

2021 International Mechanical Code®

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PREFACE

Introduction

The *International Mechanical Code*® (IMC®) establishes minimum requirements for mechanical systems using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new mechanical designs. This 2021 edition is fully compatible with all of the International Codes (I-Codes®) published by the International Code Council (ICC), including the *International Building Code*®, *International Energy Conservation Code*®, *International Existing Building Code*®, *International Fire Code*®, *International Fuel Gas Code*®, *International Green Construction Code*®, *International Plumbing Code*®, *International Private Sewage Disposal Code*®, *International Property Maintenance Code*®, *International Residential Code*®, *International Swimming Pool and Spa Code*®, *International Wildland-Urban Interface Code*®, *International Zoning Code*® and *International Code Council Performance Code*®.

The I-Codes, including this *International Mechanical Code*, are used in a variety of ways in both the public and private sectors. Most industry professionals are familiar with the I-Codes as the basis of laws and regulations in communities across the US and in other countries. However, the impact of the codes extends well beyond the regulatory arena, as they are used in a variety of nonregulatory settings, including:

- Voluntary compliance programs such as those promoting sustainability, energy efficiency and disaster resistance.
- The insurance industry, to estimate and manage risk, and as a tool in underwriting and rate decisions.
- Certification and credentialing of individuals involved in the fields of building design, construction and safety.
- Certification of building and construction-related products.
- US federal agencies, to guide construction in an array of government-owned properties.
- Facilities management.
- “Best practices” benchmarks for designers and builders, including those who are engaged in projects in jurisdictions that do not have a formal regulatory system or a governmental enforcement mechanism.
- College, university and professional school textbooks and curricula.
- Reference works related to building design and construction.

In addition to the codes themselves, the code development process brings together building professionals on a regular basis. It provides an international forum for discussion and deliberation about building design, construction methods, safety, performance requirements, technological advances and innovative products.

Development

This 2021 edition presents the code as originally issued, with changes reflected in the 2003 through 2018 editions and further changes approved by the ICC Code Development Process through 2019. A new edition such as this is promulgated every 3 years.

This code is founded on principles intended to establish provisions consistent with the scope of a mechanical code that adequately protects public health, safety and welfare; provisions that do not unnecessarily increase construction costs; provisions that do not restrict the use of new materials, products or methods of construction; and provisions that do not give preferential treatment to particular types or classes of materials, products or methods of construction.

Maintenance

The *International Mechanical Code* is kept up-to-date through the review of proposed changes submitted by code enforcement officials, industry representatives, design professionals and other interested parties. Proposed changes are carefully considered through an open code development process in which all interested and affected parties may participate.

The ICC Code Development Process reflects principles of openness, transparency, balance, due process and consensus, the principles embodied in OMB Circular A-119, which governs the federal government's use of private-sector standards. The ICC process is open to anyone; there is no cost to participate, and people can participate without travel cost through the ICC's cloud-based app, *cdp access*®. A broad cross-section of interests are represented in the ICC Code Development Process. The codes, which are updated regularly, include safeguards that allow for emergency action when required for health and safety reasons.

In order to ensure that organizations with a direct and material interest in the codes have a voice in the process, the ICC has developed partnerships with key industry segments that support the ICC's important public safety mission. Some code development committee members were nominated by the following industry partners and approved by the ICC Board:

- American Institute of Architects (AIA)
- National Association of Home Builders (NAHB)

The code development committees evaluate and make recommendations regarding proposed changes to the codes. Their recommendations are then subject to public comment and council-wide votes. The ICC's governmental members—public safety officials who have no financial or business interest in the outcome—cast the final votes on proposed changes.

The contents of this work are subject to change through the code development cycles and by any governmental entity that enacts the code into law. For more information regarding the code development process, contact the Codes and Standards Development Department of the International Code Council.

While the I-Code development procedure is thorough and comprehensive, the ICC, its members and those participating in the development of the codes disclaim any liability resulting from the publication or use of the I-Codes, or from compliance or noncompliance with their provisions. The ICC does not have the power or authority to enforce or enforce compliance with the contents of this code.

Code Development Committee Responsibilities (Letter Designations in Front of Section Numbers)

In each code development cycle, proposed changes to this code are considered at the Committee Action Hearings of the International Mechanical Code Development Committee, whose action constitutes a recommendation to the voting membership for final action on the proposed change. Code change proposals to sections of the code that are preceded by a bracketed letter designation are considered by a different code development committee. For example, proposed changes to code sections that have [BG] in front of them (e.g., [BG] 309.1) are considered by the IBC—General Code Development Committee at the Committee Action Hearing.

The bracketed letter designations for committees responsible for portions of this code are as follows:

- [A] = Administrative Code Development Committee
- [BE] = IBC—Egress Code Development Committee
- [BF] = IBC—Fire Safety Code Development Committee
- [BG] = IBC—General Code Development Committee
- [BS] = IBC—Structural Code Development Committee
- [E] = International Energy Conservation Code Development Committee

[F] = International Fire Code Development Committee

[FG] = International Fuel Gas Code Development Committee

[P] = *International Plumbing Code*

For the development of the 2024 edition of the I-Codes, there will be two groups of code development committees and they will meet in separate years, as shown in the following Code Development Hearings table.

CODE DEVELOPMENT HEARINGS

| Group A Codes (Heard in 2021, Code Change Proposals Deadline: January 11, 2021) | Group B Codes (Heard in 2022, Code Change Proposals Deadline: January 10, 2022) |
|---|---|
| International Building Code – Egress (Chapters 10, 11, Appendix E) – Fire Safety (Chapters 7, 8, 9, 14, 26) – General (Chapters 2–6, 12, 27–33, Appendices A, B, C, D, K, N) | Administrative Provisions (Chapter 1) of all codes except IECC, IRC and IgCC. Administrative updates to currently referenced standards, and designated definitions) |
| International Fire Code | International Building Code – Structural (Chapters 15–25, Appendices F, G, H, I, J, L, M) |
| International Fuel Gas Code | International Existing Building Code |
| International Mechanical Code | International Energy Conservation Code— Commercial |
| International Plumbing Code | International Energy Conservation Code— Residential – IECC—Residential – IRC—Energy (Chapter 11) |
| International Property Maintenance Code | International Green Construction Code (Chapter 1) |
| International Private Sewer Disposal Code | International Residential Code – IRC—Building (Chapters 1–10, Appendices E, F, H, J, K, L, M, O, Q, R, S, T) |
| International Residential Code – IRC—Mechanical (Chapters 12–23) – IRC—Plumbing (Chapters 25–33, Appendices G, I, N, P) | |
| International Swimming Pool and Spa Code | |
| International Wildland-Urban Interface Code | |
| International Zoning Code | |

Note: Proposed changes to the *ICC Performance Code™* will be heard by the code development committee noted in brackets [] in the text of the *ICC Performance Code™*.

Code change proposals submitted for code sections that have a letter designation in front of them will be heard by the respective committee responsible for such code sections. Because different committees hold Committee Action Hearings in different years, proposals for this code will be heard by committees in both the 2021 (Group A) and the 2022 (Group B) code development cycles.

For example, every section of Chapter 1 of this code is designated as the responsibility of the Administrative Code Development Committee, and that committee is part of the Group B code hearings. This committee will conduct its code development hearings in 2022 to consider all code change

proposals for Chapter 1 of this code and proposals for Chapter 1 of all I-Codes except the *International Energy Conservation Code*, *International Residential Code* and *International Green Construction Code*. Therefore, any proposals received for Chapter 1 of this code will be assigned to the Administrative Code Development Committee for consideration in 2022.

Another example is Section [BS] 302.3 of this code, which is designated as the responsibility of the International Building Code Structural Code Development Committee. This committee will conduct its code development hearings in 2022 to consider code change proposals in its purview, which includes any proposals to Section [BS] 302.3.

In some cases, another committee in Group A will be responsible for a section of this code. For example, Section 607 has a [BF] in front of the numbered sections, indicating that these sections of the code are the responsibility of one of the International Building Code Development Committees. The *International Building Code* is in Group A; therefore, any code change proposals to this section will be due before the Group A deadline of January 2021, and these code change proposals will be assigned to the appropriate International Building Code Development Committee for consideration.

It is very important that anyone submitting code change proposals understand which code development committee is responsible for the section of the code that is the subject of the code change proposal. For further information on the Code Development Committee responsibilities, please visit the ICC website at <https://www.iccsafe.org/products-and-services/i-codes/code-development/current-code-development-cycle>.

Marginal Markings

Solid vertical lines in the margins within the body of the code indicate a technical change from the requirements of the 2018 edition. Deletion indicators in the form of an arrow (➡) are provided in the margin where an entire section, exception or table has been deleted or an item in a list of items or a row of a table has been deleted.

A single asterisk [*] placed in the margin indicates that text or a table has been relocated within the code. A double asterisk [**] placed in the margin indicates that the text or table immediately following it has been relocated there from elsewhere in the code. The following table indicates such relocations in the 2021 edition of the *International Mechanical Code*.

RELOCATIONS

| 2021 LOCATION | 2018 LOCATION |
|---------------|---------------------|
| 104.1 | 103.4 |
| 104.1.1 | 103.4.1 |
| 107 | 110 |
| 108 | 107.1–107.3.3 |
| 109 | 106.5 and 106.5.1 |
| 110 | 106.3.1 and 106.4.6 |
| 111 | 107.4 and 107.4.1 |
| 112 | 107.5 and 107.6 |
| 114.2 | 109.1 |
| 115 | 108 |
| C101.3 | 109.2 |
| C101.3.1 | 109.2.1 |
| C101.3.2 | 109.2.2 |
| C101.3.4 | 109.2.3 |
| C101.3.5 | 109.2.5 |
| C101.3.6 | 109.2.4 |
| C101.3.7 | 109.2.6 |

(continued)

RELOCATIONS—continued

| 2021 LOCATION | 2018 LOCATION |
|---------------|---------------|
| C101.4 | 109.4.1 |
| C101.5.1 | 109.4 |
| C101.5.3 | 109.5 |
| C101.7 | 109.6 |
| C101.7.1 | 109.6.1 |
| C101.7.2 | 109.6.2 |
| C101.8 | 109.7 |

Coordination of the International Codes

The coordination of technical provisions is one of the strengths of the ICC family of model codes. The codes can be used as a complete set of complementary documents, which will provide users with full integration and coordination of technical provisions. Individual codes can also be used in subsets or as stand-alone documents. To make sure that each individual code is as complete as possible, some technical provisions that are relevant to more than one subject area are duplicated in some of the model codes. This allows users maximum flexibility in their application of the I-Codes.

Italicized Terms

Words and terms defined in Chapter 2, Definitions, are italicized where they appear in code text and the Chapter 2 definitions apply. Where such words and terms are not italicized, common-use definitions apply. The words and terms selected have code-specific definitions that the user should read carefully to facilitate better understanding of the code.

Adoption

The International Code Council maintains a copyright in all of its codes and standards. Maintaining copyright allows the ICC to fulfill its mission through sales of books, in both print and electronic formats. The ICC welcomes adoption of its codes by jurisdictions that recognize and acknowledge the ICC's copyright in the code and further acknowledge the substantial shared value of the public/private partnership for code development between jurisdictions and the ICC.

The ICC also recognizes the need for jurisdictions to make laws available to the public. All I-Codes and I-Standards, along with the laws of many jurisdictions, are available for free in a nondownloadable form on the ICC's website. Jurisdictions should contact the ICC at adoptions@iccsafe.org to learn how to adopt and distribute laws based on the *International Mechanical Code* in a manner that provides necessary access, while maintaining the ICC's copyright.

To facilitate adoption, several sections of this code contain blanks for fill-in information that needs to be supplied by the adopting jurisdiction as part of the adoption legislation. For this code, please see:

Section 101.1. Insert: [NAME OF JURISDICTION]

Section 103.1. Insert: [NAME OF DEPARTMENT]

Section 115.4. Insert: [OFFENSE, DOLLAR AMOUNT, NUMBER OF DAYS]

Effective Use of the International Mechanical Code

The *International Mechanical Code*® (IMC®) is a model code that regulates the design and installation of mechanical systems, appliances, appliance venting, duct and ventilation systems, combustion air provisions, hydronic systems and solar systems. The purpose of the code is to establish the minimum acceptable level of safety and to protect life and property from the potential dangers associated with

the installation and operation of mechanical systems. The code also protects the personnel that install, maintain, service and replace the systems and appliances addressed by this code.

The IMC is primarily a prescriptive code with some performance text. The code relies heavily on product specifications and listings to provide much of the appliance and equipment installation requirements. The general Section 105.2 and the exception to Section 403.2 allow designs and installations to be performed by approved engineering methods as alternatives to the prescriptive methods in the code.

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ARRANGEMENT AND FORMAT OF THE 2021 IMC

The format of the IMC allows each chapter to be devoted to a particular subject with the exception of Chapter 3, which contains general subject matters that are not extensive enough to warrant their own independent chapter.

The following is a chapter-by-chapter synopsis of the scope and intent of the provisions of the *International Mechanical Code*:

Chapter 1 Scope and Administration.

Chapter 1 establishes the limits of applicability of the code and describes how the code is to be applied and enforced. A mechanical code, like any other code, is intended to be adopted as a legally enforceable document and it cannot be effective without adequate provisions for its administration and enforcement. The provisions of Chapter 1 establish the authority and duties of the code official appointed by the authority having jurisdiction and also establish the rights and privileges of the design professional, contractor and property owner.

Chapter 2 Definitions.

Chapter 2 is the repository of the definitions of terms used in the body of the code. Codes are technical documents and every word and term can impact the meaning of the code text and the intended results. The code often uses terms that have a unique meaning in the code and the code meaning can differ substantially from the ordinarily understood meaning of the term as used outside of the code.

The terms defined in Chapter 2 are deemed to be of prime importance in establishing the meaning and intent of the code text that uses the terms. The user of the code should be familiar with and consult this chapter because the definitions are essential to the correct interpretation of the code and because the user may not be aware that a term is defined.

Chapter 3 General Regulations.

Chapter 3 contains broadly applicable requirements related to appliance location and installation, appliance and systems access, protection of structural elements, condensate disposal and clearances to combustibles, among others.

Chapter 4 Ventilation.

Chapter 4 includes means for protecting building occupant health by controlling the quality of indoor air and protecting property from the effects of inadequate ventilation. In some cases, ventilation is required to prevent or reduce a health hazard by removing contaminants at their source.

Ventilation is both necessary and desirable for the control of air contaminants, moisture and temperature. Habitable and occupiable spaces are ventilated to promote a healthy and comfortable environment for the occupants. Uninhabited and unoccupied spaces are ventilated to protect the building structure from the harmful effects of excessive humidity and heat. Ventilation of specific occupancies is necessary to minimize the potential for toxic or otherwise harmful substances to reach dangerously high concentrations in air.

Chapter 5 Exhaust Systems.

Chapter 5 provides guidelines for reasonable protection of life, property and health from the hazards associated with exhaust systems, air contaminants and smoke development in the event of a fire. In most cases, these hazards involve materials and gases that are flammable, explosive, toxic or otherwise hazardous. Where contaminants are known to be present in quantities that are irritating or harmful to the occupants' health or are hazardous in a fire, both naturally and mechanically ventilated

spaces must be equipped with mechanical exhaust systems capable of collecting and removing the contaminants.

This chapter contains requirements for the installation of exhaust systems, with an emphasis on the structural integrity of the systems and equipment involved and the overall impact of the systems on the fire safety performance of the building. It includes requirements for the exhaust of commercial kitchen grease- and smoke-laden air; hazardous fumes and toxic gases; clothes dryer moisture and heat; and dust, stock and refuse materials.

Chapter 6 Duct Systems.

Chapter 6 of the code regulates the materials and methods used for constructing and installing ducts, plenums, system controls, exhaust systems, fire protection systems and related components that affect the overall performance of a building's air distribution system and the reasonable protection of life and property from the hazards associated with air-moving equipment and systems. This chapter contains requirements for the installation of supply, return and exhaust air systems. Specific exhaust systems are also addressed in Chapter 5. Information on the design of duct systems is limited to that in Section 603.2. The code is very much concerned with the structural integrity of the systems and the overall impact of the systems on the fire safety and life safety performance of the building. Design considerations such as duct sizing, maximum efficiency, cost-effectiveness, occupant comfort and convenience are the responsibility of the design professional. The provisions for the protection of duct penetrations of wall, floor, ceiling and roof assemblies are extracted from the *International Building Code*.

Chapter 7 Combustion Air.

Complete combustion of solid and liquid fuel is essential for the proper operation of appliances, for control of harmful emissions and for achieving maximum fuel efficiency.

The specific combustion air requirements provided in previous editions of the code have been deleted in favor of a single section that directs the user to NFPA 31 for oil-fired appliance combustion air requirements and the manufacturer's installation instructions for solid fuel-burning appliances. For gas-fired appliances, the provisions of the *International Fuel Gas Code* are applicable.

Chapter 8 Chimneys and Vents.

Chapter 8 is intended to regulate the design, construction, installation, maintenance, repair and approval of chimneys, vents and their connections to solid and liquid fuel-burning appliances. The requirements of this chapter are intended to achieve the complete removal of the products of combustion from fuel-burning appliances and equipment. This chapter includes regulations for the proper selection, design, construction and installation of a chimney or vent, along with appropriate measures to minimize the related potential fire hazards. A chimney or vent must be designed for the type of appliance or equipment it serves. Chimneys and vents are designed for specific applications, depending on the flue gas temperatures and the type of fuel being burned in the appliance. Chimneys and vents for gas-fired appliances are covered in the *International Fuel Gas Code*.

Chapter 9 Specific Appliances, Fireplaces and Solid Fuel-burning Equipment.

Chapter 9 sets minimum construction and performance criteria for fireplaces, appliances and equipment and provides for the safe installation of these items. It reflects the code's intent to specifically address all of the types of appliances that the code intends to regulate. Other regulations affecting the installation of solid fuel-burning fireplaces, appliances and accessory appliances are found in Chapters 3, 6, 7, 8, 10, 11, 12, 13 and 14.

Chapter 10 Boilers, Water Heaters and Pressure Vessels.

Chapter 10 presents regulations for the proper installation of boilers, water heaters and pressure vessels to protect life and property from the hazards associated with those appliances and vessels. It applies to all types of boilers and pressure vessels, regardless of size, heat input, operating pressure or operating temperature.

Because pressure vessels are closed containers designed to contain liquids, gases or both under pressure, they must be designed and installed to prevent structural failures that can result in extremely hazardous situations. Certain safety features are therefore provided in Chapter 10 to reduce the potential for explosion hazards.

Chapter 11 Refrigeration.

Chapter 11 contains regulations pertaining to the life safety of building occupants. These regulations establish minimum requirements to achieve the proper design, construction, installation and operation of refrigeration systems. Refrigeration systems are a combination of inter-connected components and piping assembled to form a closed circuit in which a refrigerant is circulated. The system's function is to extract heat from a location or medium, and to reject that heat to a different location or medium. This chapter establishes reasonable safeguards for the occupants by defining and mandating practices that are consistent with the practices and experience of the industry.

Chapter 12 Hydronic Piping.

Hydronic piping includes piping, fittings and valves used in building space conditioning systems. Applications include hot water, chilled water, steam, steam condensate, brines and water/antifreeze mixtures. Chapter 12 contains the provisions that govern the construction, installation, alteration and repair of all hydronic piping systems that affect reliability, serviceability, energy efficiency and safety.

Chapter 13 Fuel Oil Piping and Storage.

Chapter 13 regulates the design and installation of fuel oil storage and piping systems. The regulations include reference to construction standards for above-ground and underground storage tanks, material standards for piping systems (both above-ground and underground) and extensive requirements for the proper assembly of system piping and components. The *International Fire Code* (IFC) covers subjects not addressed in detail here. The provisions in this chapter are intended to prevent fires, leaks and spills involving fuel oil storage and piping systems.

Chapter 14 Solar Thermal Systems.

Chapter 14 establishes provisions for the safe installation, operation and repair of solar energy systems used for space heating or cooling, domestic hot water heating or processing. Although such systems use components similar to those of conventional mechanical equipment, many of these provisions are unique to solar energy systems.

Chapter 15 Referenced Standards.

Chapter 15 lists all of the product and installation standards and codes that are referenced throughout Chapters 1 through 14. As stated in Section 102.8, these standards and codes become an enforceable part of the code (to the prescribed extent of the reference) as if printed in the body of the code. Chapter 15 provides the full title and edition year of the standards and codes in addition to the address of the promulgators and the section numbers in which the standards and codes are referenced.

Appendix A Chimney Connector Pass-throughs.

Appendix A provides figures that illustrate various requirements in the body of the code. Figures A101.1(1) and A101.1(2) illustrate the chimney connector clearance requirements of Table 803.10.4.

Appendix B Recommended Permit Fee Schedule.

Appendix B provides a sample permit fee schedule for mechanical permits. The local jurisdiction can adopt this appendix and fill in the dollar amounts in the blank spaces to establish their official permit fee schedule. The ICC does not establish permit fees because the code is adopted throughout the country and there are vast differences in operating budgets between different parts of the country, as well as between large and small municipalities within the same region.

Appendix C Board of Appeals.

Appendix C contains the provisions for appeal and the establishment of a board of appeals that were formerly in Chapter 1. The provisions include the application for an appeal, the makeup of the board of appeals and the conduct of the appeal process. Appeals can be for:

- Hearing requests for modifications of code requirements.
- Claims that the code has not been applied or interpreted correctly.
- Claims that the code is not applicable to a specific case.
- Claims that equivalence to the code requirements has not been recognized.

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