

IECC[®]

INTERNATIONAL **ENERGY CONSERVATION** CODE[®]

A Member of the International Code Family[®]

2021



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2021 International Energy Conservation Code®

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PREFACE

Introduction

The *International Energy Conservation Code*® (IECC®) establishes minimum requirements for energy-efficient buildings using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new energy-efficient 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*® (IBC®), *International Existing Building Code*® (IEBC®), *International Fire Code*® (IFC®), *International Fuel Gas Code*® (IFGC®), *International Green Construction Code*® (IgCC®), *International Mechanical Code*® (IMC®), *International Plumbing Code*® (IPC®), *International Private Sewage Disposal Code*® (IPSDC®), *International Property Maintenance Code*® (IPMC®), *International Residential Code*® (IRC®), *International Swimming Pool and Spa Code*® (ISPSC®), *International Wildland-Urban Interface Code*® (IWUIC®), *International Zoning Code*® (IZC®) and *International Code Council Performance Code*® (ICCP®).

This code contains separate provisions for commercial buildings and for low-rise residential buildings (3 stories or less in height above grade). Each set of provisions, IECC—Commercial Provisions and IECC—Residential Provisions, is separately applied to buildings within its respective scope. Each set of provisions is to be treated separately. Each contains a Scope and Administration chapter, a Definitions chapter, a General Requirements chapter, a chapter containing energy efficiency requirements and an Existing Buildings chapter containing provisions applicable to buildings within its scope.

The I-Codes, including the IECC, 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 2000 through 2018 editions and further changes approved through 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 an energy conservation code that adequately conserves energy; 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 IECC 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, cdpACCESS®. 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:

- National Association of Home Builders (NAHB)
- National Multifamily Housing Council (NMHC)

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 ICC.

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 police 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 by the applicable International Code Development Committee. The IECC—Commercial Provisions (sections designated with a “C” prior to the section number) are primarily maintained by the Commercial Energy Code Development Committee. The IECC—Residential Provisions (sections designated with an “R” prior to the section number) are maintained by the Residential Energy Code Development Committee. This is designated in the chapter headings by a [CE] and [RE], respectively.

Maintenance responsibilities for the IECC are designated as follows:

[CE] = International Commercial Energy Conservation Code Development Committee

[RE] = International Residential Energy Conservation Code Development Committee

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 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 several I-Codes will be heard by committees in both the 2021 (Group A) and the 2022 (Group B) code development cycles.

All code change proposals for the IECC are considered in the Group B hearings.

It is very important that anyone submitting code change proposals understands 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 www.iccsafe.org/current-code-development-cycle.

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; IBC Appendix O; the appendices titled “Board of Appeals” for all codes except IECC, IRC, IgCC, ICCPC and IZC; 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 Sewage Disposal Code	International Residential Code – IRC—Building (Chapters 1–10, Appendices AE, AF, AH, AJ, AK, AL, AM, AO, AQ, AR, AS, AT, AU, AV, AW)
International Residential Code – IRC—Mechanical (Chapters 12–23) – IRC—Plumbing (Chapters 25–33, Appendices AG, AI, AN, AP)	
International Swimming Pool and Spa Code	
International Wildland-Urban Interface Code	
International Zoning Code	

Note: Proposed changes to the ICCPC will be heard by the code development committee noted in brackets [] in the text of the ICCPC.

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 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 tables indicate such relocations in the 2021 edition of the IECC.

IECC COMMERCIAL RELOCATIONS

2021 LOCATION	2018 LOCATION
C402.2.1.5	C402.2.1.1
C404.6.1.1	C404.7
C405.2.3.1	C405.2.2.2
C405.2.4	C405.2.3
C501.2	C501.4
C503.2.2.1	C401.2.1

IECC RESIDENTIAL RELOCATIONS

2021 LOCATION	2018 LOCATION
Table R402.1.2	Table R402.1.4
Table R402.1.3	Table R402.1.2
R403.3.2	R403.3.7
R403.3.3	R403.3.6
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R403.3.4	R403.3.2
R403.3.4.1	R403.3.2.1
R403.3.5	R403.3.3
R403.3.6	R403.3.4
R403.3.7	R403.3.5

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

Terms italicized in code text, other than document titles, are defined in Chapter 2. The terms selected to be italicized have definitions that the user should read carefully to better understand the code. Where italicized, the Chapter 2 definition applies. If not italicized, common-use definitions apply.

Adoption

The ICC maintains a copyright in all of its codes and standards. Maintaining copyright allows the ICC to fund 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 non-downloadable 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 IECC in a manner that provides necessary access, while maintaining the ICC's copyright.

To facilitate adoption, two 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 C101.1. Insert: **[NAME OF JURISDICTION]**.

Section R101.1. Insert: **[NAME OF JURISDICTION]**.

Effective Use of the International Energy Conservation Code

The IECC is a model code that regulates minimum energy conservation requirements for new buildings. The IECC addresses energy conservation requirements for all aspects of energy use in both commercial and residential construction, including heating and ventilating, lighting, water heating, and power usage for appliances and building systems.

The IECC is a design document. For example, before one constructs a building, the designer must determine the minimum insulation *R*-values and fenestration *U*-factors for the building exterior envelope. Depending on whether the building is for residential use or for commercial use, the IECC sets forth minimum requirements for exterior envelope insulation, window and door *U*-factors and SHGC ratings, duct insulation, lighting and power efficiency, and water distribution insulation.

ARRANGEMENT AND FORMAT OF THE 2021 IECC

The IECC contains two separate sets of provisions—one for commercial buildings and one for residential buildings. Each set of provisions is applied separately to buildings within their scope. The IECC—Commercial Provisions apply to all buildings except for residential buildings three stories or less in height. The IECC—Residential Provisions apply to detached one- and two-family dwellings and multiple single-family dwellings as well as Group R-2, R-3 and R-4 buildings three stories or less in height. These scopes are based on the definitions of “Commercial building” and “Residential building,” respectively, in Chapter 2 of each set of provisions. Note that the IECC—Commercial Provisions therefore contain provisions for residential buildings four stories or greater in height.

The following table shows how the IECC is divided. The ensuing chapter-by-chapter synopsis details the scope and intent of the provisions of the IECC.

Chapter Topics	
Chapter	Subjects
1–2	Administration and definitions
3	Climate zones and general materials requirements
4	Energy efficiency requirements
5	Existing buildings
6	Referenced standards
CA	Board of appeals
CB	Solar-ready zone
CC	Net zero energy

Chapter 1 Scope and Administration

Chapters 1 [CE] and 1 [RE] contain provisions for the application, enforcement and administration of subsequent requirements of the code. In addition to establishing the scope of the code, Chapter 1 identifies which buildings and structures come under its purview. Chapter 1 is largely concerned with maintaining “due process of law” in enforcing the energy conservation criteria contained in the body of this code. Only through careful observation of the administrative provisions can the code official reasonably expect to demonstrate that “equal protection under the law” has been provided.

Chapter 2 Definitions

Terms that are defined in the code are listed alphabetically in Chapters 2 [CE] and 2 [RE]. While a defined term may be used in one chapter or another, the meaning provided in Chapter 2 is applicable throughout the code.

Additional definitions regarding climate zones are found in Tables C301.3 and R301.3. These are not listed in Chapter 2.

Where understanding of a term’s definition is especially key to or necessary for understanding of a particular code provision, the term is shown in *italics*. This is true only for those terms that have a meaning that is unique to the code. In other words, the generally understood meaning of a term or phrase might not be sufficient or consistent with the meaning prescribed by the code; therefore, it is essential that the code-defined meaning be known.

Guidance regarding tense, gender and plurality of defined terms as well as guidance regarding terms not defined in this code is provided.

Chapter 3 General Requirements

Chapters 3 [CE] and 3 [RE] specify the climate zones that will serve to establish the exterior design conditions. In addition, Chapter 3 provides interior design conditions that are used as a basis for assumptions in heating and cooling load calculations, and provides basic material requirements for insulation materials and fenestration materials. Climate has a major impact on the energy use of most buildings. The code establishes many requirements such as wall and roof insulation *R*-values, window and door thermal transmittance (*U*-factors) and provisions that affect the mechanical systems based on the climate where the building is located. This chapter contains information that will be used to properly assign the building location into the correct climate zone and is used as the basis for establishing or eliminating requirements.

Chapter 4 Energy Efficiency

Chapter 4 [CE] contains the energy-efficiency-related requirements for the design and construction of most types of commercial buildings and residential buildings greater than three stories in height above grade. This chapter defines requirements for the portions of the building and building systems that impact energy use in new commercial construction and new residential construction greater than three stories in height, and promotes the effective use of energy. In addition to energy conservation requirements for the building envelope, this chapter contains requirements that impact energy efficiency for the HVAC systems, the electrical systems and the plumbing systems. It should be noted, however, that requirements are contained in other codes that have an impact on energy conservation. For instance, requirements for water flow rates are regulated by the *International Plumbing Code*.

Chapter 4 [RE] contains the energy-efficiency-related requirements for the design and construction of residential buildings regulated under this code. It should be noted that the definition of a residential building in this code is unique for this code. In this code, residential buildings include detached one- and two-family dwellings and multiple single-family dwellings as well as R-2, R-3 or R-4 buildings three stories or less in height. All other buildings, including residential buildings greater than three stories in height, are regulated by the energy conservation requirements in the IECC—Commercial Provisions. The applicable portions of a residential building must comply with the provisions within this chapter for energy efficiency. This chapter defines requirements for the portions of the building and building systems that impact energy use in new residential construction and promotes the effective use of energy. The provisions within the chapter promote energy efficiency in the building envelope, the heating and cooling system and the service water-heating system of the building.

Chapter 5 Existing Buildings

Chapters 5 [CE] and [RE] contain the technical energy efficiency requirements for existing buildings. Chapter 5 provisions address the maintenance of buildings in compliance with the code as well as how additions, alterations, repairs and changes of occupancy need to be addressed from the standpoint of energy efficiency. Specific provisions are provided for historic buildings.

Chapter 6 Referenced Standards

The code contains numerous references to standards that are used to regulate materials and methods of construction. Chapters 6 [CE] and 6 [RE] list all standards referenced in their respective portions of the code. The standards are part of the code to the extent of the reference to the standard. Compliance with the referenced standard is necessary for compliance with this code. By providing specifically adopted standards, the construction and installation requirements necessary for compliance with the code can be readily determined. The basis for code compliance is, therefore, established and available on an equal basis to the code official, contractor, designer and owner.

Chapter 6 is organized in a manner that makes it easy to locate specific standards. It lists all of the referenced standards, alphabetically, by acronym of the promulgating agency of the standard. Each agency's standards are then listed in either alphabetical or numeric order based on the standard identification. The list also contains the title of the standard; the edition (date) of the standard referenced; any addenda included as part of the ICC adoption; and the section or sections of this code that reference the standard.

Appendices

The appendices, while not part of the code, can become part of the code when specifically included in the adopting ordinance.

Chapter 1 requires the establishment of a board of appeals to hear appeals regarding determinations made by the code official. Appendices CA and RA provide qualification standards for members of the board as well as operational procedures of such board.

Appendices CB and RB address provisions for solar capacity in new structures.

Appendices CC and RC provide requirements intended bring about net zero annual energy consumption in their respective structures.

ABBREVIATIONS AND NOTATIONS

The following table contains a list of common abbreviations and units of measurement used in this code. Some of the abbreviations are for terms defined in Chapter 2. Others are terms used in various tables and text of the code.

Abbreviations and Notations

AFUE	Annual fuel utilization efficiency
bhp	Brake horsepower (fans)
Btu	British thermal unit
Btu/h × ft ²	Btu per hour per square foot
C-factor	See Chapter 2—Definitions
CDD	Cooling degree days
cfm	Cubic feet per minute
cfm/ft ²	Cubic feet per minute per square foot
ci	Continuous insulation
COP	Coefficient of performance
DCV	Demand control ventilation
°C	Degrees Celsius
°F	Degrees Fahrenheit
DWHR	Drain water heat recovery
DX	Direct expansion
E_c	Combustion efficiency
E_v	Ventilation efficiency
E_t	Thermal efficiency
EER	Energy efficiency ratio
EF	Energy factor
ERI	Energy rating index
F-factor	See Chapter 2—Definitions
FDD	Fault detection and diagnostics
FEI	Fan energy index
FL	Full load
ft ²	Square foot
gpm	Gallons per minute
HDD	Heating degree days
hp	Horsepower
HSPF	Heating seasonal performance factor
HVAC	Heating, ventilating and air conditioning

(continued)

Abbreviations and Notations—continued

IEER	Integrated energy efficiency ratio
IPLV	Integrated Part Load Value
Kg/m ²	Kilograms per square meter
kW	Kilowatt
LPD	Light power density (lighting power allowance)
L/s	Liters per second
Ls	Liner system
m ²	Square meters
MERV	Minimum efficiency reporting value
NAECA	National Appliance Energy Conservation Act
NPLV	Nonstandard Part Load Value
Pa	Pascal
PF	Projection factor
pcf	Pounds per cubic foot
psf	Pounds per square foot
PTAC	Packaged terminal air conditioner
PTHP	Packaged terminal heat pump
R-value	See Chapter 2—Definitions
SCOP	Sensible coefficient of performance
SEER	Seasonal energy efficiency ratio
SHGC	Solar Heat Gain Coefficient
SPVAC	Single packaged vertical air conditioner
SPVHP	Single packaged vertical heat pump
SRI	Solar reflectance index
SWHF	Service water heat recovery factor
U-factor	See Chapter 2—Definitions
VAV	Variable air volume
VRF	Variable refrigerant flow
VT	Visible transmittance
W	Watts
w.c.	Water column
w.g.	Water gauge

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CHAPTER 1 [CE]

SCOPE AND ADMINISTRATION

User note:

About this chapter: Chapter 1 establishes the limits of applicability of the code and describes how the code is to be applied and enforced. Chapter 1 is in two parts: Part 1—Scope and Application and Part 2—Administration and Enforcement. Section C101 identifies what buildings, systems, appliances and equipment fall under its purview and references other I-Codes as applicable. Standards and codes are scoped to the extent referenced.

The 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.

PART 1—SCOPE AND APPLICATION

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the *Energy Conservation Code* of [NAME OF JURISDICTION], and shall be cited as such. It is referred to herein as “this code.”

C101.2 Scope. This code applies to *commercial buildings* and the buildings’ sites and associated systems and equipment.

C101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

C101.4 Applicability. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

C101.4.1 Mixed residential and commercial buildings. Where a building includes both *residential building* and *commercial building* portions, each portion shall be separately considered and meet the applicable provisions of IECC—Commercial Provisions or IECC—Residential Provisions.

C101.5 Compliance. *Residential buildings* shall meet the provisions of IECC—Residential Provisions. *Commercial buildings* shall meet the provisions of IECC—Commercial Provisions.

C101.5.1 Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

SECTION C102 ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT

C102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. The *code official* shall have the authority to approve an alternative material, design or method of construction upon the written application of the owner or the owner’s authorized agent. The *code official* shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, *fire resistance*, durability, energy conservation and safety. The *code official* shall respond to the applicant, in writing, stating the reasons why the alternative was approved or was not *approved*.

C102.1.1 Above code programs. The *code official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program as exceeding the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered to be in compliance with this code. The requirements identified in Table C407.2 shall be met.

PART 2—ADMINISTRATION AND ENFORCEMENT

SECTION C103 CONSTRUCTION DOCUMENTS

C103.1 General. Construction documents and other supporting data shall be submitted in one or more sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction

documents to be prepared by a registered design professional.

Exception: The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

C103.2 Information on construction documents.

Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, the following as applicable:

1. Energy compliance path.
2. Insulation materials and their *R*-values.
3. Fenestration *U*-factors and solar heat gain coefficients (SHGCs).
4. Area-weighted *U*-factor and solar heat gain coefficient (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Economizer description.
8. Equipment and system controls.
9. Fan motor horsepower (hp) and controls.
10. Duct sealing, duct and pipe insulation and location.
11. Lighting fixture schedule with wattage and control narrative.
12. Location of *daylight* zones on floor plans.
13. Air barrier and air sealing details, including the location of the air barrier.

C103.2.1 Building thermal envelope depiction. The *building thermal envelope* shall be represented on the construction drawings.

C103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. The *code official* is authorized to utilize a registered design professional, or other *approved* entity not affiliated with the building design or construction, in conducting the review of the plans and specifications for compliance with the code.

C103.3.1 Approval of construction documents. When the *code official* issues a permit where construction documents are required, the construction documents shall be endorsed in writing and stamped “Reviewed for Code Compliance.” Such *approved* construction documents shall not be changed, modified or altered without authorization from the *code official*. Work shall be done in accordance with the *approved* construction documents.

One set of construction documents so reviewed shall be retained by the *code official*. The other set shall be returned to the applicant, kept at the site of work and shall be open to inspection by the *code official* or a duly authorized representative.

C103.3.2 Previous approvals. This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

C103.3.3 Phased approval. The *code official* shall have the authority to issue a permit for the construction of part of an energy conservation system before the construction documents for the entire system have been submitted or *approved*, provided that adequate information and detailed statements have been filed complying with all pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire energy conservation system will be granted.

C103.4 Amended construction documents. Changes made during construction that are not in compliance with the *approved* construction documents shall be resubmitted for approval as an amended set of construction documents.

C103.5 Retention of construction documents. One set of *approved* construction documents shall be retained by the *code official* for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws.

C103.6 Building documentation and closeout submittal requirements. The construction documents shall specify that the documents described in this section be provided to the building owner or owner’s authorized agent within 90 days of the date of receipt of the certificate of occupancy.

C103.6.1 Record documents. Construction documents shall be updated to convey a record of the completed work. Such updates shall include mechanical, electrical and control drawings that indicate all changes to size, type and location of components, equipment and assemblies.

C103.6.2 Compliance documentation. Energy code compliance documentation and supporting calculations shall be delivered in one document to the building owner as part of the project record documents or manuals, or as a standalone document. This document shall include the specific energy code edition utilized for compliance determination for each system, documentation demonstrating compliance with Section C303.1.3 for each fenestration product installed, and the interior lighting power compliance path, building area or space-by-space, used to calculate the lighting power allowance.

For projects complying with Item 2 of Section C401.2, the documentation shall include:

1. The envelope insulation compliance path.

2. All compliance calculations including those required by Sections C402.1.5, C403.8.1, C405.3 and C405.5.

For projects complying with Section C407, the documentation shall include that required by Sections C407.3.1 and C407.3.2.

C103.6.3 Systems operation control. Training shall be provided to those responsible for maintaining and operating equipment included in the manuals required by Section C103.6.2.

The training shall include:

1. Review of manuals and permanent certificate.
2. Hands-on demonstration of all normal maintenance procedures, normal operating modes, and all emergency shutdown and startup procedures.
3. Training completion report.

SECTION C104 FEES

C104.1 Fees. A permit shall not be issued until the fees prescribed in Section C104.2 have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

C104.2 Schedule of permit fees. A fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

C104.3 Work commencing before permit issuance. Any person who commences any work before obtaining the necessary permits shall be subject to an additional fee established by the *code official* that shall be in addition to the required permit fees.

C104.4 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

C104.5 Refunds. The *code official* is authorized to establish a refund policy.

SECTION C105 INSPECTIONS

C105.1 General. Construction or work for which a permit is required shall be subject to inspection by the code official, his or her designated agent or an *approved agency*, and such construction or work shall remain visible and able to be accessed for inspection purposes until *approved*. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain visible and able to be accessed for inspection

purposes. Neither the code official nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.

C105.2 Required inspections. The *code official*, his or her designated agent or an *approved agency*, upon notification, shall make the inspections set forth in Sections C105.2.1 through C105.2.6.

C105.2.1 Footing and foundation insulation. Inspections shall verify the footing and foundation insulation *R*-value, location, thickness, depth of burial and protection of insulation as required by the code, *approved* plans and specifications.

C105.2.2 Thermal envelope. Inspections shall verify the correct type of insulation, *R*-values, location of insulation, fenestration, *U*-factor, SHGC and VT, and that air leakage controls are properly installed, as required by the code, *approved* plans and specifications.

C105.2.3 Plumbing system. Inspections shall verify the type of insulation, *R*-values, protection required, controls and heat traps as required by the code, *approved* plans and specifications.

C105.2.4 Mechanical system. Inspections shall verify the installed HVAC equipment for the correct type and size, controls, insulation, *R*-values, system and damper air leakage, minimum fan efficiency, energy recovery and economizer as required by the code, *approved* plans and specifications.

C105.2.5 Electrical system. Inspections shall verify lighting system controls, components and meters as required by the code, *approved* plans and specifications.

C105.2.6 Final inspection. The final inspection shall include verification of the installation and proper operation of all required building controls, and documentation verifying activities associated with required *building commissioning* have been conducted in accordance with Section C408.

C105.3 Reinspection. A building shall be reinspected where determined necessary by the *code official*.

C105.4 Approved inspection agencies. The *code official* is authorized to accept reports of third-party inspection agencies not affiliated with the building design or construction, provided that such agencies are *approved* as to qualifications and reliability relevant to the building components and systems that they are inspecting.

C105.5 Inspection requests. It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

C105.6 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made to achieve compliance

with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

SECTION C106 NOTICE OF APPROVAL

C106.1 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

C106.2 Revocation. The *code official* is authorized to suspend or revoke, in writing, a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the *building* or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

SECTION C107 VALIDITY

C107.1 General. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

SECTION C108 REFERENCED STANDARDS

C108.1 Referenced codes and standards. The codes and standards referenced in this code shall be those listed in Chapter 6, and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections C108.1.1 and C108.1.2.

C108.1.1 Conflicts. Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

C108.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

C108.2 Applications of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

C108.3 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

SECTION C109 STOP WORK ORDER

C109.1 Authority. Where the *code official* finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe

manner, the *code official* is authorized to issue a stop work order.

C109.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property, the owner's authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

C109.3 Emergencies. Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.

C109.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

SECTION C110 BOARD OF APPEALS

C110.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The *code official* shall be an ex officio member of said board but shall not have a vote on any matter before the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *code official*.

C110.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The board shall not have authority to waive requirements of this code.

C110.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

CHAPTER 2 [CE]

DEFINITIONS

User note:

About this chapter: Codes, by their very nature, are technical documents. Every word, term and punctuation mark can add to or change the meaning of a technical requirement. It is necessary to maintain a consensus on the specific meaning of each term contained in the code. Chapter 2 performs this function by stating clearly what specific terms mean for the purposes of the code.

SECTION C201 GENERAL

C201.1 Scope. Unless stated otherwise, the following words and terms in this code shall have the meanings indicated in this chapter.

C201.2 Interchangeability. Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural includes the singular.

C201.3 Terms defined in other codes. Terms that are not defined in this code but are defined in the *International Building Code*, *International Fire Code*, *International Fuel Gas Code*, *International Mechanical Code*, *International Plumbing Code* or the *International Residential Code* shall have the meanings ascribed to them in those codes.

C201.4 Terms not defined. Terms not defined by this chapter shall have ordinarily accepted meanings such as the context implies.

SECTION C202 GENERAL DEFINITIONS

ABOVE-GRADE WALL. See “Wall, above-grade.”

ACCESS (TO). That which enables a device, appliance or equipment to be reached by *ready access* or by a means that first requires the removal or movement of a panel or similar obstruction.

ADDITION. An extension or increase in the *conditioned space* floor area, number of stories or height of a building or structure.

AIR BARRIER. One or more materials joined together in a continuous manner to restrict or prevent the passage of air through the *building thermal envelope* and its assemblies.

AIR CURTAIN. A device, installed at the *building entrance*, that generates and discharges a laminar air stream intended to prevent the infiltration of external, unconditioned air into the conditioned spaces, or the loss of interior, conditioned air to the outside.

ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation.

APPROVED. Acceptable to the code official.

APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, or furnishing product certification, where such agency has been approved by the *code official*.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature or mechanical configuration (see “*Manual*”).

BELOW-GRADE WALL. See “Wall, below-grade.”

BIOGAS. A mixture of hydrocarbons that is a gas at 60°F (15.5°C) and 1 atmosphere of pressure that is produced through the anaerobic digestion of organic matter.

BIOMASS. Nonfossilized and biodegradable organic material originating from plants, animals and/or microorganisms, including products, by-products, residues and waste from agriculture, forestry and related industries as well as the nonfossilized and biodegradable organic fractions of industrial and municipal wastes, including gases and liquids recovered from the decomposition of nonfossilized and biodegradable organic material.

BOILER, MODULATING. A boiler that is capable of more than a single firing rate in response to a varying temperature or heating load.

BOILER SYSTEM. One or more boilers, their piping and controls that work together to supply steam or hot water to heat output devices remote from the boiler.

BUBBLE POINT. The refrigerant liquid saturation temperature at a specified pressure.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy, including any mechanical systems, service water-heating systems and electric power and lighting systems located on the building site and supporting the building.

BUILDING COMMISSIONING. A process that verifies and documents that the selected building systems have been designed, installed and function according to the owner’s project requirements and construction documents, and to minimum code requirements.

BUILDING ENTRANCE. Any door, set of doors, doorway or other form of portal that is used to gain access to the building from the outside by the public.

BUILDING SITE. A contiguous area of land that is under the ownership or control of one entity.

DEFINITIONS

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floors, ceilings, roofs and any other building element assemblies that enclose *conditioned space* or provide a boundary between *conditioned space* and exempt or unconditioned space.

CAPTIVE KEY OVERRIDE. A lighting control that will not release the key that activates the override when the lighting is on.

CAVITY INSULATION. Insulating material located between framing members.

C-FACTOR (THERMAL CONDUCTANCE). The coefficient of heat transmission (surface to surface) through a building component or assembly, equal to the time rate of heat flow per unit area and the unit temperature difference between the warm side and cold side surfaces ($\text{Btu/h} \times \text{ft}^2 \times ^\circ\text{F}$) [$\text{W}/(\text{m}^2 \times \text{K})$].

CHANGE OF OCCUPANCY. A change in the use of a building or a portion of a building that results in any of the following:

1. A *change of occupancy* classification.
2. A change from one group to another group within an occupancy classification.
3. Any change in use within a group for which there is a change in the application of the requirements of this code.

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to the fixture supply and back to the water-heating equipment.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code.

CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

COEFFICIENT OF PERFORMANCE (COP) – COOLING. The ratio of the rate of heat removal to the rate of energy input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.

COEFFICIENT OF PERFORMANCE (COP) – HEATING. The ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system, including the compressor and, if applicable, auxiliary heat, under designated operating conditions.

COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of “*Residential building*.”

COMPUTER ROOM. A room whose primary function is to house equipment for the processing and storage of electronic data which has a design total information technology equipment (ITE) equipment power density less than or equal to 20 watts per square foot (20 watts per 0.092 m^2) of conditioned area or a design total ITE equipment load less than or equal to 10 kW.

CONDENSING UNIT. A factory-made assembly of refrigeration components designed to compress and liquefy a specific refrigerant. The unit consists of one or more refrigerant compressors, refrigerant condensers (air-cooled, evaporatively cooled or water-cooled), condenser fans and motors (where used) and factory-supplied accessories.

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the *conditioned space*.

CONDITIONED SPACE. An area, room or space that is enclosed within the *building thermal envelope* and is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling.

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

CRAWL SPACE WALL. The opaque portion of a wall that encloses a crawl space and is partially or totally below grade.

CURTAIN WALL. Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.

DATA CENTER. A room or series of rooms that share data center systems, whose primary function is to house equipment for the processing and storage of electronic data and that has a design total ITE equipment power density exceeding 20 watts per square foot (20 watts per 0.092 m^2) of conditioned area and a total design ITE equipment load greater than 10 kW.

DATA CENTER SYSTEMS. HVAC systems and equipment, or portions thereof, used to provide cooling or ventilation in a data center.

DAYLIGHT RESPONSIVE CONTROL. A device or system that provides automatic control of electric light levels based on the amount of daylight in a space.

DAYLIGHT ZONE. That portion of a building’s interior floor area that is illuminated by natural light.

DEMAND CONTROL VENTILATION (DCV). A ventilation system capability that provides for the automatic reduction of outdoor air intake below design rates when the actual occupancy of spaces served by the system is less than design occupancy.

DEMAND RECIRCULATION WATER SYSTEM. A water distribution system where one or more pumps prime the service hot water piping with heated water upon a demand for hot water.

DIRECT DIGITAL CONTROL (DDC). A type of control where controlled and monitored analog or binary data, such as temperature and contact closures, are converted to digital format for manipulation and calculations by a digital computer or microprocessor, then converted back to analog or binary form to control physical devices.

DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

DYNAMIC GLAZING. Any fenestration product that has the fully reversible ability to change its performance properties, including *U*-factor, solar heat gain coefficient (SHGC) or visible transmittance (VT).

ECONOMIZER, AIR. A duct and damper arrangement and automatic control system that allows a cooling system to supply outside air to reduce or eliminate the need for mechanical cooling during mild or cold weather.

ECONOMIZER, WATER. A system where the supply air of a cooling system is cooled indirectly with water that is itself cooled by heat or mass transfer to the environment without the use of mechanical cooling.

ENCLOSED SPACE. A volume surrounded by solid surfaces such as walls, floors, roofs and openable devices, such as doors and operable windows.

ENERGY ANALYSIS. A method for estimating the annual energy use of the *proposed design* and *standard reference design* based on estimates of energy use.

ENERGY COST. The total estimated annual cost for purchased energy for the building functions regulated by this code, including applicable demand charges.

ENERGY RECOVERY VENTILATION SYSTEM. Systems that employ air-to-air heat exchangers to recover energy from exhaust air for the purpose of preheating, precooling, humidifying or dehumidifying outdoor ventilation air prior to supplying the air to a space, either directly or as part of an HVAC system.

ENERGY SIMULATION TOOL. An *approved* software program or calculation-based methodology that projects the annual energy use of a building.

ENTHALPY RECOVERY RATIO. Change in the enthalpy of the *outdoor air* supply divided by the difference between the *outdoor air* and entering exhaust air enthalpy, expressed as a percentage.

ENTRANCE DOOR. A vertical fenestration product used for occupant ingress, egress and access in nonresidential buildings, including, but not limited to, exterior entrances utilizing latching hardware and automatic closers and containing over 50 percent glazing specifically designed to withstand heavy-duty usage.

EQUIPMENT ROOM. A space that contains either electrical equipment, mechanical equipment, machinery, water pumps or hydraulic pumps that are a function of the building's services.

EXTERIOR WALL. Walls including both above-grade walls and basement walls.

FAN, EMBEDDED. A fan that is part of a manufactured assembly where the assembly includes functions other than air movement.

FAN ARRAY. Multiple fans in parallel between two plenum sections in an air distribution system.

FAN BRAKE HORSEPOWER (BHP). The horsepower delivered to the fan's shaft. Brake horsepower does not include the mechanical drive losses, such as that from belts and gears.

FAN ENERGY INDEX (FEI). The ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated in accordance with AMCA 208.

FAN NAMEPLATE ELECTRICAL INPUT POWER. The nominal electrical input power rating stamped on a fan assembly nameplate.

FAN SYSTEM BHP. The sum of the fan brake horsepower of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the *conditioned spaces* and return it to the source or exhaust it to the outdoors.

FAN SYSTEM DESIGN CONDITIONS. Operating conditions that can be expected to occur during normal system operation that result in the highest supply fan airflow rate to conditioned spaces served by the system, other than during air economizer operation.

FAN SYSTEM ELECTRICAL INPUT POWER. The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.

FAN SYSTEM MOTOR NAMEPLATE HP. The sum of the motor nameplate horsepower of all fans that are required to operate at design conditions to supply air from the heating or cooling source to the *conditioned spaces* and return it to the source or exhaust it to the outdoors.

FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM. A software platform that utilizes building analytic algorithms to convert data provided by sensors and devices to automatically identify faults in building systems and provide a prioritized list of actionable resolutions to those faults based on cost or energy avoidance, comfort and maintenance impact.

FENESTRATION. Products classified as either skylights or vertical fenestration.

Skylights. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices and glazing materials in solariums, sunrooms, roofs, greenhouses and sloped walls.

Vertical fenestration. Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass

DEFINITIONS

or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees (1.05 rad) from horizontal.

FENESTRATION PRODUCT, FIELD-FABRICATED.

A fenestration product whose frame is made at the construction site of standard dimensional lumber or other materials that were not previously cut or otherwise formed with the specific intention of being used to fabricate a fenestration product or exterior door. Field-fabricated does not include site-built fenestration.

FENESTRATION PRODUCT, SITE-BUILT. A fenestration designed to be made up of field-glazed or field-assembled units using specific factory cut or otherwise factory-formed framing and glazing units. Examples of site-built fenestration include storefront systems, curtain walls and atrium roof systems.

F-FACTOR. The perimeter heat loss factor for slab-on-grade floors ($\text{Btu/h} \times \text{ft} \times ^\circ\text{F}$) [$\text{W}/(\text{m} \times \text{K})$].

FLOOR AREA, NET. The actual occupied area not including unoccupied accessory areas such as corridors, stairways, toilet rooms, mechanical rooms and closets.

GENERAL LIGHTING. Interior lighting that provides a substantially uniform level of illumination throughout a space.

GREENHOUSE. A structure or a thermally isolated area of a building that maintains a specialized sunlit environment exclusively used for, and essential to, the cultivation, protection or maintenance of plants. *Greenhouses* are those that are erected for a period of 180 days or more.

GROUP R. Buildings or portions of buildings that contain any of the following occupancies as established in the *International Building Code*:

1. *Group R-1.*
2. *Group R-2* where located more than three stories in height above grade plane.
3. *Group R-4* where located more than three stories in height above grade plane.

HEAT TRAP. An arrangement of piping and fittings, such as elbows, or a commercially available heat trap that prevents thermosiphoning of hot water during standby periods.

HEATED SLAB. Slab-on-grade construction in which the heating elements, hydronic tubing or hot air distribution system is in contact with, or placed within or under, the slab.

HIGH SPEED DOOR. A nonswinging door used primarily to facilitate vehicular access or material transportation, with a minimum opening rate of 32 inches (813 mm) per second, a minimum closing rate of 24 inches (610 mm) per second and that includes an automatic-closing device.

HISTORIC BUILDING. Any building or structure that is one or more of the following:

1. Listed, or certified as eligible for listing, by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, in the National Register of Historic Places.

2. Designated as historic under an applicable state or local law.
3. Certified as a contributing resource within a National Register-listed, state-designated or locally designated historic district.

IEC DESIGN H MOTOR. An electric motor that meets all of the following:

1. It is an induction motor designed for use with three-phase power.
2. It contains a cage rotor.
3. It is capable of direct-on-line starting.
4. It has four, six or eight poles.
5. It is rated from 0.4 kW to 1600 kW at a frequency of 60 hertz.

IEC DESIGN N MOTOR. An electric motor that meets all of the following:

1. It is an induction motor designed for use with three-phase power.
2. It contains a cage rotor.
3. It is capable of direct-on-line starting.
4. It has two, four, six or eight poles.
5. It is rated from 0.4 kW to 1600 kW at a frequency of 60 hertz.

INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

INFORMATION TECHNOLOGY EQUIPMENT (ITE). Items including computers, data storage devices, servers and network and communication equipment.

INTEGRATED PART LOAD VALUE (IPLV). A single-number figure of merit based on part-load EER, COP or kW/ton expressing part-load efficiency for air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for equipment.

INTERNAL CURTAIN SYSTEM. A system consisting of movable panels of fabric or plastic film used to cover and uncover the space enclosed in a *greenhouse* on a daily basis.

ISOLATION DEVICES. Devices that isolate HVAC zones so that they can be operated independently of one another. *Isolation devices* include separate systems, isolation dampers and controls providing shutoff at terminal boxes.

LABELED. Equipment, materials or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, *approved agency* or other organization concerned with product evaluation that maintains periodic inspection of the production of the labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

LARGE-DIAMETER CEILING FAN. A ceiling fan that is greater than 7 feet (2134 mm) in diameter. These fans are sometimes referred to as High-Volume, Low-Speed (HVLS) fans.

LINER SYSTEM (Ls). A system that includes the following:

1. A continuous vapor barrier liner membrane that is installed below the purlins and that is uninterrupted by framing members.
2. An uncompressed, unfaced insulation resting on top of the liner membrane and located between the purlins.

For multilayer installations, the last rated *R*-value of insulation is for unfaced insulation draped over purlins and then compressed when the metal roof panels are attached.

LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the *code official* and concerned with evaluation of products or services that maintains periodic inspection of production of *listed* equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

LOW-SLOPED ROOF. A roof having a slope less than 2 units vertical in 12 units horizontal.

LOW-VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMER. A transformer that is air-cooled, does not use oil as a coolant, has an input voltage less than or equal to 600 volts and is rated for operation at a frequency of 60 hertz.

LUMINAIRE-LEVEL LIGHTING CONTROLS. A lighting system consisting of one or more luminaires with embedded lighting control logic, occupancy and ambient light sensors, wireless networking capabilities and local override switching capability, where required.

MANUAL. Capable of being operated by personal intervention (see “Automatic”).

NAMEPLATE HORSEPOWER. The nominal motor output power rating stamped on the motor nameplate.

NEMA DESIGN A MOTOR. A squirrel-cage motor that meets all of the following:

1. It is designed to withstand full-voltage starting and develop locked-rotor torque as shown in paragraph 12.38.1 of NEMA MG 1.
2. It has pull-up torque not less than the values shown in paragraph 12.40.1 of NEMA MG 1.
3. It has breakdown torque not less than the values shown in paragraph 12.39.1 of NEMA MG 1.
4. It has a locked-rotor current higher than the values shown in paragraph 12.35.1 of NEMA MG 1 for 60 hertz and paragraph 12.35.2 of NEMA MG 1 for 50 hertz.
5. It has a slip at rated load of less than 5 percent for motors with fewer than 10 poles.

NEMA DESIGN B MOTOR. A squirrel-cage motor that meets all of the following:

1. It is designed to withstand full-voltage starting.

2. It develops locked-rotor, breakdown and pull-up torques adequate for general application as specified in Sections 12.38, 12.39 and 12.40 of NEMA MG1.
3. It draws locked-rotor current not to exceed the values shown in Section 12.35.1 for 60 hertz and Section 12.35.2 for 50 hertz of NEMA MG1.
4. It has a slip at rated load of less than 5 percent for motors with fewer than 10 poles.

NEMA DESIGN C MOTOR. A squirrel-cage motor that meets all of the following:

1. Designed to withstand full-voltage starting and develop locked-rotor torque for high-torque applications up to the values shown in paragraph 12.38.2 of NEMA MG1 (incorporated by reference, see A§431.15).
2. It has pull-up torque not less than the values shown in paragraph 12.40.2 of NEMA MG1.
3. It has breakdown torque not less than the values shown in paragraph 12.39.2 of NEMA MG1.
4. It has a locked-rotor current not to exceed the values shown in paragraph 12.35.1 of NEMA MG1 for 60 hertz and paragraph 12.35.2 for 50 hertz.
5. It has a slip at rated load of less than 5 percent.

NETWORKED GUESTROOM CONTROL SYSTEM. A control system, with access from the front desk or other central location associated with a *Group R-1* building, that is capable of identifying the rented and unrented status of each guestroom according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guestroom separately.

NONSTANDARD PART LOAD VALUE (NPLV). A single-number part-load efficiency figure of merit calculated and referenced to conditions other than IPLV conditions, for units that are not designed to operate at AHRI standard rating conditions.

OCCUPANT SENSOR CONTROL. An automatic control device or system that detects the presence or absence of people within an area and causes lighting, equipment or appliances to be regulated accordingly.

ON-SITE RENEWABLE ENERGY. Energy from renewable energy resources harvested at the building project site.

OPAQUE DOOR. A door that is not less than 50-percent opaque in surface area.

POWERED ROOF/WALL VENTILATORS. A fan consisting of a centrifugal or axial impeller with an integral driver in a weather-resistant housing and with a base designed to fit, usually by means of a curb, over a wall or roof opening.

PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on total building performance.

RADIANT HEATING SYSTEM. A heating system that transfers heat to objects and surfaces within a conditioned space, primarily by infrared radiation.

DEFINITIONS

READY ACCESS (TO). That which enables a device, appliance or equipment to be directly reached without requiring the removal or movement of any panel or similar obstruction.

REFRIGERANT DEW POINT. The refrigerant vapor saturation temperature at a specified pressure.

REFRIGERATED WAREHOUSE COOLER. An enclosed storage space capable of being refrigerated to temperatures above 32°F (0°C) that can be walked into and has a total chilled storage area of not less than 3,000 square feet (279 m²).

REFRIGERATED WAREHOUSE FREEZER. An enclosed storage space capable of being refrigerated to temperatures at or below 32°F (0°C) that can be walked into and has a total chilled storage area of not less than 3,000 square feet (279 m²).

REFRIGERATION SYSTEM, LOW TEMPERATURE. Systems for maintaining food product in a frozen state in refrigeration applications.

REFRIGERATION SYSTEM, MEDIUM TEMPERATURE. Systems for maintaining food product above freezing in refrigeration applications.

REGISTERED DESIGN PROFESSIONAL. An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

RENEWABLE ENERGY RESOURCES. Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or extracted from hot fluid or steam heated within the earth.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

REROOFING. The process of recovering or replacing an existing roof covering. See “*Roof recover*” and “*Roof replacement*.”

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and *Group R-2*, *R-3* and *R-4* buildings three stories or less in height above grade plane.

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, underlayment, roof deck, insulation, vapor retarder and interior finish.

ROOF RECOVER. The process of installing an additional roof covering over an existing roof covering without removing the existing roof covering.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purpose of its maintenance.

ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

ROOFTOP MONITOR. A raised section of a roof containing vertical fenestration along one or more sides.

R-VALUE (THERMAL RESISTANCE). The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \times ft^2 \times ^\circ F/Btu$) [$(m^2 \times K)/W$].

SATURATED CONDENSING TEMPERATURE. The saturation temperature corresponding to the measured refrigerant pressure at the condenser inlet for single component and azeotropic refrigerants, and the arithmetic average of the dew point and *bubble point* temperatures corresponding to the refrigerant pressure at the condenser entrance for zeotropic refrigerants.

SERVICE WATER HEATING. Supply of hot water for purposes other than comfort heating.

SLEEPING UNIT. A room or space in which people sleep that can include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are part of a dwelling unit are not *sleeping units*.

SMALL ELECTRIC MOTOR. A general purpose alternating-current single-speed induction motor.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted or convected into the space.

STANDARD REFERENCE DESIGN. A version of the *proposed design* that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

STOREFRONT. A system of doors and windows mulled as a composite fenestration structure that has been designed to resist heavy use. *Storefront* systems include, but are not limited to, exterior fenestration systems that span from the floor level or above to the ceiling of the same story on commercial buildings, with or without mulled windows and doors.

TESTING UNIT ENCLOSURE AREA. The area sum of all the boundary surfaces that define the *dwelling unit*, *sleeping unit* or occupiable *conditioned space* including top/ceiling, bottom/floor and all side walls. This does not include interior partition walls within the *dwelling unit*, *sleeping unit*, or occupiable *conditioned space*. Wall height shall be measured from the finished floor of the *conditioned space* to the finished floor or roof/ceiling air barrier above.

THERMAL DISTRIBUTION EFFICIENCY (TDE). The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable setpoint.

TIME SWITCH CONTROL. An automatic control device or system that controls lighting or other loads, including switching off, based on time schedules.

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films ($\text{Btu/h} \times \text{ft}^2 \times ^\circ\text{F}$) [$\text{W}/(\text{m}^2 \times \text{K})$].

VARIABLE REFRIGERANT FLOW SYSTEM. An engineered direct-expansion (DX) refrigerant system that incorporates a common condensing unit, at least one variable-capacity compressor, a distributed refrigerant piping network to multiple indoor fan heating and cooling units each capable of individual zone temperature control, through integral zone temperature control devices and a common communications network. Variable refrigerant flow utilizes three or more steps of control on common interconnecting piping.

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof a building's top surface that includes, by design, vegetation and related landscape elements.

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VENTILATION AIR. That portion of supply air that comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

VISIBLE TRANSMITTANCE (VT). The ratio of visible light entering the space through the fenestration product assembly to the incident visible light. Visible transmittance includes the effects of glazing material and frame and is expressed as a number between 0 and 1.

VISIBLE TRANSMITTANCE, ANNUAL ($\text{VT}_{\text{annual}}$). The ratio of visible light entering the space through the fenestration product assembly to the incident visible light during the course of a year, which includes the effects of glazing material, frame, and light well or tubular conduit, and is expressed as a number between 0 and 1.

VOLTAGE DROP. A decrease in voltage caused by losses in the wiring systems that connect the power source to the load.

WALK-IN COOLER. An enclosed storage space capable of being refrigerated to temperatures above 32°F (0°C) and less than 55°F (12.8°C) that can be walked into, has a ceiling height of not less than 7 feet (2134 mm) and has a total chilled storage area of less than 3,000 square feet (279 m²).

WALK-IN FREEZER. An enclosed storage space capable of being refrigerated to temperatures at or below 32°F (0°C) that can be walked into, has a ceiling height of not less than 7 feet (2134 mm) and has a total chilled storage area of less than 3,000 square feet (279 m²).

WALL, ABOVE-GRADE. A wall associated with the *building thermal envelope* that is more than 15 percent above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building. This includes, but is not limited to, between-floor spandrels, peripheral edges of floors, roof knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

WALL, BELOW-GRADE. A wall associated with the basement or first story of the building that is part of the *building thermal envelope*, is not less than 85 percent below grade and is on the exterior of the building.

WATER HEATER. Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

ZONE. A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device.

CHAPTER 3 [CE]

GENERAL REQUIREMENTS

User note:

About this chapter: Chapter 3 addresses broadly applicable requirements that would not be at home in other chapters having more specific coverage of subject matter. This chapter establishes climate zone by US counties and territories and includes methodology for determining climate zones elsewhere. It also contains product rating, marking and installation requirements for materials such as insulation, windows, doors and siding.

SECTION C301 CLIMATE ZONES

C301.1 General. *Climate zones* from Figure C301.1 or Table C301.1 shall be used for determining the applicable requirements from Chapter 4. Locations not indicated in Table C301.1 shall be assigned a *climate zone* in accordance with Section C301.3.

C301.2 Warm Humid counties. In Table C301.1, Warm Humid counties are identified by an asterisk.

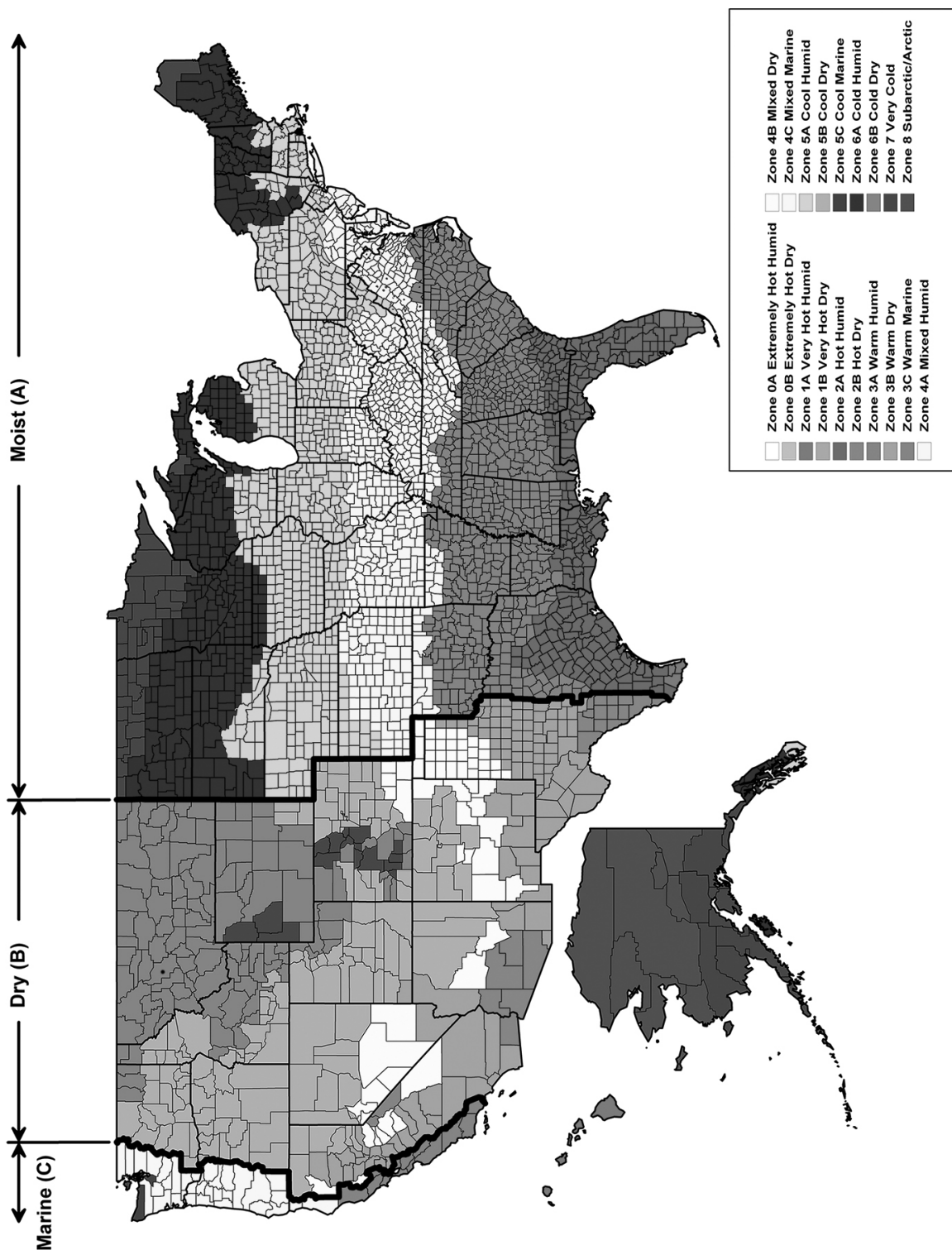


FIGURE C301.1
CLIMATE ZONES

TABLE C301.1
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES	3A Lowndes*
ALABAMA	3A Macon*
3A Autauga*	3A Madison
2A Baldwin*	3A Marengo*
3A Barbour*	3A Marion
3A Bibb	3A Marshall
3A Blount	2A Mobile*
3A Bullock*	3A Monroe*
3A Butler*	3A Montgomery*
3A Calhoun	3A Morgan
3A Chambers	3A Perry*
3A Cherokee	3A Pickens
3A Chilton	3A Pike*
3A Choctaw*	3A Randolph
3A Clarke*	3A Russell*
3A Clay	3A Shelby
3A Cleburne	3A St. Clair
2A Coffee*	3A Sumter
3A Colbert	3A Talladega
3A Conecuh*	3A Tallapoosa
3A Coosa	3A Tuscaloosa
2A Covington*	3A Walker
3A Crenshaw*	3A Washington*
3A Cullman	3A Wilcox*
2A Dale*	3A Winston
3A Dallas*	ALASKA
3A DeKalb	7 Aleutians East
3A Elmore*	7 Aleutians West
2A Escambia*	7 Anchorage
3A Etowah	7 Bethel
3A Fayette	7 Bristol Bay
3A Franklin	8 Denali
2A Geneva*	7 Dillingham
3A Greene	8 Fairbanks North Star
3A Hale	6A Haines
2A Henry*	6A Juneau
2A Houston*	7 Kenai Peninsula
3A Jackson	5C Ketchikan Gateway
3A Jefferson	6A Kodiak Island
3A Lamar	7 Lake and Peninsula
3A Lauderdale	7 Matanuska-Susitna
3A Lawrence	8 Nome
3A Lee	8 North Slope
3A Limestone	8 Northwest Arctic

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued
ALASKA (continued)
5C Prince of Wales Outer Ketchikan
5C Sitka
6A Skagway-Hoonah-Angoon
8 Southeast Fairbanks
7 Valdez-Cordova
8 Wade Hampton
6A Wrangell-Petersburg
7 Yakutat
8 Yukon-Koyukuk
ARIZONA
5B Apache
3B Cochise
5B Coconino
4B Gila
3B Graham
3B Greenlee
2B La Paz
2B Maricopa
3B Mohave
5B Navajo
2B Pima
2B Pinal
3B Santa Cruz
4B Yavapai
2B Yuma
ARKANSAS
3A Arkansas
3A Ashley
4A Baxter
4A Benton
4A Boone
3A Bradley
3A Calhoun
4A Carroll
3A Chicot
3A Clark
3A Clay
3A Cleburne
3A Cleveland
3A Columbia*
3A Conway
3A Craighead
3A Crawford

3A Crittenden
3A Cross
3A Dallas
3A Desha
3A Drew
3A Faulkner
3A Franklin
4A Fulton
3A Garland
3A Grant
3A Greene
3A Hempstead*
3A Hot Spring
3A Howard
3A Independence
4A Izard
3A Jackson
3A Jefferson
3A Johnson
3A Lafayette*
3A Lawrence
3A Lee
3A Lincoln
3A Little River*
3A Logan
3A Lonoke
4A Madison
4A Marion
3A Miller*
3A Mississippi
3A Monroe
3A Montgomery
3A Nevada
4A Newton
3A Ouachita
3A Perry
3A Phillips
3A Pike
3A Poinsett
3A Polk
3A Pope
3A Prairie
3A Pulaski
3A Randolph

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	5B Nevada
ARKANSAS (continued)	3B Orange
3A Saline	3B Placer
3A Scott	5B Plumas
4A Searcy	3B Riverside
3A Sebastian	3B Sacramento
3A Sevier*	3C San Benito
3A Sharp	3B San Bernardino
3A St. Francis	3B San Diego
4A Stone	3C San Francisco
3A Union*	3B San Joaquin
3A Van Buren	3C San Luis Obispo
4A Washington	3C San Mateo
3A White	3C Santa Barbara
3A Woodruff	3C Santa Clara
3A Yell	3C Santa Cruz
CALIFORNIA	3B Shasta
3C Alameda	5B Sierra
6B Alpine	5B Siskiyou
4B Amador	3B Solano
3B Butte	3C Sonoma
4B Calaveras	3B Stanislaus
3B Colusa	3B Sutter
3B Contra Costa	3B Tehama
4C Del Norte	4B Trinity
4B El Dorado	3B Tulare
3B Fresno	4B Tuolumne
3B Glenn	3C Ventura
4C Humboldt	3B Yolo
2B Imperial	3B Yuba
4B Inyo	COLORADO
3B Kern	5B Adams
3B Kings	6B Alamosa
4B Lake	5B Arapahoe
5B Lassen	6B Archuleta
3B Los Angeles	4B Baca
3B Madera	4B Bent
3C Marin	5B Boulder
4B Mariposa	5B Broomfield
3C Mendocino	6B Chaffee
3B Merced	5B Cheyenne
5B Modoc	7 Clear Creek
6B Mono	6B Conejos
3C Monterey	6B Costilla
3C Napa	5B Crowley

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	6B San Miguel
COLORADO <i>(continued)</i>	5B Sedgwick
5B Custer	7 Summit
5B Delta	5B Teller
5B Denver	5B Washington
6B Dolores	5B Weld
5B Douglas	5B Yuma
6B Eagle	CONNECTICUT
5B Elbert	5A (all)
5B El Paso	DELAWARE
5B Fremont	4A (all)
5B Garfield	DISTRICT OF COLUMBIA
5B Gilpin	4A (all)
7 Grand	FLORIDA
7 Gunnison	2A Alachua*
7 Hinsdale	2A Baker*
5B Huerfano	2A Bay*
7 Jackson	2A Bradford*
5B Jefferson	2A Brevard*
5B Kiowa	1A Broward*
5B Kit Carson	2A Calhoun*
7 Lake	2A Charlotte*
5B La Plata	2A Citrus*
5B Larimer	2A Clay*
4B Las Animas	2A Collier*
5B Lincoln	2A Columbia*
5B Logan	2A DeSoto*
5B Mesa	2A Dixie*
7 Mineral	2A Duval*
6B Moffat	2A Escambia*
5B Montezuma	2A Flagler*
5B Montrose	2A Franklin*
5B Morgan	2A Gadsden*
4B Otero	2A Gilchrist*
6B Ouray	2A Glades*
7 Park	2A Gulf*
5B Phillips	2A Hamilton*
7 Pitkin	2A Hardee*
4B Prowers	2A Hendry*
5B Pueblo	2A Hernando*
6B Rio Blanco	2A Highlands*
7 Rio Grande	2A Hillsborough*
7 Routt	2A Holmes*
6B Saguache	2A Indian River*
7 San Juan	2A Jackson*

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	3A Barrow
FLORIDA (continued)	3A Bartow
2A Jefferson*	3A Ben Hill*
2A Lafayette*	2A Berrien*
2A Lake*	3A Bibb
2A Lee*	3A Bleckley*
2A Leon*	2A Brantley*
2A Levy*	2A Brooks*
2A Liberty*	2A Bryan*
2A Madison*	3A Bulloch*
2A Manatee*	3A Burke
2A Marion*	3A Butts
2A Martin*	2A Calhoun*
1A Miami-Dade*	2A Camden*
1A Monroe*	3A Candler*
2A Nassau*	3A Carroll
2A Okaloosa*	3A Catoosa
2A Okeechobee*	2A Charlton*
2A Orange*	2A Chatham*
2A Osceola*	3A Chattahoochee*
1A Palm Beach*	3A Chattooga
2A Pasco*	3A Cherokee
2A Pinellas*	3A Clarke
2A Polk*	3A Clay*
2A Putnam*	3A Clayton
2A Santa Rosa*	2A Clinch*
2A Sarasota*	3A Cobb
2A Seminole*	2A Coffee*
2A St. Johns*	2A Colquitt*
2A St. Lucie*	3A Columbia
2A Sumter*	2A Cook*
2A Suwannee*	3A Coweta
2A Taylor*	3A Crawford
2A Union*	3A Crisp*
2A Volusia*	3A Dade
2A Wakulla*	3A Dawson
2A Walton*	2A Decatur*
2A Washington*	3A DeKalb
GEORGIA	3A Dodge*
2A Appling*	3A Dooly*
2A Atkinson*	2A Dougherty*
2A Bacon*	3A Douglas
2A Baker*	2A Early*
3A Baldwin	2A Echols*
3A Banks	2A Effingham*

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	
GEORGIA (continued)	
3A Elbert	3A Madison
3A Emanuel*	3A Marion*
2A Evans*	3A McDuffie
3A Fannin	2A McIntosh*
3A Fayette	3A Meriwether
3A Floyd	2A Miller*
3A Forsyth	2A Mitchell*
3A Franklin	3A Monroe
3A Fulton	3A Montgomery*
3A Gilmer	3A Morgan
3A Glascock	3A Murray
2A Glynn*	3A Muscogee
3A Gordon	3A Newton
2A Grady*	3A Oconee
3A Greene	3A Oglethorpe
3A Gwinnett	3A Paulding
3A Habersham	3A Peach*
3A Hall	3A Pickens
3A Hancock	2A Pierce*
3A Haralson	3A Pike
3A Harris	3A Polk
3A Hart	3A Pulaski*
3A Heard	3A Putnam
3A Henry	3A Quitman*
3A Houston*	3A Rabun
3A Irwin*	3A Randolph*
3A Jackson	3A Richmond
3A Jasper	3A Rockdale
2A Jeff Davis*	3A Schley*
3A Jefferson	3A Screven*
3A Jenkins*	2A Seminole*
3A Johnson*	3A Spalding
3A Jones	3A Stephens
3A Lamar	3A Stewart*
2A Lanier*	3A Sumter*
3A Laurens*	3A Talbot
3A Lee*	3A Taliaferro
2A Liberty*	2A Tattnall*
3A Lincoln	3A Taylor*
2A Long*	3A Telfair*
2A Lowndes*	3A Terrell*
3A Lumpkin	2A Thomas*
3A Macon*	2A Tift*
	2A Toombs*
	3A Towns

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	6B Franklin
GEORGIA (<i>continued</i>)	6B Fremont
3A Treutlen*	5B Gem
3A Troup	5B Gooding
3A Turner*	5B Idaho
3A Twiggs*	6B Jefferson
3A Union	5B Jerome
3A Upson	5B Kootenai
3A Walker	5B Latah
3A Walton	6B Lemhi
2A Ware*	5B Lewis
3A Warren	5B Lincoln
3A Washington	6B Madison
2A Wayne*	5B Minidoka
3A Webster*	5B Nez Perce
3A Wheeler*	6B Oneida
3A White	5B Owyhee
3A Whitfield	5B Payette
3A Wilcox*	5B Power
3A Wilkes	5B Shoshone
3A Wilkinson	6B Teton
2A Worth*	5B Twin Falls
HAWAII	6B Valley
1A (all)*	5B Washington
IDAHO	ILLINOIS
5B Ada	5A Adams
6B Adams	4A Alexander
6B Bannock	4A Bond
6B Bear Lake	5A Boone
5B Benewah	5A Brown
6B Bingham	5A Bureau
6B Blaine	4A Calhoun
6B Boise	5A Carroll
6B Bonner	5A Cass
6B Bonneville	5A Champaign
6B Boundary	4A Christian
6B Butte	4A Clark
6B Camas	4A Clay
5B Canyon	4A Clinton
6B Caribou	4A Coles
5B Cassia	5A Cook
6B Clark	4A Crawford
5B Clearwater	4A Cumberland
6B Custer	5A DeKalb
5B Elmore	5A De Witt

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	
ILLINOIS (continued)	
5A Douglas	5A Menard
5A DuPage	5A Mercer
5A Edgar	4A Monroe
4A Edwards	4A Montgomery
4A Effingham	5A Morgan
4A Fayette	5A Moultrie
5A Ford	5A Ogle
4A Franklin	5A Peoria
5A Fulton	4A Perry
4A Gallatin	5A Piatt
4A Greene	5A Pike
5A Grundy	4A Pope
4A Hamilton	4A Pulaski
5A Hancock	5A Putnam
4A Hardin	4A Randolph
5A Henderson	4A Richland
5A Henry	5A Rock Island
5A Iroquois	4A Saline
4A Jackson	5A Sangamon
4A Jasper	5A Schuyler
4A Jefferson	5A Scott
4A Jersey	4A Shelby
5A Jo Daviess	5A Stark
4A Johnson	4A St. Clair
5A Kane	5A Stephenson
5A Kankakee	5A Tazewell
5A Kendall	4A Union
5A Knox	5A Vermilion
5A Lake	4A Wabash
5A La Salle	5A Warren
4A Lawrence	4A Washington
5A Lee	4A Wayne
5A Livingston	4A White
5A Logan	5A Whiteside
5A Macon	5A Will
4A Macoupin	4A Williamson
4A Madison	5A Winnebago
4A Marion	5A Woodford
5A Marshall	INDIANA
5A Mason	5A Adams
4A Massac	5A Allen
5A McDonough	4A Bartholomew
5A McHenry	5A Benton
5A McLean	5A Blackford
	5A Boone
	4A Brown

(continued)



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TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	
INDIANA (continued)	
5A Carroll	4A Martin
5A Cass	5A Miami
4A Clark	4A Monroe
4A Clay	5A Montgomery
5A Clinton	4A Morgan
4A Crawford	5A Newton
4A Daviess	5A Noble
4A Dearborn	4A Ohio
4A Decatur	4A Orange
5A De Kalb	4A Owen
5A Delaware	5A Parke
4A Dubois	4A Perry
5A Elkhart	4A Pike
4A Fayette	5A Porter
4A Floyd	4A Posey
5A Fountain	5A Pulaski
4A Franklin	4A Putnam
5A Fulton	5A Randolph
4A Gibson	4A Ripley
5A Grant	4A Rush
4A Greene	4A Scott
5A Hamilton	4A Shelby
5A Hancock	4A Spencer
4A Harrison	5A Starke
4A Hendricks	5A Steuben
5A Henry	5A St. Joseph
5A Howard	4A Sullivan
5A Huntington	4A Switzerland
4A Jackson	5A Tippecanoe
5A Jasper	5A Tipton
5A Jay	4A Union
4A Jefferson	4A Vanderburgh
4A Jennings	5A Vermillion
4A Johnson	4A Vigo
4A Knox	5A Wabash
5A Kosciusko	5A Warren
5A LaGrange	4A Warrick
5A Lake	4A Washington
5A LaPorte	5A Wayne
4A Lawrence	5A Wells
5A Madison	5A White
4A Marion	5A Whitley
5A Marshall	IOWA
	5A Adair
	5A Adams

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	
IOWA (continued)	
5A Allamakee	5A Humboldt
5A Appanoose	5A Ida
5A Audubon	5A Iowa
5A Benton	5A Jackson
6A Black Hawk	5A Jasper
5A Boone	5A Jefferson
5A Bremer	5A Johnson
5A Buchanan	5A Jones
5A Buena Vista	5A Keokuk
5A Butler	6A Kossuth
5A Calhoun	5A Lee
5A Carroll	5A Linn
5A Cass	5A Louisa
5A Cedar	5A Lucas
6A Cerro Gordo	6A Lyon
5A Cherokee	5A Madison
5A Chickasaw	5A Mahaska
5A Clarke	5A Marion
6A Clay	5A Marshall
5A Clayton	5A Mills
5A Clinton	6A Mitchell
5A Crawford	5A Monona
5A Dallas	5A Monroe
5A Davis	5A Montgomery
5A Decatur	5A Muscatine
5A Delaware	6A O'Brien
5A Des Moines	6A Osceola
6A Dickinson	5A Page
5A Dubuque	6A Palo Alto
6A Emmet	5A Plymouth
5A Fayette	5A Pocahontas
5A Floyd	5A Polk
5A Franklin	5A Pottawattamie
5A Fremont	5A Poweshiek
5A Greene	5A Ringgold
5A Grundy	5A Sac
5A Guthrie	5A Scott
5A Hamilton	5A Shelby
6A Hancock	6A Sioux
5A Hardin	5A Story
5A Harrison	5A Tama
5A Henry	5A Taylor
5A Howard	5A Union
	5A Van Buren
	5A Wapello

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	
IOWA (continued)	
5A Warren	4A Grant
5A Washington	4A Gray
5A Wayne	5A Greeley
5A Webster	4A Greenwood
6A Winnebago	4A Hamilton
5A Winneshiek	4A Harper
5A Woodbury	4A Harvey
6A Worth	4A Haskell
5A Wright	4A Hodgeman
KANSAS	4A Jackson
4A Allen	4A Jefferson
4A Anderson	5A Jewell
4A Atchison	4A Johnson
4A Barber	4A Kearny
4A Barton	4A Kingman
4A Bourbon	4A Kiowa
4A Brown	4A Labette
4A Butler	4A Lane
4A Chase	4A Leavenworth
4A Chautauqua	4A Lincoln
4A Cherokee	4A Linn
5A Cheyenne	5A Logan
4A Clark	4A Lyon
4A Clay	4A Marion
4A Cloud	4A Marshall
4A Coffey	4A McPherson
4A Comanche	4A Meade
4A Cowley	4A Miami
4A Crawford	4A Mitchell
5A Decatur	4A Montgomery
4A Dickinson	4A Morris
4A Doniphan	4A Morton
4A Douglas	4A Nemaha
4A Edwards	4A Neosho
4A Elk	4A Ness
4A Ellis	5A Norton
4A Ellsworth	4A Osage
4A Finney	4A Osborne
4A Ford	4A Ottawa
4A Franklin	4A Pawnee
4A Geary	5A Phillips
5A Gove	4A Pottawatomie
4A Graham	4A Pratt
	5A Rawlins
	4A Reno

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	3A Claiborne*
KANSAS (continued)	3A Concordia*
5A Republic	3A De Soto*
4A Rice	2A East Baton Rouge*
4A Riley	3A East Carroll
4A Rooks	2A East Feliciana*
4A Rush	2A Evangeline*
4A Russell	3A Franklin*
4A Saline	3A Grant*
5A Scott	2A Iberia*
4A Sedgwick	2A Iberville*
4A Seward	3A Jackson*
4A Shawnee	2A Jefferson*
5A Sheridan	2A Jefferson Davis*
5A Sherman	2A Lafayette*
5A Smith	2A Lafourche*
4A Stafford	3A La Salle*
4A Stanton	3A Lincoln*
4A Stevens	2A Livingston*
4A Sumner	3A Madison*
5A Thomas	3A Morehouse
4A Trego	3A Natchitoches*
4A Wabaunsee	2A Orleans*
5A Wallace	3A Ouachita*
4A Washington	2A Plaquemines*
5A Wichita	2A Pointe Coupee*
4A Wilson	2A Rapides*
4A Woodson	3A Red River*
4A Wyandotte	3A Richland*
KENTUCKY	3A Sabine*
4A (all)	2A St. Bernard*
LOUISIANA	2A St. Charles*
2A Acadia*	2A St. Helena*
2A Allen*	2A St. James*
2A Ascension*	2A St. John the Baptist*
2A Assumption*	2A St. Landry*
2A Avoyelles*	2A St. Martin*
2A Beauregard*	2A St. Mary*
3A Bienville*	2A St. Tammany*
3A Bossier*	2A Tangipahoa*
3A Caddo*	3A Tensas*
2A Calcasieu*	2A Terrebonne*
3A Caldwell*	3A Union*
2A Cameron*	2A Vermilion*
3A Catahoula*	3A Vernon*

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	4A St. Mary's
LOUISIANA (continued)	4A Talbot
2A Washington*	4A Washington
3A Webster*	4A Wicomico
2A West Baton Rouge*	4A Worcester
3A West Carroll	MASSACHUSETTS
2A West Feliciana*	5A (all)
3A Winn*	MICHIGAN
MAINE	6A Alcona
6A Androscoggin	6A Alger
7 Aroostook	5A Allegan
6A Cumberland	6A Alpena
6A Franklin	6A Antrim
6A Hancock	6A Arenac
6A Kennebec	6A Baraga
6A Knox	5A Barry
6A Lincoln	5A Bay
6A Oxford	6A Benzie
6A Penobscot	5A Berrien
6A Piscataquis	5A Branch
6A Sagadahoc	5A Calhoun
6A Somerset	5A Cass
6A Waldo	6A Charlevoix
6A Washington	6A Cheboygan
6A York	6A Chippewa
MARYLAND	6A Clare
5A Allegany	5A Clinton
4A Anne Arundel	6A Crawford
4A Baltimore	6A Delta
4A Baltimore (city)	6A Dickinson
4A Calvert	5A Eaton
4A Caroline	6A Emmet
4A Carroll	5A Genesee
4A Cecil	6A Gladwin
4A Charles	6A Gogebic
4A Dorchester	6A Grand Traverse
4A Frederick	5A Gratiot
5A Garrett	5A Hillsdale
4A Harford	6A Houghton
4A Howard	5A Huron
4A Kent	5A Ingham
4A Montgomery	5A Ionia
4A Prince George's	6A Iosco
4A Queen Anne's	6A Iron
4A Somerset	6A Isabella

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	5A Washtenaw
MICHIGAN (continued)	5A Wayne
5A Jackson	6A Wexford
5A Kalamazoo	MINNESOTA
6A Kalkaska	7 Aitkin
5A Kent	6A Anoka
7 Keweenaw	6A Becker
6A Lake	7 Beltrami
5A Lapeer	6A Benton
6A Leelanau	6A Big Stone
5A Lenawee	6A Blue Earth
5A Livingston	6A Brown
6A Luce	7 Carlton
6A Mackinac	6A Carver
5A Macomb	7 Cass
6A Manistee	6A Chippewa
7 Marquette	6A Chisago
6A Mason	6A Clay
6A Mecosta	7 Clearwater
6A Menominee	7 Cook
5A Midland	6A Cottonwood
6A Missaukee	7 Crow Wing
5A Monroe	6A Dakota
5A Montcalm	6A Dodge
6A Montmorency	6A Douglas
5A Muskegon	6A Faribault
6A Newaygo	5A Fillmore
5A Oakland	6A Freeborn
6A Oceana	6A Goodhue
6A Ogemaw	6A Grant
6A Ontonagon	6A Hennepin
6A Osceola	5A Houston
6A Oscoda	7 Hubbard
6A Otsego	6A Isanti
5A Ottawa	7 Itasca
6A Presque Isle	6A Jackson
6A Roscommon	6A Kanabec
5A Saginaw	6A Kandiyohi
5A Sanilac	7 Kittson
6A Schoolcraft	7 Koochiching
5A Shiawassee	6A Lac qui Parle
5A St. Clair	7 Lake
5A St. Joseph	7 Lake of the Woods
5A Tuscola	6A Le Sueur
5A Van Buren	6A Lincoln

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	5A Winona
MINNESOTA (continued)	6A Wright
6A Lyon	6A Yellow Medicine
7 Mahnomen	MISSISSIPPI
7 Marshall	3A Adams*
6A Martin	3A Alcorn
6A McLeod	3A Amite*
6A Meeker	3A Attala
6A Mille Lacs	3A Benton
6A Morrison	3A Bolivar
6A Mower	3A Calhoun
6A Murray	3A Carroll
6A Nicollet	3A Chickasaw
6A Nobles	3A Choctaw
7 Norman	3A Claiborne*
6A Olmsted	3A Clarke
6A Otter Tail	3A Clay
7 Pennington	3A Coahoma
7 Pine	3A Copiah*
6A Pipestone	3A Covington*
7 Polk	3A DeSoto
6A Pope	3A Forrest*
6A Ramsey	3A Franklin*
7 Red Lake	2A George*
6A Redwood	3A Greene*
6A Renville	3A Grenada
6A Rice	2A Hancock*
6A Rock	2A Harrison*
7 Roseau	3A Hinds*
6A Scott	3A Holmes
6A Sherburne	3A Humphreys
6A Sibley	3A Issaquena
6A Stearns	3A Itawamba
6A Steele	2A Jackson*
6A Stevens	3A Jasper
7 St. Louis	3A Jefferson*
6A Swift	3A Jefferson Davis*
6A Todd	3A Jones*
6A Traverse	3A Kemper
6A Wabasha	3A Lafayette
7 Wadena	3A Lamar*
6A Waseca	3A Lauderdale
6A Washington	3A Lawrence*
6A Watonwan	3A Leake
6A Wilkin	3A Lee

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	5A Andrew
MISSISSIPPI (continued)	5A Atchison
3A Leflore	4A Audrain
3A Lincoln*	4A Barry
3A Lowndes	4A Barton
3A Madison	4A Bates
3A Marion*	4A Benton
3A Marshall	4A Bollinger
3A Monroe	4A Boone
3A Montgomery	4A Buchanan
3A Neshoba	4A Butler
3A Newton	4A Caldwell
3A Noxubee	4A Callaway
3A Oktibbeha	4A Camden
3A Panola	4A Cape Girardeau
2A Pearl River*	4A Carroll
3A Perry*	4A Carter
3A Pike*	4A Cass
3A Pontotoc	4A Cedar
3A Prentiss	4A Chariton
3A Quitman	4A Christian
3A Rankin*	5A Clark
3A Scott	4A Clay
3A Sharkey	4A Clinton
3A Simpson*	4A Cole
3A Smith*	4A Cooper
2A Stone*	4A Crawford
3A Sunflower	4A Dade
3A Tallahatchie	4A Dallas
3A Tate	5A Daviess
3A Tippah	5A DeKalb
3A Tishomingo	4A Dent
3A Tunica	4A Douglas
3A Union	3A Dunklin
3A Walthall*	4A Franklin
3A Warren*	4A Gasconade
3A Washington	5A Gentry
3A Wayne*	4A Greene
3A Webster	5A Grundy
3A Wilkinson*	5A Harrison
3A Winston	4A Henry
3A Yalobusha	4A Hickory
3A Yazoo	5A Holt
MISSOURI	4A Howard
5A Adair	4A Howell

(continued)

TABLE C301.1—continued
CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY^a

US STATES—continued	4A Reynolds
MISSOURI (continued)	4A Ripley
4A Iron	4A Saline
4A Jackson	5A Schuyler
4A Jasper	5A Scotland
4A Jefferson	4A Scott
4A Johnson	4A Shannon
5A Knox	5A Shelby
4A Laclede	4A St. Charles
4A Lafayette	4A St. Clair
4A Lawrence	4A St. Francois
5A Lewis	4A St. Louis
4A Lincoln	4A St. Louis (city)
5A Linn	4A Ste. Genevieve
5A Livingston	4A Stoddard
5A Macon	4A Stone
4A Madison	5A Sullivan
4A Maries	4A Taney
5A Marion	4A Texas
4A McDonald	4A Vernon
5A Mercer	4A Warren
4A Miller	4A Washington
4A Mississippi	4A Wayne
4A Moniteau	4A Webster
4A Monroe	5A Worth
4A Montgomery	4A Wright
4A Morgan	MONTANA
4A New Madrid	6B (all)
4A Newton	NEBRASKA
5A Nodaway	5A (all)
4A Oregon	NEVADA
4A Osage	4B Carson City (city)
4A Ozark	5B Churchill
3A Pemiscot	3B Clark
4A Perry	4B Douglas
4A Pettis	5B Elko
4A Phelps	4B Esmeralda
5A Pike	5B Eureka
4A Platte	5B Humboldt
4A Polk	5B Lander
4A Pulaski	4B Lincoln
5A Putnam	4B Lyon
5A Ralls	4B Mineral
4A Randolph	4B Nye
4A Ray	5B Pershing

(continued)