	30	7.5	0.12	—
Education				
Art classroom[g]	20	10	0.18	0.7
Auditoriums	150	5	0.06	—
Classrooms (ages 5–8)	25	10	0.12	—
Classrooms (age 9 plus)	35	10	0.12	—
Computer lab	25	10	0.12	—
Corridors (see “Public spaces”)	—	—	—	—
Day care (through age 4)	25	10	0.18	—
Lecture classroom	65	7.5	0.06	—
Lecture hall (fixed seats)	150	7.5	0.06	—
Locker/dressing rooms[g]	—	—	—	0.25
Media center	25	10	0.12	—
Multiuse assembly	100	7.5	0.06	—
Music/theater/dance	35	10	0.06	—
Science laboratories[g]	25	10	0.18	1.0
Smoking lounges[b]	70	60	—	—
Sports locker rooms[g]	—	—	—	0.5
Wood/metal shops[g]	20	10	0.18	0.5
Food and beverage service				
Bars, cocktail lounges	100	7.5	0.18	—
Break rooms	25	5	0.06	—
Cafeteria, fast food	100	7.5	0.18	—
Coffee stations	20	5	0.06	—
Corridors	—	—	0.06	—
Dining rooms	70	7.5	0.18	—
Kitchens (cooking)[b]	20	7.5	0.12	0.7
Occupiable storage rooms for liquids or gels	2	5	0.12	—
Hotels, motels, resorts and dormitories				

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/FT	EXHAUST AIRFLOW RATE CFM/FT
Bathrooms/toilet—private[g]	—	—	—	25/50[f]
Bedroom/living room	10	5	0.06	—
Conference/meeting	50	5	0.06	—
Dormitory sleeping areas	20	5	0.06	—
Gambling casinos	120	7.5	0.18	—
Laundry rooms, central	10	5	0.12	—
Laundry rooms within dwelling units	10	5	0.12	—
Lobbies/prefunction	30	7.5	0.06	—
Multipurpose assembly	120	5	0.06	—
Offices				
Break rooms	50	5	0.12	—
Conference rooms	50	5	0.06	—
Main entry lobbies	10	5	0.06	—
Occupiable storage rooms for dry materials	2	5	0.06	—
Office spaces	5	5	0.06	—
Reception areas	30	5	0.06	—
Telephone/data entry	60	5	0.06	—
Outpatient healthcare facilities[i, j]				
Birthing room	15	10	0.18	—
Class 1 imaging room	5	~~5~~7.5	0.12	—
Dental operatory[k]	20	10	0.18	—
General examination room	20	7.5	0.12	—
Other dental treatment areas	5	5	0.06	—
Physical therapy exercise area	7	20	0.18	—
Physical therapy individual room	20	10	~~0.06~~0.12	—
Physical therapeutic pool area	—	—	0.48	—
Prosthetics and orthotics room	20	10	0.18	—
Psychiatric consultation room	20	5	0.06	—
Psychiatric examination room	20	5	0.06	—
Psychiatric group room	50	5	0.06	—
Psychiatric seclusion room	5	10	~~0.06~~0.12	—
Speech therapy room	20	5	0.06	—
Urgent care examination room	20	7.5	0.12	—
Urgent care observation room	20	5	0.06	—
Urgent care treatment room	20	7.5	~~0.18~~0.12	—
Urgent care triage room	20	10	0.18	—
Private dwellings, single and multiple				
Garages, common for multiple units[b]	—	—	—	0.75
Kitchens[b]	—	—	—	50/100[f]
Living areas[c]	Based on number of bedrooms. First bedroom, 2; each additional bedroom, 1	0.35 ACH but not less than 15 cfm/person	—	—
Toilet rooms and bathrooms[g]	—	—	—	25/50[f]
Public spaces				
Corridors	—	—	0.06	—
Courtrooms	70	5	0.06	—
Elevator car	—	—	—	1.0
Legislative chambers	50	5	0.06	—
Libraries	10	5	0.12	—
Museums (children's)	40	7.5	0.12	—
Museums/galleries	40	7.5	0.06	—
Places of religious worship	120	5	0.06	—
Room with adult changing station	—	—	—	50/70[e]
Shower room (per shower head)[g]	—	—	—	~~50/20~~20/50[f]
Smoking lounges[b]	70	60	—	—
Toilet rooms — public[g]	—	—	—	50/70[e]
Retail stores, sales floors and showroom floors				
Dressing rooms	—	—	—	0.25
Mall common areas	40	7.5	0.06	—
Sales	15	7.5	0.12	—
Shipping and receiving	2	10	0.12	—
Smoking lounges[b]	70	60	—	—
Storage rooms	—	—	0.12	—
Warehouses (see "Storage")	—	10	0.06	—
Specialty shops				
Automotive motor fuel-dispensing stations[b]	—	—	—	1.5
Banks or lobbies	15	7.5	0.06	—
Barber	25	7.5	0.06	0.5
Beauty salons[b]	25	20	0.12	0.6
Embalming room[b]	—	—	—	2.0

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R CFM/FT	EXHAUST AIRFLOW RATE CFM/FT
Nail salons [b, h]	25	20	0.12	0.6
Pet shops (animal areas)[b]	10	7.5	0.18	0.9
Supermarkets	8	7.5	0.06	—
Sports and amusement				
Bowling alleys (seating areas)	40	10	0.12	—
Disco/dance floors	100	20	0.06	—
Game arcades	20	7.5	0.18	—
Gym, stadium, arena (play area)	7	20	0.18	—
Health club/aerobics room	40	20	0.06	—
Health club/weight room	10	20	0.06	—
Ice arenas without combustion engines	—	—	0.30	0.5
Spectator areas	150	7.5	0.06	—
Swimming pools (pool and deck area)	—	—	0.48	—
Storage				
Refrigerated warehouses/freezers (< 50°F)	—	10	—	—
Repair garages, enclosed parking garages[b, d]	—	—	—	0.75
Warehouses [l]	—	10	0.06	—
Theaters				
Auditoriums (see "Education")	—	—	—	—
Lobbies	150	5	0.06	—
Stages, studios	70	10	0.06	—
Ticket booths	60	5	0.06	—
Transportation				
Platforms	100	7.5	0.06	—
Transportation waiting	100	7.5	0.06	—
Workrooms				
Bank vaults/safe deposit	5	5	0.06	—
Computer (without printing)	4	5	0.06	—
Copy, printing rooms	4	5	0.06	0.5
Darkrooms	—	—	—	1.0
Manufacturing where hazardous materials are not used	7	10	0.18	—
Manufacturing where hazardous materials are used (excludes heavy industrial and chemical processes)	7	10	0.18	—
Meat processing[c]	10	15	—	—
Pharmacy (prep. area)	10	5	0.18	—
Photo studios	10	5	0.12	—
Sorting, packing, light assembly	7	7.5	0.12	—
Telephone closets	—	—	0.00	—

For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 ton = 908 kg, 1 cubic foot per minute per square foot = 0.00508 $m^3/(s \times m^2)$, °C = [(°F) – 32]/1.8, 1 square foot = 0.0929 m^2.

a. Based on net occupiable floor area.

b. Mechanical exhaust required and the recirculation of air from such spaces is prohibited. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Item 3).

c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.

d. Ventilation systems in enclosed parking garages shall comply with Section 404.

e. Rates are per water closet, urinal or adult changing station. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted only where the exhaust system is designed to operate continuously while occupied.

g. Mechanical exhaust is required and recirculation from such spaces is prohibited. For occupancies other than science laboratories, where there is a wheel-type energy recovery ventilation (ERV) unit in the exhaust system design, the volume of air leaked from the exhaust airstream into the outdoor airstream within the ERV shall be less than 10 percent of the outdoor air volume. Recirculation of air that is contained completely within such spaces shall not be prohibited (see Section 403.2.1, Items 2 and 4).

h. For nail salons, each manicure and pedicure station shall be provided with a source capture system capable of exhausting not less than 50 cfm per station. Exhaust inlets shall be located in accordance with Section 502.20. Where one or more required source capture systems operate continuously during occupancy, the exhaust rate from such systems shall be permitted to be applied to the exhaust flow rate required by Table 403.3.1.1 for the nail salon.

i. Outpatient facilities to which the rates apply are freestanding birth centers, urgent care centers, neighborhood clinics and physicians' offices, Class 1 imaging facilities, outpatient psychiatric facilities, outpatient rehabilitation facilities and outpatient dental facilities.

j. The requirements of this table provide for acceptable IAQ. The requirements of this table do not address the airborne transmission of airborne viruses, bacteria and other infectious contagions.

k. These rates are intended only for outpatient dental clinics where the amount of nitrous oxide is limited. They are not intended for dental operatories in institutional buildings where nitrous oxide is piped.

l. The occupiable floor area in warehouses shall not include the floor area of self-storage units, floor areas under rack storage or designated palletized storage floor areas.

Reason: This proposal seeks to update the existing ventilation rate table in the IMC. Standard 62.1 is the source material for this table, and this updates Table 403.3.1.1 to match the appropriate ventilation rates in 62.1-2022.

Bibliography: ASHRAE Standard 62.1-2022

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal revises ventilation rates for specific spaces within varying occupancy classifications. However, this does not dictate system design to meet those requirements and therefore does not increase the cost of construction.

M33-24

M34-24

IMC®: 403.3.2.5

Proponents: Amanda Hickman, The Hickman Group, Air Movement and Control Association International, Inc. (AMCA) (amanda@thehickmangroup.com)

2024 International Mechanical Code

Revise as follows:

403.3.2.5 Ventilating equipment. Fans <u>that supply</u> ~~providing exhaust or~~ outdoor air<u>to or *exhaust air* from a space</u> shall be *listed* and *labeled* ~~to provide the minimum required air flow~~ in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51<u>. Minimum required airflow rates shall be determined in accordance with Chapter 4 of this code.</u>

Reason: This proposal suggests editorial changes to the language to more accurately describe how fans in ventilating equipment function and to harmonize the language with language in the standard that is referenced in this section. The original wording contains two separate requirements that are mixed. Requirement one is to have the fans listed and labeled to AMCA 210/ASHRAE 51. Requirement two is that the fans must provide the minimum required airflow. As currently stated, section 403.3.2.5 can be interpreted to state that the fans shall "provide the minimum required air flow in accordance with" AMCA 210/ASHRAE 51. However, AMCA 210/ASHRAE 51 provides no minimum air flow rates. Minimum airflow rates are regulated by Chapter 4 of the IMC.

This proposal harmonizes the following IMC-defined terms:

Outdoor air is a defined term. OUTDOOR AIR. Air taken from the outdoors, and therefore not previously circulated through the system.

Exhaust air is a defined term. AIR, EXHAUST. Air being removed from any space, appliance or piece of equipment and conveyed directly to the atmosphere by means of openings or ducts.

Supply air is a defined term. SUPPLY AIR. That air delved to each or any space supplied by the air distribution system or the total air delivered to all spaces supply by the air distribution system, which is provided for ventilating, heating, cooling, humidification, dehumidification, and other similar purposes.

The definition of Balanced ventilation system provides a basis for better wording of this section.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal only updates terminology to be more consistent with referenced standard and industry practice.

M34-24

M35-24

IMC®: CHAPTER 4, 408.1 (New), 408.1.1 (New), APPENDIX D, SECTION D101, D101.1, D101.1.1

Proponents: Jonathan Flannery, Pandemic Task Force Code Development Working Group, PTF CDWG (jflannery@aha.org)

2024 International Mechanical Code

CHAPTER 4 VENTILATION

Add new text as follows:

408.1 Clean Air Delivery Capability. In group A, B, E, and I occupancies, each mechanical system shall meet the requirement in Section 408.1.1.

408.1.1 Airflow for increased filtration. Mechanical systems shall be sized to accommodate a design airflow at a total static pressure drop that assumes the utilization of a supply air filter with a Minimum Efficiency Reporting Value of not less than 13 (MERV 13).

Exceptions:

1. Ventilation for ambulatory care facilities, Group I-1 and Group I-2 occupancies shall be designed and installed in accordance with this code, ASHRAE/ASHE 170 and NFPA 99.
2. In group B occupancies, spaces smaller than 500 square feet (47 m^2) served by unitary or Packaged Terminal HVAC equipment.

Delete without substitution:

~~APPENDIX D CLEAN AIR DELIVERY~~

~~SECTION D101~~ ~~GENERAL~~

~~**D101.1 Clean air delivery capability.**~~

~~In Group A, B, E and I *occupancies*, each mechanical system shall meet the requirements in Section D101.1.1.~~

~~**Exception:** Occupiable spaces where 100 percent of the supply air meets high-efficiency particulate air filtration.~~

~~**D101.1.1 Airflow for increased filtration.**~~

~~Mechanical systems shall be sized to accommodate a design airflow at a total static pressure drop that assumes the utilization of a supply air filter with a Minimum Efficiency Reporting Value (MERV) of not less than 13.~~

Reason: According to the World Health Organization, 3.2 million people die from household air pollution worldwide[1]. As we spend 90% of our time indoors (inclusive of any occupancy types), this is where we absorb most of the pollutants.

There is currently no requirement for filtration in the International Code. MERV 13 is critical to fight both particulate matter and airborne biological contaminants.

Since the pandemic, we have seen numerous events of wildfire affecting a large percentage of the population.

- ASHRAE 241 document that MERV-13 filters are 77% efficient at removing infectious aerosol.
- ASHRAE GPC 44 documents that filters with a MERV rating lower than 11 are not effective to at removing PM2.5

The choice of filtration level efficiency is made by the person who originally selected and engineered the HVAC system. It is frequently not feasible to upgrade to a MERV-13 in equipment that has not been sized for it.

California Title 24 requires MERV-13 for high-rise residential buildings, nonresidential and hotel/motel buildings.

This proposal will relocate language regarding clean air delivery capability from Appendix D to Chapter 4, Ventilation, of the IMC.

[1] https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

The ICC/NEHA Pandemic Task Force (PTF) was organized and tasked with researching the effects of the COVID-19 pandemic on the built environment and developing a roadmap and proposing needed resources – including guidelines, recommended practices, publications and updates to the International Codes® (I-Codes®) – that are necessary to overcome the numerous challenges that may be faced during future pandemics and to construct and manage safe, sustainable and affordable occupancy of the built environment. The ICC Pandemic Task Force Code Development Work Group (PTF CDWG) has conducted a comprehensive review of current code requirements as they relate to the prevention of the transmission of diseases and other serious health concerns and suggested revisions to current code requirements based on this assessment.

Cost Impact: Increase

Estimated Immediate Cost Impact:

Estimated installation cost increase on a 7.5-ton rooftop air conditioning unit (serves ~3,000 ft^2 space) with MERV13 is about 2% or < $0.20 per square foot.

Estimated Immediate Cost Impact Justification (methodology and variables):

Based cost impact on a typical rooftop air conditioning unit.

M35-24

M36-24

IMC®: 501.3.1

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Revise as follows:

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 ~~, except where the exhaust opening is located not less than 1 foot (305 mm) above the gravity air intake opening~~ into buildings for all occupancies other than Group U; except where the exhaust opening is located not less than 1 foot (305 mm) above the gravity air intake opening ~~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 an approved factory built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the 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 510.2.
   5.4. Subslab soil exhaust systems, Section 511.4.
   5.5. Smoke control systems, Section 512.10.3.
   5.6. Refrigerant discharge, Section 1105.7.
   5.7. *Machinery room* discharge, Section 1105.6.1.

Reason: This proposal fixes poor language of M28-21 so that it is understandable and clear.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no change to the technical requirements of the code. This is just simple wordsmithing to clarify what the intent of the section was requiring.

M37-24

IMC®: [F] 502.4, [F] 502.5

Proponents: Jeanne Rice, NYS DOS, NYS DOS (jeanne.rice@dos.ny.gov); Chad Sievers, NYS, NYS DOS (chad.sievers@dos.ny.gov); Kevin Duerr-Clark, NYS DOS, NYS DOS (kevin.duerr-clark@dos.ny.gov); China Clarke, New York State Dept of State, Manager Technical Support Unit (china.clarke@dos.ny.gov)

THIS PROPOSAL WILL BE HEARD BY THE IFC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2024 International Mechanical Code

Revise as follows:

[F] 502.4 ~~Stationary storage battery~~ Energy storage systems. ~~Stationary storage battery~~ Energy storage systems (ESS) shall be regulated and ventilated in accordance with Section 1207.6.1 of the International Fire Code and the general requirements of this chapter.

Delete without substitution:

~~**[F] 502.5 Ventilation of battery systems in cabinets.** Stationary storage battery systems installed in cabinets shall be provided with ventilation in accordance with Section 502.4.~~

Reason: The terminology "battery storage systems" is outdated. This proposed change updates the language to utilize the current terminology found throughout the ICC code books - Energy Storage Systems (ESS). This change also removes section 502.5, as it is redundant - section 502.4 covers all ESS, including ones in cabinets.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed change is editorial only - changing terminology and removing redundant provisions.

M37-24

M38-24 Part I

IMC®: 504.1, 504.9.6

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Revise as follows:

504.1 Installation. Clothes dryers shall be exhausted in accordance with the manufacturer's instructions. Dryer exhaust systems shall convey the moisture and any products of *combustion* to the outside of the *building*.

> **Exception:** This section shall not apply to *listed* and *labeled* condensing-type ~~(ductless)~~ or heat pump clothes dryers.

504.9.6 Exhaust duct required. Where space for a clothes dryer is provided, an exhaust duct system shall be installed. Where the clothes dryer is not installed at the time of occupancy, the exhaust duct shall be capped at the location of the future dryer.

> **Exception:** This section shall not apply w~~W~~here a *listed* and *labeled* condensing-type or heat pump clothes dryer is installed prior to occupancy of structure.

M38-24 Part I

M38-24 Part II

IRC: M1502.2, M1502.4.8

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Revise as follows:

M1502.2 Independent exhaust systems. Dryer exhaust systems shall be independent of all other systems and shall convey the moisture to the outdoors.

Exception: This section shall not apply to *listed* and *labeled* condensing-type ~~(ductless)~~ or heat pump clothes dryers.

M1502.4.8 Exhaust duct required.

Where space for a clothes dryer is provided, an exhaust *duct system* shall be installed. Where the clothes dryer is not installed at the time of occupancy the exhaust duct shall be capped or plugged in the space in which it originates and identified and marked "future use."

Exception: This section shall not apply w~~W~~here a *listed* and *labeled* condensing-type or heat pump clothes dryer is installed prior to occupancy of structure.

Reason: This proposal recognizes the new technology of heat pump clothes dryers. These dryers use a refrigerant system to heat the air within the dryer and remove the moisture. Like condensing-type dryers, these dryers need to be connected to a drain line to dispose of the water. They are electric and are listed and labeled in accordance with UL 2158, which is referenced in IMC 913.1. This proposal also updates description for condensing-type dryers to industry standard terminology, and standardizes formatting of exception language.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifies scope of standards as part of existing listing requirements already applicable to all electric- powered dryers.

M38-24 Part II

M39-24

IMC®: 504.2, 504.2.1 (New)

Proponents: Tony Crimi, A.C. Consulting Solutions Inc., International Firestop Council (tcrimi@sympatico.ca)

2024 International Mechanical Code

Revise as follows:

504.2 Exhaust penetrations. Where a clothes dryer exhaust duct penetrates a non-fire-resistance rated wall or ceiling membrane, the annular space shall be sealed with noncombustible material, *approved* fire caulking or a noncombustible dryer exhaust duct wall receptacle. ~~Ducts that exhaust clothes dryers shall not penetrate or be located within any fireblocking, draftstops or any wall, floor/ceiling or other assembly required by the *International Building Code* to be fire-resistance rated, unless such duct is constructed of galvanized steel or aluminum of the thickness specified in Section 603.4 and the fire-resistance rating is maintained in accordance with the *International Building Code*.~~ *Fire dampers*, *combination fire/smoke dampers* and any similar devices that will obstruct the exhaust flow shall be prohibited in clothes dryer exhaust ducts.

Add new text as follows:

504.2.1 Ducts penetrating fire resistance rated assemblies, fireblocks or draftstops. . Ducts that exhaust clothes dryers shall not penetrate or be located within any fireblocking, draft stopping or any wall, floor/ceiling or other assembly required by the *International Building Code* to be fire-resistance rated, unless it complies with one of the following:

1. The duct is constructed of galvanized steel or aluminum of the thickness specified in Section 603.4 and the fire-resistance rating of any wall, floor/ceiling or other assembly required by the International Building Code to be fire- resistance rated is*maintained in accordance with Chapter 7 of the International Building Code.*
2. Ducts that are continuously covered on all sides from the point at which the duct penetrates the membrane of a wall or ceiling to the outlet terminal with a classified, listed and labeled system specifically evaluated for such purpose, in accordance with nationally recognized standards. The required fire resistance-rating shall be equal to the fire-resistance rating of the assembly being penetrated.

Reason: This proposal does several things. First, it reformats the paragraph and separates the individual criteria for better clarity. It also better differentiates the requirements based on whether the wall or ceiling is fire resistance rated, or not. Lastly, the proposal provides an additional option for ducts that penetrate fire resistance rated walls and floors. Third-party certification organizations like UL and Intertek provide listing and labelling services for fire-resistant duct systems using a variety of nationally recognized Standards and applicable ICC-ES criteria. These Listings have been in the marketplace for many years and have proven their effectiveness.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds an additional option for protection of ducts. It does not remove any existing provisions or mandate additional costs.

M39-24

M40-24

IMC®: 506.3 (New), ASTM Chapter 15 (New)

Proponents: Tony Crimi, A.C. Consulting Solutions Inc., International Firestop Council (tcrimi@sympatico.ca)

2024 International Mechanical Code

Add new text as follows:

506.3.1 Special inspection and test requirements. Commercial kitchen grease ducts serving Type I hoods conforming to the provisions of Section 506.3.11 that are listed and labeled to the requirements of 506.3.11.2 or 506.3.11.3 shall undergo special inspection by an approved agency in accordance with ASTM WK70806.

Add new standard(s) as follows:

ASTM

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

ASTM WK70806 Standard Practice for On-Site Inspection of Fire Resistive Duct Systems

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM WK70806 Standard Practice for On-Site Inspection of Fire Resistive Duct Systems, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: Commercial kitchen operations are consistently one of the leading causes of non-residential fires reported in the United States. Until recently, there has been no document produced in the industry that is a consensus of the manufacturers, installation contractors, and inspection agencies. The new ASTM Standard is a key document that provides a standard set of procedures for inspecting and reporting on the installed fire resistive duct systems. At the time of submission, the ASTM WK70806*, Standard Practice for On-Site Inspection of Fire Resistive Duct Systems* had not been published, but has gone through the full ASTM process and is awaiting final publication.

This Standard Practice provides a means to verify compliance of the installed fire resistive duct system to the inspection document, and requires all information contained in the inspection document to be submitted to the Authorizing Authority having jurisdiction. It establishes procedure to inspect products and systems, including methods for field verification and inspection.

Bibliography: ASTM WK70806, Standard Practice for On-Site Inspection of Fire Resistive Duct Systems, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

Cost Impact: Increase

Estimated Immediate Cost Impact:

There are multiple jurisdictions that already require commercial grease duct inspections. The estimated cost is lower for instances where multiple duct inspections could be coordinated in the same time period, or for projects of low complexity. For those jurisdictions that already require duct inspection, the anticipated costs would be much lower as this proposal would be a replacement of existing requirements rather than an additional item.

Estimated Immediate Cost Impact Justification (methodology and variables):

For jurisdictions that do not currently require fire-resistant duct inspections, the anticipated cost increase for this proposal is between $1000 to $1500 per duct system inspected.

M40-24

M41-24

IMC®: 506.3.2.5, 506.3.2.5.1, 506.3.2.5.2, 506.3.2.5.2 (New), 506.3.2.5.3 (New)

Proponents: Joseph Summers, Mashantucket Pequot Tribal Nation, Building Code Enforcement

2024 International Mechanical Code

Revise as follows:

506.3.2.5 Grease duct test. A field test shall be performed prior to the use or concealment of any portion of a grease duct system. Grease ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the grease ducts 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 test shall be performed for the entire grease duct system, including the hood-to-duct connection. The grease duct system 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 506.3.2.5.2.

~~506.3.2.5.1 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~~ 506.3.2.5.1 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 1,200 psi (8274 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.

Add new text as follows:

506.3.2.5.2 Positive pressure smoke test. The positive pressure smoke test shall be performed by sealing the entire duct system from the hood exhaust opening(s) to the duct termination. Visible smoke shall be introduced to the duct system. The sealed duct shall then be pressurized to a minimum pressure of 1.0 inch water column, but shall not exceed the positive pressure capability of the system and components under test. No smoke shall emit from any exterior surface of the duct.

506.3.2.5.3 Air test. The air test shall be performed by sealing the entire duct system from the hood exhaust opening(s) to the duct termination. The sealed duct system shall then be pressurized to a minimum pressure of 1.0 inch (249 Pa) water column and shall be required to hold the initial set pressure for a minimum of 20 minutes.

Reason: The light test can be easily manipulated by “bubble gum” patches. The industry criteria for a light test also requires the room to be in total darkness which is very difficult to achieve. The benefit of the water test is that is how hoods and ducts are cleaned. Very little water is used and is easily cleaned up. The other benefit is that during construction, if you can not hit a joint with the high pressure water, then an access panel is required.

The IKECA, recommends the use of a water test in their standards

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This adds alternatives to test methods the installer can use.

M42-24

IMC®: 507.1; IFC: [M] 606.2, UL Chapter 80 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Mechanical Code

Revise as follows:

507.1 General. Commercial kitchen exhaust hoods shall comply with the requirements of this section. Hoods shall be Type I or II and shall be designed to capture and confine cooking vapors and residues. A Type I hood shall be installed at or above appliances in accordance with Section 507.2. A Type II hood shall be installed at or above *appliances* in accordance with Section 507.3. Where any cooking *appliance* under a single hood requires a Type I hood, a Type I hood shall be installed. Where a Type II hood is required, a Type I or Type II hood shall be installed.

Exceptions:

1. Factory-built commercial ~~cooking recirculating systems~~ exhaust hoods that are *listed* and *labeled* in accordance with UL 710~~B~~, and installed in accordance with Section 304.1, shall not be required to comply with Sections 507.1.5, 507.1.6, 507.2.3, 507.2.5, 507.2.8, 507.2.10, ~~and~~ 507.3.1~~,~~ and 507.3.3. ~~Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1. For the purpose of determining the floor area required to be ventilated, each individual *appliance* shall be considered as occupying not less than 100 square feet (9.3 m^2).~~
2. A hood shall not be required at or above any of the following:

   2. 1. Factory-built commercial cooking recirculating systems *listed* and *labeled* in accordance with UL 710B, and installed in accordance with Section 304.1 . Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1. For the purpose of determining the floor area required to be ventilated, each individual *appliance* shall be considered as occupying not less than 100 square feet (9.3 m^2).

   2.2. Cooking *appliances* equipped with integral down-draft exhaust systems ~~are~~ *listed* and *labeled* for the application in accordance with NFPA 96.

   2.3. Smoker ovens with ~~the~~ integral exhaust systems ~~are~~ *listed* and tested for the application.

   ~~3~~ 2.4. Ovens *listed* and *labeled* for use with wood fuel in accordance with UL 2162 and vented in accordance with the manufacturer's instructions.

   ~~4~~ 2.5. An electric cooking *appliance listed* and *labeled* in accordance with UL 197 for reduced grease emissions.

   ~~5~~ 2.6. Commercial electric dishwashers incorporating a self-contained condensing system *listed* and *labeled* in accordance with UL 921.

   ~~6~~ 2.7. Where the heat and moisture loads from dishwashers and *appliances* that produce heat or moisture and do not produce grease or smoke as a result of the cooking process are incorporated into the HVAC system design or into the design of a separate removal system. Spaces containing such cooking *appliances* that do not require Type II hoods shall be provided with exhaust at a rate of 0.70 cfm per square foot [0.00356 m^3/(s × m^2)]. For the purpose of determining the floor area required to be exhausted, each individual *appliance* that is not required to be installed under a Type II hood shall be considered as occupying not less than 100 square feet (9.3 m^2). Such additional square footage shall be provided with exhaust at a rate of 0.70 cfm per square foot [0.00356 m^3/(s × m^2)].

2024 International Fire Code

Revise as follows:

[M] 606.2 Where required.

A Type I hood shall be installed at or above all commercial cooking appliances and domestic cooking appliances used for commercial purposes that produce grease vapors.

Exceptions:

1. Factory-built commercial exhaust hoods that are *listed* and *labeled* in accordance with UL 710, and installed in accordance with Section 304.1 of the International Mechanical Code, shall not be required to comply with Sections 507.1.5, 507.1.6, 507.2.3, 507.2.5, 507.2.8, 507.2.10, 507.3.1, and 507.3.3, ~~507.1.6 and 507.2.10~~ of the International Mechanical Code.

2. A hood shall not be required at or above any of the following:
   - 2.1. A Factory-built commercial cooking recirculating systems that are *listed* and *labeled* in accordance with UL 710B, and installed in accordance with Section 304.1 of the International Mechanical Code, ~~shall not be required to comply with Sections 507.1.5, 507.2.3, 507.2.5, 507.2.8, 507.3.1, 507.3.3, 507.1.6 and 507.2.10 of the International Mechanical Code.~~ Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1 of the International Mechanical Code. For the purpose of determining the floor area required to be ventilated, each individual appliance shall be considered as occupying not less than 100 square feet (9.3 m^2).
   - 2.2. Cooking appliances equipped with integral down-draft exhaust systems listed and labeled for the application in accordance with NFPA 96.
   - 2.3. Smoker ovens with integral exhaust systems listed and tested for the application.
   - 2.4. Ovens listed and labeled for use with wood fuel in accordance with UL 2162 and vented in accordance with the manufacturer’s instructions.
   - 2.5. Electric cooking appliances listed and labeled in accordance with UL 197 for reduced grease emissions.

3. ~~Where cooking appliances are equipped with integral down-draft exhaust systems and such appliances and exhaust systems are *listed* and *labeled* for the application in accordance with NFPA 96, a hood shall not be required at or above them.~~

4. ~~A Type I hood shall not be required for an electric cooking appliance where an *approved* testing agency provides documentation that the appliance effluent contains 5 mg/m^3 or less of grease when tested at an exhaust flow rate of 500 cfm (0.236 m^3/s) in accordance with UL 710B.~~

Add new standard(s) as follows:

UL

Underwriters Laboratories LLC
333 Pfingsten Road
Northbrook, IL 60062

197—2010	Commercial Electric Cooking Appliances—with Revisions through January 2018
2162—2014	Commercial Wood-Fired Baking Ovens—Refractory Type—with Revisions through August 2019

Staff Analysis: The proposed referenced standards, UL 197 and UL 2162, are currently referenced in the IMC. The proposed referenced standard, NFPA 96, is currently referenced in the IMC and IFC.

Reason: This proposal is an editorial cleanup of the code change proposals M40-21 through M46-21 that were approved as submitted for the 2024 codes. This clean-up is necessary to address one of the primary reasons for these proposals, which was to clarify all the exceptions to Type 1 and Type 2 hoods.

For the IMC, exception 1 was always intended to remain as an exception for exhaust hoods listed and labeled to UL 710 (not recirculating systems listed and labeled to UL 710B). This proposal reverts exception 1 back to what was originally in the 2021 code. Also, the current exceptions 3, 4, 5, and 6 were intended to be sub items of Exception 2.

In addition, the exceptions added to Section 507.1 in the IMC that applied to the requirement for Type 1 hoods were also intended to be done in Section 606.2 of the IFC. This proposal aligns the IFC exceptions with the IMC exceptions.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is an editorial cleanup of the code change proposals M40-21 through M46-21 that were approved as submitted for the 2024 codes. It does not add new requirements it simply relocates existing requirements to another section of the codes.

M42-24

M43-24

IMC®: 507.1, 507.1.5, 507.1.6, 507.2; IFC: [M] 606.2

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Mechanical Code

Revise as follows:

507.1 General. Commercial kitchen exhaust hoods shall comply with the requirements of this section. Hoods shall be Type I or II and shall be designed to capture and confine cooking vapors and residues. A Type I hood shall be installed at or above appliances in accordance with Section 507.2. A Type II hood shall be installed at or above *appliances* in accordance with Section 507.3. Where any cooking *appliance* under a single hood requires a Type I hood, a Type I hood shall be installed. Where a Type II hood is required, a Type I or Type II hood shall be installed.

Exceptions:

~~1. Factory-built commercial cooking recirculating systems that are and *labeled* in accordance with UL 710B, and installed in accordance with Section 304.1, shall not be required to comply with Sections 507.1.5, 507.1.6, 507.2.3, 507.2.5, 507.2.8, 507.2.10 and 507.3.1, Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1. For the purpose of determining the floor area required to be ventilated, each individual *appliance* shall be considered as occupying not less than 100 square feet (9.3 m^2).~~

~~2~~ <u>1</u>. A hood shall not be required at or above any of the following:

   ~~2.1~~ <u>1.1</u>. Factory-built commercial cooking recirculating systems *listed* and *labeled* in accordance with UL 710B, and installed in accordance with Section 304.1 . Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1. For the purpose of determining the floor area required to be ventilated, each individual *appliance* shall be considered as occupying not less than 100 square feet (9.3 m^2).

   ~~2.2~~ <u>1.2</u>. Cooking *appliances* equipped with integral down-draft exhaust systems are *listed* and *labeled* for the application in accordance with NFPA 96.

   ~~2.3~~ <u>1.3</u>. Smoker ovens with the integral exhaust systems are *listed* and tested for the application.

<u>4</u>~~3~~. Ovens *listed* and *labeled* for use with wood fuel in accordance with UL 2162 and vented in accordance with the manufacturer's instructions.

<u>5</u>~~4~~. An electric cooking *appliance listed* and *labeled* in accordance with UL 197 for reduced grease emissions.

<u>6</u>~~5~~. Commercial electric dishwashers incorporating a self-contained condensing system *listed* and *labeled* in accordance with UL 921.

<u>7</u>~~6~~. Where the heat and moisture loads from dishwashers and *appliances* that produce heat or moisture and do not produce grease or smoke as a result of the cooking process are incorporated into the HVAC system design or into the design of a separate removal system. Spaces containing such cooking *appliances*that do not require Type II hoods shall be provided with exhaust at a rate of 0.70 cfm per square foot [0.00356 m^3/(s × m^2)]. For the purpose of determining the floor area required to be exhausted, each individual *appliance*that is not required to be installed under a Type II hood shall be considered as occupying not less than 100 square feet (9.3 m^2). Such additional square footage shall be provided with exhaust at a rate of 0.70 cfm per square foot [0.00356 m^3/(s × m^2)].

507.1.5 Exhaust outlets. Exhaust outlets located within the hood shall be located so as to optimize the capture of particulate matter. Each outlet shall serve not more than a 12-foot (3658 mm) section of hood.

<u>**Exception:** Exhaust outlets within hoods *listed* and *labeled* in accordance with UL 710 installed in accordance with the listing and the manufacturer's installation instructions.</u>

507.1.6 Hood size and location. Hoods shall comply with the overhang, setback and height requirements in accordance with Sections 507.1.6.1 and 507.1.6.2, based on the type of hood.

<u>**Exception:** Exhaust hoods *listed* and *labeled* in accordance with UL 710 installed in accordance with the listing and the manufacturer's installation instructions.</u>

507.2 Type I hoods. Type I hoods shall be installed where cooking *appliances* produce grease or smoke as a result of the cooking process. Type I hoods shall be installed over *medium-duty, heavy-duty* and *extra-heavy-duty cooking appliances*. <u>Type I hoods shall comply with one of the following:</u>

1. <u>Constructed and installed in accordance with Sections 507.2.1 through 507.2.11</u>
2. <u>*Listed* and *labeled* in accordance with UL 710, and installed in accordance with the listing, the manufacturer's installation instructions, and Sections 507.2.2, 507.2.4, 507.2.7 and 507.2.11.</u>

2024 International Fire Code

Revise as follows:

[M] 606.2 Where required.

A Type I hood shall be installed at or above all commercial cooking appliances and domestic cooking appliances used for commercial purposes that produce grease vapors.

Exceptions:

~~1. Factory-built commercial exhaust hoods that are *listed* and *labeled* in accordance with UL 710, and installed in accordance with Section 304.1 of the International Mechanical Code, shall not be required to comply with Sections 507.1.5, 507.2.3, 507.2.5, 507.2.8, 507.3.1, 507.3.3, 507.1.6 and 507.2.10 of the International Mechanical Code.~~

~~2~~ 1. Factory-built commercial cooking recirculating systems that are *listed* and *labeled* in accordance with UL 710B, and installed in accordance with Section 304.1 ~~of the International Mechanical Code, shall not be required to comply with Sections 507.1.5, 507.2.3, 507.2.5, 507.2.8, 507.3.1, 507.3.3, 507.1.6 and 507.2.10~~ of the International Mechanical Code. Spaces in which such systems are located shall be considered to be kitchens and shall be ventilated in accordance with Table 403.3.1.1 of the International Mechanical Code. For the purpose of determining the floor area required to be ventilated, each individual appliance shall be considered as occupying not less than 100 square feet (9.3 m^2).

~~3~~ 2. Where cooking appliances are equipped with integral down-draft exhaust systems and such appliances and exhaust systems are *listed* and *labeled* for the application in accordance with NFPA 96, a hood shall not be required at or above them.

~~4~~ 3. A Type I hood shall not be required for an electric cooking appliance where an *approved* testing agency provides documentation that the appliance effluent contains 5 mg/m^3 or less of grease when tested at an exhaust flow rate of 500 cfm (0.236 m^3/s) in accordance with UL 710B.

Reason: This proposal recognizes two code compliance paths for Type I hoods. One path is to construct in accordance with the prescriptive code requirements and the other in accordance with requirements found within UL 710. As noted in the scope of UL 710, "These requirements cover Type I commercial kitchen exhaust hoods intended for placement over commercial cooking equipment". UL 710 is not an exception for exhaust hoods, but is the standard used to test and certify factory-built exhaust hoods. Most of the prescriptive requirements in the code for Type I hoods do not apply, because UL 710 is a performance method, which is an alternative means for determining the suitability of the exhaust hood for the installation. The previous exceptions found in the code for UL 710 hoods have not changed they have just been reformatted for clarity.

The first exception to IFC 606.2 is not an appropriate exception to the requirement, because a Type I hood is required to be placed over these cooking appliances, regardless of whether it is constructed in accordance with the code prescribed requirements or is tested and listed in accordance with UL 710. Also, IFC 606.2 is updated to align with the IMC Section 507.2.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This clarifies that code permits two different methods for construction and installation of a Type I exhaust hood. The certification of a factory-built exhaust hood has always been permitted as an alternative method to the prescriptive requirements in the code. Also aligns the IFC with the IMC installation requirements.

M43-24

M44-24 Part I

IMC®: 513.1

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Mechanical Code

Revise as follows:

513.1 General. Energy and heat recovery ventilation systems shall be installed in accordance with this section. Where required for purposes of energy conservation, energy and heat recovery ventilation systems shall also comply with the *International Energy Conservation Code* . Ducted energy and heat recovery ventilators shall be *listed* and *labeled* in accordance with UL 1812. Nonducted energy and heat recovery ventilators shall be *listed* and *labeled* in accordance with UL 1815.

Staff Analysis: Staff Analysis: The proposed referenced standards, UL 1812 and UL 1815, are currently referenced in the IMC.

M44-24 Part I

M44-24 Part II

IRC: SECTION M1905 (New), M1905.1 (New), UL Chapter 44 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Add new text as follows:

SECTION M1905 ENERGY AND HEAT RECOVERY VENTILATION SYSTEMS

M1905.1 General. Energy and heat recovery ventilation systems shall be installed in accordance with this section. Where required for purposes of energy conservation, energy and heat recovery ventilation systems shall also comply with Chapter 11. Ducted energy and heat recovery ventilators shall be *listed* and *labeled* in accordance with UL 1812. Nonducted energy and heat recovery ventilators shall be listed and labeled in accordance with UL 1815.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

1812-2013	Ducted Heat Recovery Ventilators - with revisions through May 3, 2022
1815-2012	Nonducted Heat Recovery Ventilators - with revisions December 7, 2021

Staff Analysis: The proposed referenced standards, UL 1812 and UL 1815, are currently referenced in the IMC.

Reason: The common industry terms for the equipment covered by these requirements are “Energy Recovery Ventilators (ERVs)” and “Heat Recovery Ventilators (HRVs)”. The primary difference is that ERVs have moisture permeable heat exchangers to facilitate both sensible and latent heat transfer between the air streams. HRV’s have nonpermeable heat exchangers, and thus only facilitate sensible heat transfer. Both ERVs and HRVs are in scope of the referenced standards. This proposal aligns the code terminology with industry, the IECC, and the IRC to improve clarity. This clarifies that safety requirements always apply independently of energy conservation requirements of IECC. This clarifies that this section does not mandate installation, but provides requirements where installed.

Correlates IRC with mechanical code requirements (Section 514). Chapter 11 of IRC contains energy efficiency related requirements for this equipment (see N1103.6.1), however the main body of code does not contain safety requirements for this equipment.

This equipment is becoming more common in construction. M1301.1 already requires that equipment not covered by this code refer to the IMC. This equipment is covered by 514.1 of the IMC. By also adding these requirements into the body of the IRC, it assists the user in applying code requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Editorial, clarifies existing requirements in the IMC, and also incorporates the updated text into the IRC for ease of use.

For the IRC: E3403.3 already requires listing of electrical equipment, while this proposal clarifies the specific listing standards. IRC M1301.1 points to the IMC for requirements for equipment not covered, and the IMC already includes these requirements. Additionally the IRC, Section M1302.1, requires appliances regulated by the IRC be listed and labeled for the application.

M44-24 Part II

M45-24

IMC®: 601.5

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 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 for heating or air-conditioning systems 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 for heating or air-conditioning systems shall not be taken from a bathroom, toilet room, kitchen, garage, boiler room, furnace room or unconditioned attic.
8. ~~Return air from a closet shall serve only the closet and shall not require a dedicated closet supply duct.~~Where return ~~Return~~ air taken from a closet smaller than 30 square feet (2.8 m^2) in area ~~shall require~~ the closet door shall be undercut not less than $1^1/_2$ inches (38 mm)~~ or~~, shall have ~~either~~ a louvered door or shall include an air transfer grille, each with a net free area of not less than 30 square inches (19 355 mm^2.) Where return air is taken from a closet 30 ft^2 or larger in area, the closet shall comply with Item 4. Return air taken from closets shall serve only the closet space.
9. Return air taken from a closet smaller than 30 square feet (2.8 m^2) shall require the closet door be undercut not less than $1^1/_2$ inches (38 mm) or have either a louvered door or an air transfer grille, each with a net free area of not less than 30 square inches (19 355 mm^2).
10. Return air for heating or air-conditioning systems 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 for heating or air-conditioning systems 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 for heating or air-conditioning systems 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: This proposal simply fixes poor language of M53-21 to give the reader a better idea of what it required by the language.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal clarifies the intent of M53-21.

M45-24

M46-24

IMC®: 602.1.1

Proponents: Thomas Allen, Orange County - Division of Building Safety, Self (thomas.allen@ocfl.net)

2024 International Mechanical Code

Revise as follows:

602.1.1 Locations limited.
Plenums shall be limited to uninhabited crawl spaces, above a ceiling or below the floor, attic spaces, mechanical equipment rooms and the framing cavities addressed in Section 602.2.

Exception: Finished Mechanical rooms in a dwelling unit only serving that dwelling unit.

Reason: The Mechanical code has made great strides to define the plenum locations, "*Plenums* shall be limited to uninhabited crawl spaces, above a ceiling or below the floor, attic spaces, mechanical equipment rooms and the framing cavities addressed in Section 602.2." and further defines the requirements for within stud spaces and joist. The finished mechanical equipment room within a dwelling unit serving only that unit should be exempted from plenum construction requirements, it does not serve another fire area, a finished equipment room would have the rough framing space behind the finish. The current mechanical equipment room brings to mind the HVAC closets of the past that are a rough stud space with a door.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The exception for a finished equipment room not being considered a plenum is a clarification that many jurisdictions already apply this code section.

M46-24

M47-24 Part I

IMC®: 603.9.1 (New), UL Chapter 15 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Add new text as follows:

603.9.1 Collars and sleeves. Nonmetallic collars and sleeves used to join or attach flexible air ducts and air connectors shall be *listed* and *labeled* in accordance with UL 181C

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

181C-2020 Outline of Investigation for Non-Metal Joining Accessories for Flexible Air Ducts and Air Connectors

M47-24 Part I

M47-24 Part II

IRC: M1601.1.1, UL Chapter 44 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Revise as follows:

M1601.1.1 Above-ground duct systems.
Above-ground *duct systems* shall conform to the following:

1. *Equipment* connected to *duct systems* shall be designed to limit discharge air temperature to not greater than 250°F (121°C).
2. Factory-made ducts shall be *listed* and *labeled* in accordance with UL 181 and installed in accordance with the manufacturer's instructions.
3. Nonmetallic collars and sleeves used to join or attach flexible air ducts shall be *listed* and *labeled* in accordance with UL 181C
4. Fibrous glass duct construction shall conform to the *SMACNA Fibrous Glass Duct Construction Standards or NAIMA Fibrous Glass Duct Construction Standards.*

~~4~~5. Field-fabricated and shop-fabricated metal and flexible duct constructions shall conform to the *SMACNA HVAC Duct Construction Standards—Metal and Flexible* except as allowed by Table M1601.1.1. Galvanized steel shall conform to ASTM A653.

~~5~~ 6. The use of gypsum products to construct return air ducts or plenums is permitted, provided that the air temperature does not exceed 125°F (52°C) and exposed surfaces are not subject to condensation.

~~6~~ 7. *Duct systems* shall be constructed of materials having a *flame spread index* of not greater than 200.

~~7~~ 8. Stud wall cavities and the spaces between solid floor joists to be used as air plenums shall comply with the following conditions:

   ~~7~~8.1. These cavities or spaces shall not be used as a plenum for supply air.

   ~~7~~8.2. These cavities or spaces shall not be part of a required fire-resistance-rated assembly.

   ~~7~~8.3. Stud wall cavities shall not convey air from more than one floor level.

   ~~7~~8.4. Stud wall cavities and joist-space plenums shall be isolated from adjacent concealed spaces by tight-fitting *fireblocking* in accordance with Section R302.11. *Fireblocking* materials used for isolation shall comply with Section R302.11.1.

   ~~7~~8.5. Stud wall cavities in the outside walls of building envelope assemblies shall not be utilized as air plenums.

   ~~7~~8.6. Building cavities used as plenums shall be sealed.

~~8~~ 9. Volume dampers, equipment and other means of supply, return and exhaust air adjustment used in system balancing shall be provided with access.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

181C-2020 Outline of Investigation for Non-Metal Joining Accessories for Flexible Air Ducts and Air Connectors

Reason: UL 181C, Outline of Investigation for Non-Metal Joining Accessories for Flexible Air Ducts and Air Connectors, was developed to evaluate non-metal accessories, such as collars and sleeves, used to join or attach flexible air ducts and air connectors that comply with the requirements of UL 181, Factory-Made Air Ducts and Air Connectors.

As defined in UL 181C, a collar is a non-metal accessory used to join flexible air ducts and air connectors at their terminations to other portions of the air duct system. A sleeve is defined as a non-metal accessory used to join sections of flexible air ducts or air connectors.

The requirements for these collars and sleeves include all the applicable requirements that would be applied to factory-made air ducts (UL 181) and discrete products within plenums (UL 2043).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This does not increase of decrease cost. This does not mandate the use of these collars and sleeves. This is providing an alternative to existing methods for connecting flexible air ducts and air connectors. The proposal sets the base safety and performance requirements if these nonmetallic collars and sleeves are used.
Listing for heat pump heaters regulated by this section of the code is currently required by this code, so there is no cost impact. The proposal is a simple editorial revision to the correct (current) product standard.

M47-24 Part II

M48-24

IMC®: 603.17

Proponents: Kevin Gebke, DuctSox, DuctSox/Engineering Manager (kgebke@ductsox.com)

2024 International Mechanical Code

Revise as follows:

603.17 Air dispersion systems. Air dispersion systems shall:

1. Be installed entirely in exposed locations.

~~2. Be utilized in systems under positive pressure.~~

2.~~3.~~ Not pass through or penetrate fire-resistant-rated construction.

3.~~4.~~ Be *listed* and *labeled* in compliance with UL 2518.

Reason: UL 2518 Standard for Air Dispersion Systems was updated and published on April 6, 2023. The update recognized that Air Dispersion Systems can be operated in both positive and negative pressure modes if the correct products are specified. This proposal looks to align the IMC and the UL 2518 standard.

Bibliography: UL 2518 Standard for Air Dispersion Systems - April 6, 2023

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal simply aligns the UL 2518 standard and the IMC and has no impact on cost of construction.

M48-24

M49-24

IMC®: [F] 606.4

Proponents: William Koffel, Koffel Associates, Inc., Semiconductor Industry Association (wkoffel@koffel.com)

THIS PROPOSAL WILL BE HEARD BY THE IFC CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THIS COMMITTEE.

2024 International Mechanical Code

Revise as follows:

[F] 606.4 Controls operation. Upon activation, the smoke detectors shall shut down all operational capabilities of the air distribution system in accordance with the listing and labeling of *appliances* used in the system. Air distribution systems that are part of a smoke control system shall switch to the smoke control mode upon activation of a detector.

> **Exception:** In a Group H-5 occupancy, automatic shutdown of the air distribution system shall not be required where a smoke detection system, with remote indication and manual shutdown capability at the emergency control station, is provided.

Reason: The 2024 Edition of the IBC permits an increased travel distance in Group H-5 occupancies based upon computer modeling. One of the assumptions in the modeling, which is a requirement in the IBC, is that the ventilation system continues to operate. A proposal has been submitted to require the annunciation and manual shutdown capability at the emergency control station. This proposal correlates with the 2024 Edition of the IBC and the revisions proposed this cycle.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal correlates with 2024 IBC provisions and proposed changes related to the increased travel distance in Group H-5 occupancies.

M49-24

M50-24

IMC®: CHAPTER 6, SECTION 608, 608.1, CHAPTER 15, 15 SMACNA, SMACNA Chapter 15 (New)

Proponents: Eli Howard, SMACNA, SMACNA (ehoward@smacna.org)

2024 International Mechanical Code

CHAPTER 6 DUCT SYSTEMS

SECTION 608
BALANCING

Revise as follows:

608.1 Balancing. Air distribution, ventilation and exhaust systems shall be provided with means to adjust the system to achieve the design airflow rates and shall be balanced by an *approved* method in accordance with SMACNA HVAC Systems Testing, Adjusting, and Balancing Manual, or equivalent.. *Ventilation air* distribution shall be balanced by an *approved* method in accordance with SMACNA HVAC Systems Testing, Adjusting, and Balancing Manual, or equivalent. and such balancing shall verify that the air distribution system is capable of supplying and exhausting the airflow rates required by Chapter 4.

CHAPTER 15 REFERENCED STANDARDS

Revise as follows:

SMACNA

Sheet Metal and Air Conditioning Contractors' National Association, Inc.
4201 Lafayette Center Drive
Chantilly, VA 20151-1219

2023 HVAC SYSTEMS TESTING, ADJUSTING & BALANCING, FOURTH EDITION

Staff Analysis: *New Standard

A review of the standard proposed for inclusion in the code, SMACNA HVAC Systems Testing, Adjusting, and Balancing Manual, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: Balancing is currently required by the IMC, and this document would provide proper procedures for compliance to the code requirements.

Bibliography: SMACNA HVAC Testing, Adjusting & Balancing Manual 4th edition 2023.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Balancing of HVAC Systems is currently required by the IMC, and this would just provide a specific standard of procedure to follow.

M50-24

M51-24

IMC®: 801.20

Proponents: Abraham MURRA, Abraham Murra Consulting, Abraham Murra Consulting

2024 International Mechanical Code

Revise as follows:

801.20 Plastic vent joints. Plastic pipe and fittings used to vent *appliances* shall be installed in accordance with the *appliance* manufacturer's installation instructions <u>and with the installation instructions of the manufacturer of the venting pipe and fittings.</u>

Reason: As part of the certification process, venting piping systems must include installation instructions, as required by UL 1738. Therefore, the proposed new text is making users of the IMC, including tradespersons, aware that the pipe and fittings used for venting must be installed in accordance with the installation instructions of the piping manufacturer.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal only adds a statement for clarity.

M51-24

M52-24 Part I

IMC®: 803.6

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Revise as follows:

803.6 Automatic dampers.
Automatic dampers shall be *listed* and *labeled* in accordance with ~~UL 17~~ UL 378 for oil-fired heating *appliances*. The dampers shall be installed in accordance with the manufacturer's instructions. An automatic vent damper device shall not be installed on an existing *appliance* unless the *appliance* is *listed* and *labeled* and the device is installed in accordance with the terms of its listing. The name of the installer and date of installation shall be marked on a label affixed to the damper device.

Staff Analysis: The proposed referenced standard, UL 378, is currently referenced in the IMC and IRC.

M52-24 Part I

M52-24 Part II

IRC: M1802.2.2

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Revise as follows:

M1802.2.2 Automatically operated.
Automatically operated dampers shall conform to ~~UL 17~~ UL 378 and be installed in accordance with the terms of their *listing* and *label*. The installation shall prevent firing of the burner when the damper is not opened to a safe position.

Staff Analysis: The proposed referenced standard, UL 378, is currently referenced in the IMC and IRC.

Reason: UL 17 has been withdrawn by UL Standards & Engagement February 28, 2019. UL 378 contains appropriate listing requirements for the products referenced by these requirements. There are currently at least seven manufacturers with listed products to these requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Editorial change to clarify correct and current listing standard in relation to existing requirements.

M52-24 Part II

M53-24

IMC®: SECTION 905, 905.1, TABLE 905.1 (New), UL Chapter 15 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Mechanical Code

Revise as follows:

SECTION 905
FIREPLACE STOVES, FIREPLACE INSERTS, AND ROOM HEATERS

905.1 General. Fireplace stoves, ~~and~~ solid-fuel-type room heaters, and fireplace inserts shall be *listed* and *labeled* in accordance with the requirements of table 905.1 and shall be installed in accordance with the ~~conditions of the~~ listing and the manufacturer's instructions. ~~Fireplace stoves shall be tested in accordance with UL 737. Solid-fuel-type room heaters shall be tested in accordance with UL 1482. Fireplace inserts intended for installation in fireplaces shall be *listed* and *labeled* in accordance with the requirements of UL 1482 and shall be installed in accordance with the manufacturer's instructions.~~ New wood-burning residential hydronic heaters shall be EPA certified.

Add new text as follows:

TABLE 905.1 FIREPLACE STOVES, FIREPLACE INSERTS, AND ROOM HEATERS STANDARDS

Stove/Heater Type	Standard
Fireplace stoves	UL 737
Solid-fuel room heaters	UL 1482
Solid-fuel fireplace inserts installed in masonry fireplaces	UL 1390
Solid-fuel fireplace inserts installed in factory-built fireplaces	UL 1391

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

1390-2024 Solid Fuel Fireplace Inserts and Hearth-Mounted Stoves for Installation into Masonry Fireplaces

1391-2024 Solid-Fuel Space Heaters for Installation into Factory-Built Fireplaces

Reason: This proposal creates a table with the information formerly found in paragraph form. Additionally since fireplace inserts are not in the scope of UL 1482 this proposal introduces two new UL standards which are the correct references for the requirements related to fireplace inserts. This proposal does not address gas-fired fireplace inserts which are covered by the IFGC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The cost for obtaining listed fireplace inserts may or may not represent increased product costs over obtaining non-listed products that ha

O

btaining and maintaining a listing for a listed fireplace insert involves both product investigation costs and costs for periodic inspection of

M53-24

M54-24 Part I

IMC®: 908.1, 918.1, 918.2, TABLE 1101.2, 1101.2.1, UL Chapter 15 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. PART III WILL BE HEARD BY THE POOL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Revise as follows:

908.1 General. A cooling tower used in conjunction with an air-conditioning *appliance* shall be installed in accordance with the manufacturer's instructions. Factory-built cooling towers shall be *listed* in accordance with ~~UL 1995 or~~ UL/CSA60335-2-40.

918.1 Forced-air furnaces. Oil-fired furnaces shall be tested in accordance with UL 727. Electric furnaces shall be tested in accordance with ~~UL 1995 or~~ UL/CSA 60335-2-40. Solid fuel furnaces shall be tested in accordance with UL 391. Forced-air furnaces shall be installed in accordance with the listings and the manufacturer's instructions.

918.2 Heat pumps. Electric heat pumps shall be tested in accordance with ~~UL 1995~~ or UL/CSA60335-2-40.

TABLE 1101.2 FACTORY-BUILT EQUIPMENT AND APPLIANCES

EQUIPMENT	STANDARDS
Air-conditioning equipment	~~UL 1995 or~~ UL/CSA 60335-2-40
Packaged terminal air conditioners and heat pumps	~~UL 484 or~~ UL/CSA 60335-2-40
Split-system air conditioners and heat pumps	~~UL 1995 or~~ UL/CSA 60335-2-40
Dehumidifiers	~~UL 474 or~~ UL/CSA 60335-2-40
Unit coolers	~~UL 412 or~~ UL/CSA 60335-2-89
Commercial refrigerators, freezers, beverage coolers and walk-in coolers	~~UL 471 or~~ UL/CSA 60335-2-89
Refrigerating units and walk-in coolers	~~UL 427 or~~ UL 60335-2-89
Refrigerant-containing components and accessories	UL 207
Drinking water coolers	UL 399
Refrigerated vending machines	UL 541
Ice makers	UL 563
Residential refrigerators, freezers, beverage coolers and walk-in coolers	UL 60335-2-24

Delete without substitution:

~~**1101.2.1 Group A2L, A2, A3 and B1 high-probability equipment.**~~
~~High-probability equipment using Group A2L, A2, A3 or B1 refrigerant shall comply with UL 484, UL/CSA 60335-2-40 or UL/CSA 60335-2-89.~~

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

399-2017 Drinking Water Coolers - with revisions through July 2023

541-2016 Refrigerated Vending Machines - with revisions through November 2020

563-2009 Ice Makers - with revisions through May 2021

60335-2-24-2022 Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers

Reason: This proposal updates the standards used for various factory-built equipment and appliances. UL 412, UL 427, UL 471, UL 474, UL 484, and UL 1995 will be sunset in 2024. The applicable requirements from these standards are now in the harmonized standards UL 60335-2-40 and UL 60335-2-89. EPA sell-through date for products certified to these older standards will be effective before the 2027 codes will be adopted by any jurisdiction, see https://www.epa.gov/climate-hfcs-reduction/technology-transitions-hfc-restrictions-sector. Section 1101.2.1 is not necessary, because it is already covered in Table 1101.2.

This proposal further identifies the standards used for listing drinking water coolers, refrigerated vending machines, ice makers. It also provides the standard for residential refrigerators, freezers, beverage coolers and walk-in coolers.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Listing for factory-built cooling towers, oil-fired furnaces, electric heat pumps and other equipment regulated by this section of the code is currently required by this code, so there is no cost impact. The proposal is a simple editorial revision to the correct (current) product standard.

Staff Analysis: A review of the standard proposed for inclusion in the code, UL 399-2017 *Drinking Water Coolers - with revisions through July 2023*, UL541-2016 *Refrigerated Vending Machines - with revisions through November 2020,* UL 563-2009 *Ice Makers - with revisions through May 2021*, UL 60335-2-24-2022 *Household and Similar Electrical Appliances – Safety – Part 2-24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers,*with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

M54-24 Part I

M54-24 Part II

IRC: M1402.1, M1403.1, M1412.1, M1413.1, M2006.1

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Revise as follows:

M1402.1 General.
Oil-fired central furnaces shall be *listed* and *labeled* in accordance with UL 727. Electric *furnaces* shall be *listed* and *labeled* in accordance with ~~UL 1995 or~~ UL/CSA 60335-2-40.

M1403.1 Heat pumps.
Electric *heat pumps* shall be *listed* and *labeled* in accordance with ~~UL 1995 or~~ UL/CSA 60335-2-40.

M1412.1 Listed equipment.
Absorption systems shall be installed in accordance with the manufacturer's instructions. Absorption *equipment* shall be *listed* and *labeled* in accordance with ~~UL 1995 or~~ UL/CSA 60335-2-40.

M1413.1 General.
Evaporative cooling *equipment* and *appliances* shall comply with ~~UL 1995 or~~ UL/CSA 60335-2-40, and shall be installed:

1. In accordance with the manufacturer's instructions.
2. On level platforms in accordance with Section M1305.1.3.1.
3. So that openings in exterior walls are flashed in accordance with Section R703.4.
4. So as to protect the potable water supply in accordance with Section P2902.
5. So that air intake opening locations are in accordance with Section R325.4.1.

M2006.1 General.
Pool and spa heaters shall be installed in accordance with the manufacturer's installation instructions. Oil-fired pool heaters shall be *listed* and *labeled* in accordance with UL 726. Electric pool and spa heaters shall be listed and *labeled* in accordance with UL 1261. Pool and spa *heat pump* water heaters shall be *listed* and *labeled* in accordance with ~~UL 1995 or~~ UL/CSA~~/ANCE~~ 60335-2-40.

> **Exception:** Portable residential spas and portable residential exercise spas shall be *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.

Reason: This proposal updates the standards used for various furnace and heat pump and evaporative cooling equipment. The UL 1995 Standard will be sunset in 2024 and the applicable requirements from these standards are now in the harmonized standards UL 60335-2-40, therefore the reference to UL 1995 in this section is being removed by this proposal.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Listing for oil-fired central furnaces, electric furnaces, electric heat pumps, pool and spa heaters and other equipment regulated by this section of the code is currently required by this code, so there is no cost impact. The proposal is a simple editorial revision to the correct (current) product standard.

M54-24 Part II

M54-24 Part III

ISPSC: TABLE 317.2(1)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Swimming Pool and Spa Code

Revise as follows:

TABLE 317.2(1) WATER HEATERS

DEVICE	STANDARD
Electric water heater	UL 1261, UL 1563 or CSA C22.2 No. 218.1
Gas-fired water heater	ANSI Z21.56/CSA 4.7a
Heat exchanger	AHRI 400
Heat pump water heater	AHRI 1160 and one of the following: CSA C22.2 No. 236, ~~UL 1995,~~ or UL/CSA 60335-2-40

Reason: This proposal updates the standards used for various pool heaters. The UL 1995 Standard will be sunset in 2024 and the applicable requirements from this standard is now in the harmonized standard UL 60335-2-40, therefore the reference to UL 1995 in this section is being removed by this proposal.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Listing for heat pump heaters regulated by this section of the code is currently required by this code, so there is no cost impact. The proposal is a simple editorial revision to the correct (current) product standard.

M54-24 Part III

M55-24

IMC®: 913.1

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Mechanical Code

Revise as follows:

913.1 General. Clothes dryers shall be installed in accordance with the manufacturer's instructions. Electric ~~residential~~ clothes dryers, including heat pump and condensing-type dryers, for residential use or commercial use by the general public shall be tested in accordance with UL 2158. Electric industrial and institutional ~~coin-operated~~ clothes dryers for use only by trained personnel shall be *listed* and *labeled* ~~tested in accordance with UL 2158. Electric commercial clothes dryers shall be tested~~ in accordance with UL 1240.

Reason: This proposal clarifies three things:

1. The requirements for heat pump clothes dryers: Heat pump clothes-dryers are becoming more common in the marketplace. UL 2158 was revised in 2021 to include these appliances within the scope of the standard. EPA Significant New Alternative Policy Program (SNAP) rules regarding low-GWP refrigerants will essentially require the use of refrigerants with higher flammability safety classifications per ASHRAE 34. These refrigerants introduce new hazards compared to those used previously. These concerns are addressed in the standards used to evaluate this equipment for listing.
2. The scope of the referenced standards: The scope of UL 2158 includes clothes-dryers for both home and commercial installations (such as a laundromat) where no special training is need for the operator. The scope of UL 1240 is for industrial clothes dryers not intended for use by the general public.
3. The third party certification requirements: Replaced "tested" with "listed and labeled" consistent with the requirements of 301.7 which more simply describes the compliance mechanism for code officials.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarifies scope of standards as part of existing listing requirements already applicable to all electric- powered dryers.

M55-24

M56-24

IMC®: 930.1

Proponents: Amanda Hickman, The Hickman Group, Air Movement and Control Association International, Inc. (AMCA) (amanda@thehickmangroup.com)

2024 International Mechanical Code

Revise as follows:

930.1 General. Where provided, large-diameter ceiling fans shall be ~~tested~~<u>*listed*</u> and *labeled* in accordance with AMCA 230, *listed* and *labeled* in accordance with UL 507, and installed in accordance with the manufacturer's instructions.

Reason:

The IMC already requires compliance and *labeling* with AMCA 230. This proposal harmonizes the requirement for listing consistent with both standards that are already referenced in this section. Additionally, the *listing* requirement also will make it easier for code officials to enforce this provision. Other benefits include making it more likely that products will perform as rated, specified products will meet U.S. Department of Energy efficiency regulations for ceiling fans, and engineers will have standardized performance data they need to design and specify products for life-safety application.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This section already requires a label and therefore inherently also requires the product to be *listed*. Typically, certification bodies provide a listing when providing a product labeling service. This proposal is meant to provide clarification to the language that listing is also required for the product, consistent with numerous other sections and products requiring them to be listed and labeled. There is no cost associated due to labeling already being a requirement in this section.

M56-24

M57-24 Part I

IMC®: SECTION 931 (New), 931.1 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Add new text as follows:

SECTION 931 GERMICIDAL UV IRRADIATION SYSTEMS AND EQUIPMENT

931.1 General.
Where germicidal UV irradiation systems and equipment are installed in air ducts, plenums, or within the enclosure of heating and cooling equipment, they shall be *listed* and *labeled* in accordance with UL 60335-2-40 and shall conform to all of the following requirements:

1. Shall be installed in accordance with the manufacturer's instructions.
2. Shall be installed with interlock devices and markings in accordance with the listing and the manufacturer's instructions to prevent accidental UV radiation exposure by service personnel.
3. Where field installed within the enclosure of heating and cooling equipment, the equipment listing shall identify the germicidal UV system as a field installable accessory.

M57-24 Part I

M57-24 Part II

IRC: M1416 (New), M1416.1 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Add new text as follows:

M1416
GERMICIDAL UV IRRADIATION SYSTEMS AND EQUIPMENT

M1416.1 General.
Where germicidal UV irradiation systems and equipment are installed in air ducts, plenums, or within the enclosure of heating and cooling equipment, they shall be *listed* and *labeled* in accordance with UL 60335-2-40 and shall conform to all of the following requirements:

1. Shall be installed in accordance with the manufacturer's instructions.
2. Shall be installed with interlock devices and markings in accordance with the listing and the manufacturer's instructions to prevent accidental UV radiation exposure by service personnel.
3. Where field installed within the enclosure of heating and cooling equipment, the equipment listing shall identify the germicidal UV system as a field installable accessory.

Reason: Germicidal UV systems and equipment are becoming increasingly common for indoor air quality and equipment protection. The listing standard includes specific requirements to protect personnel from accidental exposure during maintenance and servicing. Some of these features, as referenced in item 2, are installation dependent and thus rely upon instructions to provide the protection. Unique requirements apply to the scenario where the systems are duct or plenum installed, or factory or field installed within listed heating and cooling equipment.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The cost of obtaining listed germicidal UV irradiation systems and equipment may or may not represent increased product costs over obta

Obtaining and maintaining a listing for a listed germicidal UV irradiation system or equipment involves both product investigation costs an

M57-24 Part II

M58-24

IMC®: 1001.1

Proponents: Julius Ballanco, P.E., JB Engineering and Code Consulting, P.C., Daikin U.S. (jbengineer@aol.com)

2024 International Mechanical Code

Revise as follows:

1001.1 Scope. This chapter shall govern the installation, *alteration* and repair of boilers, water heaters and pressure vessels.

Exceptions:

1. Pressure vessels used for unheated water supply.
2. Portable unfired pressure vessels and Interstate Commerce Commission containers.
3. Containers for bulk oxygen and medical gas.
4. Unfired pressure vessels having a volume of 5 cubic feet (0.14 m^3) or less operating at pressures not exceeding 250 pounds per square inch (psi) (1724 kPa) and located within *occupancies* of Groups B, F, H, M, R, S and U.
5. Pressure vessels used in *refrigeration systems* that are regulated by Chapter 11 of this code.
6. Pressure tanks used in conjunction with coaxial cables, telephone cables, power cables and other similar humidity control systems.
7. Any boiler or pressure vessel subject to inspection by federal or state inspectors.
8. Pressure vessels used in specific *appliances* and *equipment* that are regulated by ~~Chapter~~Chapters 9 and 11 of this code.

Reason: This exception was added prior to the Table in Chapter 11 being added to the code. There are many referenced standards in Table 1101.2 that regulate the pressure vessel within the appliance. This will added the reference to Chapter 11 to this exception. It should be noted that many of the standards listed in Table 1101.2 are also referenced in Chapter 9.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change is basically editorial in nature since it will add Chapter 11 to the exception. The standards listed in Chapter 9 also appear in Chapter 11. This will simply clarify that both chapters have standards that regulate pressure vessels.

M58-24

M59-24 Part I

IMC®: 1101.2.1 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-MP CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Mechanical Code

Add new text as follows:

1101.2.1 Field installed auxiliary electric heaters. Where auxiliary electric resistance heaters are field installed within the enclosure of listed heating and cooling equipment, the equipment shall be labeled to indicate that the heater is a field installable accessory as part of the equipment listing. The auxiliary electric resistance heater shall be listed and labeled in accordance with UL 60335-2-40 and be installed in accordance with the listing and the manufacturer's instructions.

Staff Analysis: The proposed referenced standard, UL 60335-2-40, is currently referenced in the IMC.

M59-24 Part I

M59-24 Part II

IRC: M1411.10 (New)

Proponents: Jonathan Roberts, UL Solutions, UL Solutions (jonathan.roberts@ul.com)

2024 International Residential Code

Add new text as follows:

M1411.10 Field installed auxiliary electric heater kits. Where auxiliary electric resistance heaters are field installed within the enclosure of *listed* heating and cooling equipment, the equipment shall be labeled to indicate that the heater is a field installable accessory as part of the equipment listing. The auxiliary electric resistance heater shall be *listed* and *labeled* in accordance with UL 60335-2-40 and be installed in accordance with the listing and the manufacturer's instructions.

Staff Analysis: The proposed referenced standard, UL 60335-2-40, is currently referenced in the IRC.

Reason: Field installed electric heaters within the enclosure of listed air-conditioning equipment and heat pumps are covered by the scope of the end product standard (UL 60335-2-40). The heaters are required to be evaluated and tested as part of the equipment. The product standard requires that the equipment be marked to identify which field installed accessories are approved as part of the equipment listing.
The HVAC industry has seen an increase in installation of third-party manufactured electric heaters. These heaters are not approved by the equipment manufacturer and are not evaluated by the listing of the equipment. As a result, manufacturers have received numerous reports of fire incidents resulting from these installations.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal clarifies that existing listing requirements of air conditioning and heat pump equipment. For IMC reference 1102.1, and general listing requirements 301.7. For IRC reference M1302.1, M1401.1, M1403 and general listing requirements M3404.3. Both codes already require installation per the listing and manufacturer's instructions so this highlights and brings attention to what is already required by the code.

M59-24 Part II

M60-24 Part I

IMC®: 1002.1, TABLE 1002.1 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

THIS IS A 3 PART CODE CHANGE. PART I WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. PART II WILL BE HEARD BY THE PLUMBING CODE COMMITTEE, PART III WILL BE HEARD BY THE IRC MECHANICAL and PLUMBING CODE COMMITTEE

2024 International Mechanical Code

Revise as follows:

1002.1 General. Potable water heaters and hot water storage tanks shall be *listed* and *labeled* ~~and installed~~ in accordance with the standards in Table 1002.1, and installed in accordance with the listing, the manufacturer's instructions, the *International Plumbing Code* and this code.Gas-fired storage tank and tankless instantaneous water heaters shall be listed and labeled and installed in accordance with the *International Fuel Gas Code.* Water heaters shall be capable of being removed without first removing a permanent portion of the *building* structure. The potable water connections and relief valves for all water heaters shall conform to the requirements of the *International Plumbing Code* . ~~Domestic electric water heaters shall comply with UL 174 or UL 1453. Commercial electric water heaters shall comply with UL 1453. Oil-fired water heaters shall comply with UL 732. Solid-fuel-fired water heaters shall comply with UL 2523. Solar thermal water heating systems shall comply with Chapter 14 and ICC 900/SRCC 300.~~

Add new text as follows:

TABLE 1002.1 WATER HEATER STANDARDS

APPLIANCE/EQUIPMENT	STANDARDS
Domestic storage tank electric water heaters	UL 174
Commercial storage tank electric and commercial booster water heaters	UL 1453
Heat pump water heaters	UL 60335-2-40
Electric tankless instantaneous and booster water heaters	UL 499
Oil-fired water heaters	UL 732
Solid-fuel-fired water heaters	UL 2523
Solar thermal water heating systems	ICC 900/SRCC 300

Staff Analysis: The proposed referenced standards referenced in Table 1002.1(new) are currently referenced in the IMC.

M60-24 Part I

M60-24 Part II

IPC: 502.1, TABLE 502.1 (New), ICC Chapter 15 (New), UL Chapter 15 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Plumbing Code

Revise as follows:

502.1 General.
Water heaters shall be *listed* and *labeled* in accordance with the standards in Table 502.1, and installed in accordance with the listing, the manufacturer's instructions, *the International Mechanical Code* and this code. Gas-fired storage tank and tankless instantaneous water heaters shall be listed and labeled and installed in accordance with the *International Fuel Gas Code.* ~~Oil-fired water heaters shall conform to the requirements of this code and the *International Mechanical Code.*~~ Electric water heaters, heat pump water heaters, and electric circuits associated with other types of water heaters shall conform to the requirements ~~of this code and provisions~~ of NFPA 70. ~~Gas-fired water heaters shall conform to the requirements of the *International Fuel Gas Code.* Solar thermal water heating systems shall conform to the requirements of the *International Mechanical Code* and ICC 900/SRCC 300.~~

Add new text as follows:

TABLE 502.1 WATER HEATER STANDARDS

APPLIANCE/EQUIPMENT	STANDARDS
Domestic storage tank electric water heaters	UL 174
Commercial storage tank electric and commercial booster water heaters	UL 1453
Heat pump water heaters	UL 60335-2-40
Electric tankless instantaneous and booster water heaters	UL 499
Oil-fired water heaters	UL 732
Solid-fuel-fired water heaters	UL 2523
Solar thermal water heating systems	ICC 900/SRCC 300

Add new standard(s) as follows:

ICC

International Code Council, Inc.
200 Massachusetts Avenue, NW, Suite 250
Washington, DC 20001

ICC 900/SRCC Standard 300—2020 Solar Thermal System Standard

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062-2096

174-2004 Household Electric Storage Tank Water Heaters—with Revisions through October 2021

499-2014 Standard for Electric Heating Appliances—with Revisions through February 2017

732-2018 Oil-fired Storage Tank Water Heaters—with Revisions through August 2018

1453-2016 Electric Booster and Commercial Storage Tank Water Heaters—with Revisions through May 2018

2523-2009 Solid Fuel-fired Hydronic Heating Appliances, Water Heaters, and Boilers—with Revisions through March 2018

UL 60335-2-40—2022	Household and Similar Electrical Appliances—Safety—Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers

Staff Analysis: The proposed referenced standards referenced in new Table are referenced in the current edition of the IMC.

M60-24 Part II

M60-24 Part III

IRC: M2005.1, TABLE M2005.1 (New), UL Chapter 44 (New)

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Residential Code

Revise as follows:

M2005.1 General.
Water heaters shall be installed in accordance with Chapter 28, the manufacturer's instructions and the requirements of this code. Water heaters installed in an *attic* shall comply with the requirements of Section M1305.1.2. ~~Gas-fired water heaters shall comply with the requirements in Chapter 24. Domestic electric water heaters shall comply with UL 174. Oiled-fired water heaters shall comply with UL 732. Solar thermal water heating systems shall comply with Chapter 23 and ICC 900/SRCC 300. Solid fuel-fired water heaters shall comply with UL 2523~~. Water heaters shall comply with the requirements of standards in Table M2005.1, and the referenced chapters of this code.

Add new text as follows:

TABLE M2005.1 WATER HEATER STANDARDS/IRC CHAPTERS

APPLIANCE/EQUIPMENT	STANDARDS	IRC CHAPTER
Domestic storage tank electric water heaters	UL 174	Chapters 34-43
Heat pump water heaters	UL 60335-2-40	Chapter 14, Chapters 34-43
Electric tankless instantaneous and booster water heaters	UL 499	Chapters 34-43
Oil-fired water heaters	UL 732	
Solid-fuel-fired water heaters	UL 2523	Chapter 10
Gas-fired storage tank and tankless instantaneous water heaters	Chapter 24	Chapter 24
Solar thermal water heating systems	ICC 900/SRCC 300	Chapter 23

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

UL 499-2014 Electric Heating Appliances (with revisions through May 31, 2023)

Staff Analysis: The proposed referenced standards referenced in Table are currently referenced in the IMC.

Reason: Reformats existing requirements into table format for clarity. Adds product standards for heat pump water heaters, electric tankless, and commercial electric booster water heaters. Provide pointer for gas heaters. Water heater installation requirements are spread across several different codes. This new language is intended to clarify and simplify the pointers. This proposed language gives guidance in one place to help navigate the various requirements.

The reference to the IMC is appropriate for all water heater installations since the IMC contains the following unique information not found elsewhere 1) product standard requirements (1002.1), 2) distinction from appliances requiring ASME BPVC certification (1001, 1003), 3) Refrigerant-based heater requirements (1002.3 and Chapter 11) and 4) Hydronic heating requirements (Chapter 12) and 5) clarification of scope of IFGC requirements (101.2).
This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal does not mandate which type of water heater is to be installed. These changes only clarify the standards for which water heaters must comply with once the type of water heater is chosen by the designer. Listing is already required for this equipment. This change only clarifies the appropriate product standards for code usability.

M60-24 Part III

M61-24

IMC®: 1002.3

Proponents: Andrew Bevis, Chair, Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org)

2024 International Mechanical Code

Revise as follows:

1002.3 Refrigerant-based supplemental ~~Supplemental~~ water-heating devices. Potable supplemental water-heating devices that utilize refrigerant-to-water heat exchangers shall be ~~approved~~ listed and labeled in accordance with UL 60335-2-40 and installed in accordance with the *International Plumbing Code* and the manufacturer's instructions.

Staff Analysis: The proposed referenced standard, UL 60335-40, is currently referenced in the IMC.

Reason: The concerns associated with A2L and other flammable refrigerants increase the need to provide standard requirements and third party certification. This is consistent with requirements of IMC 1101.2 for factory-built equipment. The title has been clarified to reflect the content of this section.

This proposal is submitted by the ICC Plumbing Mechanical Gas Code Action Committee (PMGCAC)

PMGCAC 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 2023 PMGCAC has held 26 virtual meetings open to any interested party. In addition, there were several virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the PMGCAC website at PMGCAC.

Cost Impact: Increase

Estimated Immediate Cost Impact:

Impact: $0

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal requires listing instead of approval by the code official. Therefore, in principle, it has potential to increase costs due to overhead and product features that may be required for certification. However, in practice a cost increase is unlikely as a result of this change, and also impractical to calculate, for the following reasons:

1. The committee is unaware of any manufacturer of these devices on the market which does not currently have listing, so it is impractical to compare the costs of a listed and not-listed product.
2. The most typical installation scenario for these devices known to the committee is that they are already a component of listed equipment.
3. The existing approval process most typically already relies on listing, but requires the code official to independently determine the appropriate requirements. This change is intended to simplify enforcement.

M61-24

M62-24

IMC®: CHAPTER 11, SECTION 1101, 1101.1, 1101.1.1, 1107.4, 1107.5, 1109.2.7, 1109.3.2, ASHRAE Chapter 15 (New)

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

2024 International Mechanical Code

CHAPTER 11 REFRIGERATION

SECTION 1101
GENERAL

1101.1 Scope. This chapter shall govern the design, installation, construction and repair of *refrigeration systems* . Permanently installed refrigerant storage systems and other components shall be considered as part of the *refrigeration system* to which they are attached.

Revise as follows:

1101.1.1 Refrigerants other than ammonia. *Refrigeration systems* using a refrigerant other than ammonia shall comply with this chapter, the International Fire Code, and either ASHRAE 15 or ASHRAE 15.2, as applicable~~and the *International Fire Code*~~. *Refrigeration systems* containing carbon dioxide as the refrigerant shall also comply with IIAR CO2 .

1107.4 Piping materials standards. Refrigerant pipe shall conform to one or more of the standards *listed* in Table 1107.4. For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, refrigerant piping and tubing shall be limited to aluminum, copper, and copper alloy. The exterior of the pipe shall be protected from corrosion and degradation.

1107.5 Pipe fittings. Refrigerant pipe fittings shall be *approved* for installation with the piping materials to be installed, and shall conform to one of more of the standards listed in Table 1107.5 or shall be *listed* and *labeled* as complying with UL 207. For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, refrigerant fittings shall be limited to aluminum, copper, copper alloys, stainless steel, and steel.

1109.2.7 Pipe identification. Refrigerant pipe located in areas other than the room or space where the refrigerating *equipment* is located shall be identified. The pipe identification shall be located at intervals not exceeding 20 feet (6096 mm) on the refrigerant piping or pipe insulation. The minimum height of lettering of the identification label shall be $^{1}/_{2}$ inch (12.7 mm). The identification shall indicate the *refrigerant designation* and safety group classification of refrigerant used in the piping system. For Group A2L and B2L refrigerants, the identification shall also include the following statement: “WARNING—Risk of Fire. Flammable Refrigerant.” For Group A2, A3, B2 and B3 refrigerants, the identification shall also include the following statement: “DANGER—Risk of Fire or Explosion. Flammable Refrigerant.” For any Group B refrigerant, the identification shall also include the following statement: “DANGER—Toxic Refrigerant.”

Exception: For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit pipe identification shall not be required.

1109.3.2 Shaft ventilation. Refrigerant pipe shafts with systems using Group A2L or B2L refrigerant shall be naturally or mechanically ventilated. Refrigerant pipe shafts with one or more systems using any Group A2, A3, B2 or B3 refrigerant shall be continuously mechanically ventilated and shall include a refrigerant detector. The shaft ventilation exhaust outlet shall comply with Section 501.3.1. Naturally ventilated shafts shall have a pipe, duct or conduit not less than 4 inches (102 mm) in diameter that connects to the lowest point of the shaft and extends to the outdoors. The pipe, duct or conduit shall be level or pitched downward to the outdoors. Mechanically ventilated shafts shall have a minimum airflow velocity in accordance with Table 1109.3.2. The mechanical ventilation shall be continuously operated or activated by a refrigerant detector. Systems utilizing a refrigerant detector shall activate the mechanical ventilation at a maximum refrigerant concentration of 25 percent of the lower flammable limit of the refrigerant. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The shaft shall not be required to be ventilated for double-wall refrigerant pipe where the interstitial space of the double-wall pipe is vented to the outdoors. For refrigeration systems used in residential occupancies serving only a single dwelling unit or sleeping unit, shaft ventilation shall not be required where the pipe or tube is continuous without fittings in the shaft.

Add new standard(s) as follows:

ASHRAE

ASHRAE
180 Technology Parkway
Peachtree Corners, GA 30092

15.2-2022 Safety Standard for Refrigeration Systems in Residential Applications

Staff Analysis: A review of the standard proposed for inclusion in the code, ASHREA 15.2 Safety Standard for Refrigeration Systems in Residential Applications, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: This code change proposal adds the reference to ASHRAE 15.2, the installation standard for residential air conditioning systems used for a single dwelling or sleeping unit. This addition addresses a gap created in the Code when ASHRAE 15 split its scope between standards 15 and 15.2. As some systems covered by the scope of ASHRAE 15.2 are also covered by the IMC, its inclusion within the IMC is necessary.With the separation between ASHRAE 15 and ASHRAE 15.2, there were certain changes that impact the refrigerant piping requirements. For residential systems, the piping material is limited to aluminum, copper, and copper alloy pipe or tube. The fitting requirements are similar material requirements with the addition of stainless steel and steel.

Pipe identification is not required for piping system regulated by ASHRAE 15.2. The reason for this is that the refrigerant piping is obvious not needing to be individually identified. Whereas in commercial buildings there are often multiple piping systems where the type of piping system is not obvious.

For shaft ventilation, there is an allowance in residential systems to eliminate the ventilation of the shaft when the piping system is continuous without fittings in the shaft. This provision was added to the end of the section.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The inclusion of ASHRAE 15.2 into the IMC is editorial in nature, and as such will not impact the cost of construction. Changes to piping for ASHRAE 15.2 may actually reduce the cost of construction, by not requiring shaft ventilation when no joints are present in the shaft.

M62-24

M63-24

IMC®: 1101.1.1

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

2024 International Mechanical Code

Revise as follows:

1101.1.1 Refrigerants other than ammonia. *Refrigeration systems* using a refrigerant other than ammonia shall comply with this chapter, ASHRAE 15 and the *International Fire Code*. *Refrigeration systems* containing carbon dioxide as the refrigerant shall also comply with IIAR CO2 <u>or be part of listed and labeled equipment</u>.

Reason: The scope of IIAR CO2 specifically excludes “Listed equipment or systems.” There are many listed refrigeration systems using carbon dioxide as the refrigerant. Field erected systems may also be evaluated by NRTLs to existing industry safety standards, such as UL 60335-2-40, UL 60335-2-89, and UL 471.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change is only meant to address an inconsistency in order to maintain the intent of the scope.

M63-24

M64-24

IMC®: TABLE 1103.1

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

2024 International Mechanical Code

Revise as follows:

TABLE 1103.1 REFRIGERANT CLASSIFICATION, AMOUNT AND OEL

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE							(F) DEGREES OF HAZARD[a]
				RCL			LFL[f]			OEL [d]	
				lb/~~MCf~~ 1000 ft^3	ppm	g/m^3	lb/~~MCf~~ 1000 ft^3	ppm	g/m^3	ppm	
R-11[c]	CCl_3F	trichlorofluoromethane	A1	0.39	1,100	6.1	—	—	—	1,000	2-0-0[b]
R-12[c]	CCl_2F_2	dichlorodifluoromethane	A1	5.6	18,000	90	—	—	—	1,000	2-0-0[b]
R-13[c]	$CClF_3$	chlorotrifluoromethane	A1	—	—	—	—	—	—	1,000	2-0-0[b]
R-13B1[c]	$CBrF_3$	bromotrifluoromethane	A1	—	—	—	—	—	—	1,000	2-0-0[b]
R-13I1	CF_3I	trifluoroiodomethane	A1	1.0	2,000	16	—	—	—	500	—
R-14	CF_4	tetrafluoromethane (carbon tetrafluoride)	A1	25	110,000	400	—	—	—	1,000	2-0-0[b]
R-22	$CHClF_2$	chlorodifluoromethane	A1	13	59,000	210	—	—	—	1,000	2-0-0[b]
R-23	CHF_3	trifluoromethane (fluoroform)	A1	7.3	41,000	120	—	—	—	1,000	2-0-0[b]
R-30	CH_2Cl_2	dichloromethane (methylene chloride)	B1	—	—	—	—	—	—	—	—
R-31	CH_2ClF	chlorofluoromethane	—	—	—	—	—	—	—	—	—
R-32	CH_2F_2	difluoromethane (methylene fluoride)	A2L	4.8	36,000	77	19.1	144,000	306	1,000	1-4-0
R-40	CH_3Cl	chloromethane (methyl chloride)	B2	—	—	—	—	—	—	—	—
R-41	CH_3F	fluoromethane (methyl fluoride)	—	—	—	—	—	—	—	—	—
R-50	CH_4	methane	A3	—	—	—	—	50,000	—	1,000	—
R-113[c]	CCl_2FCClF_2	1,1,2-trichloro-1,2,2-trifluoroethane	A1	1.2	2,600	20	—	—	—	1,000	2-0-0[b]
R-114[c]	$CClF_2CClF_2$	1,2-dichloro-1,1,2,2-tetrafluoroethane	A1	8.7	20,000	140	—	—	—	1,000	2-0-0[b]
R-115	$CClF_2CF_3$	chloropentafluoroethane	A1	47	120,000	760	—	—	—	1,000	—
R-116	CF_3CF_3	hexafluoroethane	A1	34	97,000	550	—	—	—	1,000	1-0-0
R-123	$CHCl_2CF_3$	2,2-dichloro-1,1,1-trifluoroethane	B1	3.5	9,100	57	—	—	—	50	2-0-0[b]
R-124	$CHClFCF_3$	2-chloro-1,1,1,2-tetrafluoroethane	A1	3.5	10,000	56	—	—	—	1,000	2-0-0[b]
R-125	CHF_2CF_3	pentafluoroethane	A1	23	75,000	370	—	—	—	1,000	2-0-0[b]
R-134a	CH_2FCF_3	1,1,1,2-tetrafluoroethane	A1	13	50,000	210	—	—	—	1,000	2-0-0[b]
R-141b	CH_3CCl_2F	1,1-dichloro-1-fluoroethane	—	0.78	2,600	12	17.8	60,000	287	500	2-1-0
R-142b	CH_3CClF_2	1-chloro-1, 1-difluoroethane	A2	5.1	20,000	82	20.4	80,000	329	1,000	2-4-0
R-143a	CH_3CF_3	1,1,1-trifluoroethane	A2L	4.4	21,000	70	17.5	82,000	282	1,000	2-0-0[b]
R-152a	CH_3CHF_2	1,1-difluoroethane	A2	2.0	12,000	32	8.1	48,000	130	1,000	1-4-0
R-170	CH_3CH_3	ethane	A3	0.54	7,000	8.6	2.4	31,000	38	1,000	2-4-0
R-E170	CH_3OCH_3	Methoxymethane (dimethyl ether)	A3	1.0	8,500	16	4.0	34,000	64	1,000	—
R-218	$CF_3CF_2CF_3$	octafluoropropane	A1	43	90,000	690	—	—	—	1,000	2-0-0[b]
R-227ea	CF_3CHFCF_3	1,1,1,2,3,3,3-heptafluoropropane	A1	36	84,000	580	—	—	—	1,000	—
R-236fa	$CF_3CH_2CF_3$	1,1,1,3,3,3-hexafluoropropane	A1	21	55,000	340	—	—	—	1,000	2-0-0[b]
R-245fa	$CHF_2CH_2CF_3$	1,1,1,3,3-pentafluoropropane	B1	12	34,000	190	—	—	—	300	2-0-0[b]
R-290	$CH_3CH_2CH_3$	propane	A3	0.59	5,300	9.5	2.4	21,000	38	1,000	2-4-0
R-C318	$-(CF_2)_4-$	octafluorocyclobutane	A1	41	80,000	650	—	—	—	1,000	—
R-400[c]	zeotrope	R-12/114 (50.0/50.0)	A1	10	28,000	160	—	—	—	1,000	2-0-0[b]
R-400[c]	zeotrope	R-12/114 (60.0/40.0)	A1	11	30,000	170	—	—	—	1,000	—
R-401A	zeotrope	R-22/152a/124 (53.0/13.0/34.0)	A1	6.6	27,000	110	—	—	—	1,000	2-0-0[b]
R-401B	zeotrope	R-22/152a/124 (61.0/11.0/28.0)	A1	7.2	30,000	120	—	—	—	1,000	2-0-0[b]
R-401C	zeotrope	R-22/152a/124 (33.0/15.0/52.0)	A1	5.2	20,000	84	—	—	—	1,000	2-0-0[b]
R-402A	zeotrope	R-125/290/22 (60.0/2.0/38.0)	A1	17	66,000	270	—	—	—	1,000	2-0-0[b]
R-402B	zeotrope	R-125/290/22 (38.0/2.0/60.0)	A1	15	63,000	240	—	—	—	1,000	2-0-0[b]
R-403A	zeotrope	R-290/22/218 (5.0/75.0/20.0)	A2	7.6	33,000	120	—	—	—	1,000	2-0-0[b]
R-403B	zeotrope	R-290/22/218 (5.0/56.0/39.0)	A1	18	68,000	290	—	—	—	1,000	2-0-0[b]
R-404A	zeotrope	R-125/143a/134a (44.0/52.0/4.0)	A1	31	130,000	500	—	—	—	1,000	2-0-0[b]
R-405A	zeotrope	R-22/152a/142b/C318 (45.0/7.0/5.5/42.5)	—	16	57,000	260	—	—	—	1,000	—
R-406A	zeotrope	R-22/600a/142b (55.0/4.0/41.0)	A2	4.7	21,000	75	18.8[g]	82,000[g]	301.9[g]	1,000	—
R-407A	zeotrope	R-32/125/134a (20.0/40.0/40.0)	A1	19	83,000	300	—	—	—	1,000	2-0-0[b]
R-407B	zeotrope	R-32/125/134a (10.0/70.0/20.0)	A1	21	79,000	330	—	—	—	1,000	2-0-0[b]
R-407C	zeotrope	R-32/125/134a (23.0/25.0/52.0)	A1	18	81,000	290	—	—	—	1,000	2-0-0[b]
R-407D	zeotrope	R-32/125/134a (15.0/15.0/70.0)	A1	16	68,000	250	—	—	—	1,000	2-0-0[b]
R-407E	zeotrope	R-32/125/134a (25.0/15.0/60.0)	A1	17	80,000	280	—	—	—	1,000	2-0-0[b]

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE							(F) DEGREES OF HAZARD
				RCL			LFL			OEL	
				lb/~~MCf~~ 1000 ft	ppm	g/m	lb/~~MCf~~ 1000 ft	ppm	g/m	ppm	
R-407F	zeotrope	R-32/125/134a (30.0/30.0/40.0)	A1	20	95,000	320	—	—	—	1,000	—
R-407G	zeotrope	R-32/125/134a (2.5/2.5/95.0)	A1	13	52,000	210	—	—	—	1,000	—
R-407H	zeotrope	R-32/125/134a (32.5/15.0/52.5)	A1	19	92,000	300	—	—	—	1,000	—
R-407I	zeotrope	R-32/125/124a (19.5/8.5/72.0)	A1	16	71,100	250	—	—	—	1,000	—
R-408A	zeotrope	R-125/143a/22 (7.0/46.0/47.0)	A1	21	94,000	330	—	—	—	1,000	2-0-0[b]
R-409A	zeotrope	R-22/124/142b (60.0/25.0/15.0)	A1	7.1	29,000	110	—	—	—	1,000	2-0-0[b]
R-409B	zeotrope	R-22/124/142b (65.0/25.0/10.0)	A1	7.3	30,000	120	—	—	—	1,000	2-0-0[b]
R-410A	zeotrope	R-32/125 (50.0/50.0)	A1	26	140,000	420	—	—	—	1,000	2-0-0[b]
R-410B	zeotrope	R-32/125 (45.0/55.0)	A1	27	140,000	430	—	—	—	1,000	2-0-0[b]
R-411A	zeotrope	R-127/22/152a (1.5/87.5/11.0)	A2	2.9	14,000	46	11.6[f]	55,000[f]	185.6[f]	970	—
R-411B	zeotrope	R-1270/22/152a (3.0/94.0/3.0)	A2	2.8	13,000	45	14.8[f]	70,000[f]	238.3[f]	940	—
R-412A	zeotrope	R-22/218/142b (70.0/5.0/25.0)	A2	5.1	22,000	82	20.5[f]	87,000[f]	328.6[f]	1,000	—
R-413A	zeotrope	R-218/134a/600a (9.0/88.0/3.0)	A2	5.8	22,000	93	23.4[f]	88,000[f]	374.9[f]	1,000	—
R-414A	zeotrope	R-22/124/600a/142b (51.0/28.5/4.0/16.5)	A1	6.4	26,000	100	—	—	—	1,000	—
R-414B	zeotrope	R-22/124/600a/142b (50.0/39.0/1.5/9.5)	A1	6.0	23,000	96	—	—	—	1,000	—
R-415A	zeotrope	R-22/152a (82.0/18.0)	A2	2.9	14,000	47	11.7[g]	56,000[g]	187.9[g]	1,000	—
R-415B	zeotrope	R-22/152a (25.0/75.0)	A2	2.1	12,000	34	—	—	—	1,000	—
R-416A	zeotrope	R-134a/124/600 (59.0/39.5/1.5)	A1	3.9	14,000	62	—	—	—	1,000	2-0-0[b]
R-417A	zeotrope	R-125/134a/600 (46.6/50.0/3.4)	A1	3.5	13,000	55	—	—	—	1,000	2-0-0[b]
R-417B	zeotrope	R-125/134a/600 (79.0/18.3/2.7)	A1	4.3	15,000	69	—	—	—	1,000	—
R-417C	zeotrope	R-125/134a/600 (19.5/78.8/1.7)	A1	5.4	21,000	87	—	—	—	1,000	—
R-418A	zeotrope	R-290/22/152a (1.5/96.0/2.5)	A2	4.8	22,000	77	19.2[g]	89,000[g]	308.4[g]	1,000	—
R-419A	zeotrope	R-125/134a/E170 (77.0/19.0/4.0)	A2	4.2	15,000	67	16.7[g]	60,000[g]	268.6[g]	1,000	—
R-419B	zeotrope	R-125/134a/E170 (48.5/48.0/3.5)	A2	4.6	17,000	74	18.5[g]	69,000[g]	297.3[g]	1,000	—
R-420A	zeotrope	R-134a/142b (88.0/12.0)	A1	12	44,000	180	—	—	—	1,000	2-0-0[b]
R-421A	zeotrope	R-125/134a (58.0/42.0)	A1	17	61,000	280	—	—	—	1,000	2-0-0[b]
R-421B	zeotrope	R-125/134a (85.0/15.0)	A1	21	69,000	330	—	—	—	1,000	2-0-0[b]
R-422A	zeotrope	R-125/134a/600a (85.1/11.5/3.4)	A1	18	63,000	290	—	—	—	1,000	2-0-0[b]
R-422B	zeotrope	R-125/134a/600a (55.0/42.0/3.0)	A1	16	56,000	250	—	—	—	1,000	2-0-0[b]
R-422C	zeotrope	R-125/134a/600a (82.0/15.0/3.0)	A1	18	62,000	290	—	—	—	1,000	2-0-0[b]
R-422D	zeotrope	R-125/134a/600a (65.1/31.5/3.4)	A1	16	58,000	260	—	—	—	1,000	2-0-0[b]
R-422E	zeotrope	R-125/134a/600a (58.0/39.3/2.7)	A1	16	57,000	260	—	—	—	1,000	—
R-423A	zeotrope	R-134a/227ea (52.5/47.5)	A1	19	59,000	300	—	—	—	1,000	2-0-0[b]
R-424A	zeotrope	R-125/134a/600a/600/601a (50.5/47.0/0.9/1.0/0.6)	A1	6.2	23,000	100	—	—	—	990	2-0-0[b]
R-425A	zoetrope	R-32/134a/227ea (18.5/69.5/12.0)	A1	16	72,000	260	—	—	—	1,000	2-0-0[b]
R-426A	zeotrope	R-125/134a/600a/601a (5.1/93.0/1.3/0.6)	A1	5.2	20,000	83	—	—	—	990	—
R-427A	zeotrope	R-32/125/143a/134a (15.0/25.0/10.0/50.0)	A1	18	79,000	290	—	—	—	1,000	2-1-0
R-428A	zeotrope	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	A1	23	84,000	370	—	—	—	1,000	—
R-429A	zeotrope	R-E170/152a/600a (60.0/10.0/30.0)	A3	0.81	6,300	13	3.2	25,000	83.8	1,000	—
R-430A	zeotrope	R-152a/600a (76.0/24.0)	A3	1.3	8,000	21	5.2	32,000	44.0	1,000	—
R-431A	zeotrope	R-290/152a (71.0/29.0)	A3	0.68	5,500	11	2.7	22,000	38.6	1,000	—
R-432A	zeotrope	R-1270/E170 (80.0/20.0)	A3	0.13	1,200	2.1	2.4	22,000	39.2	550	—
R-433A	zeotrope	R-1270/290 (30.0/70.0)	A3	0.34	3,100	5.5	2.4	20,000	32.4	750	—
R-433B	zeotrope	R-1270/290 (5.0-95.0)	A3	0.39	3,500	6.3	2.0	18,000	32.1	950	—
R-433C	zeotrope	R-1270/290 (25.0-75.0)	A3	0.41	3,700	6.5	2.0	18,000	83.8	790	—
R-434A	zeotrope	R-125/143a/600a (63.2/18.0/16.0/2.8)	A1	20	73,000	320	—	—	—	1,000	—
R-435A	zeotrope	R-E170/152a (80.0/20.0)	A3	1.1	8,500	17	4.3	34,000	68.2	1,000	—
R-436A	zeotrope	R-290/600a (56.0/44.0)	A3	0.50	4,000	8.1	2.0	16,000	32.3	1,000	—
R-436B	zeotrope	R-290/600a (52.0/48.0)	A3	0.51	4,000	8.2	2.0	16,000	32.7	1,000	—
R-436C	zeotrope	R-290/600a (95.0/5.0)	A3	0.57	5,000	9.1	2.3	20,000	36.5	1,000	—
R-437A	zeotrope	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	A1	5.1	19,000	82	—	—	—	990	—
R-438A	zeotrope	R-32/125/134a/600/601a (8.5/45.0/44.2/1.7/0.6)	A1	4.9	20,000	79	—	—	990	—	
R-439A	zeotrope	R-32/125/600a (50.0/47.0/3.0)	A2	4.7	26,000	76	18.9	104,000	303.3	1,000	—
R-440A	zeotrope	R-290/134a/152a (0.6/1.6/97.8)	A2	1.9	12,000	31	7.8[h]	46,000[h]	124.7[h]	1,000	—
R-441A	zeotrope	R-170/290/600a/600 (3.1/54.8/6.0/36.1)	A3	0.39	3,200	6.3	2.0	16,000	31.7	1,000	—
R-442A	zeotrope	R-32/125/134a/152a/227ea (31.0/31.0/30.0/3.0/5.0)	A1	21	100,000	330	—	—	1,000	—	
R-443A	zeotrope	R-1270/290/600a (55.0/40.0/5.0)	A3	0.19	1,700	3.1	2.2	20,000	35.6	640	—
R-444A	zeotrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	~~5.1~~5.0	21,000	~~81~~80	19.9	82,000	~~324.8~~ 319.4	850	—
R-444B	zeotrope	R-32/152a/1234ze(E) (41.5/10.0/48.5)	A2L	4.3	23,000	~~69~~70	17.3	93,000	~~277.3~~ 278.1	930	—
R-445A	zeotrope	R-744/134a/1234ze(E) (6.0/9.0/85.0)	A2L	~~4.2~~5.4	16,000	~~67~~87	~~2.7~~21.6	63,000	347.4	930	—
R-446A	zeotrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	~~2.5~~3.7	~~16,000~~ 23,000	~~39~~59	~~13.5~~14.8	~~62,000~~ 93,000	~~217.4~~ 237.7	960	—

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE							(F) DEGREES OF HAZARD
				RCL			LFL			OEL	
				lb/~~MCf~~ 1000 ft	ppm	g/m	lb/~~MCf~~ 1000 ft	ppm	g/m	ppm	
R-447A	zeotrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	~~2.6~~5.2	~~16,000~~ 32,000	~~42~~83	~~18.9~~20.6	~~65,000~~ 128,000	~~303.5~~ 331.4	960	—
R-447B	zeotrope	R-32/125/1234ze(E) (68.0/8.0/24.0)	A2L	~~2.6~~4.8	~~16,000~~ 30,000	~~42~~78	~~20.6~~19.5	121,000	312.7	970	—
R-448A	zeotrope	R-32/125/1234yf/134a/1234ze(E) (26.0/26.0/20.0/21.0/7.0)	A1	24	110,000	390	—	—	860	—	
R-449A	zeotrope	R-32/125/1234yf/134a (24.3/24.7/25.3/25.7)	A1	23	100,000	370	—	—	—	840	—
R-449B	zeotrope	R-32/125/1234yf/134a (25.2/24.3/23.2/27.3)	A1	23	100,000	370	—	—	—	850	—
R-449C	zeotrope	R-32/125/1234yf/134a (20.0/20.0/31.0/29.0)	A1	23	98,000	360	—	—	800	—	
R-450A	zeotrope	R-134a/1234ze(E) (42.0/58.0)	A1	20	72,000	320	—	—	—	880	—
R-451A	zeotrope	R-1234yf/134a (89.8/10.2)	A2L	~~5.0~~5.3	18,000	81	~~20.3~~21.3	~~70,000~~ 74,000	~~326.6~~ 341	530	—
R-451B	zeotrope	R-1234yf/134a (88.8/11.2)	A2L	5.0	18,000	81	~~20.3~~21.3	~~70,000~~ 74,000	~~326.6~~ 341.6	530	—
R-452A	zeotrope	R-32/125/1234yf (11.0/59.0/30.0)	A1	27	100,000	440	—	—	790	—	
R-452B	zeotrope	R-32/125/1234yf (67.0/7.0/26.0)	A2L	4.8	30,000	77	19.3	119,000	310.5	870	—
R-452C	zeotrope	R-32/125/1234yf (12.5/61.0/26.5)	A1	27	100,000	430	—	—	—	810	—
R-453A	zeotrope	R-32/125/134a/227ea/600/601a (20.0/20.0/53.8/5.0/0.6/0.6)	A1	7.8	34,000	120	—	—	1,000	—	
R-454A	zeotrope	R-32/1234yf (35.0/65.0)	A2L	~~3.2~~4.4	~~16,000~~ 21,000	~~52~~70	~~18.3~~17.5	~~63,000~~ 84,000	~~293.9~~ 281.4	690	—
R-454B	zeotrope	R-32/1234yf (68.9/31.1)	A2L	~~3.1~~4.6	~~19,000~~ 29,000	~~49~~74	~~22.0~~18.5	~~77,000~~ 115,000	~~352.6~~ 296.8	850	—
R-454C	zeotrope	R-32/1234yf (21.5/78.5)	A2L	~~4.4~~4.6	19,000	~~71~~73	~~18.0~~18.2	~~62,000~~ 77,000	~~289.5~~ 291.7	620	—
R-455A	zeotrope	R-744/32/1234yf (3.0/21.5/75.5)	A2L	~~4.9~~6.8	~~22,000~~ 30,000	~~79~~ 108	26.9	118,000	432.1	650	—
R-456A	zeotrope	R-32/134a/1234ze(E) (6.0/45.0/49.0)	A1	20	77,000	320	—	—	—	900	—
R-457A	zeotrope	R-32/1234yf/152a (18.0/70.0/12.0)	A2L	3.4	15,000	54	13.5	60,000	216.3	650	—
R-457B	zeotrope	R-32/1234yf/152a (35.0/55.0/10.0)	A2L	3.7	19,000	59	14.9	76,000	239	730	—
R-457C	zeotrope	R-32/1234yf/152a (7.5/78.0/14.5)	A2L	3.4	13,800	54	13.6	55,000	215	610	
R-457D	zeotrope	R-32/1234yf/152a (4.0/82.0/14.0)	A2L	3.6	14,000	58	14.9	57,000	235	580	
R-458A	zeotrope	R-32/125/134a/227ea/236fa (20.5/4.0/61.4/13.5/0.6)	A1	18	76,000	280	—	—	1,000	—	
R-459A	zeotrope	R-32/1234yf/1234ze(E) (68.0/26.0/6.0)	A2L	4.3	27,000	69	17.4	107,000	278.7	870	—
R-459B	zeotrope	R-32/1234yf/1234ze(E) (21.0/69.0/10.0)	A2L	~~30~~5.8	25,000	92	23.3	99,000	373.5	640	—
R-460A	zeotrope	R-32/125/134a/1234ze(E) (12.0/52.0/14.0/22.0)	A1	24	92,000	380	—	—	—	950	—
R-460B	zeotrope	R-32/125/134a/1234ze(E) (28.0/25.0/20.0/27.0)	A1	25	120,000	400	—	—	—	950	—
R-460C	zeotrope	R-32/125/134a/1234ze(E) (2.5/2.5/46.0/49.0)	A1	20	73,000	310	—	—	—	900	—
R-461A	zeotrope	R-125/143a/134a/227ea/600a (55.0/5.0/32.0/5.0/3.0)	A1	17	61,000	270	—	—	—	1,000	—
R-462A	zeotrope	R-32/125/143a/134a/600 (9.0/42.0/2.0/44.0/3.0)	A2	3.9	16,000	62	16.6[f]	105,000 [f]	265.8[f]	1,000	—
R-463A	zeotrope	R-744/32/125/1234yf/134a (6.0/36.0/30.0/14.0/14.0)	A1	19	98,000	300	—	—	—	990	—
R-464A	zeotrope	R-32/125/1234ze(E)/227ea (27.0/27.0/40.0/6.0)	A1	27	120,000	430	—	—	—	930	—
R-465A	zeotrope	R-32/290/1234yf (21.0/7.9/71.1)	A2	2.5	12,000	40	10.0	98,000	160.9	660	—
R-466A	zeotrope	R-32/125/13I1 (49.0/11.5/39.5)	A1	6.2	30,000	99	—	—	860	—	
R-467A	zeotrope	R-32/125/134a/600a (22.0/5.0/72.4/0.6)	A2L	6.7	31,000	110	—	—	1,000	—	
R-468A	zeotrope	R-1132a/32/1234yf (3.5/21.5/75.0)	A2L	4.1	18,000	66	—	—	—	610	—
R-468B	zeotrope	R-1132a/32/1234yf (6.0/13.0/81.0)	A2L	4.4	18,000	70	570				
R-468C	zeotrope	R-1132a/32/1234yf (6.0/42.0/52.0)	A2L	4.3	23,000	69	710				
R-469A	zeotrope	R-744/R-32/R-125 (35.0/32.5/32.5)	A1	8	53,000	—	—	—	1,600	—	
R-470A	zeotrope	R-744/32/125/134a/1234ze(E)/227ea (10.0/17.0/19.0/7.0/44.0/3.0)	A1	17	77,000	270	—	—	—	1,100	—
R-470B	zeotrope	R-744/32/125/134a/1234ze(E)/227ea (10.0/17.0/19.0/7.0/44.0/3.0)	A1	16	72,000	270	—	—	—	1,100	—
R-471A	zeotrope	R-1234ze(E)/227ea/1336mzz(E) (78.7/4.3/17.0)	A1	9.7	31,000	160	—	—	710	—	
R-472A	zeotrope	R-744/32/134a (69.0/12.0/19.0)	A1	4.5	35,000	72	—	—	—	2,700	—
R-472B	zeotrope	R-744/32/134a (58.0/10.0/32.0)	A1	5.0	36,000	80	2,400				
R-473A	zeotrope	R-1132a/23/744/125 (20.0/10.0/60.0/10.0)	A1	4.8	36,000	77	1,700				
R-474A	zeotrope	R-1132(E)/1234yf (23.0/77.0)	A2L	3.3	13,000	53	13	53,000	209	440	
R-475A	zeotrope	R-1234yf/134a/1234ze(E) (45.0/43.0/12.0)	A1	20.0	73,000	320	690				

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE							(F) DEGREES OF HAZARD
				RCL			LFL			OEL	
				lb/~~MCf~~ 1000 ft	ppm	g/m	lb/~~MCf~~ 1000 ft	ppm	g/m	ppm	
R-476A	zeotrope	R-134a/1234ze(E)/1336mzz(E) (10.0/78.0/12.0)	A1	11	38,000	180	750				
R-477A	zeotrope	R-1270/600a (84.0/16.0)	A3	0.13	1,100	2.0	2.4	21,000	38	530	
R-477B	zeotrope	R-1270/600a (38.0/62.0)	A3	0.27	2,100	4.3	2.3	18,000	37	690	
R-478A	zeotrope	R-744/32/125/134a/152a/1234ze(E)/227ea (7.0/26.0/15.0/15.0/3.0/30.0/4.0)	A2L	4.8	24,000	77	17.1[f]	95,000[f]	270[f]	1,100	
R-479A	zeotrope	R-1132(E)/32/1234yf (28.0/21.5/50.5)	A2L	3.0	15,000	48	12.0	61,000	193	510	
R-480A	zeotrope	R-744/1234ze(E)/227ea (5.0/86.0/9.0)	A1	16	59,000	260	900				
R-481A	zeotrope	R-32/125/134a/1233zd(E)/601a (16.9/6.3/74.4/1.8/0.6)	A1	10	45,000	160	1,000				
R-482A	zeotrope	R-134a/1234ze(E)/1224yd(Z) (10.0/83.5/6.5)	A1	18	62,000	290	830				
R-484A	zeotrope	R-1270/600 (12.0/88.0)	A3	0.14	1,000	2.3	2.6	18,000	41	860	
R-500[~~d~~c]	azeotrope	R-12/152a (73.8/26.2)	A1	7.4	29,000	120	—	—	—	1,000	2-0-0[b]
R-501[c]	azeotrope	R-22/12 (75.0/25.0)	A1	13	54,000	210	—	—	—	1,000	—
R-502[~~d~~c]	azeotrope	R-22/115 (48.8/51.2)	A1	21	73,000	330	—	—	—	1,000	2-0-0[b]
R-503[~~d~~c]	azeotrope	R-23/13 (40.1/59.9)	—	—	—	—	—	—	—	1,000	2-0-0[b]
R-504[c]	azeotrope	R-32/115 (48.2/51.8)	—	28	140,000	450	—	—	—	1,000	—
R-507A	azeotrope	R-125/143a (50.0/50.0)	A1	32	130,000	510	—	—	—	1,000	2-0-0[b]
R-508A	azeotrope	R-23/116 (39.0/61.0)	A1	14	55,000	220	—	—	—	1,000	2-0-0[b]
R-508B	azeotrope	R-23/116 (46.0/54.0)	A1	13	52,000	200	—	—	—	1,000	2-0-0[b]
R-509A	azeotrope	R-22/218 (44.0/56.0)	A1	24	75,000	380	—	—	—	1,000	2-0-0[b]
R-510A	azeotrope	R-E170/600a (88.0/12.0)	A3	0.87	7,300	14	3.5	29,000	56.1	1,000	—
R-511A	azeotrope	R-290/E170 (95.0/5.0)	A3	0.59	5,300	9.5	2.4	21,000	38.0	1,000	—
R-512A	azeotrope	R-134a/152a (5.0/95.0)	A2	1.9	11,000	31	7.7	45,000	123.9	1,000	—
R-513A	azeotrope	R-1234yf/134a (56.0/44.0)	A1	20	72,000	320	—	—	—	650	—
R-513B	azeotrope	R-1234yf/134a (58.5/41.5)	A1	21	74,000	330	—	—	—	640	—
R-514A	azeotrope	R-1336mzz(S)/1130(E) (74.7/25.3)	B1	0.86	2,400	14	—	—	—	320	—
R-515A	azeotrope	R-1234ze(E)/227ea (88.0/12.0)	A1	19	63,000	300	—	—	—	810	—
R-515B	azeotrope	R-1234ze(E)/227ea (91.1/8.9)	A1	18	61,000	290	—	—	810		
R-516A	azeotrope	R-1234yf/134a/152a (77.5/8.5/14.0)	A2	3.2	13,000	5 2	13.1	50,000	210.1	590	—
R-600	$CH_3CH_2CH_2CH_3$	butane	A3	0.15	1,000	2.4	3.0	20,000	48	1,000	1-4-0
R-600a	$CH(CH_3)_2CH_3$	2-methylpropane (isobutane)	A3	0.59	4,000	9.5	2.4	16,000	38	1,000	2-4-0
R-601	$CH_3CH_2CH_2CH_2CH_3$	pentane	A3	0.18	1,000	2.9	2.2	12,000	35	600	—
R-601a	$(CH_3)_2CHCH_2CH_3$	2-methylbutane (isopentane)	A3	0.18	1,000	2.9	2.4	13,000	38	600	—
R-610	$CH_3CH_2OCH_2CH_3$	ethoxyethane (ethyl ether)	—	—	—	—	—	—	—	400	—
R-611	$HCOOCH_3$	methyl formate	B2	—	—	—	—	—	—	100	—
R-717	NH_3	ammonia	B2L	0.014	320	0.22	7.2	167,000	116	25	3-3-0[c]
R-718	H_2O	water	A1	—	—	—	—	—	—	—	0-0-0
R-744	CO_2	carbon dioxide	A1	~~4.5~~3.4	~~40,000~~ 30,000	~~72~~54	—	—	—	5,000	2-0-0[b]
R-1130(E)	CHCl=CHCl	trans-1,2-dichloroethene	B2	0.25	1,000	4	16	65,000	258	200	—
R-1132a	$CF_2=CH_2$	1,1-difluoro~~ethylene~~ethene	A2	2.0	13,000	33	8.1	50,000	131	500	—
R-1132(E)	(E)-CFH=CFH	Trans-1,2-difluoroethene	B2	1.8	11,000	28	7.0	43,000	113	350	
R-1150	$CH_2=CH_2$	ethene (ethylene)	~~A3~~B3	—	—	—	2.2	31,000	36	200	1-4-2
R-1224yd(Z)	$CF_3CF=CHCl$	(Z)-1-chloro-2,3,3,3-tetrafluoroethylene	A1	23	60,000	370	—	—	—	1,000	—
R-1233zd(E)	$CF_3CH=CHCl$	trans-1-chloro-3,3,3-trifluoro-1-propene	A1	5.3	16,000	85	—	—	—	800	—
R-1234yf	$CF_3CF=CH_2$	2,3,3,3-tetrafluoro-1-propene	A2L	4.5	16,000	75	18.0	62,000	289	500	—
R-1234ze(E)	$CF_3CH=CFH$	trans-1,3,3,3-tetrafluoro-1 -propene	A2L	4.7	16,000	76	18.8	65,000	303	800	—
R-1270	$CH_3CH=CH_2$	Propene (propylene)	A3	0.11	1,000	1.7	—	—	—	500	1-4-1
R-1336mzz(E)	$CF_3CHCHCF_3$	trans 1,1,1,4,4,4-hexafluoro-2- butene	A1	3.0	7,200	48	—	—	—	400	
R-1336mzz(Z)	$CF_3CHCHCF_3$	cis-1,1,1,4,4,4-hexaflouro-2-butene	A1	5.2	13,000	84	—	—	—	500	—

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m^3.

a. Degrees of hazard are for health, fire, and reactivity, respectively, in accordance with NFPA 704.

b. Reduction to 1-0-0 is allowed if analysis satisfactory to the code official shows that the maximum concentration for a rupture or full loss of refrigerant charge would not exceed the IDLH, considering both the refrigerant quantity and room volume.

c. Class I ozone depleting substance; prohibited for new installations.

d. Occupational Exposure Limit based on the OSHA PEL, ACGIH TLV-TWA, the TERA WEEL or consistent value on a time-weighed average (TWA) basis (unless noted C for ceiling) for an 8 hr/d and 40 hr/wk.

e. LFL is based on WCF @ 73.4°F (23°C) unless otherwise noted.

f. WCFF LFL @ 140°F (60°C).

g. WCFF LFL @ 73.4°F (23°C).

h. WCF LFL @ 212°F (100°C).

Reason: The Refrigerant Classifications (except Degrees of Hazard) are determined by ASHRAE SSPC 34 and published in ASHRAE Standard 34. This proposal seeks to update the refrigerant table with the new refrigerants added to Standard 34 since the last code cycle. The reasons for the additions of new refrigerants can be found at https://www.ashrae.org/standards-research--technology/standards-addenda. All proposed changes are either incorporated into ASHRAE Standard 34-2022 or the published addenda to ASHRAE Standard 34-2022 located at the link above.

Bibliography: ASHRAE Standard 34-2022, Addenda a, b, c, d, e, f, g, h, j, k, m, ac, ah to ASHRAE Standard 34-2022 - https://www.ashrae.org/standards-research--technology/standards-addenda

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Updating the table of refrigerants that could be used in systems does not add labor or material costs because the choice of refrigerant is up to the owner and designer.

M64-24

M65-24

IMC®: 1103.1

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

2024 International Mechanical Code

Revise as follows:

1103.1 Refrigerant classification. Refrigerants shall be classified in accordance with ASHRAE 34 as listed in Table 1103.1. <u>Refrigerants without a refrigerant number designation or without a safety group classification in the referenced edition of ASHRAE Standard 34 shall be classified in accordance with the criteria in ASHRAE Standard 34 as a single-compound refrigerant blend of two or more compounds. Such safety classifications not assigned by ASHRAE Standard 34 shall be submitted for approval to the code official. Compliance with the requirements of this code is contingent upon use of approved safey classifications where not assigned by the referenced edition of ASHRAE Standard 34.</u>

Staff Analysis: The standard referenced within the new code text is in the current edition of the IMC.

Reason: This change accounts for the fact that new refrigerants will be approved during continuous maintenance of ASHRAE 34 that cannot all be reflected in the latest edition of the IMC due to timing. It offers flexibility to use approved refrigerants even though they are not yet specified in the IMC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal will provide more choice to the user and, thus, direct costs could ultimately be lower. In general, this change is not expected to have a bearing on cost.

M65-24

M66-24

IMC®: 1104.3.1

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

2024 International Mechanical Code

Revise as follows:

1104.3.1 ~~Air conditioning for human comfort~~<u>High-probability air conditioners, heat pumps, and dehumidifiers</u>. High-probability ~~systems used for human comfort~~ <u>air conditioners, heat pumps, and dehumidifiers</u> shall use Group A1 or A2L refrigerant.

Exceptions:

1. Equipment *listed* for and used in residential *occupancies* containing a maximum of 6.6 pounds (3 kg) of refrigerant.
2. Equipment *listed* for and used in commercial *occupancies* containing a maximum of 22 pounds (10 kg) of refrigerant.
3. Industrial *occupancies* .

Reason: This code change proposal is for correlation with provisions in Addendum e of ASHRAE 15-2022. ASHRAE 15 has removed the term "human comfort" from the standard, as it did not adequately describe the applications it covered, and replaced it with "air conditioners, heat pumps, and dehumidifiers". This proposal better aligns the IMC with the current language in ASHRAE 15.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

These changes will have no impact on the cost of construction. They simply provide better clarity on what applications are intended by this section of the code.

M66-24

M67-24

IMC®: 1104.3.2

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

2024 International Mechanical Code

Revise as follows:

1104.3.2 Group A2, A3, B2 and B3 refrigerants. Group A2 and B2 refrigerants shall not be used in high-probability systems. Group A3 and B3 refrigerants shall not be used except where *approved*.

Exceptions: ~~This section does not apply to:~~

1. Laboratories where the floor area per occupant is not less than 100 square feet (9.3 m^2).
2. *Listed* self-contained systems having a maximum of 0.331 pounds (150 g) of Group A3 refrigerant.
3. Industrial *occupancies*.
4. *Equipment listed* for and used in residential *occupancies* containing a maximum of 6.6 pounds (3 kg) of Group A2 or B2 refrigerant.
5. *Equipment listed* for and used in commercial occupancies containing a maximum of 22 pounds (10 kg) of Group A2 or B2 refrigerant.
6. Self-contained *equipment* using Groups A3 and B3 refrigerants that are listed to UL 60335-2-89 and installed in accordance with the listing, the manufacturer's installation instructions, and ASHRAE 15.
7. Self-contained *equipment* using Groups A3 and B3 refrigerants that are listed to UL 60335-2-40 and installed in accordance with the listing, the manufacturer's installation instructions, and ASHRAE 15.

Staff Analysis: The proposed referenced standard, ASHRAE 15, is currently referenced in the IMC.

Reason: This code change proposal better aligns the IMC with Addendum l of ASHRAE 15, 2019 edition (which was incorporated into the 2022 edition), which allows for larger charge sizes of Group A3 refrigerants in commercial refrigeration applications.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal involves optional equipment choices.

M67-24

M68-24

IMC®: TABLE 1107.4, ASTM Chapter 15 (New)

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1107.4 REFRIGERANT PIPE

PIPING MATERIAL	STANDARD
Aluminum tube	ASTM B210 , 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
Polyethylene of Raised Temperature/ Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) pipe	ASTM F3346
Steel pipe[b]	ASTM A53, ASTM A106 , ASTM A333
Steel tube	ASTM A254, ASTM A334

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 only be permitted for discharge lines in pressure relief systems.

Add new standard(s) as follows:

ASTM

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

ASTM F3346-19 Standard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) Composite Pressure Pipe

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM F3346-19 Standard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) Composite Pressure Pipe, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: Piping produced according to ASTM F3346 "Standard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) Composite Pressure Pipe" is intended for the applications referred to in Section 1107.4 of the code and in Table 1107.4. It is proposed to add this piping material to Table 1107.4 to provide installers with a high-performance corrosion-resistant option for this application.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Including PE-RT/AL/PE-RT piping in Table 1107.4 provides an alternative piping option for refrigerant applications. PE-RT/AL/PE-RT piping is less expensive than some of the existing materials (e.g., copper, brass, or steel), but may be more expensive than certain other piping materials. This code change proposal may decrease the cost of construction by 0% to 10% if PE-RT/AL/PE-RT piping is selected by users, or it may increase the cost of construction by 0% to 10% if selected, or it may have no impact on the cost of construction if PE-RT/AL/PE-RT piping is not selected. It depends on which of the seven existing approved materials is used for this comparison.

To assign dollar values to this proposal, the use of PE-RT/AL/PE-RT piping could decrease construction costs over a range from $1 to $10,000, depending on the size of the project, size of piping, etc. or it could increase construction costs over a range from $1 to $10,000, depending on the size of the project, size of piping, etc., or it could have no effect on construction costs if users do not select to use PE-RT/AL/PE-RT piping. This proposal simply provides another material option.

Estimated Immediate Cost Impact Justification (methodology and variables):

Seven (7) piping materials produced according to seventeen (17) listed standards are already approved in Table 1107.4.. This proposal simply provides another material option. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. Therefore, only a range of cost decreases or increases can be provided in this format.

Estimated Life Cycle Cost Impact:

Seven (7) piping materials produced according to seventeen (17) listed standards are already approved in Table 1107.4. This proposal simply provides another material option. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. PE-RT/AL/PE-RT piping has a corrosion-resistant plastic inner and outer liner for long life.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Seven (7) piping materials produced according to seventeen (17) listed standards are already approved in Table 1107.4. This proposal simply provides another material option. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. PE-RT/AL/PE-RT piping has a corrosion-resistant plastic inner and outer liner for long life.

M68-24

M69-24

IMC®: TABLE 1107.4, ASTM Chapter 15 (New)

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1107.4 REFRIGERANT PIPE

PIPING MATERIAL	STANDARD
Aluminum tube	ASTM B210 , 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
Polyethylene of Raised Temperature/ Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT)pipe	ASTM F3506
Steel pipe[b]	ASTM A53, ASTM A106 , ASTM A333
Steel tube	ASTM A254, ASTM A334

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 only be permitted for discharge lines in pressure relief systems.

Add new standard(s) as follows:

ASTM

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

F3506-21e1 Standard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM 3506 tandard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) 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 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: Piping produced according to ASTM F3506 “Standard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems” is intended specifically for the applications referred to in Section 1107.4 of the code and in Table 1107.4. It is proposed to add this piping material to Table 1107.4 to provide installers with a high-performance corrosion-resistant option for this application.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Including PE-RT/AL/PE-RT piping produced according to ASTM F3506 in Table 1107.4 provides an alternative piping option for refrigerant applications. PE-RT/AL/PE-RT piping is less expensive than some of the existing materials (e.g., copper, brass, or steel), but may be more expensive than certain other piping materials. This code change proposal may decrease the cost of construction by 0% to 10% if PE-RT/AL/PE-RT piping is selected by users, or it may increase the cost of construction by 0% to 10% if selected, or it may have no impact on the cost of construction if PERT/ AL/PE-RT piping is not selected. It depends on which of the seven existing approved materials is used for this comparison.

To assign dollar values to this proposal, the use of PE-RT/AL/PE-RT piping could decrease construction costs over a range from $1 to $10,000, depending on the size of the project, size of piping, etc. or it could increase construction costs over a range from $1 to $10,000, depending on the size of the project, size of piping, etc., or it could have no effect on construction costs if users do not select to use PERT/AL/PE-RT piping. This proposal simply provides another material option.

Estimated Immediate Cost Impact Justification (methodology and variables):

Seven (7) piping materials produced according to seventeen (17) listed standards are already approved in Table 1107.4.. This proposal simply provides another material option. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. Therefore, only a range of cost decreases or increases can be provided in this format.

Estimated Life Cycle Cost Impact:

Seven (7) piping materials produced according to seventeen (17) listed standards are already approved in Table 1107.4. This proposal simply provides another material option. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. PE-RT/AL/PE-RT piping has a corrosion-resistant plastic inner and outer liner for long life.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Seven (7) piping materials produced according to seventeen (17) listed standards are already approved in Table 1107.4. This proposal simply provides another material option. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. PE-RT/AL/PE-RT piping has a corrosion-resistant plastic inner and outer liner for long life.

M69-24

M70-24

IMC®: TABLE 1107.4, TABLE 1107.5, 1108.7 (New), 1108.8 (New), ASTM Chapter 15 (New)

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

2024 International Mechanical Code

Revise as follows:

TABLE 1107.4 REFRIGERANT PIPE

PIPING MATERIAL	STANDARD
Aluminum tube	ASTM B210 , 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, ASTM A333
Steel tube	ASTM A254, ASTM A334
Stainless Steel Pipe	ASTM A312/A312M
Stainless Steel Tube	ASTM A269/A269M, ASTM A632

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 only be permitted for discharge lines in pressure relief systems.

TABLE 1107.5 REFRIGERANT PIPE FITTINGS

FITTING MATERIAL	STANDARD
Aluminum	ASTM B361
Copper and copper alloy (brass)	ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.24, ASME B16.26, ASME B16.50
Steel	ASTM A105, ASTM A181, ASTM A193, ASTM A234, ASTM A420, ASTM A707
Stainless Steel	ASTM A403/A403M, ASME B16.11

Add new text as follows:

1108.7 Stainless steel pipe. Joints between stainless steel pipe or fittings shall be brazed, mechanical, threaded, press-connect, or welded joints conforming to Section 1108.3.

1108.8 Stainless steel tube. Joints between stainless steel tube or fittings shall be brazed, flared, mechanical, press-connect, or welded joints conforming to Section 1108.3.

Add new standard(s) as follows:

ASTM

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

ASTM A632-19 — Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service

ASTM A403/A403M-20 — Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM A632 and A403/A403M, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: ASHRAE 15 includes the use of stainless steel pipe and stainless steel tube for refrigerant piping. This proposed change adds the requirements for stainless steel pipe and tube. The appropriate standards are listed in Table 1107.4 for the pipe and tube and Table 1107.5 for the fittings.

Section 1108.7 and 1108.8 added the joining methods. ASHRAE 15 allows brazed, mechanical, threaded, press-connect, or welded joints for stainless steel pipe and brazed, flared, mechanical, press-connect, or welded joints for stainless steel tube.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The use of stainless steel pipe or tube is optional, therefore not impacting the cost of construction.

M70-24

M71-24

IMC®: 1107.4.1

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

2024 International Mechanical Code

Delete without substitution:

~~**1107.4.1 Steel pipe Groups A2, A3, B2 and B3.** The minimum weight of steel pipe for Group A2, A3, B2 and B3 refrigerants shall be Schedule 80 for sizes $1^1/_2$ inches or less in diameter.~~

Reason: ASHRAE 15 does not restrict the use of steel pipe to Schedule 80 for Group A2, A3, B2, and B3 refrigerants. By deleting this section, the requirements are consistent with ASHRAE 15.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The allowance for Schedule 40 steel pipe will lower the cost of the refrigerant piping system.
Schedule 40 (thinner) will cost less than Schedule 80 (thicker) due to material. Based on Grainger's website, use of Schedule 40 will reduce cost by $0.78 – $2.75 per foot, depending on the length installed.

	3/4" diameter unthreaded, welded Cost (Cost/ft)	
Length	Schedule 40	Schedule 80
1 foot (12 inch)	$9.00 ($9.00/ft)	$9.78 ($9.78/ft)
3 foot	$18.47 ($6.16/ft)	$26.74 ($8.91/ft)
5 foot	$30.35 ($6.07/ft)	
6 foot		$53.09 ($8.84/ft)

Estimated Immediate Cost Impact Justification (methodology and variables):

This is based on the current pricing of Schedule 40.

M71-24

M72-24

IMC®: 1107.5.1, TABLE 1107.5.1

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

2024 International Mechanical Code

Revise as follows:

1107.5.1 Copper ~~brazed~~ field swaged. The minimum and maximum cup depth of field-fabricated copper ~~brazed~~ swaged fitting connections shall comply with Table 1107.5.1.

TABLE 1107.5.1 COPPER ~~BRAZED~~ SWAGED CUP DEPTHS

	Brazed Cup Depths		Solder Cup Depths
FITTING SIZE (inch)	MINIMUM ~~DEPTH~~ (inch)	MAXIMUM ~~DEPTH~~ (inch)	MINIMUM (inch)
1/8	0.15	0.23	0.25
3/16	0.16	0.24	0.31
1/4	0.17	0.26	0.31
3/8	0.20	0.30	0.38
1/2	0.22	0.33	0.50
5/8	0.24	0.36	0.62
3/4	0.25	0.38	0.75
1	0.28	0.42	0.91
1 1/4	0.31	0.47	0.97
1 1/2	0.34	0.51	1.09
2	0.40	0.60	1.34
2 1/2	0.47	0.71	1.47
3	0.53	0.80	1.66
3 1/2	0.59	0.89	1.91
4	0.64	0.96	2.16

For SI: 1 inch = 25.4 mm.

Reason: ASHRAE 15 added the minimum cup depth for copper solder swaged joint since solder joints are permitted for lower pressure Group A1 refrigerant systems. By striking the word “brazed” in the title and the section, the table results in regulations for both brazed and soldered field made swaged joints. The information on cup depth for solder joints was provided by the Copper Development Association which lists minimum depths for proper solder joints.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The use of field made swaged solder joints is optional.

M72-24

M73-24

IMC®: 1108.7, 1108.8

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

2024 International Mechanical Code

Revise as follows:

1108.7 Steel pipe. Joints between steel pipe or fittings shall be <u>brazed,</u> mechanical ~~joints~~, threaded, press-connect or welded joints conforming to Section 1108.3.

1108.8 Steel tube. Joints between steel tubing or fittings shall be <u>brazed,</u> flared, mechanical, press-connect or welded joints conforming to Section 1108.3.

Reason: ASHRAE 15 includes the allowance of brazed joints for both steel pipe and steel tube. This change adds the allowance of these joining methods to the Mechanical Code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The use of brazed joints is optional.

M73-24

M74-24

IMC®: 1108.9 (New)

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Add new text as follows:

1108.9 PE-RT/AL/PE-RT pipe. Joints between PE-RT/AL/PE-RT pipe or fittings shall be mechanical or press-connect joints conforming to Section 1108.3.

Reason: Following the proposal to add new standards ASTM F3346 and ASTM F3506 to Table 1107.4, this proposed new Section 1108.9 provides mandatory language regarding joints for PE-RT/AL/PE-RT pipes consistent with requirements for other piping materials found in this section. Therefore, the new section 1108.9 should be added to include these mandatory requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Following the proposals to add standards ASTM F3346 and ASTM F3506 to Table 1107.4, this proposed new Section provides mandatory language regarding joints for PE-RT/AL/PE-RT pipes consistent with requirements for other piping materials found in this section. The user has several choices for refrigeration piping materials, and the addition of this new section clarifies requirements for PE-RT/AL/PE-RT joints without decreasing or increasing the cost of construction.

M74-24

M75-24

IMC®: 1109.2.5

Proponents: Greg Johnson, Johnson & Associates Consulting Services, National Multifamily Housing Council (gjohnsonconsulting@gmail.com); Vladimir G. Kochkin, National Association of Home Builders - NAHB, NAHB (vkochkin@nahb.org); Andrew Klein, A S Klein Engineering, PLLC, BOMA International (andrew@asklein.com); Emily Toto, ASHRAE, ASHRAE (etoto@ashrae.org)

2024 International Mechanical Code

Revise as follows:

1109.2.5 Refrigerant pipe shafts. Refrigerant piping that penetrates two or more floor/ceiling assemblies shall be enclosed in a fire-resistance-rated shaft enclosure. The fire-resistance-rated shaft enclosure shall comply with Section 713 of the International Building Code.

Exceptions:

1. *Refrigeration* systems using R-718 refrigerant (water).
2. Piping in a direct refrigeration system ~~using Group A1 refrigerant~~ where the refrigerant quantity does not exceed the limits of Table 1103.1 for the smallest occupied space through which the piping passes.
3. Piping located on the exterior of the *building* where vented to the outdoors.

Reason: JOHNSON: This will make the IMC consistent with Section 9.12.1.5 of ASHRAE 15-2022. Note that IMC Section 1109.2.2 still requires piping protection, either within building elements or protective enclosures.

TOTO: This section was added to the IMC before the completion of the changes to ASHRAE 15. ASHRAE 15 removed the limitation in exception 2 as applying only to Group A1 refrigerants. It was determined that any refrigerant meeting the limitations of Table 1103.1 are safe to install without a shaft enclosure. This modification is consistent with ASHRAE 15-2022.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

JOHNSON: Costs are estimated to be reduced by roughly $1,000 per piping run per floor of an R-2 multifamily building.
TOTO: This may reduce the cost of construction by eliminating the shaft requirements for all refrigerants that do not exceed the safe limitations in the code. $22,400 estimated avoided total cost per mechanical room.

Estimated Immediate Cost Impact Justification (methodology and variables):

JOHNSON: Lineal feet of shaft-wall system avoided estimated to be 20 feet. Height of ceiling estimated to be 9 feet. Cost of installed shaft system estimated to be $7.00 per square foot. 20 X 9 X $7 = $960. $960 was rounded to $1,000.
TOTO: This change provides a lower cost alternative to the installation of a pipe shaft. Assumed area of avoided shaft wall system = 10 ft high X 40 lineal ft ($ sided enclosure) = 400 sf of shaft wall area. Assume shaft liner wall board is $34 per sf (kamcoboston.com), assume shaft framing materials are $8 per sf (schillings.com), assume $4 per sf labor (forbes.com), = $56 per sf for installed shaft wall without finishing. $56 per sf X 400 sf = **$22,400 estimated avoided total cost per mechanical room.**

Estimated Life Cycle Cost Impact:

JOHNSON: N/A

Estimated Life Cycle Cost Impact Justification (methodology and variables):

JOHNSON: N/A

M75-24

M76-24

IMC®: 1109.3.1

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Revise as follows:

1109.3.1 Protection against physical damage. In addition to the requirements of Section 305.5, aluminum, copper, multilayer composite, and and steel tube used for Group A2, A3, B2 and B3 refrigerants and located in concealed locations where tubing is installed in studs, joists, rafters or similar member spaces, and located less than 1$^{1}/_{4}$ inches (32 mm) from the nearest edge of the member, shall be continuously protected by shield plates. Protective steel shield plates shall cover the area of the tube plus the area extending not less than 2 inches (51 mm) beyond both sides of the tube.

Reason: Following the proposals to add new refrigeration piping standards ASTM F3346 and ASTM F3506 to Table 1107.4, this proposed revision to Section 1109.3.1 provides mandatory language regarding protection for PE-RT/AL/PE-RT pipes, consistent with requirements for other piping materials found in this section.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Following the proposals to add new refrigeration piping standards ASTM F3346 and ASTM F3506 to Table 1107.4, this proposed revision to Section 1109.3.1 provides mandatory language regarding protection for PE-RT/AL/PE-RT pipes, consistent with requirements for other piping materials found in this section. The user has several choices for refrigeration piping materials, and this revision clarifies requirements for protection of PERT/AL/PE-RT piping without decreasing or increasing the cost of construction.

M76-24

M77-24

IMC®: 1109.4

Proponents: Howard Ahern, Airex, Manufacturing (howard.ahern@airexmfg.com)

2024 International Mechanical Code

Revise as follows:

1109.4 Refrigerant pipe penetrations.
The annular space between the outside of a refrigerant pipe and the inside of a pipe sleeve or opening in a *building* envelope wall, floor or ceiling assembly penetrated by a refrigerant pipe shall be sealed in an *approved* manner with caulking material or ~~foam~~ sealant or closed with a gasketing system. The caulking material, ~~foam~~ sealant or gasketing system shall be designed for the conditions at the penetration location and shall be compatible with the pipe, sleeve and *building* materials in contact with the sealing materials.Sealing shall allow for expansion and contraction of materials and mechanical vibration. Refrigerant pipes penetrating fire-resistance-rated assemblies or membranes of fire-resistance-rated assemblies shall be sealed or closed in accordance with Section 714 of the International Building Code. Rodent Proofing shall comply with Section 301.17

Reason: The **2018 IECC Commerical code Air Barrier Construction C402.5.1.1 (3), and 2021 IECC C402.5.1.1 (3) , R402.4.1.1 Air Barrier, Air Sealing and Insulation Installation, 2021 IRC Table N1102.4.1.1 Air Barrier, Air Sealing and Insulation Installation states for Penetrations sealing that "sealing shall allow for expansion, contraction of materials and mechanical vibration"**.

Refrigeration Piping does have vibration. Condenser manufactures have installation instruction to isolate the refrigeration piping for vibration. Codes and standards have instruction for care to be taken in construction of refrigeration piping and joints to avoid stress from the vibration.
The US Department of Energy states on their website Caulking | Department of Energy for sealing. On Expanding foam " **Use in non friction areas, as material can become dry and powdery over time". as the friction caused by the vibration turns the foam into powder.**
The HVAC industry is well aware of going back to jobs where the foam has degraded substantially or is completely gone from the vibration. In Addition, it renders the pipe penetration nearly impractical for future modifications or maintenance.

Also, a serious concern is the utilization of isocyanates, particularly MDI (Methylene Diphenyl Diisocyanate), a hazardous component prevalent in numerous polyurethane foams. MDI is acknowledged for its potential as a respiratory and skin irritant, with prolonged exposure carrying the risk of severe health issues. Inhaling MDI fumes or direct skin contact can result in sensitization, allergic reactions, and potentially long-term health problems. Consequently, the inclusion of MDI in expanding foam introduces an avoidable health hazard for workers involved in its application. Plus, manufactures warn of foam getting into water were it kills aquatic life and to not allow it to lay on the ground as well

This proposal will keep with requirements from the IECC for penetration sealing and remove foam for refrigerant pipe penetration sealing only due to vibration.

Bibliography: Caulking | Department of Energy

DIY Foam Failures: The Pitfalls of Expanding Polyurethane in Cable Ducts | by Carl Pike - The Duct Sealing Man | Nov, 2023 | Medium

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change should not increase the cost of construction as these sealing requirements are already in the 2018,2021 IECC and IRC. The upcoming 2024 IECC commercial and residential had no code proposals pertain to this requirement and is unchallenged. Any cost of construction increase has already been approved in two and now almost three code cycles. There are a variety of low-cost compounds, caulking, sealants and gaskets used extensively by contractors already. There is no research or data available that was searchable on pipe penetration sealing cost that could be found.

M77-24

M78-24

IMC®: TABLE 1202.4, ASTM Chapter 15 (New)

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1202.4 HYDRONIC PIPE

MATERIAL	STANDARD (see Chapter 15)
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM F2806
Chlorinated polyvinyl chloride (CPVC) plastic pipe	ASTM D2846; ASTM F441; ASTM F442
Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC)	ASTM F2855
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tube (Type K, L or M)	ASTM B75; ASTM B88; ASTM B135; ASTM B251
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe	ASTM F1281; CSA CAN/CSA-B-137.10
Cross-linked polyethylene (PEX) tubing	ASTM F876; ASTM F3253; CSA B137.5
Ductile iron pipe	AWWA C115/A21.15; AWWA C151/A21.51
High-density Polyethylene (HDPE) pipe	ASTM D2737; ASTM D3035; ASTM F714; ASTM F2165; AWWA C901; CSA B137.1
Polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe	ASTM F1282; CSA B137.9
Polypropylene (PP) plastic pipe	ASTM F2389
Polyvinyl chloride (PVC) plastic pipe	ASTM D1785; ASTM D2241
Raised temperature polyethylene (PE-RT)	ASTM F2623; ASTM F2769; CSA B137.18
Stainless steel pipe	ASTM A269; ASTM A312; ASTM A778
Stainless steel tubing	ASTM A269; ASTM A312; ASTM A778
Steel pipe	ASTM A53; ASTM A106
Steel tubing	ASTM A254

Add new standard(s) as follows:

ASTM

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

ASTM F2165-19 Standard Specification for Flexible Pre-Insulated Plastic Piping

ASTM D2683-20 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM F2165-19 Standard Specification for Flexible Pre-Insulated Plastic Piping, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: Certain hydronic systems operate at temperatures of 140°F or lower and are suitable for High-density Polyethylene (HDPE) piping systems. Examples include chilled water piping, indoor geothermal piping, and low temperature hydronic distribution. HDPE is often used for these applications and is approved in other codes. The six industry standards in the proposal are for HDPE pipe and tubing and are all current and up-to-date and represent piping materials that are suitable for several hydronic applications. .

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Including HDPE piping in Table 1202.4 provides an alternative piping option for hydronic applications. HDPE piping is less expensive than existing materials such as copper, iron, steel, or PEX piping, but HDPE is more expensive than certain other piping materials. This code change proposal may decrease the cost of construction by 0% to 50% if HDPE piping is selected by users, or it may increase the cost of construction by 0% to 25% if selected, or it may have no impact on the cost of construction if HDPE is not selected.

To assign dollar values to this proposal, the use of HDPE piping could decrease construction costs over a range from $1 to $100,000, depending on the size of the project, size of piping, etc. or it could increase construction costs over a range from $1 to $50,000, depending on the size of the project, size of piping, etc., or it could have no effect on construction costs if users do not select to use HDPE piping. This proposal simply provides another material option.

Estimated Immediate Cost Impact Justification (methodology and variables):

Sixteen piping materials are already approved in Table 1202.4. This proposal simply provides another material option. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. Therefore, only a range of cost decreases or increases can be provided in this format.

Estimated Life Cycle Cost Impact:

Sixteen piping materials are already approved in Table 1202.4. This proposal simply provides another material option. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. Published LCA studies indicate a reduced life cycle cost when using HDPE instead of several metallic materials.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

This proposal simply provides another material option. A summary of a LCA that compares HDPE to ductile iron pipe is available at

https://www.teppfa.eu/sustainability/environmental-footprint/lca/pe-vs-di-pipe-systems-for-pressurised-water-supply/

M78-24

M79-24

IMC®: TABLE 1202.5

2024 International Mechanical Code

Revise as follows:

TABLE 1202.5 HYDRONIC PIPE FITTINGS

MATERIAL	STANDARD (see Chapter 15)
Copper and copper alloys	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.24; ASME B16.26; ASME B16.51; ASSE 1061; ASTM F1974 ; ASTM F3226
CPVC	ASSE 1061; ASTM D2846; ASTM F438; ASTM F439
Ductile iron and gray iron	ANSI/AWWA C110/A21.10; ASTM A395; ASTM A536; ASTM F1476; ASTM F1548; AWWA C153/A21.53
Ductile iron	ANSI/AWWA C153/A21.53
Gray iron	ASTM A126
HDPE fittings	ASTM D2683; ASTM D3261; ASTM F1055; CSA B137.1
Malleable iron	ASME B16.3
PE-RT fittings	ASSE 1061; ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18
PEX fittings	ASSE 1061; ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F3253 ; ASTM F3347; ASTM F3348
Plastic	ASTM D2466; ASTM D2467; ASTM D2846; ASTM F877; ASTM F2389; ASTM F2735
Stainless steel	ASTM A269; ASTM A312; ASTM A778; ASTM F3226
Steel	ASME B16.5; ASME B16.9; ASME B16.11; ASME B16.28; ASTM A53; ASTM A106; ASTM A234; ASTM A395; ASTM A420; ASTM A536; ASTM F1476; ASTM F1548 ; ASTM F3226

Staff Analysis: The proposed referenced standards, ASTM D2683, D3261, F1055, and CSA B137.1, are currently referenced in the IMC.

Reason: Certain hydronic systems operate at temperatures of 140°F or lower and are suitable for High-density Polyethylene (HDPE) piping systems. Examples include chilled water piping, indoor geothermal piping, and low temperature hydronic distribution. HDPE is often used for these applications and is approved in other codes. The four industry standards in the proposal are for different styles of HDPE fittings which are suitable for certain hydronic applications and are all current and up-to-date.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

This proposal is related to a proposal to add HDPE piping to Table 1202.4 as an alternative piping option for hydronic applications. If HDPE piping is approved for Table 1202.4, then suitable HDPE fittings should be added to Table 1202.5.

HDPE piping is less expensive than existing materials such as copper, iron, steel, or PEX piping, but HDPE is more expensive than certain other piping materials. This code change proposal may decrease the cost of construction by 0% to 50% if HDPE piping is selected by users, or it may increase the cost of construction by 0% to 25% if selected, or it may have no impact on the cost of construction if HDPE is not selected.

To assign dollar values to this proposal, the use of HDPE piping could decrease construction costs over a range from $1 to $100,000, depending on the size of the project, size of piping, etc. or it could increase construction costs over a range from $1 to $50,000, depending on the size of the project, size of piping, etc., or it could have no effect on construction costs if users do not select to use HDPE piping. This proposal simply provides another material option.

Estimated Immediate Cost Impact Justification (methodology and variables):

Fittings for eleven (11) piping materials are already approved in Table 1202.5. This proposal simply provides another material option.

The amount of the cost decrease or increase is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. Therefore, only a range of cost decreases or increases can be provided in this format.

Estimated Life Cycle Cost Impact:

Fittings for eleven (11) piping materials are already approved in Table 1202.5. This proposal simply provides another material option.

The impact to Life Cycle Cost is highly dependent on exact comparisons for specific piping materials and sizes plus assembly and construction costs which vary for each individual project. Published LCA studies indicate a reduced life cycle cost when using HDPE instead of several metallic materials.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

This proposal simply provides another material option. A summary of a LCA that compares HDPE to ductile iron pipe is available at https://www.teppfa.eu/sustainability/environmental-footprint/lca/pe-vs-di-pipe-systems-for-pressurised-water-supply/

M79-24

M80-24

IMC®: TABLE 1202.5, ANSI Chapter 15 (New)

Proponents: Christopher Adam Smith, Viega, LLC, Codes and Standards Manager for Viega, LLC

2024 International Mechanical Code

Revise as follows:

TABLE 1202.5 HYDRONIC PIPE FITTINGS

MATERIAL	STANDARD (see Chapter 15)
Copper and copper alloys	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.24; ASME B16.26; ASME B16.51; ASSE 1061; ASTM F1974 ; ASTM F3226; IAPMO/ANSI/CAN Z1117
CPVC	ASSE 1061; ASTM D2846; ASTM F438; ASTM F439
Ductile iron and gray iron	ANSI/AWWA C110/A21.10; ASTM A395; ASTM A536; ASTM F1476; ASTM F1548; AWWA C153/A21.53
Ductile iron	ANSI/AWWA C153/A21.53
Gray iron	ASTM A126
Malleable iron	ASME B16.3
PE-RT fittings	ASSE 1061; ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18
PEX fittings	ASSE 1061; ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F3253 ; ASTM F3347; ASTM F3348
Plastic	ASTM D2466; ASTM D2467; ASTM D2846; ASTM F877; ASTM F2389; ASTM F2735
Stainless steel	ASTM A269; ASTM A312; ASTM A778; ASTM F3226; IAPMO/ANSI/CAN Z1117
Steel	ASME B16.5; ASME B16.9; ASME B16.11; ASME B16.28; ASTM A53; ASTM A106; ASTM A234; ASTM A395; ASTM A420; ASTM A536; ASTM F1476; ASTM F1548 ; ASTM F3226; IAPMO/ANSI/CAN Z1117

Add new standard(s) as follows:

ANSI

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036

IAPMO/ANSI/CAN Z1117-2022 Standard for Press Connections

Staff Analysis: A review of the standard proposed for inclusion in the code, IAPMO/ANSI/CAN Z1117-2022 Standard for Press Connections, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before March 18, 2024.

Reason: IAPMO/ANSI/CAN Z1117 is a harmonized standard for press-connect fittings used across North America. It is recognized and enforced in both the United States and Canada and encompasses multiple press-connect materials such as copper, steel, and stainless steel 304 and 316.

This addition to the Referenced Standards Chapter is in support of Proposal # 9274 that adds IAPMO/ANSI/CAN Z1117 to Table 1202.5 of the IMC.

ANSI/CAN Z1117 is a harmonized standard for all of North America recognized and enforced in both the United States and Canada. This standard encompasses multiple press-connect materials such as copper, steel, and stainless steel 304 and 316. There are already several press connect standards within the code, the addition of Z1117 seeks to add a harmonized version that makes adoption and enforcement easier across North America.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The addition of this standard does not increase the cost of construction. The addition of this standard allows for a wider selection of materials but does not make their use mandatory. By including this standard in the code, the options for installers will increase while the cost of construction should stay the same or even decrease.

M80-24

M81-24

IMC®: TABLE 1202.5

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1202.5 HYDRONIC PIPE FITTINGS

MATERIAL	STANDARD (see Chapter 15)
Copper and copper alloys	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.24; ASME B16.26; ASME B16.51; ASSE 1061; ASTM F1974 ; ASTM F3226
CPVC	ASSE 1061; ASTM D2846; ASTM F438; ASTM F439
Ductile iron and gray iron	ANSI/AWWA C110/A21.10; ASTM A395; ASTM A536; ASTM F1476; ASTM F1548; AWWA C153/A21.53
Ductile iron	ANSI/AWWA C153/A21.53
Gray iron	ASTM A126
Malleable iron	ASME B16.3
PE-RT fittings	ASSE 1061; ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18; ASTM F1960; ASTM F2623
PEX fittings	ASSE 1061; ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F3253 ; ASTM F3347; ASTM F3348
Plastic	ASTM D2466; ASTM D2467; ASTM D2846; ASTM F877; ASTM F2389; ASTM F2735
Stainless steel	ASTM A269; ASTM A312; ASTM A778; ASTM F3226
Steel	ASME B16.5; ASME B16.9; ASME B16.11; ASME B16.28; ASTM A53; ASTM A106; ASTM A234; ASTM A395; ASTM A420; ASTM A536; ASTM F1476; ASTM F1548 ; ASTM F3226

Staff Analysis: The proposed referenced standards, ASTM F1960 and F2623, are currently referenced in the IMC.

Reason: This proposal is to add two industry standards for fittings for PE-RT tubing to Table 1202.5.

ASTM F1960 “Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing” is for a fitting system which has recently been approved for use with PE-RT tubing (PE-RT and PEX have identical dimensions and share most of the same fitting systems).

ASTM F2623 “Standard Specification for Polyethylene of Raised Temperature (PE-RT) Systems for Non-Potable Water Applications” is a PE-RT system standard for non-potable applications, including hydronics, and includes requirements for fittings intended for use with PE-RT tubing.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Including these fitting standards for PE-RT tubing in Table 1202.5 provides alternative fitting options for hydronic applications. The fittings covered by these standards are slightly less expensive than certain existing fitting standards, but also might be slightly more expensive than other existing fitting standards. It depends on which fittings are being compared.

This code change proposal may decrease the cost of construction by 0% to 10% if these fitting standards are selected by users, or it may increase the cost of construction by 0% to 10% if these fitting standards are selected, or it may have no impact on the cost of construction if these fitting standards are not selected by users.

To assign dollar values to this proposal, the use of the fittings covered by these proposed standards could decrease construction costs over a range from $1 to $5 per fitting, depending on the size of the piping, or it could increase construction costs over a range from $1 to $5 per fitting, depending on the size of the piping, etc., or it could have no effect on construction costs if users do not select to use one of these fitting standards. This proposal simply provides other fitting options.

Estimated Immediate Cost Impact Justification (methodology and variables):

Eleven (11) fitting standards for use with PE-RT tubing are already approved in Table 1202.5. This proposal simply provides additional options. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific fitting materials and sizes, plus assembly and construction costs which vary for each individual project. Therefore, only a range of cost decreases or increases can be provided in this format.

Estimated Life Cycle Cost Impact:

Eleven (11) fitting standards for use with PE-RT tubing are already approved in Table 1202.5. This proposal simply provides additional options. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific fitting materials and sizes, plus assembly and construction costs which vary for each individual project.

The impact to Life Cycle Cost is highly dependent on exact comparisons for specific fitting materials and sizes plus assembly and construction costs which vary for each individual project.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Eleven (11) fitting standards for use with PE-RT tubing are already approved in Table 1202.5. This proposal simply provides additional options. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific fitting materials and sizes, plus assembly and construction costs which vary for each individual project.

The impact to Life Cycle Cost is highly dependent on exact comparisons for specific fitting materials and sizes plus assembly and construction costs which vary for each individual project.

M81-24

M82-24

IMC®: TABLE 1202.5

Proponents: Michael Cudahy, PPFA Plastic Pipe and Fittings Association, PPFA Plastic Pipe and Fittings Association (mikec@cmservices.com)

2024 International Mechanical Code

Revise as follows:

TABLE 1202.5 HYDRONIC PIPE FITTINGS

MATERIAL	STANDARD (see Chapter 15)
Copper and copper alloys	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.24; ASME B16.26; ASME B16.51; ASSE 1061; ASTM F1974 ; ASTM F3226
CPVC	ASSE 1061; ASTM D2846; ASTM F438; ASTM F439
Ductile iron and gray iron	ANSI/AWWA C110/A21.10; ASTM A395; ASTM A536; ASTM F1476; ASTM F1548; AWWA C153/A21.53
Ductile iron	ANSI/AWWA C153/A21.53
Gray iron	ASTM A126
Malleable iron	ASME B16.3
PE-RT fittings	ASSE 1061; ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18
PEX fittings	ASSE 1061; ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F2735; ASTM F3253 ; ASTM F3347; ASTM F3348
Polypropylene	ASTM F2389;
~~Plastic~~ PVC	ASTM D2466; ASTM D2467; ~~ASTM D2846; ASTM F877; ASTM F2389; ASTM F2735~~
Stainless steel	ASTM A269; ASTM A312; ASTM A778; ASTM F3226
Steel	ASME B16.5; ASME B16.9; ASME B16.11; ASME B16.28; ASTM A53; ASTM A106; ASTM A234; ASTM A395; ASTM A420; ASTM A536; ASTM F1476; ASTM F1548 ; ASTM F3226

Reason: This table looks like it had "plastic" as a legacy row, and there are already rows for other modern plastic materials, and some were missing, like PVC and PP. This proposal attempts to improve the table by reorganizing the rows with proper material names and proper standards.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal is a reorganization of a table and is not expected to change the costs of construction.

M82-24

M83-24

IMC®: 1208.1

Proponents: Michael Cudahy, PPFA Plastic Pipe and Fittings Association, PPFA Plastic Pipe and Fittings Association (mikec@cmservices.com)

2024 International Mechanical Code

Revise as follows:

1208.1 General. Hydronic piping systems shall be tested hydrostatically at one and one-half times the maximum system design pressure, but not less than 100 psi (689 kPa). The duration of each test shall be not less than 15 minutes.

> **Exception:** For PEX and PERT piping systems, testing with a compressed gas shall be an alternative to hydrostatic testing where compressed air or other gas pressure testing is specifically authorized by all of the manufacturers' instructions for the PEX and PERT pipe and fitting products installed at the time the system is being tested, and compressed air or other gas testing is not otherwise prohibited by applicable codes, laws or regulations outside of this code.

Reason: Current PEX and PERT manufacturers may allow for the practice of air testing.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

This proposal offers an alternative for pressure testing PERT tubing materials using compressed gas, potentially reducing the cost of testing pipes in these systems by $1 to $10,000. In situations with available water and no freezing risk, the cost decrease may be minimal, around $1 or less, as compressed gas testing is unnecessary.

If water is unavailable during pipe installation, the cost reduction could range from $1 to $1,000 by eliminating the need to transport water for testing.

In cold weather, when compressed air isn't an option, providing temporary heat to prevent freezing may cost $100 to $10,000, depending on building size and completion status. For instance, if a partially enclosed building requires temporary insulation during cold-weather testing, or occupancy is delayed due to conditions, allowing the use of compressed gas could yield a +$10,000 cost reduction.

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal offers an alternative for pressure testing PERT tubing materials using compressed gas, potentially reducing the cost of testing pipes in these systems by $1 to $10,000. In situations with available water and no freezing risk, the cost decrease may be minimal, around $1 or less, as compressed gas testing is unnecessary.

If water is unavailable during pipe installation, the cost reduction could range from $1 to $1,000 by eliminating the need to transport water for testing.

In cold weather, when compressed air isn't an option, providing temporary heat to prevent freezing may cost $100 to $10,000, depending on building size and completion status. For instance, if a partially enclosed building requires temporary insulation during cold-weather testing, or occupancy is delayed due to conditions, allowing the use of compressed gas could yield a +$10,000 cost reduction.

Estimated Life Cycle Cost Impact:

No life cycle cost impacts are expected to occur using air or water testing during the life of the building or project.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

No life cycle cost impacts are expected to occur using air or water testing during the life of the building or project.

M83-24

M84-24

IMC®: TABLE 1210.4, TABLE 1210.5, 1210.6.4

Proponents: Greg Kurtz Technical Director, The International Ground Source Heat Pump Association (IGSHPA), The International Ground Source Heat Pump Association (IGSHPA) (gkurtz@igshpa.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1210.4 GROUND-SOURCE LOOP PIPE

MATERIAL	STANDARD (see Chapter 15)
~~Chlorinated polyvinyl chloride (CPVC)~~	~~ASTM D2846; ASTM F441; ASTM F442~~
Cross-linked polyethylene (PEX)	ASTM F876; ASTM F3253; CSA B137.5; CSA C448; NSF 358-3
Polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe	ASTM F1282; CSA B137.9
High-density polyethylene (HDPE)	ASTM D2737; ASTM D3035; ASTM F714; AWWA C901; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F2389; CSA B137.11; NSF 358-2
Polyvinyl chloride (PVC)	ASTM D1785; ASTM D2241
Raised temperature polyethylene (PE-RT)	ASTM F2623; ASTM F2769; CSA B137.18; CSA C448; NSF 358-4

TABLE 1210.5 GROUND-SOURCE LOOP PIPE FITTINGS

PIPE MATERIAL	STANDARD (see Chapter 15)
~~Chlorinated polyvinyl chloride (CPVC)~~	~~ASTM D2846; ASTM F437; ASTM F438; ASTM F439; CSA B137.6~~
Cross-linked polyethylene (PEX)	ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F2434; ASTM F3347; ASTM F3348; CSA B137.5; CSA C448; NSF 358-3
Polyethylene/aluminum/polyethylene (PE-AL-PE)	ASTM F1282; ASTM F2434; CSA B137.9
High-density polyethylene (HDPE)	ASTM D2683; ASTM D3261; ASTM F1055; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F2389; CSA B137.11; NSF 358-2
Polyvinyl chloride (PVC)	ASTM D2464; ASTM D2466; ASTM D2467; CSA B137.2; CSA B137.3
Raised temperature polyethylene (PE-RT)	ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18; CSA C448; NSF 358-4

Delete without substitution:

~~**1210.6.4 CPVC plastic pipe.** Joints between CPVC plastic pipe or fittings shall be solvent-cemented or threaded joints complying with Section 1203.3.~~

Reason: CPVC is a rigid piping material supplied only in short lengths of 10-20 feet and joined via solvent cement or various types of mechanical fittings (e.g., flanges). This pipe is not suitable for ground loop piping because of its lack of flexibility and requirement for many joints over a typical pipe length of 400 or more feet in a ground loop piping system. In addition, the time required for solvent cement joints to cure is not suitable for installation of pipes in a vertical borehole, which often requires more than 400 feet of two vertical pipes to be installed as quickly as possible to prevent the drilled hole from collapsing. Also, CPVC is not suitable for use with propylene glycol in the higher concentrations which are sometimes required in geothermal ground loop systems. The International Ground Source Heat Pump Association (IGSHPA), founded in 1987, has never recommended CPVC for ground source loop piping. Failures have occurred in the field when installers attempted to use CPVC piping for these applications many years ago. The *ANSI / CSA / IGSHPA C448 Series 16 Bi-National Standard for the design and installation of ground source heat pump systems for commercial and residential buildings* does not list CPVC rigid piping as an acceptable material for Geothermal ground loop installations. Additionally, the piping Task Force for the New Edition (2024) of the *ANSI / CSA / IGSHPA C448 Bi- National Standard* have reviewed all suitable piping materials for Geothermal ground loop installations and continue to NOT list CPVC material as suitable piping material for Geothermal installations.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

CPVC is one of seven (7) piping materials listed in Table 1210.4 for ground loop piping and the user has several choices of better materials for this application, which are approved by IGSHPA or listed in the ANSI / CSA / IGSHPA Bi – National C448 Standard, and commonly used for this purpose. Because CPVC is known in the industry to be not suitable for these applications and is not recommended for this purpose by IGSHPA or the ANSI / CSA / IGSHPA Bi – National C448 Standard, it is rarely, if ever, used for this purpose. Therefore, the removal of CPVC piping from Table 1210.4 will neither decrease nor increase the cost of construction.

M85-24

IMC®: TABLE 1210.4, TABLE 1210.5, 1210.6.9

Proponents: Greg Kurtz Technical Director, The International Ground Source Heat Pump Association (IGSHPA), The International Ground Source Heat Pump Association (IGSHPA) (gkurtz@igshpa.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1210.4 GROUND-SOURCE LOOP PIPE

MATERIAL	STANDARD (see Chapter 15)
Chlorinated polyvinyl chloride (CPVC)	ASTM D2846; ASTM F441; ASTM F442
Cross-linked polyethylene (PEX)	ASTM F876; ASTM F3253; CSA B137.5; CSA C448; NSF 358-3
Polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe	ASTM F1282; CSA B137.9
High-density polyethylene (HDPE)	ASTM D2737; ASTM D3035; ASTM F714; AWWA C901; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F2389; CSA B137.11; NSF 358-2
~~Polyvinyl chloride (PVC)~~	~~ASTM D1785; ASTM D2241~~
Raised temperature polyethylene (PE-RT)	ASTM F2623; ASTM F2769; CSA B137.18; CSA C448; NSF 358-4

TABLE 1210.5 GROUND-SOURCE LOOP PIPE FITTINGS

PIPE MATERIAL	STANDARD (see Chapter 15)
Chlorinated polyvinyl chloride (CPVC)	ASTM D2846; ASTM F437; ASTM F438; ASTM F439; CSA B137.6
Cross-linked polyethylene (PEX)	ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F2434; ASTM F3347; ASTM F3348; CSA B137.5; CSA C448; NSF 358-3
Polyethylene/aluminum/polyethylene (PE-AL-PE)	ASTM F1282; ASTM F2434; CSA B137.9
High-density polyethylene (HDPE)	ASTM D2683; ASTM D3261; ASTM F1055; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F2389; CSA B137.11; NSF 358-2
~~Polyvinyl chloride (PVC)~~	~~ASTM D2464; ASTM D2466; ASTM D2467; CSA B137.2; CSA B137.3~~
Raised temperature polyethylene (PE-RT)	ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18; CSA C448; NSF 358-4

Delete without substitution:

~~**1210.6.9 PVC plastic pipe.** Joints between PVC plastic pipe and fittings shall be solvent-cemented or threaded joints complying with Section 1203.3.~~

Reason: PVC is a rigid piping material supplied only in short lengths of 10-20 feet and joined via solvent cement or various types of mechanical fittings (e.g., flanges). This pipe is not suitable for ground loop piping because of its lack of flexibility and requirement for many joints over a typical pipe length of 400 or more feet in a ground loop piping system. In addition, the time required for solvent cement joints to cure is not suitable for installation of pipes in a vertical borehole, which often requires more than 400 feet of two vertical pipes to be installed as quickly as possible to prevent the drilled hole from collapsing. The International Ground Source Heat Pump Association (IGSHPA), founded in 1987, has never recommended PVC for ground source loop piping. Failures have occurred in the field when installers attempted to use PVC piping for these applications many years ago. The *ANSI / CSA / IGSHPA C448 Series 16 Bi-National Standard for the design and installation of ground source heat pump systems for commercial and residential buildings* does not list PVC rigid piping as an acceptable material for Geothermal ground loop installations. Additionally, the piping Task Force for the New Edition (2024) of the *ANSI / CSA / IGSHPA C448 Bi- National Standard* have reviewed all suitable piping materials for Geothermal ground loop installations and continue to NOT list PVC material as suitable piping material for Geothermal installations.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

PVC is one of seven (7) piping materials listed in Table 1210.4 for ground loop piping and the user has several choices of better materials for this application, which are approved by IGSHPA or listed in the ANSI / CSA / IGSHPA Bi – National C448 Standard, and commonly used for this purpose. Because PVC is known in the industry to be not suitable for these applications and is not recommended for this purpose by IGSHPA, or the ANSI / CSA / IGSHPA Bi – National C448 Standard it is rarely, if ever, used for this purpose. Therefore, the removal of PVC piping from Table 1210.4 will neither decrease nor increase the cost of construction.

M86-24

IMC®: TABLE 1210.5

Proponents: Lance MacNevin, Director of Engineering, The Plastics Pipe Institute, The Plastics Pipe Institute (lmacnevin@plasticpipe.org)

2024 International Mechanical Code

Revise as follows:

TABLE 1210.5 GROUND-SOURCE LOOP PIPE FITTINGS

PIPE MATERIAL	STANDARD (see Chapter 15)
Chlorinated polyvinyl chloride (CPVC)	ASTM D2846; ASTM F437; ASTM F438; ASTM F439; CSA B137.6
Cross-linked polyethylene (PEX)	ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F2434; ASTM F3347; ASTM F3348; CSA B137.5; CSA C448; NSF 358-3
Polyethylene/aluminum/polyethylene (PE-AL-PE)	ASTM F1282; ASTM F2434; CSA B137.9
High-density polyethylene (HDPE)	ASTM D2683; ASTM D3261; ASTM F1055; CSA B137.1; CSA C448; NSF 358-1
Polypropylene (PP-R)	ASTM F2389; CSA B137.11; NSF 358-2
Polyvinyl chloride (PVC)	ASTM D2464; ASTM D2466; ASTM D2467; CSA B137.2; CSA B137.3
Raised temperature polyethylene (PE-RT)	ASTM D3261; ASTM F1807; ASTM F1960; ASTM F2098; ASTM F2159; ASTM F2623; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.1; CSA B137.18; CSA C448; NSF 358-4

Staff Analysis: The proposed referenced standards, ASTM F1960 and F2623, are currently referenced in the IMC.

Reason: This proposal is to add two industry standards for fittings for PE-RT tubing to Table 1210.5. ASTM F1960 “Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing” is for a fitting system which has recently been approved for use with PERT tubing (PE-RT and PEX have identical dimensions and share most of the same fitting systems). ASTM F2623 “Standard Specification for Polyethylene of Raised Temperature (PE-RT) Systems for Non-Potable Water Applications” is a PE-RT system standard for non-potable applications, including hydronics, and includes requirements for fittings intended for use with PERT tubing.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Including these fitting standards for PE-RT tubing in Table 1210.5 provides alternative fitting options for hydronic applications. The fittings covered by these standards are slightly less expensive than certain existing fitting standards, but also might be slightly more expensive than other existing fitting standards. It depends on which fittings are being compared. This code change proposal may decrease the cost of construction by 0% to 10% if these fitting standards are selected by users, or it may increase the cost of construction by 0% to 10% if these fitting standards are selected, or it may have no impact on the cost of construction if these fitting standards are not selected by users. To assign dollar values to this proposal, the use of the fittings covered by these proposed standards could decrease construction costs over a range from $1 to $5 per fitting, depending on the size of the piping, or it could increase construction costs over a range from $1 to $5 per fitting, depending on the size of the piping, etc., or it could have no effect on construction costs if users do not select to use one of these fitting standards. This proposal simply provides other fitting options.

Estimated Immediate Cost Impact Justification (methodology and variables):

Twelve (12) fitting standards for use with PE-RT tubing are already approved in Table 1210.5. This proposal simply provides additional options. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific fitting materials and sizes, plus assembly and construction costs which vary for each individual project. Therefore, only a range of cost decreases or increases can be provided in this format.

Estimated Life Cycle Cost Impact:

Twelve (12) fitting standards for use with PE-RT tubing are already approved in Table 1210.5. This proposal simply provides additional options. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific fitting materials and sizes, plus assembly and construction costs which vary for each individual project. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific fitting materials and sizes plus assembly and construction costs which vary for each individual project.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Twelve (12) fitting standards for use with PE-RT tubing are already approved in Table 1210.5. This proposal simply provides additional options. The amount of the cost decrease or increase is highly dependent on exact comparisons for specific fitting materials and sizes, plus assembly and construction costs which vary for each individual project. The impact to Life Cycle Cost is highly dependent on exact comparisons for specific fitting materials and sizes plus assembly and construction costs which vary for each individual project.

M86-24

M87-24

IMC®: TABLE 1302.3

Proponents: Christopher Adam Smith, Viega, LLC, Codes and Standards Manager for Viega, LLC

2024 International Mechanical Code

Revise as follows:

TABLE 1302.3 FUEL OIL PIPING AND FITTINGS

MATERIAL	STANDARD (see Chapter 15)
Copper or copper-alloy pipe and fittings	ASTM B42; ASTM B43; ASTM B302; ASTM F3226
Copper or copper-alloy tubing and fittings (Type K, L or M)	~~ASME B16.51;~~ <u>;</u> ASTM B75; ASTM B88; ~~ASTM B280;~~ ASTM F3226
Labeled pipe	(See Section 1302.4)
Nonmetallic pipe	ASTM D2996
Steel and stainless steel pipe and fittings	ASTM A53; ASTM A106; A312/A312M; ASTM F3226; <u>UL 180</u>
Steel and stainless steel tubing and fittings	ASTM A254; A269/A269M; ASTM A539; ASTM F3226; <u>UL 180</u>

Staff Analysis: The proposed referenced standard, UL 180, is currently referenced in the IMC.

Reason: This proposal adds UL 180 "Combustible Liquid Tank Accessories" is a standard for pipe, fittings, and accessories for use with fuel oil. This Standard has been revised since the IMC was last updated, and now includes press-connect fittings. Adding UL 180 to this table will allow press-connect fittings to be used for fuel oil applications, and inspectors will be able to verify that those fittings have been listed and labeled for the application.

This proposal will also remove the standards ASME B16.51 "Copper and Copper-Alloy Press-Connect Pressure Fittings" and ASTM B280 "Seamless Copper Tube for Air Conditioning and Refrigeration Field Service." ASME B16.51 has a scope which covers only "...pressure fittings for use with hard-drawn seamless copper water tube conforming to ASTM B88 for piping systems conveying water." ASTM B280 is a refrigerant tubing standard. It is our understanding that these standards were used in lieu of applicable standards available at the time. The Code will be more accurate and less confusing with these two inappropriate references removed from the Table. Removal of these standards from this table will decrease the likelihood of inappropriate products being used in a fuel oil application.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The addition of this standard does not increase the cost of construction. The addition of this standard allows for a wider selection of materials but does not make their use mandatory. By including this standard in the code, the options for installers will increase while the cost of construction should stay the same or even decrease.

M87-24

M88-24

IMC®: 1302.9

Proponents: Christopher Adam Smith, Viega, LLC, Codes and Standards Manager for Viega, LLC

2024 International Mechanical Code

Revise as follows:

1302.9 Piping systems.
Above-ground piping systems shall be *listed* and *labeled* in accordance with UL 1369 or UL 180. Underground piping systems shall be *listed* and *labeled* in accordance with UL 971A.

Staff Analysis: The proposed referenced standard, UL 180, is currently referenced in the IMC.

Reason: This proposal adds UL 180 "Combustible Liquid Tank Accessories" is a standard for pipe, fittings, and accessories for use with fuel oil. This Standard has been revised since the IMC was last updated, and now includes press-connect fittings. Adding UL 180 to this table will allow press-connect fittings to be used for fuel oil applications, and inspectors will be able to verify that those fittings have been listed and labeled for the application.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The addition of this standard does not increase the cost of construction. The addition of this standard allows for a wider selection of materials but does not make their use mandatory. By including this standard in the code, the options for installers will increase while the cost of construction should stay the same or even decrease.

M88-24

M89-24

IMC®: SECTION 202 (New), 309.2 (New)

Proponents: Clayton Trevillyan, City of Tucson, City of Tucson (clayton.trevillyan@tucsonaz.gov); Pete Quintela, Miami-Dade County, Miami-Dade County; Jane Gilbert, Miami-Dade County, Miami-Dade County (jane.gilbert@miamidade.gov); Stefano Schiavon, University of California, Berkeley, Self (schiavon@berkeley.edu); Ali Frazzini, Los Angeles County Chief Sustainability Office (afrazzini@cso.lacounty.gov); Mary Wright, City of Phoenix/Office of Heat Response and Mitigation, self

2024 International Mechanical Code

Add new definition as follows:

DESIGN COOLING DAY. A design parameter where air conditioning loads are determined.

Add new text as follows:

309.2 Cooling systems. Interior spaces intended for human occupancy shall be capable of maintaining an indoor temperature at or below 80°F (27°C) in the occupied zone 3 feet (914 mm) above the floor and at least 2 feet (610 mm) from exterior walls on the *design cooling day.* Where permanently installed fans capable of generating 120 fpm (0.6 m/s) air speed within the occupied zone, the indoor temperature during the *design cooling day* shall be maintained at or below 85°F (29°C). The installation of one or more portable systems shall not be used to achieve compliance with this section.

Exception: Cooling systems shall not be required for the following:

1. Interior spaces where the primary purpose is not associated with human comfort.
2. Group F, H, S and U occupancies.

Reason: The building code requires minimum heating of spaces for the safety of the occupants. The code is silent on requirements for cooling, despite the negative impacts of elevated exterior thermal conditions on humans. The built environment is a safe haven from the effects of weather and climatic conditions, heat not being an exception for people to seek shelter from the elements. Media attention to heat-related health emergencies on the elderly and people in underserved communities demonstrates the need for improvements in the built environment[1]. As a result of increased summer temperatures, some jurisdictions have already mandated cooling be provided in new buildings and many others are considering extreme heat related ordinances. A coordinated application in the codes that can be consistently applied to new construction is warranted due to the trend in local agencies with differing requirements throughout the county.

The proposal is a performance specification to ensure safety in the built environment due to higher expected summer thermal conditions. The solution can either be active or passive systems, or a combination of these systems to provide relief from elevated thermal conditions. The active systems would include traditional central mechanical air conditioning systems that are provided in most modern homes and do not represent a significant change to how most buildings are constructed. Passive cooling systems utilize unique design features of the building that prevent heat from entering the building and/or removing heat from the building. Passive design applications include building orientation, insulation, solar control (shading and landscaping), ventilation and other methods that naturally, and without input energy, would provide and maintain thermal comfort. Passive systems could be more cost effective in both the short term and the long term as compared to active mechanical systems for circumstances where a few design changes could comply with specified interior temperature. The interior temperature of 80°F was selected as the maximum temperature for the thermal comfort of the interior environment based on ANSI/ASHRAE Standard 55-2020[2] and generally at, or above the temperature in most local ordinances.

The second sentence recognizes that air movement provides a cooling effect as experienced by the occupants of the building. ASHRAE Standard 55-2020 states that air movement of only 120 feet per minute results in the perception of 5°F cooler temperatures. Where permanent fans are installed, the resulting interior maximum temperature can be increased 5°F above the baseline temperature of 80°F that would be required for either the active or passive systems installed in accordance with the first sentence of the code change proposal. This is an additional cost-effective manner to provide the minimum cooling effect on human bodies where thermal comfort and safety is provided in the built environment. Permanently installed fans can include ceiling fans, wall-mounted fans, bladeless ceiling fans, or any permanently installed fan that can be verified at the time of final inspection that the equipment is installed.

The third sentence is a carryover from the heating requirement, where the expectation for compliance is permanently installed equipment that can be utilized by the occupant as needed for thermal comfort and lifesaving opportunities from dangerous heat related health considerations.

Bibliography: (1) Kenny, Glen P., Jane Yardley, Candice Brown, Ronald J. Sigal, and Ollie Jay. "Heat Stress in Older Individuals and Patients with Common Chronic Diseases." CMAJ 182, no. 10 (July 13, 2010): 1053–60. https://doi.org/10.1503/cmaj.081050.

(2) ANSI/ASHRAE 55-2020: Thermal Environmental Conditions for Human Occupancy. Atlanta, GA, US: ASHRAE, 2020.

(3) RSMeans https://www.businesshue.com/commercial-hvac-cost-per-square-foot/.

(4) Energy Trust https://www.energytrust.org/wp-content/uploads/2018/06/AC-Research_PhaseII_9MAR2018_Final.pdf.

(5) IEA https://www.iea.org/reports/sustainable-affordable-cooling-can-save-tens-of-thousands-of-lives-each-year.

Cost Impact: Increase

Estimated Immediate Cost Impact:

$0 - $31+ per square foot of new or renovated habitable buildings.
The immediate cost impact to construction is for newly constructed or renovated buildings. There is no immediate cost to existing buildings. This value ranges greatly depending on variables that include but are not limited to:

- If the proposed construction would include cooling regardless of this code change. Zero cost impact will apply to many regions and project scopes for new permits.
- If the project includes a system that can be further supplemented at relatively low cost due to other air handling equipment that would have otherwise been included in the project scope.
- The method of proposed cooling and quality of equipment.
- Level of efficiency and sustainability of system design.
- The climate zone of project area.

Estimated Immediate Cost Impact Justification (methodology and variables):

1. Estimation from major HVAC contractor (Watsco)

"There are a lot of variables (i.e. size of the building, type of system, region, needs, installation costs). Below are some rough estimates"

- For commercial buildings the average cost can range from $15 to $30 per sq ft for a basic system but can go up to $40+ for more complex or high efficiency systems.
- For multi-family buildings the average cost can range from $2,500-$5,000 per unit for a basic system increasing in price for high efficiency units. ($40 pf @ 2 units for 4000 sf)

Comparison necessary to isolate cost of heating systems alone (e.g. furnace/boiler systems) to identify cost differential.

2. RSMeans Data (remeansonline.com)

$8-30 per sf
https://www.businesshue.com/commercial-hvac-cost-per-square-foot/

3. AC cost report (page 28)

https://www.energytrust.org/wp-content/uploads/2018/06/AC-Research_PhaseII_9MAR2018_Final.pdf

4. Report from IEA, claiming that fans are the best affordable and available active cooling technology.

https://www.iea.org/reports/sustainable-affordable-cooling-can-save-tens-of-thousands-of-lives-each-year

M89-24