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2012 International Energy Conservation Code®

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PREFACE

Introduction

Internationally, code officials recognize the need for a modern, up-to-date energy conservation code addressing the design of energy-efficient building envelopes and installation of energy efficient mechanical, lighting and power systems through requirements emphasizing performance. The *International Energy Conservation Code*®, in this 2012 edition, is designed to meet these needs through model code regulations that will result in the optimal utilization of fossil fuel and nondepletable resources in all communities, large and small.

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 in this code—IECC-Commercial Provisions and IECC—Residential Provisions are separately applied to buildings within their respective scopes. Each set of provisions are to be treated separately; they each contain a Scope and Administration chapter, a Definitions chapter, a General Requirements chapter, and a chapter containing energy efficiency requirements applicable to buildings within their scope.

This comprehensive energy conservation code establishes minimum regulations 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 2012 edition is fully compatible with all of the *International Codes*® (I-Codes®) published by the International Code Council (ICC)®, including: the *International Building Code*®, *International Existing Building Code*®, *International Fire Code*®, *International Fuel Gas Code*®, *International Green Construction Code*™ (to be available March 2012), *International Mechanical Code*®, *ICC Performance Code*®, *International Plumbing Code*®, *International Private Sewage Disposal Code*®, *International Property Maintenance Code*®, *International Residential Code*®, *International Swimming Pool and Spa Code*™ (to be available March 2012), *International Wildland-Urban Interface Code*® and *International Zoning Code*®.

The *International Energy Conservation Code* provisions provide many benefits, among which is the model code development process that offers an international forum for energy professionals to discuss performance and prescriptive code requirements. This forum provides an excellent arena to debate proposed revisions. This model code also encourages international consistency in the application of provisions.

Development

The first edition of the *International Energy Conservation Code* (1998) was based on the 1995 edition of the *Model Energy Code* promulgated by the Council of American Building Officials (CABO) and included changes approved through the CABO Code Development Procedures through 1997. CABO assigned all rights and responsibilities to the International Code Council and its three statutory members at that time, including Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO) and Southern Building Code Congress International (SBCCI). This 2012 edition presents the code as originally issued, with changes reflected in the 2000, 2003, 2006 and 2009 editions and further changes approved through the ICC Code Development Process through 2010. A new edition such as this is promulgated every three 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.

Adoption

The *International Energy Conservation Code* is available for adoption and use by jurisdictions internationally. Its use within a governmental jurisdiction is intended to be accomplished through adoption by reference in accordance with proceedings establishing the jurisdiction's laws. At the time of adoption, jurisdictions should insert the appropriate information in provisions requiring specific local information, such as the name of the adopting jurisdiction. These locations are shown in bracketed words in small capital letters in the code and in the sample ordinance. The sample adoption ordinance on page ix addresses several key elements of a code adoption ordinance, including the information required for insertion into the code text.

Maintenance

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

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

While the development procedure of the *International Energy Conservation Code* assures the highest degree of care, ICC, its members and those participating in the development of this code do not accept any liability resulting from compliance or noncompliance with the provisions because ICC and its members do not have the power or authority to police or enforce compliance with the contents of this code. Only the governmental body that enacts the code into law has such authority.

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

In each code development cycle, proposed changes to the code are considered at the Code Development 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. Proposed changes to a code section or defined term, other than those designated by [CE] or [RE], that has a number beginning with a letter in brackets are considered by a different code development committee. For example, proposed changes to code sections or defined terms that have [M] in front of them are considered by the International Mechanical Code Development Committee.

Maintenance responsibilities for the IECC are designated as follows:

[CE] = Commercial Energy Code Development Committee

[M] = International Mechanical Code Development Committee

[RE] = Residential Energy Code Development Committee

Note that, for the development of the 2015 edition of the I-Codes, there will be two groups of code development committees and they will meet in separate years. The groupings are as follows:

Group A Codes (Heard in 2012, Code Change Proposals Deadline: January 3, 2012)	Group B Codes (Heard in 2013, Code Change Proposals Deadline: January 3, 2013)
International Building Code	Administrative Provisions (Chapter 1 all codes except the IECC, IRC and ICCPC, administrative updates to currently referenced standards, and designated definitions)
International Fuel Gas Code	International Energy Conservation Code
International Mechanical Code	International Existing Building Code
International Plumbing Code	International Fire Code
International Private Sewage Disposal Code	International Green Construction Code
	ICC Performance Code
	International Property Maintenance Code
	International Residential Code
	International Swimming Pool and Spa Code
	International Wildland-Urban Interface Code
	International Zoning Code

Code change proposals submitted for code sections that have a letter designation in front of them will be heard by the respective committee responsible for such code sections. Because different committees will meet in different years, it is possible that some proposals for this code will be heard by a committee in a different year than the year in which the primary committees for this code meets.

For example, the definition of the term “Energy Recovery Ventilation System” for the IECC—Commercial Provisions (page C-8) is the responsibility of the International Mechanical Code Development Committee, which is part of the Group A code hearings. Therefore, any proposed changes to this defined term will need to be submitted by the deadline for the Group A codes, so that the International Mechanical Code Development Committee can consider that proposed change during the 2012 Code Change Cycle.

It is very important that anyone submitting code change proposals understand which code development committee is responsible for the section of the code that is the subject of the code change proposal. For further information on the code development committee responsibilities, please visit the ICC web site at www.iccsafe.org/scoping.

Marginal Markings

Solid vertical lines in the margins within the body of the code indicate a technical change from the requirements of the 2009 edition. Deletion indicators in the form of an arrow (➡) are provided in the margin where an entire section, paragraph, exception or table has been deleted or an item in a list of items or a table has been deleted.

A single asterisk [*] placed in the margin indicates that text or a table has been relocated within the code. A double asterisk [**] placed in the margin indicates that the text or table immediately following it has been relocated there from elsewhere in the code. The following table indicates such relocations in the 2012 Edition of the *International Energy Conservation Code*.

2012 LOCATION	2009 LOCATION
C402.4.3	502.4.1
C408.2.2.1	503.2.9.1
C408.2.2.2	503.2.9.2
C408.2.5.2	503.2.9.3

Italicized Terms

Selected terms set forth in Chapter 2, Definitions, for both the Commercial and Residential Provisions are italicized where they appear in code text. Such terms are not italicized where the definition set forth in Chapter 2 does not impart the intended meaning in the use of the term. The terms selected have definitions which the user should read carefully to facilitate better understanding of the code.

Effective Use of the International Energy Conservation Code

The *International Energy Conservation Code* (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 uses 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 2012 IECC

The IECC contains two separate sets of provisions—one for commercial buildings and one for residential buildings. Each set of provisions are applied separately to buildings within their scope. The IECC—Commercial Provisions apply to all buildings except for residential buildings 3 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 4 stories or greater in height. Each set of provisions is divided into 4 different parts:

Chapters	Subjects
1-2	Administration and definitions
3	Climate zones and general materials requirements
4	Energy efficiency requirements
5	Referenced standards

The following is a chapter-by-chapter synopsis of the scope and intent of the provisions of the *International Energy Conservation Code* and applies to both the commercial and residential energy provisions:

Chapter 1 Administration. This chapter contains 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 the code. Only through careful observation of the administrative provisions can the building official reasonably expect to demonstrate that “equal protection under the law” has been provided.

Chapter 2 Definitions. All terms that are defined in the code are listed alphabetically in Chapter 2. 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 301.3(1) and (2). 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* wherever it appears in the code. 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. Chapter 3 specifies 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 requirement (*U*-factors) as well as provisions that affect the mechanical systems based upon 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 requirements or elimination of requirements.

Chapter 4 Energy Efficiency. Chapter 4 of each set of provisions contains the technical requirements for energy efficiency.

Commercial Energy Efficiency. Chapter 4 of the IECC—Commercial Provisions 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. Residential buildings, townhouses and garden apartments three stories or less in height are covered in the IECC—Residential Provisions. 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. 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.

Residential Energy Efficiency. Chapter 4 of the IECC—Residential Provisions 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, a *residential building* is a detached one- and two-family dwelling and multiple single family dwellings as well as R-2, R-3 or R-4 building 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 Referenced Standards. The code contains numerous references to standards that are used to regulate materials and methods of construction. Chapter 5 contains a comprehensive list of all standards that are referenced in 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 5 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 upon 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.

LEGISLATION

The International Codes are designed and promulgated to be adopted by reference by legislative action. Jurisdictions wishing to adopt the 2012 *International Energy Conservation Code* as an enforceable regulation governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems should ensure that certain factual information is included in the adopting legislation at the time adoption is being considered by the appropriate governmental body. The following sample adoption legislation addresses several key elements, including the information required for insertion into the code text.

SAMPLE LEGISLATION FOR ADOPTION OF THE *INTERNATIONAL ENERGY CONSERVATION CODE* ORDINANCE NO. _____

A[N] [ORDINANCE/STATUTE/REGULATION] of the [JURISDICTION] adopting the 2012 edition of the *International Energy Conservation Code*, regulating and governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems in the [JURISDICTION]; providing for the issuance of permits and collection of fees therefor; repealing [ORDINANCE/STATUTE/REGULATION] No. _____ of the [JURISDICTION] and all other ordinances or parts of laws in conflict therewith.

The [GOVERNING BODY] of the [JURISDICTION] does ordain as follows:

Section 1. That a certain document, three (3) copies of which are on file in the office of the [TITLE OF JURISDICTION'S KEEPER OF RECORDS] of [NAME OF JURISDICTION], being marked and designated as the *International Energy Conservation Code*, 2012 edition, as published by the International Code Council, be and is hereby adopted as the Energy Conservation Code of the [JURISDICTION], in the State of [STATE NAME] for regulating and governing energy efficient building envelopes and installation of energy efficient mechanical, lighting and power systems as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Energy Conservation Code on file in the office of the [JURISDICTION] are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in Section 2 of this ordinance.

Section 2. The following sections are hereby revised:

Sections C101.1 and R101.1. Insert: [NAME OF JURISDICTION].

Sections C108.4 and R108.4. Insert: [DOLLAR AMOUNT] in two places.

Section 3. That [ORDINANCE/STATUTE/REGULATION] No. _____ of [JURISDICTION] entitled [FILL IN HERE THE COMPLETE TITLE OF THE LEGISLATION OR LAWS IN EFFECT AT THE PRESENT TIME SO THAT THEY WILL BE REPEALED BY DEFINITE MENTION] and all other ordinances or parts of laws in conflict herewith are hereby repealed.

Section 4. That if any section, subsection, sentence, clause or phrase of this legislation is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this ordinance. The [GOVERNING BODY] hereby declares that it would have passed this law, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses and phrases be declared unconstitutional.

Section 5. That nothing in this legislation or in the Energy Conservation Code hereby adopted shall be construed to affect any suit or proceeding impending in any court, or any rights acquired, or liability incurred, or any cause or causes of action acquired or existing, under any act or ordinance hereby repealed as cited in Section 3 of this law; nor shall any just or legal right or remedy of any character be lost, impaired or affected by this legislation.

Section 6. That the [JURISDICTION'S KEEPER OF RECORDS] is hereby ordered and directed to cause this legislation to be published. (An additional provision may be required to direct the number of times the legislation is to be published and to specify that it is to be in a newspaper in general circulation. Posting may also be required.)

Section 7. That this law and the rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effect [TIME PERIOD] from and after the date of its final passage and adoption.

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CHAPTER 1 [CE]

SCOPE AND ADMINISTRATION

PART 1—SCOPE AND APPLICATION

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the *International 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 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

C101.4.2 Historic buildings. Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are exempt from this code.

C101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if

the existing building and addition comply with this code as a single building.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
3. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed.
7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

C101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code. Where the use in a space changes from one use in Table C405.5.2(1) or (2) to another use in Table C405.5.2(1) or (2), the installed lighting wattage shall comply with Section C405.5.

C101.4.5 Change in space conditioning. Any nonconditioned space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

C101.4.6 Mixed occupancy. Where a building includes both *residential* and *commercial* occupancies, each occupancy 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.

C101.5.2 Low energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this code shall be exempt from the *building thermal envelope* provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*.

SECTION C102 ALTERNATE MATERIALS—METHOD OF CONSTRUCTION, DESIGN OR INSULATING SYSTEMS

C102.1 General. This code is not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been *approved* by the *code official* as meeting the intent of this code.

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 to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as “mandatory” in Chapter 4 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 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 upon suitable material. Electronic media documents are permitted to be submitted when *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, as applicable, insulation materials and their *R*-values; fenestration *U*-factors and SHGCs; area-weighted *U*-factor and SHGC calculations; mechanical system design criteria; mechanical and service water heating system and equipment types, sizes and efficiencies; economizer description; equipment and systems controls; fan motor horsepower (hp) and controls; duct sealing, duct and pipe insulation and location; lighting fixture schedule with wattage and control narrative; and air sealing details.

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.

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 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.

SECTION C104 INSPECTIONS

C104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official*.

C104.2 Required approvals. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the *code official*. The *code official*, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the *code official*.

C104.3 Final inspection. The building shall have a final inspection and not be occupied until *approved*.

C104.4 Reinspection. A building shall be reinspected when determined necessary by the *code official*.

C104.5 Approved inspection agencies. The *code official* is authorized to accept reports of *approved* inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

C104.6 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.

C104.7 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

C104.8 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*.

C104.8.1 Revocation. The *code official* is authorized to, in writing, suspend or revoke 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 C105 VALIDITY

C105.1 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 C106 REFERENCED STANDARDS

C106.1 Referenced codes and standards. The codes and standards referenced in this code shall be those listed in

Chapter 5, 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 C106.1.1 and C106.1.2.

C106.1.1 Conflicts. Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

C106.1.2 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.

C106.2 Conflicting requirements. Where the provisions of this code and the referenced standards conflict, the provisions of this code shall take precedence.

C106.3 Application 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.

C106.4 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

SECTION C107 FEES

C107.1 Fees. A permit shall not be issued until the fees prescribed in Section C107.2 have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

C107.2 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.

C107.3 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*, which shall be in addition to the required permit fees.

C107.4 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.

C107.5 Refunds. The *code official* is authorized to establish a refund policy.

SECTION C108 STOP WORK ORDER

C108.1 Authority. Whenever the *code official* finds any work regulated by this code being performed in a manner either contrary to the provisions of this code or dangerous or unsafe, the *code official* is authorized to issue a stop work order.



SCOPE AND ADMINISTRATION

C108.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property involved, or to the owner's agent, or to the person doing 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 will be permitted to resume.

C108.3 Emergencies. Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.

C108.4 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 liable to a fine of not less than [AMOUNT] dollars or more than [AMOUNT] dollars.

SECTION C109 BOARD OF APPEALS

C109.1 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 have no 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*.

C109.2 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 have no authority to waive requirements of this code.

C109.3 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

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. A wall more than 50 percent above grade and enclosing *conditioned space*. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see “*Readily accessible*”).

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

AIR BARRIER. Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

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

APPROVED. Approval by the *code official* as a result of investigation and tests conducted by him or her, or by reason of accepted principles or tests by nationally recognized organizations.

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*”).

BASEMENT WALL. A wall 50 percent or more below grade and enclosing *conditioned space*.

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.

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floor, roof, and any other building elements that enclose *conditioned space* or provides a boundary between *conditioned space* and exempt or unconditioned space.

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 ($\text{Btu/h ft}^2 \times ^\circ\text{F}$) [$\text{W}/(\text{m}^2 \times \text{K})$].

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 removal to 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 buildings*.”

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

CONDITIONED SPACE. An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent *conditioned space*.

DEFINITIONS

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal 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.

DAYLIGHT ZONE.

1. **Under skylights.** The area under skylights whose horizontal dimension, in each direction, is equal to the skylight dimension in that direction plus either the floor-to-ceiling height or the dimension to a ceiling height opaque partition, or one-half the distance to adjacent skylights or vertical fenestration, whichever is least.
2. **Adjacent to vertical fenestration.** The area adjacent to vertical fenestration which receives daylight through the fenestration. For purposes of this definition and unless more detailed analysis is provided, the daylight *zone* depth is assumed to extend into the space a distance of 15 feet (4572 mm) or to the nearest ceiling height opaque partition, whichever is less. The daylight *zone* width is assumed to be the width of the window plus 2 feet (610 mm) on each side, or the window width plus the distance to an opaque partition, or the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is least.

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 pump(s) prime the service hot water piping with heated water upon demand for hot water.

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.

[B] 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, SHGC, or 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.

[M] ENERGY RECOVERY VENTILATION SYSTEM. Systems that employ air-to-air heat exchangers to recover energy from exhaust air for the purpose of preheating, pre-cooling, 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.

ENTRANCE DOOR. Fenestration products used for ingress, egress and access in nonresidential buildings, including, but not limited to, exterior entrances that utilize latching hardware and automatic closers and contain over 50-percent glass specifically designed to withstand heavy use and possibly abuse.

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 BRAKE HORSEPOWER (BHP). The horsepower delivered to the fan's shaft. Brake horsepower does not include the mechanical drive losses (belts, gears, etc.).

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 space(s)* 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.

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 space(s)* and return it to the source or exhaust it to the outdoors.

FENESTRATION. Skylights, roof windows, vertical windows (fixed or moveable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors. Fenestration includes products with glass and nonglass glazing materials.

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 ($\text{Btu/h} \times \text{ft} \times ^\circ\text{F}$) [$\text{W}/(\text{m} \times \text{K})$].

FURNACE ELECTRICITY RATIO. The ratio of furnace electricity use to total furnace energy computed as ratio = $(3.412 \times E_{AE}) / (1000 \times E_F + 3.412 \times E_{AE})$ where E_{AE} (average annual auxiliary electrical consumption) and E_F (average annual fuel energy consumption) are defined in Appendix N to Subpart B of Part 430 of Title 10 of the Code of Federal Regulations and E_F is expressed in millions of Btu's per year.

GENERAL LIGHTING. Lighting that provides a substantially uniform level of illumination throughout an area. General lighting shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area.

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-EFFICACY LAMPS. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy of:

1. 60 lumens per watt for lamps over 40 watts;
2. 50 lumens per watt for lamps over 15 watts to 40 watts; and
3. 40 lumens per watt for lamps 15 watts or less.

HUMIDISTAT. A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.

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.

INSULATING SHEATHING. An insulating board with a core material having a minimum R -value of R-2.

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.

LABELED. Equipment, materials or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-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.

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-VOLTAGE LIGHTING. Lighting equipment powered through a transformer such as a cable conductor, a rail conductor and track lighting.

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

NAMEPLATE HORSEPOWER. The nominal motor horsepower rating stamped on the motor nameplate.

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 ARI standard rating conditions.

ON-SITE RENEWABLE ENERGY. Energy derived from solar radiation, wind, waves, tides, landfill gas, biomass, or the internal heat of the earth. The energy system providing on-site renewable energy shall be located on the project site.

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

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see "Accessible").

REPAIR. The reconstruction or renewal of any part of an existing building.

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as 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.

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 ($h \cdot \text{ft}^2 \cdot ^\circ\text{F}/\text{Btu}$) [$(\text{m}^2 \cdot \text{K})/\text{W}$].

SCREW LAMP HOLDERS. A lamp base that requires a screw-in-type lamp, such as a compact fluorescent, incandescent, or tungsten-halogen bulb.

DEFINITIONS

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

SKYLIGHT. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal. Glazing material in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls is included in this definition.

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

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 which 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 nonresidential 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.

SUNROOM. A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

THERMAL ISOLATION. Physical and space conditioning separation from *conditioned space(s)*. The *conditioned space(s)* shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

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

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 (Btu/h · ft² · °F) [W/(m² · K)].

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

[M] 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.

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

SECTION C301 CLIMATE ZONES

C301.1 General. Climate zones from Figure C301.1 or Table C301.1 shall be used in determining the applicable requirements from Chapter 4. Locations not in Table C301.1 (outside the United States) shall be assigned a climate zone based on Section C301.3.

C301.2 Warm humid counties. Warm humid counties are identified in Table C301.1 by an asterisk.

C301.3 International climate zones. The climate zone for any location outside the United States shall be determined by applying Table C301.3(1) and then Table C301.3(2).

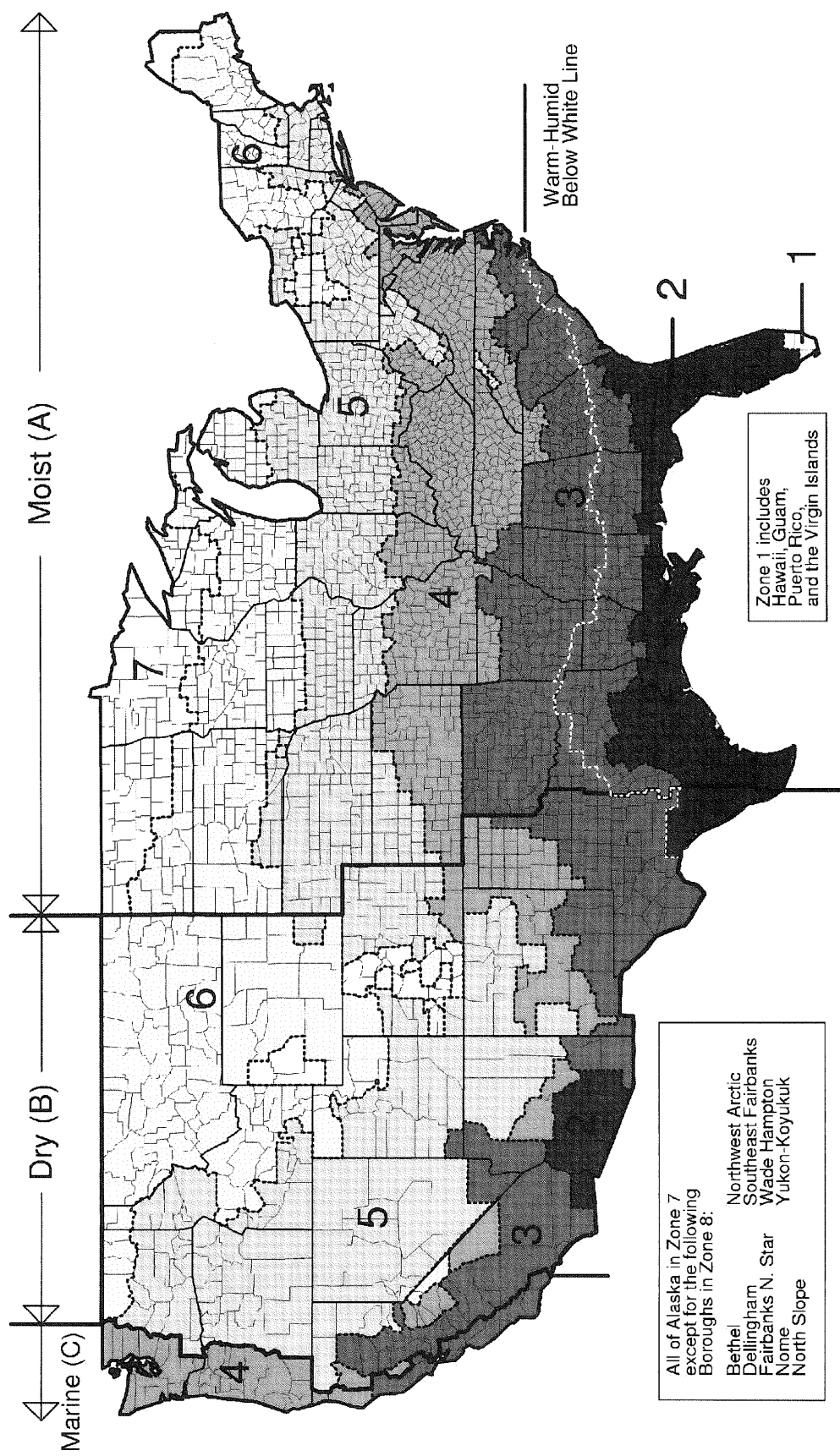


FIGURE C301.1
CLIMATE ZONES

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

Key: A – Moist, B – Dry, C – Marine. Absence of moisture designation indicates moisture regime is irrelevant. Asterisk (*) indicates a warm-humid location.

US STATES

ALABAMA

3A Autauga*
 2A Baldwin*
 3A Barbour*
 3A Bibb
 3A Blount
 3A Bullock*
 3A Butler*
 3A Calhoun
 3A Chambers
 3A Cherokee
 3A Chilton
 3A Choctaw*
 3A Clarke*
 3A Clay
 3A Cleburne
 3A Coffee*
 3A Colbert
 3A Conecuh*
 3A Coosa
 3A Covington*
 3A Crenshaw*
 3A Cullman
 3A Dale*
 3A Dallas*
 3A DeKalb
 3A Elmore*
 3A Escambia*
 3A Etowah
 3A Fayette
 3A Franklin
 3A Geneva*
 3A Greene
 3A Hale
 3A Henry*
 3A Houston*
 3A Jackson
 3A Jefferson
 3A Lamar
 3A Lauderdale
 3A Lawrence

3A Lee
 3A Limestone
 3A Lowndes*
 3A Macon*
 3A Madison
 3A Marengo*
 3A Marion
 3A Marshall
 2A Mobile*
 3A Monroe*
 3A Montgomery*
 3A Morgan
 3A Perry*
 3A Pickens
 3A Pike*
 3A Randolph
 3A Russell*
 3A Shelby
 3A St. Clair
 3A Sumter
 3A Talladega
 3A Tallapoosa
 3A Tuscaloosa
 3A Walker
 3A Washington*
 3A Wilcox*
 3A Winston

ALASKA

7 Aleutians East
 7 Aleutians West
 7 Anchorage
 8 Bethel
 7 Bristol Bay
 7 Denali
 8 Dillingham
 8 Fairbanks North Star
 7 Haines
 7 Juneau
 7 Kenai Peninsula
 7 Ketchikan Gateway

7 Kodiak Island
 7 Lake and Peninsula
 7 Matanuska-Susitna
 8 Nome
 8 North Slope
 8 Northwest Arctic
 7 Prince of Wales
 Outer Ketchikan
 7 Sitka
 7 Skagway-Hoonah-
 Angoon
 8 Southeast Fairbanks
 7 Valdez-Cordova
 8 Wade Hampton
 7 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 Izaard
 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
 3A Saline
 3A Scott
 4A Searcy
 3A Sebastian
 3A Sevier*
 3A Sharp
 3A St. Francis
 4A Stone
 3A Union*
 3A Van Buren
 4A Washington
 3A White
 3A Woodruff
 3A Yell

CALIFORNIA

3C Alameda
 6B Alpine
 4B Amador
 3B Butte
 4B Calaveras
 3B Colusa
 3B Contra Costa
 4C Del Norte
 4B El Dorado
 3B Fresno
 3B Glenn

(continued)

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

4C Humboldt	3B Yuba	5B Morgan	2A Escambia*	2A Taylor*
2B Imperial	COLORADO	4B Otero	2A Flagler*	2A Union*
4B Inyo	5B Adams	6B Ouray	2A Franklin*	2A Volusia*
3B Kern	6B Alamosa	7 Park	2A Gadsden*	2A Wakulla*
3B Kings	5B Arapahoe	5B Phillips	2A Gilchrist*	2A Walton*
4B Lake	6B Archuleta	7 Pitkin	2A Glades*	2A Washington*
5B Lassen	4B Baca	5B Prowers	2A Gulf*	GEORGIA
3B Los Angeles	5B Bent	5B Pueblo	2A Hamilton*	2A Appling*
3B Madera	5B Boulder	6B Rio Blanco	2A Hardee*	2A Atkinson*
3C Marin	6B Chaffee	7 Rio Grande	2A Hendry*	2A Bacon*
4B Mariposa	5B Cheyenne	7 Routt	2A Hernando*	2A Baker*
3C Mendocino	7 Clear Creek	6B Saguache	2A Highlands*	3A Baldwin
3B Merced	6B Conejos	7 San Juan	2A Hillsborough*	4A Banks
5B Modoc	6B Costilla	6B San Miguel	2A Holmes*	3A Barrow
6B Mono	5B Crowley	5B Sedgwick	2A Indian River*	3A Bartow
3C Monterey	6B Custer	7 Summit	2A Jackson*	3A Ben Hill*
3C Napa	5B Delta	5B Teller	2A Jefferson*	2A Berrien*
5B Nevada	5B Denver	5B Washington	2A Lafayette*	3A Bibb
3B Orange	6B Dolores	5B Weld	2A Lake*	3A Bleckley*
3B Placer	5B Douglas	5B Yuma	2A Lee*	2A Brantley*
5B Plumas	6B Eagle	CONNECTICUT	2A Leon*	2A Brooks*
3B Riverside	5B Elbert	5A (all)	2A Levy*	2A Bryan*
3B Sacramento	5B El Paso	DELAWARE	2A Liberty*	3A Bulloch*
3C San Benito	5B Fremont	4A (all)	2A Madison*	3A Burke
3B San Bernardino	5B Garfield	DISTRICT OF	2A Manatee*	3A Butts
3B San Diego	5B Gilpin	COLUMBIA	2A Marion*	3A Calhoun*
3C San Francisco	7 Grand	4A (all)	2A Martin*	2A Camden*
3B San Joaquin	7 Gunnison	FLORIDA	1A Miami-Dade*	3A Candler*
3C San Luis Obispo	7 Hinsdale	2A Alachua*	1A Monroe*	3A Carroll
3C San Mateo	5B Huerfano	2A Baker*	2A Nassau*	4A Catoosa
3C Santa Barbara	7 Jackson	2A Bay*	2A Okaloosa*	2A Charlton*
3C Santa Clara	5B Jefferson	2A Bradford*	2A Okeechobee*	2A Chatham*
3C Santa Cruz	5B Kiowa	2A Brevard*	2A Orange*	3A Chattahoochee*
3B Shasta	5B Kit Carson	1A Broward*	2A Osceola*	4A Chattooga
5B Sierra	7 Lake	2A Calhoun*	2A Palm Beach*	3A Cherokee
5B Siskiyou	5B La Plata	2A Charlotte*	2A Pasco*	3A Clarke
3B Solano	5B Larimer	2A Citrus*	2A Pinellas*	3A Clay*
3C Sonoma	4B Las Animas	2A Clay*	2A Polk*	3A Clayton
3B Stanislaus	5B Lincoln	2A Collier*	2A Putnam*	2A Clinch*
3B Sutter	5B Logan	2A Columbia*	2A Santa Rosa*	3A Cobb
3B Tehama	5B Mesa	2A DeSoto*	2A Sarasota*	3A Coffee*
4B Trinity	7 Mineral	2A Dixie*	2A Seminole*	2A Colquitt*
3B Tulare	6B Moffat	2A Duval*	2A St. Johns*	3A Columbia
4B Tuolumne	5B Montezuma		2A St. Lucie*	2A Cook*
3C Ventura	5B Montrose		2A Sumter*	3A Coweta
3B Yolo			2A Suwannee*	

(continued)

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

3A Crawford	2A Lanier*	3A Taylor*	5B Cassia	4A Crawford
3A Crisp*	3A Laurens*	3A Telfair*	6B Clark	5A Cumberland
4A Dade	3A Lee*	3A Terrell*	5B Clearwater	5A DeKalb
4A Dawson	2A Liberty*	2A Thomas*	6B Custer	5A De Witt
2A Decatur*	3A Lincoln	3A Tift*	5B Elmore	5A Douglas
3A DeKalb	2A Long*	2A Toombs*	6B Franklin	5A DuPage
3A Dodge*	2A Lowndes*	4A Towns	6B Fremont	5A Edgar
3A Dooly*	4A Lumpkin	3A Treutlen*	5B Gem	4A Edwards
3A Dougherty*	3A Macon*	3A Troup	5B Gooding	4A Effingham
3A Douglas	3A Madison	3A Turner*	5B Idaho	4A Fayette
3A Early*	3A Marion*	3A Twiggs*	6B Jefferson	5A Ford
2A Echols*	3A McDuffie	4A Union	5B Jerome	4A Franklin
2A Effingham*	2A McIntosh*	3A Upson	5B Kootenai	5A Fulton
3A Elbert	3A Meriwether	4A Walker	5B Latah	4A Gallatin
3A Emanuel*	2A Miller*	3A Walton	6B Lemhi	5A Greene
2A Evans*	2A Mitchell*	2A Ware*	5B Lewis	5A Grundy
4A Fannin	3A Monroe	3A Warren	5B Lincoln	4A Hamilton
3A Fayette	3A Montgomery*	3A Washington	6B Madison	5A Hancock
4A Floyd	3A Morgan	2A Wayne*	5B Minidoka	4A Hardin
3A Forsyth	4A Murray	3A Webster*	5B Nez Perce	5A Henderson
4A Franklin	3A Muscogee	3A Wheeler*	6B Oneida	5A Henry
3A Fulton	3A Newton	4A White	5B Owyhee	5A Iroquois
4A Gilmer	3A Oconee	4A Whitfield	5B Payette	4A Jackson
3A Glascock	3A Oglethorpe	3A Wilcox*	5B Power	4A Jasper
2A Glynn*	3A Paulding	3A Wilkes	5B Shoshone	4A Jefferson
4A Gordon	3A Peach*	3A Wilkinson	6B Teton	5A Jersey
2A Grady*	4A Pickens	3A Worth*	5B Twin Falls	5A Jo Daviess
3A Greene	2A Pierce*		6B Valley	4A Johnson
3A Gwinnett	3A Pike	HAWAII	5B Washington	5A Kane
4A Habersham	3A Polk	1A (all)*		5A Kankakee
4A Hall	3A Pulaski*	IDAHO	ILLINOIS	5A Kendall
3A Hancock	3A Putnam	5B Ada	5A Adams	5A Knox
3A Haralson	3A Quitman*	6B Adams	4A Alexander	5A Lake
3A Harris	4A Rabun	6B Bannock	4A Bond	5A La Salle
3A Hart	3A Randolph*	6B Bear Lake	5A Boone	4A Lawrence
3A Heard	3A Richmond	5B Benewah	5A Brown	5A Lee
3A Henry	3A Rockdale	6B Bingham	5A Bureau	5A Livingston
3A Houston*	3A Schley*	6B Blaine	5A Calhoun	5A Logan
3A Irwin*	3A Screven*	6B Boise	5A Carroll	5A Macon
3A Jackson	2A Seminole*	6B Bonner	5A Cass	4A Macoupin
3A Jasper	3A Spalding	6B Bonneville	5A Champaign	4A Madison
2A Jeff Davis*	4A Stephens	6B Boundary	4A Christian	4A Marion
3A Jefferson	3A Stewart*	6B Butte	5A Clark	5A Marshall
3A Jenkins*	3A Sumter*	6B Camas	4A Clay	5A Mason
3A Johnson*	3A Talbot	5B Canyon	4A Clinton	4A Massac
3A Jones	3A Taliaferro	6B Caribou	5A Coles	5A McDonough
3A Lamar	2A Tattnall*		5A Cook	5A McHenry

(continued)

GENERAL REQUIREMENTS

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

5A McLean	5A Boone	5A Miami	5A Appanoose	5A Jasper
5A Menard	4A Brown	4A Monroe	5A Audubon	5A Jefferson
5A Mercer	5A Carroll	5A Montgomery	5A Benton	5A Johnson
4A Monroe	5A Cass	5A Morgan	6A Black Hawk	5A Jones
4A Montgomery	4A Clark	5A Newton	5A Boone	5A Keokuk
5A Morgan	5A Clay	5A Noble	6A Bremer	6A Kossuth
5A Moultrie	5A Clinton	4A Ohio	6A Buchanan	5A Lee
5A Ogle	4A Crawford	4A Orange	6A Buena Vista	5A Linn
5A Peoria	4A Daviess	5A Owen	6A Butler	5A Louisa
4A Perry	4A Dearborn	5A Parke	6A Calhoun	5A Lucas
5A Piatt	5A Decatur	4A Perry	5A Carroll	6A Lyon
5A Pike	5A De Kalb	4A Pike	5A Cass	5A Madison
4A Pope	5A Delaware	5A Porter	5A Cedar	5A Mahaska
4A Pulaski	4A Dubois	4A Posey	6A Cerro Gordo	5A Marion
5A Putnam	5A Elkhart	5A Pulaski	6A Cherokee	5A Marshall
4A Randolph	5A Fayette	5A Putnam	6A Chickasaw	5A Mills
4A Richland	4A Floyd	5A Randolph	5A Clarke	6A Mitchell
5A Rock Island	5A Fountain	4A Ripley	6A Clay	5A Monona
4A Saline	5A Franklin	5A Rush	6A Clayton	5A Monroe
5A Sangamon	5A Fulton	4A Scott	5A Clinton	5A Montgomery
5A Schuyler	4A Gibson	5A Shelby	5A Crawford	5A Muscatine
5A Scott	5A Grant	4A Spencer	5A Dallas	6A O'Brien
4A Shelby	4A Greene	5A Starke	5A Davis	6A Osceola
5A Stark	5A Hamilton	5A Steuben	5A Decatur	5A Page
4A St. Clair	5A Hancock	5A St. Joseph	6A Delaware	6A Palo Alto
5A Stephenson	4A Harrison	4A Sullivan	5A Des Moines	6A Plymouth
5A Tazewell	5A Hendricks	4A Switzerland	6A Dickinson	6A Pocahontas
4A Union	5A Henry	5A Tippecanoe	5A Dubuque	5A Polk
5A Vermilion	5A Howard	5A Tipton	6A Emmet	5A Pottawattamie
4A Wabash	5A Huntington	5A Union	6A Fayette	5A Poweshiek
5A Warren	4A Jackson	4A Vanderburgh	6A Floyd	5A Ringgold
4A Washington	5A Jasper	5A Vermillion	6A Franklin	6A Sac
4A Wayne	5A Jay	5A Vigo	5A Fremont	5A Scott
4A White	4A Jefferson	5A Wabash	5A Greene	5A Shelby
5A Whiteside	4A Jennings	5A Warren	6A Grundy	6A Sioux
5A Will	5A Johnson	4A Warrick	5A Guthrie	5A Story
4A Williamson	4A Knox	4A Washington	6A Hamilton	5A Tama
5A Winnebago	5A Kosciusko	5A Wayne	6A Hancock	5A Taylor
5A Woodford	5A Lagrange	5A Wells	6A Hardin	5A Union
INDIANA	5A Lake	5A White	5A Harrison	5A Van Buren
5A Adams	5A La Porte	5A Whitley	5A Henry	5A Wapello
5A Allen	4A Lawrence	IOWA	6A Howard	5A Warren
5A Bartholomew	5A Madison	5A Adair	6A Humboldt	5A Washington
5A Benton	5A Marion	5A Adams	6A Ida	5A Wayne
5A Blackford	5A Marshall	6A Allamakee	5A Iowa	6A Webster
	4A Martin		5A Jackson	6A Winnebago

(continued)

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

6A Winneshiek	4A Haskell	4A Sedgwick	2A Iberville*	6A Cumberland
5A Woodbury	4A Hodgeman	4A Seward	3A Jackson*	6A Franklin
6A Worth	4A Jackson	4A Shawnee	2A Jefferson*	6A Hancock
6A Wright	4A Jefferson	5A Sheridan	2A Jefferson Davis*	6A Kennebec
KANSAS	5A Jewell	5A Sherman	2A Lafayette*	6A Knox
4A Allen	4A Johnson	5A Smith	2A Lafourche*	6A Lincoln
4A Anderson	4A Kearny	4A Stafford	3A La Salle*	6A Oxford
4A Atchison	4A Kingman	4A Stanton	3A Lincoln*	6A Penobscot
4A Barber	4A Kiowa	4A Stevens	2A Livingston*	6A Piscataquis
4A Barton	4A Labette	4A Sumner	3A Madison*	6A Sagadahoc
4A Bourbon	5A Lane	5A Thomas	3A Morehouse	6A Somerset
4A Brown	4A Leavenworth	5A Trego	3A Natchitoches*	6A Waldo
4A Butler	4A Lincoln	4A Wabaunsee	2A Orleans*	6A Washington
4A Chase	4A Linn	5A Wallace	3A Ouachita*	6A York
4A Chautauqua	5A Logan	4A Washington	2A Plaquemines*	MARYLAND
4A Cherokee	4A Lyon	5A Wichita	2A Pointe Coupee*	4A Allegany
5A Cheyenne	4A Marion	4A Wilson	2A Rapides*	4A Anne Arundel
4A Clark	4A Marshall	4A Woodson	3A Red River*	4A Baltimore
4A Clay	4A McPherson	4A Wyandotte	3A Richland*	4A Baltimore (city)
5A Cloud	4A Meade	KENTUCKY	3A Sabine*	4A Calvert
4A Coffey	4A Miami	4A (all)	2A St. Bernard*	4A Caroline
4A Comanche	5A Mitchell	LOUISIANA	2A St. Charles*	4A Carroll
4A Cowley	4A Montgomery	2A Acadia*	2A St. Helena*	4A Cecil
4A Crawford	4A Morris	2A Allen*	2A St. James*	4A Charles
5A Decatur	4A Morton	2A Ascension*	2A St. John the Baptist*	4A Dorchester
4A Dickinson	4A Nemaha	2A Assumption*	2A St. Landry*	4A Frederick
4A Doniphan	4A Neosho	2A Avoyelles*	2A St. Martin*	5A Garrett
4A Douglas	5A Ness	2A Beauregard*	2A St. Mary*	4A Harford
4A Edwards	4A Osage	3A Bienville*	2A St. Tammany*	4A Howard
4A Elk	5A Osborne	3A Bossier*	2A Tangipahoa*	4A Kent
5A Ellis	4A Ottawa	3A Caddo*	3A Tensas*	4A Montgomery
4A Ellsworth	4A Pawnee	2A Calcasieu*	2A Terrebonne*	4A Prince George's
4A Finney	5A Phillips	3A Caldwell*	3A Union*	4A Queen Anne's
4A Ford	4A Pottawatomie	2A Cameron*	2A Vermilion*	4A Somerset
4A Franklin	4A Pratt	3A Catahoula*	3A Vernon*	4A St. Mary's
4A Geary	5A Rawlins	3A Claiborne*	2A Washington*	4A Talbot
5A Gove	4A Reno	3A Concordia*	3A Webster*	4A Washington
5A Graham	5A Republic	3A De Soto*	2A West Baton Rouge*	4A Wicomico
4A Grant	4A Rice	2A East Baton Rouge*	3A West Carroll	4A Worcester
4A Gray	4A Riley	3A East Carroll	2A West Feliciana*	MASSACHSETTS
5A Greeley	5A Rooks	2A East Feliciana*	3A Winn*	5A (all)
4A Greenwood	4A Rush	2A Evangeline*	MAINE	MICHIGAN
5A Hamilton	4A Russell	3A Franklin*	6A Androscoggin	6A Alcona
4A Harper	4A Saline	3A Grant*	7 Aroostook	6A Alger
4A Harvey	5A Scott	2A Iberia*		

(continued)

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

5A Allegan	7 Mackinac	6A Carver	7 Otter Tail	3A Clarke
6A Alpena	5A Macomb	7 Cass	7 Pennington	3A Clay
6A Antrim	6A Manistee	6A Chippewa	7 Pine	3A Coahoma
6A Arenac	6A Marquette	6A Chisago	6A Pipestone	3A Copiah*
7 Baraga	6A Mason	7 Clay	7 Polk	3A Covington*
5A Barry	6A Mecosta	7 Clearwater	6A Pope	3A DeSoto
5A Bay	6A Menominee	7 Cook	6A Ramsey	3A Forrest*
6A Benzie	5A Midland	6A Cottonwood	7 Red Lake	3A Franklin*
5A Berrien	6A Missaukee	7 Crow Wing	6A Redwood	3A George*
5A Branch	5A Monroe	6A Dakota	6A Renville	3A Greene*
5A Calhoun	5A Montcalm	6A Dodge	6A Rice	3A Grenada
5A Cass	6A Montmorency	6A Douglas	6A Rock	2A Hancock*
6A Charlevoix	5A Muskegon	6A Faribault	7 Roseau	2A Harrison*
6A Cheboygan	6A Newaygo	6A Fillmore	6A Scott	3A Hinds*
7 Chippewa	5A Oakland	6A Freeborn	6A Sherburne	3A Holmes
6A Clare	6A Oceana	6A Goodhue	6A Sibley	3A Humphreys
5A Clinton	6A Ogemaw	7 Grant	6A Stearns	3A Issaquena
6A Crawford	7 Ontonagon	6A Hennepin	6A Steele	3A Itawamba
6A Delta	6A Osceola	6A Houston	6A Stevens	2A Jackson*
6A Dickinson	6A Oscoda	7 Hubbard	7 St. Louis	3A Jasper
5A Eaton	6A Otsego	6A Isanti	6A Swift	3A Jefferson*
6A Emmet	5A Ottawa	7 Itasca	6A Todd	3A Jefferson Davis*
5A Genesee	6A Presque Isle	6A Jackson	6A Traverse	3A Jones*
6A Gladwin	6A Roscommon	7 Kanabec	6A Wabasha	3A Kemper
7 Gogebic	5A Saginaw	6A Kandiyohi	7 Wadena	3A Lafayette
6A Grand Traverse	6A Sanilac	7 Kittson	6A Waseca	3A Lamar*
5A Gratiot	7 Schoolcraft	7 Koochiching	6A Washington	3A Lauderdale
5A Hillsdale	5A Shiawassee	6A Lac qui Parle	6A Watonwan	3A Lawrence*
7 Houghton	5A St. Clair	7 Lake	7 Wilkin	3A Leake
6A Huron	5A St. Joseph	7 Lake of the Woods	6A Winona	3A Lee
5A Ingham	5A Tuscola	6A Le Sueur	6A Wright	3A Leflore
5A Ionia	5A Van Buren	6A Lincoln	6A Yellow	3A Lincoln*
6A Iosco	5A Washtenaw	6A Lyon	Medicine	3A Lowndes
7 Iron	5A Wayne	7 Mahanomen	MISSISSIPPI	3A Madison
6A Isabella	6A Wexford	7 Marshall	3A Adams*	3A Marion*
5A Jackson	MINNESOTA	6A Martin	3A Alcorn	3A Marshall
5A Kalamazoo	7 Aitkin	6A McLeod	3A Amite*	3A Monroe
6A Kalkaska	6A Anoka	6A Meeker	3A Attala	3A Montgomery
5A Kent	7 Becker	7 Mille Lacs	3A Benton	3A Neshoba
7 Keweenaw	7 Beltrami	6A Morrison	3A Bolivar	3A Newton
6A Lake	6A Benton	6A Mower	3A Calhoun	3A Noxubee
5A Lapeer	6A Big Stone	6A Murray	3A Carroll	3A Oktibbeha
6A Leelanau	6A Blue Earth	6A Nicollet	3A Chickasaw	3A Panola
5A Lenawee	6A Brown	6A Nobles	3A Choctaw	2A Pearl River*
5A Livingston	7 Carlton	7 Norman	3A Claiborne*	3A Perry*
7 Luce		6A Olmsted		3A Pike*

(continued)

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

3A Pontotoc	5A Chariton	4A Mississippi	4A Webster	4A Cumberland
3A Prentiss	4A Christian	4A Moniteau	5A Worth	4A Essex
3A Quitman	5A Clark	4A Monroe	4A Wright	4A Gloucester
3A Rankin*	4A Clay	4A Montgomery	MONTANA	4A Hudson
3A Scott	5A Clinton	4A Morgan	6B (all)	5A Hunterdon
3A Sharkey	4A Cole	4A New Madrid	NEBRASKA	5A Mercer
3A Simpson*	4A Cooper	4A Newton	5A (all)	4A Middlesex
3A Smith*	4A Crawford	5A Nodaway	NEVADA	4A Monmouth
2A Stone*	4A Dade	4A Oregon	5B Carson City (city)	5A Morris
3A Sunflower	4A Dallas	4A Osage	5B Churchill	4A Ocean
3A Tallahatchie	5A Daviess	4A Ozark	3B Clark	5A Passaic
3A Tate	5A DeKalb	4A Pemiscot	5B Douglas	4A Salem
3A Tippah	4A Dent	4A Perry	5B Elko	5A Somerset
3A Tishomingo	4A Douglas	4A Pettis	5B Esmeralda	5A Sussex
3A Tunica	4A Dunklin	4A Phelps	5B Eureka	4A Union
3A Union	4A Franklin	5A Pike	5B Humboldt	5A Warren
3A Walthall*	4A Gasconade	4A Platte	5B Lander	NEW MEXICO
3A Warren*	5A Gentry	4A Polk	5B Lincoln	4B Bernalillo
3A Washington	4A Greene	4A Pulaski	5B Lyon	5B Catron
3A Wayne*	5A Grundy	5A Putnam	5B Mineral	3B Chaves
3A Webster	5A Harrison	5A Ralls	5B Nye	4B Cibola
3A Wilkinson*	4A Henry	4A Randolph	5B Pershing	5B Colfax
3A Winston	4A Hickory	4A Ray	5B Storey	4B Curry
3A Yalobusha	5A Holt	4A Reynolds	5B Washoe	4B DeBaca
3A Yazoo	4A Howard	4A Ripley	5B White Pine	3B Dona Ana
MISSOURI	4A Howell	4A Saline	NEW HAMPSHIRE	3B Eddy
5A Adair	4A Iron	5A Schuyler	6A Belknap	4B Grant
5A Andrew	4A Jackson	5A Scotland	6A Carroll	4B Guadalupe
5A Atchison	4A Jasper	4A Scott	5A Cheshire	5B Harding
4A Audrain	4A Jefferson	4A Shannon	6A Coos	3B Hidalgo
4A Barry	4A Johnson	5A Shelby	6A Grafton	3B Lea
4A Barton	5A Knox	4A St. Charles	5A Hillsborough	4B Lincoln
4A Bates	4A Laclede	4A St. Clair	6A Merrimack	5B Los Alamos
4A Benton	4A Lafayette	4A Ste. Genevieve	5A Rockingham	3B Luna
4A Bollinger	4A Lawrence	4A St. Francois	5A Strafford	5B McKinley
4A Boone	5A Lewis	4A St. Louis	6A Sullivan	5B Mora
5A Buchanan	4A Lincoln	4A St. Louis (city)	NEW JERSEY	3B Otero
4A Butler	5A Linn	4A Stoddard	4A Atlantic	4B Quay
5A Caldwell	5A Livingston	4A Stone	5A Bergen	5B Rio Arriba
4A Callaway	5A Macon	5A Sullivan	4A Burlington	4B Roosevelt
4A Camden	4A Madison	4A Taney	4A Camden	5B Sandoval
4A Cape Girardeau	4A Maries	4A Texas	4A Cape May	5B San Juan
4A Carroll	5A Marion	4A Vernon		5B San Miguel
4A Carter	4A McDonald	4A Warren		5B Santa Fe
4A Cass	5A Mercer	4A Washington		4B Sierra
4A Cedar	4A Miller	4A Wayne		4B Socorro

(continued)



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

5B Taos	4A Queens	4A Clay	4A Orange	7 Divide
5B Torrance	5A Rensselaer	4A Cleveland	3A Pamlico	6A Dunn
4B Union	4A Richmond	3A Columbus*	3A Pasquotank	7 Eddy
4B Valencia	5A Rockland	3A Craven	3A Pender*	6A Emmons
NEW YORK	5A Saratoga	3A Cumberland	3A Perquimans	7 Foster
5A Albany	5A Schenectady	3A Currituck	4A Person	6A Golden Valley
6A Allegany	6A Schoharie	3A Dare	3A Pitt	7 Grand Forks
4A Bronx	6A Schuyler	3A Davidson	4A Polk	6A Grant
6A Broome	5A Seneca	4A Davie	3A Randolph	7 Griggs
6A Cattaraugus	6A Steuben	3A Duplin	3A Richmond	6A Hettinger
5A Cayuga	6A St. Lawrence	4A Durham	3A Robeson	7 Kidder
5A Chautauqua	4A Suffolk	3A Edgecombe	4A Rockingham	6A LaMoure
5A Chemung	6A Sullivan	4A Forsyth	3A Rowan	6A Logan
6A Chenango	5A Tioga	4A Franklin	4A Rutherford	7 McHenry
6A Clinton	6A Tompkins	3A Gaston	3A Sampson	6A McIntosh
5A Columbia	6A Ulster	4A Gates	3A Scotland	6A McKenzie
5A Cortland	6A Warren	4A Graham	3A Stanly	7 McLean
6A Delaware	5A Washington	4A Granville	4A Stokes	6A Mercer
5A Dutchess	5A Wayne	3A Greene	4A Surry	6A Morton
5A Erie	4A Westchester	4A Guilford	4A Swain	7 Mountrail
6A Essex	6A Wyoming	4A Halifax	4A Transylvania	7 Nelson
6A Franklin	5A Yates	4A Harnett	3A Tyrrell	6A Oliver
6A Fulton	NORTH CAROLINA	4A Haywood	3A Union	7 Pembina
5A Genesee	4A Alamance	4A Henderson	4A Vance	7 Pierce
5A Greene	4A Alexander	4A Hertford	4A Wake	7 Ramsey
6A Hamilton	5A Alleghany	3A Hoke	4A Warren	6A Ransom
6A Herkimer	3A Anson	3A Hyde	3A Washington	7 Renville
6A Jefferson	5A Ashe	4A Iredell	5A Watauga	6A Richland
4A Kings	5A Avery	4A Jackson	3A Wayne	7 Rolette
6A Lewis	3A Beaufort	3A Johnston	4A Wilkes	6A Sargent
5A Livingston	4A Bertie	4A Lee	3A Wilson	7 Sheridan
6A Madison	3A Bladen	3A Lenoir	4A Yadkin	6A Sioux
5A Monroe	3A Brunswick*	4A Lincoln	5A Yancey	6A Slope
6A Montgomery	4A Buncombe	4A Macon	NORTH DAKOTA	6A Stark
4A Nassau	4A Burke	4A Madison	6A Adams	7 Steele
4A New York	3A Cabarrus	3A Martin	7 Barnes	7 Stutsman
5A Niagara	4A Caldwell	4A McDowell	7 Benson	7 Towner
6A Oneida	3A Camden	3A Mecklenburg	6A Billings	7 Traill
5A Onondaga	3A Carteret*	5A Mitchell	7 Bottineau	7 Walsh
5A Ontario	4A Caswell	3A Montgomery	6A Bowman	7 Ward
5A Orange	4A Catawba	3A Moore	7 Burke	7 Wells
5A Orleans	4A Chatham	4A Nash	6A Burleigh	7 Williams
5A Oswego	4A Cherokee	3A New Hanover*	7 Cass	OHIO
6A Otsego	3A Chowan	4A Northampton	7 Cavalier	4A Adams
5A Putnam		3A Onslow*	6A Dickey	5A Allen

(continued)

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

5A Ashland	5A Mahoning	3A Bryan	3A Okfuskee	4C Linn
5A Ashtabula	5A Marion	3A Caddo	3A Oklahoma	5B Malheur
5A Athens	5A Medina	3A Canadian	3A Okmulgee	4C Marion
5A Auglaize	5A Meigs	3A Carter	3A Osage	5B Morrow
5A Belmont	5A Mercer	3A Cherokee	3A Ottawa	4C Multnomah
4A Brown	5A Miami	3A Choctaw	3A Pawnee	4C Polk
5A Butler	5A Monroe	4B Cimarron	3A Payne	5B Sherman
5A Carroll	5A Montgomery	3A Cleveland	3A Pittsburg	4C Tillamook
5A Champaign	5A Morgan	3A Coal	3A Pontotoc	5B Umatilla
5A Clark	5A Morrow	3A Comanche	3A Pottawatomie	5B Union
4A Clermont	5A Muskingum	3A Cotton	3A Pushmataha	5B Wallowa
5A Clinton	5A Noble	3A Craig	3A Roger Mills	5B Wasco
5A Columbiana	5A Ottawa	3A Creek	3A Rogers	4C Washington
5A Coshocton	5A Paulding	3A Custer	3A Seminole	5B Wheeler
5A Crawford	5A Perry	3A Delaware	3A Sequoyah	4C Yamhill
5A Cuyahoga	5A Pickaway	3A Dewey	3A Stephens	
5A Darke	4A Pike	3A Ellis	4B Texas	PENNSYLVANIA
5A Defiance	5A Portage	3A Garfield	3A Tillman	5A Adams
5A Delaware	5A Preble	3A Garvin	3A Tulsa	5A Allegheny
5A Erie	5A Putnam	3A Grady	3A Wagoner	5A Armstrong
5A Fairfield	5A Richland	3A Grant	3A Washington	5A Beaver
5A Fayette	5A Ross	3A Greer	3A Washita	5A Bedford
5A Franklin	5A Sandusky	3A Harmon	3A Woods	5A Berks
5A Fulton	4A Scioto	3A Harper	3A Woodward	5A Blair
4A Gallia	5A Seneca	3A Haskell		5A Bradford
5A Geauga	5A Shelby	3A Hughes	OREGON	4A Bucks
5A Greene	5A Stark	3A Jackson	5B Baker	5A Butler
5A Guernsey	5A Summit	3A Jefferson	4C Benton	5A Cambria
4A Hamilton	5A Trumbull	3A Johnston	4C Clackamas	6A Cameron
5A Hancock	5A Tuscarawas	3A Kay	4C Clatsop	5A Carbon
5A Hardin	5A Union	3A Kingfisher	4C Columbia	5A Centre
5A Harrison	5A Van Wert	3A Kiowa	4C Coos	4A Chester
5A Henry	5A Vinton	3A Latimer	5B Crook	5A Clarion
5A Highland	5A Warren	3A Le Flore	4C Curry	6A Clearfield
5A Hocking	4A Washington	3A Lincoln	5B Deschutes	5A Clinton
5A Holmes	5A Wayne	3A Logan	4C Douglas	5A Columbia
5A Huron	5A Williams	3A Love	5B Gilliam	5A Crawford
5A Jackson	5A Wood	3A Major	5B Grant	5A Cumberland
5A Jefferson	5A Wyandot	3A Marshall	5B Harney	5A Dauphin
5A Knox		3A Mayes	5B Hood River	4A Delaware
5A Lake	OKLAHOMA	3A McClain	4C Jackson	6A Elk
4A Lawrence	3A Adair	3A McCurtain	5B Jefferson	5A Erie
5A Licking	3A Alfalfa	3A McIntosh	4C Josephine	5A Fayette
5A Logan	3A Atoka	3A Murray	5B Klamath	5A Forest
5A Lorain	4B Beaver	3A Muskogee	5B Lake	5A Franklin
5A Lucas	3A Beckham	3A Noble	4C Lane	5A Fulton
5A Madison	3A Blaine	3A Nowata	4C Lincoln	5A Greene

(continued)

GENERAL REQUIREMENTS

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

5A Huntingdon	3A Bamberg*	5A Bennett	6A Minnehaha	4A Gibson
5A Indiana	3A Barnwell*	5A Bon Homme	6A Moody	4A Giles
5A Jefferson	3A Beaufort*	6A Brookings	6A Pennington	4A Grainger
5A Juniata	3A Berkeley*	6A Brown	6A Perkins	4A Greene
5A Lackawanna	3A Calhoun	6A Brule	6A Potter	4A Grundy
5A Lancaster	3A Charleston*	6A Buffalo	6A Roberts	4A Hamblen
5A Lawrence	3A Cherokee	6A Butte	6A Sanborn	4A Hamilton
5A Lebanon	3A Chester	6A Campbell	6A Shannon	4A Hancock
5A Lehigh	3A Chesterfield	5A Charles Mix	6A Spink	3A Hardeman
5A Luzerne	3A Clarendon	6A Clark	6A Stanley	3A Hardin
5A Lycoming	3A Colleton*	5A Clay	6A Sully	4A Hawkins
6A McKean	3A Darlington	6A Codrington	5A Todd	3A Haywood
5A Mercer	3A Dillon	6A Corson	5A Tripp	3A Henderson
5A Mifflin	3A Dorchester*	6A Custer	6A Turner	4A Henry
5A Monroe	3A Edgefield	6A Davison	5A Union	4A Hickman
4A Montgomery	3A Fairfield	6A Day	6A Walworth	4A Houston
5A Montour	3A Florence	6A Deuel	5A Yankton	4A Humphreys
5A Northampton	3A Georgetown*	6A Dewey	6A Ziebach	4A Jackson
5A Northumberland	3A Greenville	5A Douglas	TENNESSEE	4A Jefferson
5A Perry	3A Greenwood	6A Edmunds	4A Anderson	4A Johnson
4A Philadelphia	3A Hampton*	6A Fall River	4A Bedford	4A Knox
5A Pike	3A Horry*	6A Faulk	4A Benton	3A Lake
6A Potter	3A Jasper*	6A Grant	4A Bledsoe	3A Lauderdale
5A Schuylkill	3A Kershaw	5A Gregory	4A Blount	4A Lawrence
5A Snyder	3A Lancaster	6A Haakon	4A Bradley	4A Lewis
5A Somerset	3A Laurens	6A Hamlin	4A Campbell	4A Lincoln
5A Sullivan	3A Lee	6A Hand	4A Cannon	4A Loudon
6A Susquehanna	3A Lexington	6A Hanson	4A Carroll	4A Macon
6A Tioga	3A Marion	6A Harding	4A Carter	3A Madison
5A Union	3A Marlboro	6A Hughes	4A Cheatham	4A Marion
5A Venango	3A McCormick	5A Hutchinson	3A Chester	4A Marshall
5A Warren	3A Newberry	6A Hyde	4A Claiborne	4A Maury
5A Washington	3A Oconee	5A Jackson	4A Clay	4A McMinn
6A Wayne	3A Orangeburg	6A Jerauld	4A Cocke	3A McNairy
5A Westmoreland	3A Pickens	6A Jones	4A Coffee	4A Meigs
5A Wyoming	3A Richland	6A Kingsbury	3A Crockett	4A Monroe
4A York	3A Saluda	6A Lake	4A Cumberland	4A Montgomery
RHODE ISLAND	3A Spartanburg	6A Lawrence	4A Davidson	4A Moore
5A (all)	3A Sumter	6A Lincoln	4A Decatur	4A Morgan
SOUTH	3A Williamsburg	6A Lyman	4A DeKalb	4A Obion
CAROLINA	3A York	6A Marshall	4A Dickson	4A Overton
3A Abbeville	SOUTH DAKOTA	6A McCook	3A Dyer	4A Perry
3A Aiken	6A Aurora	6A McPherson	3A Fayette	4A Pickett
3A Allendale*	6A Beadle	5A Mellette	4A Fentress	4A Polk
3A Anderson		6A Miner	4A Franklin	4A Putnam
				4A Rhea

(continued)

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

4A Roane	3B Brewster	3B Ector	3B Howard	3B McCulloch
4A Robertson	4B Briscoe	2B Edwards*	3B Hudspeth	2A McLennan*
4A Rutherford	2A Brooks*	3A Ellis*	3A Hunt*	2A McMullen*
4A Scott	3A Brown*	3B El Paso	4B Hutchinson	2B Medina*
4A Sequatchie	2A Burleson*	3A Erath*	3B Irion	3B Menard
4A Sevier	3A Burnet*	2A Falls*	3A Jack	3B Midland
3A Shelby	2A Caldwell*	3A Fannin	2A Jackson*	2A Milam*
4A Smith	2A Calhoun*	2A Fayette*	2A Jasper*	3A Mills*
4A Stewart	3B Callahan	3B Fisher	3B Jeff Davis	3B Mitchell
4A Sullivan	2A Cameron*	4B Floyd	2A Jefferson*	3A Montague
4A Sumner	3A Camp*	3B Foard	2A Jim Hogg*	2A Montgomery*
3A Tipton	4B Carson	2A Fort Bend*	2A Jim Wells*	4B Moore
4A Trousdale	3A Cass*	3A Franklin*	3A Johnson*	3A Morris*
4A Unicoi	4B Castro	2A Freestone*	3B Jones	3B Motley
4A Union	2A Chambers*	2B Frio*	2A Karnes*	3A Nacogdoches*
4A Van Buren	2A Cherokee*	3B Gaines	3A Kaufman*	3A Navarro*
4A Warren	3B Childress	2A Galveston*	3A Kendall*	2A Newton*
4A Washington	3A Clay	3B Garza	2A Kenedy*	3B Nolan
4A Wayne	4B Cochran	3A Gillespie*	3B Kent	2A Nueces*
4A Weakley	3B Coke	3B Glasscock	3B Kerr	4B Ochiltree
4A White	3B Coleman	2A Goliad*	3B Kimble	4B Oldham
4A Williamson	3A Collin*	2A Gonzales*	3B King	2A Orange*
4A Wilson	3B Collingsworth	4B Gray	2B Kinney*	3A Palo Pinto*
TEXAS	2A Colorado*	3A Grayson	2A Kleberg*	3A Panola*
2A Anderson*	2A Comal*	3A Gregg*	3B Knox	3A Parker*
3B Andrews	3A Comanche*	2A Grimes*	3A Lamar*	4B Parmer
2A Angelina*	3B Concho	2A Guadalupe*	4B Lamb	3B Pecos
2A Aransas*	3A Cooke	4B Hale	3A Lampasas*	2A Polk*
3A Archer	2A Coryell*	3B Hall	2B La Salle*	4B Potter
4B Armstrong	3B Cottle	3A Hamilton*	2A Lavaca*	3B Presidio
2A Atascosa*	3B Crane	4B Hansford	2A Lee*	3A Rains*
2A Austin*	3B Crockett	3B Hardeman	2A Leon*	4B Randall
4B Bailey	3B Crosby	2A Hardin*	2A Liberty*	3B Reagan
2B Bandera*	3B Culberson	2A Harris*	2A Limestone*	2B Real*
2A Bastrop*	4B Dallam	3A Harrison*	4B Lipscomb	3A Red River*
3B Baylor	3A Dallas*	4B Hartley	2A Live Oak*	3B Reeves
2A Bee*	3B Dawson	3B Haskell	3A Llano*	2A Refugio*
2A Bell*	4B Deaf Smith	2A Hays*	3B Loving	4B Roberts
2A Bexar*	3A Delta	3B Hemphill	3B Lubbock	2A Robertson*
3A Blanco*	3A Denton*	3A Henderson*	3B Lynn	3A Rockwall*
3B Borden	2A DeWitt*	2A Hidalgo*	2A Madison*	3B Runnels
2A Bosque*	3B Dickens	2A Hill*	3A Marion*	3A Rusk*
3A Bowie*	2B Dimmit*	4B Hockley	3B Martin	3A Sabine*
2A Brazoria*	4B Donley	3A Hood*	3B Mason	3A San Augustine*
2A Brazos*	2A Duval*	3A Hopkins*	2A Matagorda*	2A San Jacinto*
	3A Eastland	2A Houston*	2B Maverick*	2A San Patricio*

(continued)


Documents

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

3A San Saba*	3A Young	4C Clark	4A Gilmer	WISCONSIN
3B Schleicher	2B Zapata*	5B Columbia	5A Grant	6A Adams
3B Scurry	2B Zavala*	4C Cowlitz	5A Greenbrier	7 Ashland
3B Shackelford		5B Douglas	5A Hampshire	6A Barron
3A Shelby*	UTAH	6B Ferry	5A Hancock	7 Bayfield
4B Sherman	5B Beaver	5B Franklin	5A Hardy	6A Brown
3A Smith*	6B Box Elder	5B Garfield	5A Harrison	6A Buffalo
3A Somervell*	6B Cache	5B Grant	4A Jackson	7 Burnett
2A Starr*	6B Carbon	4C Grays Harbor	4A Jefferson	6A Calumet
3A Stephens	6B Daggett	4C Island	4A Kanawha	6A Chippewa
3B Sterling	5B Davis	4C Jefferson	5A Lewis	6A Clark
3B Stonewall	6B Duchesne	4C King	4A Lincoln	6A Columbia
3B Sutton	5B Emery	4C Kitsap	4A Logan	6A Crawford
4B Swisher	5B Garfield	5B Kittitas	5A Marion	6A Dane
3A Tarrant*	5B Grand	5B Klickitat	5A Marshall	6A Dodge
3B Taylor	5B Iron	4C Lewis	4A Mason	6A Door
3B Terrell	5B Juab	5B Lincoln	4A McDowell	7 Douglas
3B Terry	5B Kane	4C Mason	4A Mercer	6A Dunn
3B Throckmorton	5B Millard	6B Okanogan	5A Mineral	6A Eau Claire
3A Titus*	6B Morgan	4C Pacific	4A Mingo	7 Florence
3B Tom Green	5B Piute	6B Pend Oreille	5A Monongalia	6A Fond du Lac
2A Travis*	6B Rich	4C Pierce	4A Monroe	7 Forest
2A Trinity*	5B Salt Lake	4C San Juan	4A Morgan	6A Grant
2A Tyler*	5B San Juan	4C Skagit	5A Nicholas	6A Green
3A Upshur*	5B Sanpete	5B Skamania	5A Ohio	6A Green Lake
3B Upton	5B Sevier	4C Snohomish	5A Pendleton	6A Iowa
2B Uvalde*	6B Summit	5B Spokane	4A Pleasants	7 Iron
2B Val Verde*	5B Tooele	6B Stevens	5A Pocahontas	6A Jackson
3A Van Zandt*	6B Uintah	4C Thurston	5A Preston	6A Jefferson
2A Victoria*	5B Utah	4C Wahkiakum	4A Putnam	6A Juneau
2A Walker*	6B Wasatch	5B Walla Walla	5A Raleigh	6A Kenosha
2A Waller*	3B Washington	4C Whatcom	5A Randolph	6A Kewaunee
3B Ward	5B Wayne	5B Whitman	4A Ritchie	6A La Crosse
2A Washington*	5B Weber	5B Yakima	4A Roane	6A Lafayette
2B Webb*	VERMONT	WEST VIRGINIA	5A Summers	7 Langlade
2A Wharton*	6A (all)	5A Barbour	5A Taylor	7 Lincoln
3B Wheeler	VIRGINIA	4A Berkeley	5A Tucker	6A Manitowoc
3A Wichita	4A (all)	4A Boone	4A Tyler	6A Marathon
3B Wilbarger	WASHINGTON	4A Braxton	5A Upshur	6A Marinette
2A Willacy*	5B Adams	5A Brooke	4A Wayne	6A Marquette
2A Williamson*	5B Asotin	4A Cabell	5A Webster	6A Menominee
3B Winkler	5B Benton	4A Calhoun	5A Wetzel	6A Milwaukee
3A Wise	5B Chelan	4A Clay	4A Wirt	6A Monroe
3A Wood*	4C Clallam	5A Doddridge	4A Wood	6A Oconto
4B Yoakum		5A Fayette	4A Wyoming	7 Oneida
				6A Outagamie

(continued)

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

6A Ozaukee	7 Taylor	6B Big Horn	6B Sheridan	NORTHERN MARIANA ISLANDS
6A Pepin	6A Trempealeau	6B Campbell	7 Sublette	
6A Pierce	6A Vernon	6B Carbon	6B Sweetwater	
6A Polk	7 Vilas	6B Converse	7 Teton	
6A Portage	6A Walworth	6B Crook	6B Uinta	PUERTO RICO
7 Price	7 Washburn	6B Fremont	6B Washakie	
6A Racine	6A Washington	5B Goshen	6B Weston	1A (all)*
6A Richland	6A Waukesha	6B Hot Springs	US TERRITORIES	VIRGIN ISLANDS
6A Rock	6A Waupaca	6B Johnson		
6A Rusk	6A Waushara	6B Laramie	AMERICAN SAMOA	1A (all)*
6A Sauk	6A Winnebago	7 Lincoln		
7 Sawyer	6A Wood	6B Natrona	1A (all)*	GUAM
6A Shawano	WYOMING	6B Niobrara		
6A Sheboygan		6B Park		
6A St. Croix	6B Albany	5B Platte	1A (all)*	

TABLE C301.3(1)
INTERNATIONAL CLIMATE ZONE DEFINITIONS

MAJOR CLIMATE TYPE DEFINITIONS
Marine (C) Definition—Locations meeting all four criteria: 1. Mean temperature of coldest month between -3°C (27°F) and 18°C (65°F). 2. Warmest month mean < 22°C (72°F). 3. At least four months with mean temperatures over 10°C (50°F). 4. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.
Dry (B) Definition—Locations meeting the following criteria: Not marine and $P_m < 0.44 \times (TF - 19.5)$ $[P_{cm} < 2.0 \times (TC + 7) \text{ in SI units}]$ where: P_m = Annual precipitation in inches (cm) T = Annual mean temperature in °F (°C)
Moist (A) Definition—Locations that are not marine and not dry.
Warm-humid Definition—Moist (A) locations where either of the following wet-bulb temperature conditions shall occur during the warmest six consecutive months of the year: 1. 67°F (19.4°C) or higher for 3,000 or more hours; or 2. 73°F (22.8°C) or higher for 1,500 or more hours.

For SI: °C = [(°F)-32]/1.8, 1 inch = 2.54 cm.

GENERAL REQUIREMENTS

TABLE C301.3(2)
INTERNATIONAL CLIMATE ZONE DEFINITIONS

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
1	9000 < CDD50°F	5000 < CDD10°C
2	6300 < CDD50°F ≤ 9000	3500 < CDD10°C ≤ 5000
3A and 3B	4500 < CDD50°F ≤ 6300 AND HDD65°F ≤ 5400	2500 < CDD10°C ≤ 3500 AND HDD18°C ≤ 3000
4A and 4B	CDD50°F ≤ 4500 AND HDD65°F ≤ 5400	CDD10°C ≤ 2500 AND HDD18°C ≤ 3000
3C	HDD65°F ≤ 3600	HDD18°C ≤ 2000
4C	3600 < HDD65°F ≤ 5400	2000 < HDD18°C ≤ 3000
5	5400 < HDD65°F ≤ 7200	3000 < HDD18°C ≤ 4000
6	7200 < HDD65°F ≤ 9000	4000 < HDD18°C ≤ 5000
7	9000 < HDD65°F ≤ 12600	5000 < HDD18°C ≤ 7000
8	12600 < HDD65°F	7000 < HDD18°C

For SI: °C = [(°F)-32]/1.8.

SECTION C302 DESIGN CONDITIONS

C302.1 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C) for cooling.

SECTION C303 MATERIALS, SYSTEMS AND EQUIPMENT

C303.1 Identification. Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

C303.1.1 Building thermal envelope insulation. An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be *listed* on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and *R*-value of installed thickness shall be *listed* on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

C303.1.1.1 Blown or sprayed roof/ceiling insulation. The thickness of blown-in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m²) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed *R*-value shall

be *listed* on certification provided by the insulation installer.

C303.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

C303.1.3 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table C303.1.3(1) or C303.1.3(2). The solar heat gain coefficient (SHGC) and *visible transmittance* (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC or VT shall be assigned a default SHGC or VT from Table C303.1.3(3).

TABLE C303.1.3(1)
DEFAULT GLAZED FENESTRATION *U*-FACTOR

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

TABLE C303.1.3(2)
DEFAULT DOOR *U*-FACTORS

DOOR TYPE	<i>U</i> -FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35



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TABLE C303.1.3(3)
DEFAULT GLAZED FENESTRATION SHGC AND VT

	SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
	Clear	Tinted	Clear	Tinted	
SHGC	0.8	0.7	0.7	0.6	0.6
VT	0.6	0.3	0.6	0.3	0.6

C303.1.4 Insulation product rating. The thermal resistance (R -value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission R -value rule (CFR Title 16, Part 460) in units of $\text{h} \times \text{ft}^2 \times ^\circ\text{F}/\text{Btu}$ at a mean temperature of 75°F (24°C).

C303.2 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the *International Building Code*.

C303.2.1 Protection of exposed foundation insulation.

Insulation applied to the exterior of basement walls, crawl-space walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (153 mm) below grade.

C303.3 Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

CHAPTER 4 [CE]

COMMERCIAL ENERGY EFFICIENCY

SECTION C401 GENERAL

C401.1 Scope. The requirements contained in this chapter are applicable to commercial buildings, or portions of commercial buildings.

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402, C403, C404 and C405. In addition, commercial buildings shall comply with either Section C406.2, C406.3 or C406.4.
3. The requirements of Section C407, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

C401.2.1 Application to existing buildings. Additions, alterations and repairs to existing buildings shall comply with one of the following:

1. Sections C402, C403, C404 and C405; or
2. ANSI/ASHRAE/IESNA 90.1.

SECTION C402 BUILDING ENVELOPE REQUIREMENTS

C402.1 General (Prescriptive). The building thermal envelope shall comply with Section C402.1.1. Section C402.1.2 shall be permitted as an alternative to the *R*-values specified in Section C402.1.1.

C402.1.1 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Tables C402.2 and C402.3 based on the climate zone specified in Chapter 3. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *R*-values from the "Group R" column of Table C402.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *R*-values from the "All other" column of Table C402.2. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table C402.3 shall comply with the building envelope provisions of ANSI/ASHRAE/IESNA 90.1.

C402.1.2 *U*-factor alternative. An assembly with a *U*-factor, *C*-factor, or *F*-factor equal or less than that specified in Table C402.1.2 shall be permitted as an alternative to the *R*-value in Table C402.2. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *U*-factor, *C*-factor, or *F*-factor from the "Group R" column of Table C402.1.2. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *U*-factor, *C*-factor or *F*-factor from the "All other" column of Table C402.1.2.

C402.2 Specific insulation requirements (Prescriptive). Opaque assemblies shall comply with Table C402.2. Where two or more layers of continuous insulation board are used in a construction assembly, the continuous insulation boards shall be installed in accordance with Section C303.2. If the continuous insulation board manufacturer's installation instructions do not address installation of two or more layers, the edge joints between each layer of continuous insulation boards shall be staggered.

C402.2.1 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.2, based on construction materials used in the roof assembly. Skylight curbs shall be insulated to the level of roofs with insulation entirely above deck or *R*-5, whichever is less.

Exceptions:

1. Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or less and where the area-weighted *U*-factor is equivalent to the same assembly with the *R*-value specified in Table C402.2.
2. Unit skylight curbs included as a component of an NFRC 100 rated assembly shall not be required to be insulated.

Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.

C402.2.1.1 Roof solar reflectance and thermal emittance. Low-sloped roofs, with a slope less than 2 units vertical in 12 horizontal, directly above cooled *conditioned spaces* in Climate Zones 1, 2, and 3 shall comply with one or more of the options in Table C402.2.1.1.

Exceptions: The following roofs and portions of roofs are exempt from the requirements in Table C402.2.1.1:

1. Portions of roofs that include or are covered by:
 - 1.1. Photovoltaic systems or components.
 - 1.2. Solar air or water heating systems or components.
 - 1.3. Roof gardens or landscaped roofs.
 - 1.4. Above-roof decks or walkways.
 - 1.5. Skylights.
 - 1.6. HVAC systems, components, and other opaque objects mounted above the roof.

2. Portions of roofs shaded during the peak sun angle on the summer solstice by permanent features of the building, or by permanent features of adjacent buildings.
3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot (psf) (74 kg/m²) or 23 psf (117 kg/m²) pavers.
4. Roofs where a minimum of 75 percent of the roof area meets a minimum of one of the exceptions above.

TABLE C402.2.1.1
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS^a

Three-year aged solar reflectance ^b of 0.55 and three-year aged thermal emittance ^c of 0.75
Initial solar reflectance ^b of 0.70 and initial thermal emittance ^c of 0.75
Three-year-aged solar reflectance index ^d of 64
Initial solar reflectance index ^d of 82

- a. The use of area-weighted averages to meet these requirements shall be permitted. Materials lacking initial tested values for either solar reflectance or thermal emittance, shall be assigned both an initial solar reflectance of 0.10 and an initial thermal emittance of 0.90. Materials lacking three-year aged tested values for either solar reflectance or thermal emittance shall be assigned both a three-year aged solar reflectance of 0.10 and a three-year aged thermal emittance of 0.90.
- b. Solar reflectance tested in accordance with ASTM C 1549, ASTM E 903 or ASTM E 1918.
- c. Thermal emittance tested in accordance with ASTM C 1371 or ASTM E 408.
- d. Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of 2.1 Btu/h × ft² × °F (12 W/m² × K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance. Calculation of initial SRI shall be based on initial tested values of solar reflectance and thermal emittance.

C402.2.2 Classification of walls. Walls associated with the building envelope shall be classified in accordance with Section C402.2.2.1 or C402.2.2.2.

C402.2.2.1 Above-grade walls. Above-grade walls are those walls covered by Section C402.2.3 on the exterior of the building and completely above grade or walls that are more than 15 percent above grade.

C402.2.2.2 Below-grade walls. Below-grade walls covered by Section C402.2.4 are basement or first-story walls associated with the exterior of the building that are at least 85 percent below grade.

C402.2.3 Thermal resistance of above-grade walls. The minimum thermal resistance (*R*-value) of the insulating materials installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table C402.2, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table C402.2.

“Mass walls” shall include walls weighing not less than:

1. 35 psf (170 kg/m²) of wall surface area; or

2. 25 psf (120 kg/m²) of wall surface area if the material weight is not more than 120 pounds per cubic foot (pcf) (1900 kg/m³).

C402.2.4 Thermal resistance of below-grade walls. The minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below-grade walls shall be as specified in Table C402.2, and shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the floor, whichever is less.

C402.2.5 Floors over outdoor air or unconditioned space. The minimum thermal resistance (*R*-value) of the insulating material installed either between the floor framing or continuously on the floor assembly shall be as specified in Table C402.2, based on construction materials used in the floor assembly.

“Mass floors” shall include floors weighing not less than:

1. 35 psf (170 kg/m²) of floor surface area; or
2. 25 psf (120 kg/m²) of floor surface area if the material weight is not more than 12 pcf (1,900 kg/m³).

C402.2.6 Slabs on grade. Where the slab on grade is in contact with the ground, the minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors shall be as specified in Table C402.2. The insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil.

Exception: Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.

C402.2.7 Opaque doors. Opaque doors (doors having less than 50 percent glass area) shall meet the applicable requirements for doors as specified in Table C402.2 and be considered as part of the gross area of above-grade walls that are part of the building envelope.

C402.2.8 Insulation of radiant heating systems. Radiant panels, and associated U-bends and headers, designed for sensible heating of an indoor space through heat transfer from the thermally effective panel surfaces to the occupants or indoor space by thermal radiation and natural convection and the bottom surfaces of floor structures incorporating radiant heating shall be insulated with a minimum of *R*-3.5 (0.62 m²/K × W).

TABLE C402.1.2
OPAQUE THERMAL ENVELOPE ASSEMBLY REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above deck	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036
Walls, Below Grade																
Below-grade wall ^b	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092	C-0.092	C-0.092
Floors																
Mass	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.064	U-0.064	U-0.064	U-0.057	U-0.055	U-0.051	U-0.055	U-0.051
Joist/framing	U-0.066	U-0.066	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab-on-Grade Floors																
Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40	F-0.40
Heated slabs	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.65	F-0.65	F-0.58	F-0.58	F-0.58	F-0.58	F-0.55	F-0.55	F-0.55	F-0.55

a. Use of opaque assembly *U*-factors, *C*-factors, and *F*-factors from ANSI/ASHRAE/IESNA 90.1 Appendix A shall be permitted, provided the construction complies with the applicable construction details from ANSI/ASHRAE/IESNA 90.1 Appendix A.

b. Where heated slabs are below grade, below-grade walls shall comply with the *F*-factor requirements for heated slabs.

TABLE C402.2
OPAQUE THERMAL ENVELOPE REQUIREMENTS^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs																
Insulation entirely above deck	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal buildings (with R-5 thermal blocks) ^{a,b}	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49
Walls, Above Grade																
Mass	R-5.7ci	R-5.7ci	R-5.7ci	R-5.7ci	R-5.7ci	R-5.7ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20
Walls, Below Grade																
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-10ci	R-12.5ci
Floors																
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30
Slab-on-Grade Floors																
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below
Heated slabs ^d	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-10 for 24" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 36" below	R-15 for 36" below	R-15 for 36" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below
Opaque Doors																
Swinging	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Roll-up or sliding	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm. ci = Continuous insulation. NR = No requirement.

LS = Liner System—A continuous membrane installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins.

Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.

b. Where using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.2.

c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 Btu-in/h·ft²·°F.

d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.

e. Steel floor joist systems shall be insulated to R-38.

C402.3 Fenestration (Prescriptive). Fenestration shall comply with Table C402.3. Automatic daylighting controls specified by this section shall comply with Section C405.2.2.3.2.

C402.3.1 Maximum area. The vertical fenestration area (not including opaque doors and opaque spandrel panels) shall not exceed 30 percent of the gross above-grade wall area. The skylight area shall not exceed 3 percent of the gross roof area.

C402.3.1.1 Increased vertical fenestration area with daylighting controls. In Climate Zones 1 through 6, a maximum of 40 percent of the gross above-grade wall area shall be permitted to be vertical fenestration, provided:

1. No less than 50 percent of the conditioned floor area is within a daylight zone;
2. Automatic daylighting controls are installed in daylight zones; and
3. Visible transmittance (VT) of vertical fenestration is greater than or equal to 1.1 times solar heat gain coefficient (SHGC).

Exception: Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 3.

C402.3.1.2 Increased skylight area with daylighting controls. The skylight area shall be permitted to be a maximum of 5 percent of the roof area provided automatic daylighting controls are installed in daylight zones under skylights.

C402.3.2 Minimum skylight fenestration area. In an enclosed space greater than 10,000 square feet (929 m²), directly under a roof with ceiling heights greater than 15 feet (4572 mm), and used as an office, lobby, atrium, concourse, corridor, storage, gymnasium/exercise center, convention center, automotive service, manufacturing, non-refrigerated warehouse, retail store, distribution/sorting area, transportation, or workshop, the total daylight zone under skylights shall be not less than half the floor area

and shall provide a minimum skylight area to daylight zone under skylights of either:

1. Not less than 3 percent with a skylight VT of at least 0.40; or
2. Provide a minimum skylight effective aperture of at least 1 percent determined in accordance with Equation 4-1.

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Daylight zone under skylight}}$$

(Equation 4-1)

where:

Skylight area = Total fenestration area of skylights.

Skylight VT = Area weighted average visible transmittance of skylights.

WF = Area weighted average well factor, where well factor is 0.9 if light well depth is less than 2 feet (610 mm), or 0.7 if light well depth is 2 feet (610 mm) or greater.

Light well depth = Measure vertically from the underside of the lowest point of the skylight glazing to the ceiling plane under the skylight.

Exception: Skylights above daylight zones of enclosed spaces are not required in:

1. Buildings in climate zones 6 through 8.
2. Spaces where the designed *general lighting* power densities are less than 0.5 W/ft² (5.4 W/m²).
3. Areas where it is documented that existing structures or natural objects block direct beam sunlight on at least half of the roof over the enclosed

TABLE C402.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8
Vertical fenestration								
U-factor								
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77
SHGC								
SHGC	0.25	0.25	0.25	0.40	0.40	0.40	0.45	0.45
Skylights								
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50	0.50
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR	NR

NR = No requirement.