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Preface

General

The 2021 *International Green Construction Code*® (IgCC®) (referred to in this User's Manual as the "IgCC" or simply as "the code") provides the design and construction industry with the single most effective way to deliver sustainable, resilient, high-performance buildings. ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020 (referred to in this User's Manual as "Standard 189.1" or simply "the standard") is a standard for high-performance green buildings and is used as the technical basis for the 2021 IgCC. The IgCC is not a rating system, although it could be incorporated as the baseline in a green building rating system. It addresses sustainable sites; water use efficiency; energy efficiency; the building's impact on the atmosphere, materials and resources; and indoor environmental quality (IEQ). These five key subject areas, as well as construction and operation, are each addressed in separate sections.

This User's Manual assists readers in understanding the principles on which the IgCC is based, the requirements of the code and how those requirements may be met. This User's Manual will serve to improve the ability of these users to understand the IgCC by providing explanations of the IgCC's requirements and examples of its application. It contains sample calculations, forms to demonstrate compliance, and references to helpful resources and websites. This User's Manual can also be suitable for use in educational programs.

Audience

This User's Manual is intended to aid many types of building professionals, including architects, engineers and other design professionals applying the IgCC to the design of their buildings; general and specialty contractors constructing buildings in compliance with the IgCC; plans examiners, field inspectors and other code officials enforcing the IgCC in areas where it is adopted as code; and product manufacturers, state and local energy offices, policy groups, educators and others.

It is important to note the effectiveness of integrated design in compliance with the IgCC and in general good design practice. It is critical to emphasize the need to work with all design elements and trades and involve the appropriate professionals as early as possible in the process.

Introduction

Internationally, code officials and designers recognize the need for a modern, up-to-date code governing the impact of buildings and structures on the environment. This code is designed to meet this need through model code regulations that contain clear and specific requirements with provisions that promote safe and sustainable construction in an integrated fashion with the ICC Family of Codes. The 2021 *International Green Construction Code* (IgCC) is the first fully integrated edition of the IgCC to be developed cooperatively by ICC and ASHRAE.

The comprehensive green code (IgCC) establishes minimum regulations for building systems and site considerations using prescriptive and performance-related provisions. It is intended to be 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 Mechanical Code*®, *International*

Code Council Performance 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*® and *International Zoning Code*®.

The 2021 IgCC has been developed in collaboration with the following Cooperating Sponsors: the American Institute of Architects (AIA), ASHRAE, the US Green Building Council (USGBC) and the Illuminating Engineering Society (IES). ICC wishes to thank these Cooperating Sponsors for recognizing the need for the development of a comprehensive set of green regulations that are enforceable, usable and adoptable.

The I-Codes®, including the *International Green Construction 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.
- Education, certification and credentialing of individuals involved in the fields of building design, construction and safety.
- Evaluation, listing and 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

The IgCC is founded on principles intended to establish provisions consistent with the scope of a green construction code that adequately protects the 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. This is achieved by comprehensive provisions that are enforceable, usable and adoptable..

Foreword

The 2021 *International Green Construction Code* is the fourth edition of the IgCC. In 2015, ICC and ASHRAE partnered in the development of this new version of the IgCC sponsored by AIA, ASHRAE, ICC, IES and USGBC. The first two editions (2012 and 2015) were developed utilizing ICC's Code Development Process as part of the ICC Family of Codes.

As part of the partnership with ASHRAE, the responsibility for code provisions is now split between the ICC and ASHRAE processes. ICC is responsible for Chapter 1, Scope and Administration.

ICC coordinated the technical provisions developed by ASHRAE with the provisions in Chapter 1 of the 2018 IgCC. The remainder of the code is technical content that is based on the provisions of the 2020 edition of ANSI/ASHRAE/ICC/USGBC/IES *Standard 189.1, Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings* (Standard 189.1) developed using the American National Standards Institute (ANSI)-approved ASHRAE consensus process. The Standing Standards Project Committee (SSPC) 189.1 serves as the consensus body that developed the standard.

This IgCC User's Manual builds upon the work of the *2018 IgCC User's Manual* and the previous versions of the 189.1 User's Manual that were developed by ASHRAE and the previous versions of the IgCC Code and Commentaries that were developed by ICC.

> **USER NOTE:** The IgCC is formatted utilizing ICC's code format for chapter and section number designations. However, in order to provide the requisite road map to the technical provisions of Standard 189.1, the Standard 189.1 section number is included in parentheses following the IgCC section number—e.g., "Section 101.2 (1.) Purpose." The IgCC section number is 101.2 and the corresponding section number/title in Standard 189.1 is "Section 1 Purpose." In some cases where the text of the IgCC is based on Standard 189.1, the text has been edited to be consistent with ICC's publication style guidelines.

Scope and Administration (ICC – Chapter 1)

The provisions in Chapter 1 are primarily based on Chapter 1 of the 2021 IgCC. The text of Section 101 has been coordinated and correlated with Standard 189.1, Sections 1, 2 and 4 entitled "Purpose," "Scope" and "Administration and Enforcement," respectively. Sections 102 through 109 are basically identical to those contained in the 2021 edition of the IgCC as there are no corresponding Standard 189 sections.

Technical Content (ASHRAE – Chapters 2 through the end, including appendices)

The technical content of the code contains the provisions from Standard 189.1, which was originally published in 2009 through a collaborative effort involving ASHRAE, IES and USGBC. In 2015, ICC was added as an additional cosponsor of the standard, which reflected a Memorandum of Understanding signed in 2014 by ASHRAE, AIA, ICC, IES and USGBC to better align green building goals through Standard 189.1, the IgCC and the LEED certification system. As part of that agreement, the 2020 edition of Standard 189.1 serves as the technical content of this code. Prior to this agreement, the 2012 and the 2015 versions of the IgCC included Standard 189.1 as a project compliance option.

Building projects, which are defined in Standard 189.1 (and now in the IgCC), including both the building and the site, result in significant energy and environmental impacts through their design, construction and operation. The US Green Building Council reports that buildings in the United States produce 40 percent of US carbon dioxide emissions, are responsible for 41 percent of US energy consumption, account for 14 percent of US potable water consumption, and use 40 percent of raw materials in their construction and operation. In addition, building development frequently converts land from a biologically diverse natural habitat that helps manage rainwater to impervious hardscape with reduced biodiversity. While buildings consume energy and have other environmental impacts, they exist primarily to serve occupants who live in, work in, and otherwise use buildings. Buildings also contribute significantly to national economies. Based on a combination of research and practical experience, it is clear that buildings can provide these services with reduced energy use, greenhouse gas emissions, water use, construction waste, heat island and light pollution effects, and impacts on the atmosphere and other resources. Furthermore, a 2015 Economic Impact Study by the USGBC finds that the US green building industry supports over 2 million jobs annually and results in a median state average economic contribution of $934 million.

The far-reaching influence of buildings, and the benefits provided by high-performance green buildings, have led many organizations to pursue efforts to reduce their energy and environmental impacts. Based on ASHRAE's and the other cosponsors' ongoing responsi-

bilities to support such actions, Standing Standard Project Committee (SSPC) 189.1 has contributed to building sustainability goals by updating Standard 189.1 in response to input from the building community, the public at large and project committee members. Compliance with this code will further reduce energy and environmental impacts through high-performance building design, construction and operation, while providing indoor environments that support the activities, health and comfort of building occupants and contribute positively to local economics by providing high-quality jobs and conserving natural resources.

The project committee considers a variety of factors in developing the provisions of Standard 189.1, including published research, justification for proposals received from outside the committee and ultimately the committee members' professional judgment. Cost-benefit assessment, while an important consideration, is not a necessary criterion for inclusion of any given requirement in Standard 189.1. However, the practicality and existing application of any new requirements are considered before they are included.

Standard 189.1, and now the IgCC, address site sustainability, water use efficiency, energy use efficiency, indoor environmental quality, materials and resources, and construction and plans for operation.

Maintenance of the IgCC

The maintenance responsibilities for updating the IgCC are shared between ICC and ASHRAE as follows:

Scope and Administration (Chapter 1: ICC process)

Chapter 1 of the *International Green Construction Code* will be 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, cdpAccess®. A broad cross section of interests is 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.

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. The changes to the 2021 IgCC were completed in 2019 as part of the code development cycle. The next opportunity to propose changes to Chapter 1 of the IgCC will be ICC's 2022 Group B Code Development Process. For more information, go to ICC's website at iccsafe.org.

Technical Content (Chapters 2 through the end, including appendices: ASHRAE process)

The technical content of this code is based on ASHRAE Standard 189.1. SSPC 189.1 considers and administers changes to Standard 189.1 as a continuous maintenance standard and provides interpretations as requested. Proposed changes to the standard may originate within or outside of the committee.

The committee welcomes proposals for improving the standard using the ANSI-approved ASHRAE continuous maintenance procedure. A continuous maintenance proposal (CMP) form can be found online and may be completed and submitted at any time (https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-and-guidelines-under-continuous-maintenance).
The committee takes formal action on every proposal received, which may lead to changes to the published standard. ASHRAE posts approved addenda in publication notices on the ASHRAE website. To receive notice of all public reviews, approved and published addenda, errata, and interpretations as well as meeting notices, ASHRAE encourages interested parties to sign up for the free ASHRAE Internet Listserv for Standard 189.1 (https://www.ashrae.org/technical-resources/standards-and-guidelines/project-committee-list-servers).

Coordination of the International Codes

The coordination of code 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 provisions. Individual codes can also be used in subsets or as stand-alone documents.

Official Interpretations of the Standard

Standing Standard Project Committee (SSPC) 189.1 provides official interpretations of the IgCC upon written request. Formal interpretation request forms are available on the ASHRAE website. Address requests for interpretations to the Senior Manager of Standards:

Senior Manager of Standards
ASHRAE
180 Technology Pkwy NW
Peachtree Corners, GA 30092
Email: standards.section@ashrae.org
Fax: 404-321-5478

Be aware that requests for interpretations are forwarded to ASHRAE. The nature of the interpretation request (i.e., official or unofficial) will determine the next steps. Responses to official interpretations are developed and subsequently must be approved by SSPC 189.1; this process is typically completed within six to twelve months.

Effective Use of the International Green Construction Code

Informative Note: Corresponding ASHRAE 189.1 section numbers have not been included in this Effective Use section but have been included throughout the chapters and appendices of this User's Manual.

The *International Green Construction Code*® (IgCC®) is a model code that provides minimum requirements to safeguard the environment, public health, safety and general welfare through the establishment of requirements that are intended to reduce the negative impacts and increase the positive impacts of the built environment on the natural environment and building occupants. The IgCC is fully compatible with the ICC Family of Codes, including the *International Building Code*® (IBC®), the *International Code Council Performance Code*® (ICCPC®), the *International Energy Conservation Code*® (IECC®), the *International Existing Building Code*® (IEBC®), the *International Fire Code*® (IFC®), the *International Fuel Gas Code*® (IFGC®), the *International Mechanical Code*® (IMC®), the *International Plumbing Code*® (IPC®), the *International Private Sewage Disposal Code*® (IPSDC®), the *International Property Maintenance Code*® (IPMC®), the *International Residential Code*® (IRC®), the *International Swimming Pool and Spa Code*® (ISPSC®), the *International Wildland-Urban Interface Code*® (IWUIC®), and the *International Zoning Code*® (IZC®).

The IgCC addresses site sustainability, water and energy efficiency, indoor environmental quality, materials and resources, building commissioning, construction and plans for operations and maintenance for new and certain types of existing buildings, building sites and building materials, components, equipment and systems (see Section 101.3.1). The code will be promulgated on a 3-year cycle to allow for new construction methods and technologies to be incorporated into the code. Innovative approaches and alternative materials, designs and methods not specifically addressed in this code can be approved by the code official where the proposed innovative approaches or materials, designs or methods comply with the intent of the provisions of the code (see Section 105.4).

The IgCC applies to all occupancies other than single-family dwellings and multiple-family dwellings that are three stories or less in height (see Section 101.3.2). See discussion below for additional information in Appendix J for residential construction.

Arrangement and Format of the 2021 IgCC

Before applying the requirements of the IgCC, it is beneficial to understand its arrangement and format.

CHAPTER	SUBJECTS
1	Scope and administration
2	Reserved
3	Definitions, abbreviations and acronyms
4	Reserved
5	Site sustainability
6	Water use efficiency
7	Energy efficiency
8	Indoor environmental quality (IEQ)

9	Materials and resources
10	Construction and plans for operation
11	Normative references
Normative Appendix A	Climate zones and prescriptive building envelope and duct insulation tables
Normative Appendix B	Prescriptive equipment efficiency tables for the alternate reduced renewables and increased equipment efficiency approach in Section 701.4.1.1.2
Normative Appendix C	Performance option for energy efficency
Normative Appendix D	Building concentrations
Informative Appendix E	Building envelope tables
Informative Appendix F	Integrated design
Informative Appendix G	Informative references
Informative Appendix H	Option for energy efficiency using the IECC prescriptive compliance path
Informative Appendix I	Additional guidance for functional and performance testing (FPT) and the commissioning (Cx) process
Informative Appendix J	Option for residential compliance using the National Green Building Standard
Informative Appendix K	Addenda description information
Annex 1	Referenced standard reproduction annex—ASHRAE Standard 169

Italicized Terms

Words and terms that are defined in Chapter 3 of the IgCC, Definitions, Abbreviations and Acronyms, are italicized where they appear in the text of the IgCC. 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.

A chapter-by-chapter synopsis of the scope and intent of the provisions of the IgCC is placed at the beginning of each chapter.

User's Manual Organization

The User's Manual organization follows the IgCC's organization, with a corresponding chapter for each chapter of the code. The code's section numbers are referenced in the major chapter headings of the User's Manual. The symbol "§" may be used interchangeably with the word "Section" to reference a section of the code. As an example, a heading in the User's Manual titled "General" 101.4 (§ 4) indicates to the user that IgCC Section 101.4 is being addressed and indicates that there is a corresponding section, § 4, in ASHRAE Standard 189.1.

Many of the chapters contain compliance forms that clearly illustrate the requirements for each section, including requirements under prescriptive or performance options if they are offered for that section. The forms are available online at https://www.iccsafe.org/products-and-services/international-green-construction-code-igcc/igcc-resources/.

Acknowledgments

ICC prepared this version of the *2021 IgCC User's Manual* in an agreement with ASHRAE. This publication used the technical provisions of the *2018 IgCC User's Manual* as its base.

The *2021 IgCC User's Manual* builds on the work of those who were acknowledged in previous versions of the ASHRAE Standard 189.1 SSPC and the IgCC Code and Commentary.

Dave Walls, ICC Vice President of Business Support Initiatives, was the project manager for the *2021 IgCC User's Manual*. ICC provided administrative and resource support for the document production. Anthony Floyd provided technical support for Chapters 5 and 6, Wes Sullens provided technical support for Chapters 9 and 10, and Greg Johnson provided technical support for Chapters 7 and 8.

Existing and past members of SSPC 189.1 deserve thanks for the wealth of knowledge, experience and insight they bring to the standard and the 2021 IgCC. This User's Manual is built on the firm foundation laid by the committee. Over the years, many SSPC 189.1 members have contributed to the standard, and thousands of persons provided useful comments during the public review process. It is not possible to acknowledge all who have contributed, but special recognition is due to the SSPC past Chair, Roger Hedrick, who has worked diligently to establish and maintain Standard 189.1, which has become the technical provisions for the 2021 IgCC.

ABOUT THE INTERNATIONAL CODE COUNCIL®

The International Code Council is the leading global source of model codes and standards and building safety solutions that include product evaluation, accreditation, technology, codification, training and certification. The Code Council's codes, standards and solutions are used to ensure safe, affordable and sustainable communities and buildings worldwide. The International Code Council family of solutions includes the ICC Evaluation Service, the International Accreditation Service, General Code, S.K. Ghosh Associates, NTA Inc., ICC Community Development Solutions and the Alliance for National & Community Resilience. The Code Council is the largest international association of building safety professionals and is the trusted source of model codes and standards, establishing the baseline for building safety globally and creating a level playing field for designers, builders and manufacturers.

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About ASHRAE

With more than 50,000 members from over 132 nations, ASHRAE is a diverse organization dedicated to advancing the arts and sciences of heating, ventilation, air conditioning, and refrigeration to serve humanity and promote a sustainable world. The Society and its members focus on building systems, energy efficiency, indoor air quality, and sustainability within the industry. Through research, standards writing, publishing, and continuing education, ASHRAE shapes tomorrow's built environment today.

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