

Part IV — Energy Conservation

CHAPTER 11 ENERGY EFFICIENCY

SECTION N1101 GENERAL

N1101.1 Scope. This chapter sets forth energy-efficiency-related requirements for the design and construction of buildings regulated by this code.

Exception: Provided that they are separated by building envelope assemblies from the remainder of the building, portions of the building that do not enclose conditioned space shall be exempt from the building envelope provisions, but shall comply with the provisions for building mechanical and service water heating systems.

N1101.2 Compliance. Compliance with this chapter shall be demonstrated by meeting the requirements of the applicable sections and tables of this chapter. Where applicable, provisions are based on the climate zone where the building is located. The climate zone where the building is located shall be based on zone assignments in Table N1101.2 for the county and state in which the building is being constructed. Alternatively, the climate zone shall be permitted to be determined by the heating degree days assigned by the building official.

N1101.2.1 Detached one- and two-family dwellings. Compliance shall be demonstrated by either:

1. Meeting the requirements of this chapter for buildings with a glazing area that does not exceed 15 percent of the gross area of exterior walls; or
2. Meeting the requirements of the *International Energy Conservation Code* for detached one- and two-family dwellings.

N1101.2.2 Townhouses. Compliance shall be demonstrated by either:

1. Meeting the requirements of this chapter for buildings with a glazing area that does not exceed 25 percent of the gross area of exterior walls; or
2. Meeting the requirements of the *International Energy Conservation Code* for residential buildings of Group R-2, R-4 or townhouses.

N1101.3 Materials and equipment. Materials and equipment shall be identified in a manner that will allow a determination of their compliance with the provisions of this chapter. Materials and equipment used to conform to the applicable provisions of this chapter shall be installed in accordance with the manufacturer's installation instructions.

N1101.3.1 Insulation. The thermal resistance (*R*-value) shall be indicated on all insulation and the insulation installed such that the *R*-value can be verified during inspection, or a certification of the installed *R*-value shall

be provided at the job site by the insulation installer. Where blown-in or sprayed insulation is applied in walls, the installer shall provide a certification of the installed density and *R*-value. Where blown-in or sprayed insulation is applied in the roof-ceiling assembly, the installer shall provide a certification of the initial installed thickness, settled thickness, coverage area, and number of bags of insulating material installed. Markers shall be provided for every 300 square feet (28 m²) of attic area, attached to the trusses, rafters, or joists, and indicate in 1-inch-high (25.4 mm) numbers the installed thickness of the insulation.

N1101.3.2 Fenestration. The *U*-factor of fenestration shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. The solar heat gain coefficient (SHGC) of fenestration shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer.

N1101.3.2.1 Default fenestration performance. When a manufacturer has not determined a fenestration product's *U*-factor in accordance with NFRC 100, compliance shall be determined by assigning such products a default *U*-factor from Tables 102.5.2(1) and 102.5.2(2) in the *International Energy Conservation Code*. When a manufacturer has not determined a fenestration product's SHGC in accordance with NFRC 200, compliance shall be determined by assigning such products a default SHGC from Table 102.5.2(3) of the *International Energy Conservation Code*.

N1101.3.2.2 Air leakage. The air leakage of prefabricated fenestration shall be determined in accordance with AAMA/WDMA 101/I.S.2, 101/I.S.2/NAFS, or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer and shall not exceed the values in Table 502.1.4.1 of the *International Energy Conservation Code*. Alternatively, the manufacturer shall certify that the fenestration is installed in accordance with Section 502.1.4 of the *International Energy Conservation Code*.

N1101.3.3 Maintenance. Where mechanical or plumbing system components require preventive maintenance for efficient operation, regular maintenance requirements shall be clearly stated and affixed to the component, or the source for such information shall be shown on a label attached to the component.

TABLE N1101.2
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
ALABAMA		Madison	8	Kodiak Island	16	Cleveland ^a	6	Pope	8
Autauga ^a	6	Marengo ^a	5	Kuspuk	18	Columbia ^a	6	Prairie ^a	7
Baldwin ^a	4	Marion	7	Lake & Peninsula	17	Conway ^a	7	Pulaski ^a	7
Barbour ^a	5	Marshall	8	Lower Kuskokwim	18	Craighead	8	Randolph	8
Bibb ^a	6	Mobile ^a	4	Lower Yukon	18	Crawford	8	Saline ^a	7
Blount	7	Monroe ^a	5	Matanuska-Susitna	17	Crittenden ^a	7	Scott ^a	7
Bullock ^a	5	Montgomery ^a	6	North Slope	19	Cross ^a	7	Searcy	9
Butler ^a	5	Morgan	8	Northwest Arctic	19	Dallas ^a	6	Sebastian	8
Calhoun ^a	6	Perry ^a	5	Pribilof Islands	17	Desha ^a	6	Sevier ^a	7
Chambers ^a	6	Pickens ^a	6	Sitka	15	Drew ^a	6	Sharp	8
Cherokee	7	Pike ^a	5	Southeast Island	15	Faulkner ^a	7	St Francis ^a	7
Chilton ^a	6	Randolph	7	Southwest Region	17	Franklin	8	Stone	9
Choctaw ^a	5	Russell ^a	5	Yakutat	17	Fulton	8	Union ^a	6
Clarke ^a	5	Shelby ^a	6	Yukon Flats	19	Garland ^a	7	Van Buren	8
Clay	7	St Clair ^a	6	Yukon-Koyukuk	19	Grant ^a	6	Washington	9
Cleburne	7	Sumter ^a	5	Yupitit	18	Greene	8	White ^a	7
Coffee ^a	4	Talladega ^a	6	ARIZONA		Hempstead ^a	7	Woodruff ^a	7
Colbert	8	Tallapoosa ^a	6	Apache	13	Hot Spring ^a	7	Yell ^a	7
Conecuh ^a	5	Tuscaloosa ^a	6	Cochise	6	Howard ^a	7	CALIFORNIA	
Coosa ^a	6	Walker ^a	6	Coconino	14	Independence	8	Alameda	5
Covington ^a	4	Washington ^a	5	Gila	8	Izard	8	Alpine	15
Crenshaw ^a	5	Wilcox ^a	5	Graham	6	Jackson	8	Amador	8
Cullman	7	Winston	7	Greenlee	6	Jefferson ^a	6	Butte	6
Dale ^a	4	ALASKA BUROUGHS		La Paz	3	Johnson	8	Calaveras	8
Dallas ^a	5	AND REAA's		Maricopa	3	Lafayette ^a	6	Colusa	6
De Kalb	8	Adak Region	16	Mohave	7	Lawrence	8	Contra Costa	6
Elmore ^a	6	Alaska Gateway	19	Navajo	10	Lee ^a	7	Del Norte	9
Escambia ^a	4	Aleutian Region	17	Pima	4	Lincoln ^a	6	El Dorado	8
Etowah	7	Aleutians East	17	Pinal	4	Little River ^a	6	Fresno	6
Fayette	7	Anchorage	17	Santa Cruz	6	Logan ^a	7	Glenn	6
Franklin	8	Annette Island	15	Yavapai	10	Lonoke ^a	7	Humboldt	9
Geneva ^a	4	Bering Straits	19	Yuma	3	Madison	9	Imperial	3
Greene ^a	5	Bristol Bay	17	ARKANSAS		Marion	9	Inyo	9
Hale ^a	5	Chatham	16	Arkansas ^a	6	Miller ^a	6	Kern	5
Henry ^a	4	Chugach	17	Ashley ^a	6	Mississippi	8	Kings	6
Houston ^a	4	Copper River	18	Baxter	9	Monroe ^a	7	Lake	8
Jackson	8	Delta/Greely	18	Benton	9	Montgomery	8	Lassen	13
Jefferson ^a	6	Denali	18	Boone	9	Nevada ^a	6	Los Angeles	4
Lamar	7	Fairbanks N. Star	18	Bradley ^a	6	Newton	9	Madera	6
Lauderdale	8	Haines	16	Calhoun ^a	6	Ouachita ^a	6	Marin	6
Lawrence	8	Iditarod Area	19	Carroll	9	Perry ^a	7	Mariposa	8
Lee ^a	6	Juneau	16	Chicot ^a	6	Phillips ^a	7	Mendocino	8
Limestone	8	Kashunamiut	18	Clark ^a	6	Pike ^a	7	Merced	6
Lowndes ^a	5	Kenai Peninsula	17	Clay	8	Poinsett	8	Modoc	15
Macon ^a	6	Ketchikan Gateway	15	Cleburne	8	Polk	8		

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Mono	15	Costilla	16	San Miguel	15	Glades ^a	1	Washington ^a	4
Monterey	6	Crowley	11	Sedgwick	13	Gulf ^a	4	GEORGIA	
Napa	6	Custer	16	Summit	17	Hamilton ^a	3	Appling ^a	4
Nevada	11	Delta	13	Teller	13	Hardee ^a	2	Atkinson ^a	4
Orange	4	Denver	13	Washington	13	Hendry ^a	1	Bacon ^a	4
Placer	8	Dolores	15	Weld	13	Hernando ^a	2	Baker ^a	4
Plumas	13	Douglas	13	Yuma	13	Highlands ^a	2	Baldwin ^a	6
Riverside	4	Eagle	15	CONNECTICUT		Hillsborough ^a	2	Banks	7
Sacramento	6	El Paso	13	Fairfield	12	Holmes ^a	4	Barrow	7
San Benito	6	Elbert	13	Hartford	13	Indian Rivera	2	Bartow	7
San Bernardino	4	Fremont	11	Litchfield	14	Jackson ^a	4	Ben Hill ^a	5
San Diego	3	Garfield	15	Middlesex	12	Jefferson ^a	4	Berrien ^a	4
San Francisco	6	Gilpin	13	New Haven	12	Lafayette ^a	3	Bibb ^a	5
San Joaquin	6	Grand	17	New London	12	Lake ^a	2	Bleckley ^a	5
San Luis Obispo	6	Gunnison	17	Tolland	14	Lee ^a	1	Brantley ^a	4
San Mateo	6	Hinsdale	17	Windham	14	Leon ^a	4	Brooks ^a	4
Santa Barbara	5	Huerfano	11	DELAWARE		Levy ^a	2	Bryan ^a	4
Santa Clara	6	Jackson	17	Kent	9	Liberty ^a	4	Bulloch ^a	5
Santa Cruz	6	Jefferson	13	New Castle	10	Madison ^a	3	Burke ^a	6
Shasta	6	Kiowa	13	Sussex	9	Manatee ^a	2	Butts	7
Sierra	11	Kit Carson	13	DC		Marion ^a	2	Calhoun ^a	5
Siskiyou	11	La Plata	15	Washington	10	Martin ^a	1	Camden ^a	4
Solano	6	Lake	17	FLORIDA		Monroe ^a	1	Candler ^a	5
Sonoma	6	Larimer	13	Alachua ^a	3	Nassau ^a	3	Carroll	7
Stanislaus	6	Las Animas	11	Baker ^a	3	Okaloosa ^a	4	Catoosa	8
Sutter	6	Lincoln	13	Bay ^a	3	Okeechobee ^a	2	Charlton ^a	4
Tehama	6	Logan	13	Bradford ^a	3	Orange ^a	2	Chatham ^a	4
Trinity	9	Mesa	13	Brevard ^a	2	Osceola ^a	2	Chattahoochee ^a	5
Tulare	6	Mineral	17	Broward ^a	1	Palm Beach ^a	1	Chattooga	8
Tuolumne	8	Moffat	15	Calhoun ^a	4	Pasco ^a	2	Cherokee	8
Ventura	4	Montezuma	15	Charlotte ^a	2	Pinellas ^a	2	Clarke	7
Yolo	6	Montrose	13	Citrus ^a	2	Polk ^a	2	Clay ^a	5
Yuba	6	Morgan	13	Clay ^a	3	Putnam ^a	3	Clayton	7
COLORADO		Otero	11	Collier ^a	1	Santa Rosa ^a	4	Clinch ^a	4
Adams	13	Ouray	15	Columbia ^a	3	Sarasota ^a	2	Cobb	7
Alamosa	16	Park	17	Dade ^a	1	Seminole ^a	2	Coffee ^a	5
Arapahoe	13	Phillips	13	De Soto ^a	2	St Johns ^a	3	Colquitt ^a	4
Archuleta	16	Pitkin	17	Dixie ^a	3	St Lucie ^a	2	Columbia ^a	6
Baca	11	Prowers	11	Duval ^a	3	Sumter ^a	2	Cook ^a	4
Bent	11	Pueblo	11	Escambia ^a	4	Suwannee ^a	3	Coweta	7
Boulder	13	Rio Blanco	15	Flagler ^a	3	Taylor ^a	3	Crawford ^a	5
Chaffee	16	Rio Grande	17	Franklin ^a	4	Union ^a	3	Crisp ^a	5
Cheyenne	13	Routt	17	Gadsden ^a	4	Volusia ^a	2	Dade	8
Clear Creek	17	Saguache	16	Gilchrist ^a	3	Wakulla ^a	4	Dawson	8
Conejos	16	San Juan	17			Walton ^a	4	De Kalb	7

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Decatur ^a	4	Liberty ^a	4	Telfair ^a	5	Camas	15	Clay	11
Dodge ^a	5	Lincoln ^a	6	Terrell ^a	5	Canyon	12	Clinton	10
Dooly ^a	5	Long ^a	4	Thomas ^a	4	Caribou	15	Coles	12
Dougherty ^a	5	Lowndes ^a	4	Tift ^a	5	Cassia	14	Cook	14
Douglas	7	Lumpkin	8	Toombs ^a	4	Clark	15	Crawford	11
Early ^a	5	Macon ^a	5	Towns	8	Clearwater	12	Cumberland	12
Echols ^a	4	Madison	7	Treutlen ^a	5	Custer	16	De Kalb	14
Effingham ^a	4	Marion ^a	5	Troup ^a	6	Elmore	13	De Witt	12
Elbert	7	Mcduffie ^a	6	Turner ^a	5	Franklin	15	Douglas	12
Emanuel ^a	5	Mcintosh ^a	4	Twiggs ^a	5	Fremont	16	Du Page	14
Evans ^a	4	Meriwether ^a	6	Union	8	Gem	13	Edgar	12
Fannin	8	Miller ^a	4	Upson ^a	5	Gooding	13	Edwards	11
Fayette	7	Mitchell ^a	4	Walker	8	Idaho	15	Effingham	11
Floyd	7	Monroe ^a	6	Walton	7	Jefferson	16	Fayette	11
Forsyth	8	Montgomery ^a	5	Ware ^a	4	Jerome	14	Ford	13
Franklin	7	Morgan ^a	6	Warren ^a	6	Kootenai	14	Franklin	10
Fulton	7	Murray	8	Washington ^a	6	Latah	14	Fulton	13
Gilmer	8	Muscogee ^a	5	Wayne ^a	4	Lemhi	15	Gallatin	10
Glascocock ^a	6	Newton	7	Webster ^a	5	Lewis	15	Greene	11
Glynn ^a	4	Oconee	7	Wheeler ^a	5	Lincoln	15	Grundy	13
Gordon	8	Oglethorpe	7	White	8	Madison	16	Hamilton	10
Grady ^a	4	Paulding	7	Whitfield	8	Minidoka	15	Hancock	13
Greene ^a	6	Peach ^a	5	Wilcox ^a	5	Nez Perce	12	Hardin	10
Gwinnett	7	Pickens	8	Wilkes	7	Oneida	15	Henderson	13
Habersham	8	Pierce ^a	4	Wilkinson ^a	5	Owyhee	12	Henry	13
Hall	7	Pike ^a	6	Worth ^a	5	Payette	12	Iroquois	13
Hancock ^a	6	Polk	7	HAWAII		Power	15	Jackson	10
Haralson	7	Pulaski ^a	5	Hawaii	1	Shoshone	14	Jasper	11
Harris ^a	6	Putnam ^a	6	Honolulu	1	Teton	16	Jefferson	11
Hart	7	Quitman ^a	5	Kalawao	1	Twin Falls	14	Jersey	10
Heard ^a	6	Rabun	8	Kauai	1	Valley	16	Jo Daviess	14
Henry	7	Randolph ^a	5	Maui	1	Washington	13	Johnson	10
Houston ^a	5	Richmond ^a	6	IDAHO		ILLINOIS		Kane	14
Irwin ^a	5	Rockdale	7	Ada	12	Adams	12	Kankakee	13
Jackson	7	Schley ^a	5	Adams	15	Alexander	10	Kendall	13
Jasper ^a	6	Screven ^a	5	Bannock	15	Bond	11	Knox	13
Jeff Davis ^a	4	Seminole ^a	4	Bear Lake	15	Boone	14	La Salle	13
Jefferson ^a	6	Spalding	7	Benewah	14	Brown	12	Lake	14
Jenkins ^a	5	Stephens	7	Bingham	15	Bureau	13	Lawrence	11
Johnson ^a	5	Stewart ^a	5	Blaine	15	Calhoun	11	Lee	14
Jones ^a	6	Sumter ^a	5	Boise	15	Carroll	14	Livingston	13
Lamar ^a	6	Talbot ^a	5	Bonner	15	Cass	12	Logan	12
Lanier ^a	4	Taliaferro ^a	6	Bonneville	15	Champaign	12	Macon	12
Laurens ^a	5	Tattall ^a	4	Boundary	15	Christian	11	Macoupin	11
Lee ^a	5	Taylor ^a	5	Butte	16	Clark	12	Madison	10

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Marion	11	INDIANA		Lagrange	14	Wells	13	Hardin	15
Marshall	13	Adams	13	Lake	13	White	13	Harrison	14
Mason	12	Allen	13	Lawrence	11	Whitley	14	Henry	13
Massac	10	Bartholomew	11	Madison	13	IOWA		Howard	15
Mcdonough	13	Benton	13	Marion	12	Adair	14	Humboldt	15
Mchenry	14	Blackford	13	Marshall	13	Adams	13	Ida	15
Mclean	12	Boone	12	Martin	11	Allamakee	15	Iowa	14
Menard	12	Brown	11	Miami	14	Appanoose	13	Jackson	14
Mercer	13	Carroll	13	Monroe	11	Audubon	14	Jasper	14
Monroe	10	Cass	13	Montgomery	12	Benton	14	Jefferson	13
Montgomery	11	Clark	10	Morgan	12	Black Hawk	15	Johnson	13
Morgan	12	Clay	12	Newton	13	Boone	14	Jones	14
Moultrie	12	Clinton	13	Noble	14	Bremer	15	Keokuk	13
Ogle	14	Crawford	11	Ohio	11	Buchanan	15	Kossuth	15
Peoria	13	Daviess	11	Orange	11	Buena Vista	15	Lee	13
Perry	10	De Kalb	13	Owen	12	Butler	15	Linn	14
Piatt	12	Dearborn	11	Parke	12	Calhoun	15	Louisa	13
Pike	12	Decatur	12	Perry	10	Carroll	14	Lucas	13
Pope	10	Delaware	13	Pike	11	Cass	14	Lyon	15
Pulaski	10	Dubois	11	Porter	13	Cedar	14	Madison	14
Putnam	13	Elkhart	13	Posey	10	Cerro Gordo	15	Mahaska	13
Randolph	10	Fayette	12	Pulaski	13	Cherokee	15	Marion	13
Richland	11	Floyd	10	Putnam	12	Chickasaw	15	Marshall	14
Rock Island	13	Fountain	12	Randolph	13	Clarke	13	Mills	13
Saline	10	Franklin	12	Ripley	11	Clay	15	Mitchell	15
Sangamon	12	Fulton	14	Rush	12	Clayton	15	Monona	14
Schuyler	12	Gibson	10	Scott	11	Clinton	13	Monroe	13
Scott	12	Grant	13	Shelby	12	Crawford	14	Montgomery	13
Shelby	11	Greene	11	Spencer	10	Dallas	14	Muscatine	13
St Clair	10	Hamilton	12	St Joseph	13	Davis	13	Obrien	15
Stark	13	Hancock	12	Starke	13	Decatur	13	Osceola	15
Stephenson	14	Harrison	10	Steuben	14	Delaware	15	Page	13
Tazewell	12	Hendricks	12	Sullivan	11	Des Moines	13	Palo Alto	15
Union	10	Henry	12	Switzerland	10	Dickinson	15	Plymouth	15
Vermilion	12	Howard	13	Tippecanoe	13	Dubuque	14	Pocahontas	15
Wabash	11	Huntington	14	Tipton	13	Emmet	15	Polk	14
Warren	13	Jackson	11	Union	12	Fayette	15	Pottawattamie	14
Washington	10	Jasper	13	Vanderburgh	10	Floyd	15	Poweshiek	14
Wayne	11	Jay	13	Vermillion	12	Franklin	15	Ringgold	13
White	10	Jefferson	10	Vigo	12	Fremont	13	Sac	15
Whiteside	14	Jennings	11	Wabash	14	Greene	14	Scott	13
Will	13	Johnson	12	Warren	12	Grundy	15	Shelby	14
Williamson	10	Knox	11	Warrick	10	Guthrie	14	Sioux	15
Winnebago	14	Kosciusko	14	Washington	11	Hamilton	15	Story	14
Woodford	13	La Porte	13	Wayne	12	Hancock	15		

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Tama	14	Geary	11	Pratt	10	Bullitt	10	Knott	10
Taylor	13	Gove	12	Rawlins	13	Butler	9	Knox	10
Union	13	Graham	12	Reno	11	Caldwell	9	Larue	9
Van Buren	13	Grant	11	Republic	12	Calloway	9	Laurel	10
Wapello	13	Gray	11	Rice	11	Campbell	11	Lawrence	11
Warren	14	Greeley	12	Riley	11	Carlisle	9	Lee	10
Washington	13	Greenwood	10	Rooks	12	Carroll	10	Leslie	10
Wayne	13	Hamilton	11	Rush	11	Carter	11	Letcher	10
Webster	15	Harper	9	Russell	11	Casey	10	Lewis	11
Winnebago	15	Harvey	11	Saline	11	Christian	9	Lincoln	10
Winneshiek	15	Haskell	11	Scott	12	Clark	10	Livingston	9
Woodbury	15	Hodgeman	11	Sedgwick	10	Clay	10	Logan	9
Worth	15	Jackson	11	Seward	10	Clinton	10	Lyon	9
Wright	15	Jefferson	11	Shawnee	11	Crittenden	9	Madison	10
KANSAS		Jewell	12	Sheridan	12	Cumberland	9	Magoffin	10
Allen	10	Johnson	11	Sherman	13	Daviess	9	Marion	10
Anderson	10	Kearny	11	Smith	12	Edmonson	9	Marshall	9
Atchison	11	Kingman	10	Stafford	11	Elliot	11	Martin	11
Barber	9	Kiowa	10	Stanton	11	Estill	10	Mason	11
Barton	11	Labette	9	Stevens	10	Fayette	10	Mccracken	9
Bourbon	10	Lane	12	Sumner	9	Fleming	11	Mccreary	10
Brown	11	Leavenworth	11	Thomas	13	Floyd	10	Mclean	9
Butler	10	Lincoln	11	Trego	12	Franklin	10	Meade	9
Chase	10	Linn	10	Wabaunsee	11	Fulton	9	Menifee	10
Chautauqua	9	Logan	12	Wallace	12	Gallatin	11	Mercer	10
Cherokee	9	Lyon	11	Washington	12	Garrard	10	Metcalfe	9
Cheyenne	13	Marion	11	Wichita	12	Grant	11	Monroe	9
Clark	10	Marshall	12	Wilson	9	Graves	9	Montgomery	10
Clay	11	Mcpherson	11	Woodson	10	Grayson	9	Morgan	10
Cloud	12	Meade	10	Wyandotte	11	Green	9	Muhlenberg	9
Coffey	10	Miami	10	KENTUCKY		Greenup	11	Nelson	10
Comanche	9	Mitchell	12	Adair	9	Hancock	9	Nicholas	11
Cowley	9	Montgomery	9	Allen	9	Hardin	9	Ohio	9
Crawford	9	Morris	11	Anderson	10	Harlan	10	Oldham	10
Decatur	13	Morton	10	Ballard	9	Harrison	11	Owen	10
Dickinson	11	Nemaha	11	Barren	9	Hart	9	Owsley	10
Doniphan	11	Neosho	9	Bath	11	Henderson	9	Pendleton	11
Douglas	10	Ness	12	Bell	10	Henry	10	Perry	10
Edwards	11	Norton	13	Boone	11	Hickman	9	Pike	10
Elk	9	Osage	10	Bourbon	10	Hopkins	9	Powell	10
Ellis	12	Osborne	12	Boyd	11	Jackson	10	Pulaski	10
Ellsworth	11	Ottawa	11	Boyle	10	Jefferson	10	Robertson	11
Finney	11	Pawnee	11	Bracken	11	Jessamine	10	Rockcastle	10
Ford	11	Phillips	12	Breathitt	10	Johnson	11	Rowan	11
Franklin	10	Pottawatomie	11	Breckenridge	9	Kenton	11	Russell	10

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Scott	11	La Salle ^a	5	Knox	15	Middlesex	13	Jackson	14
Shelby	10	Lafayette ^a	4	Lincoln	15	Nantucket	12	Kalamazoo	14
Simpson	9	Lafourche ^a	3	Oxford	16	Norfolk	13	Kalkaska	15
Spencer	10	Lincoln ^a	6	Penobscot	15	Plymouth	12	Kent	14
Taylor	9	Livingston ^a	4	Piscataquis	17	Suffolk	13	Keweenaw	17
Todd	9	Madison ^a	6	Sagadahoc	15	Worcester	14	Lake	15
Trigg	9	Morehouse ^a	6	Somerset	17	MICHIGAN		Lapeer	14
Trimble	10	Natchitoches ^a	5	Waldo	15	Alcona	15	Leelanau	15
Union	9	Orleans ^a	3	Washington	15	Alger	16	Lenawee	14
Warren	9	Ouachita ^a	6	York	15	Allegan	14	Livingston	14
Washington	10	Plaquemines ^a	3	MARYLAND		Alpena	15	Luce	16
Wayne	10	Pointe Coupee ^a	4	Allegheny	12	Antrim	15	Mackinac	16
Webster	9	Rapides ^a	5	Anne Arundel	9	Arenac	15	Macomb	14
Whitley	10	Red River ^a	5	Baltimore	10	Baraga	17	Manistee	15
Wolfe	10	Richland ^a	6	Baltimore City	9	Barry	14	Marquette	16
Woodford	10	Sabine ^a	5	Calvert	9	Bay	15	Mason	15
LOUISIANA		St Bernard ^a	3	Caroline	9	Benzie	15	Mecosta	15
Acadia ^a	4	St Charles ^a	3	Carroll	11	Berrien	14	Menominee	16
Allen ^a	4	St Helena ^a	4	Cecil	10	Branch	14	Midland	15
Ascension ^a	4	St James ^a	3	Charles	9	Calhoun	14	Missaukee	15
Assumption ^a	3	St John The Baptist ^a	3	Dorchester	9	Cass	14	Monroe	13
Avoyelles ^a	5	St Landry ^a	4	Frederick	11	Charlevoix	15	Montcalm	14
Beauregard ^a	4	St Martin ^a	4	Garrett	13	Cheboygan	15	Montmorency	15
Bienville ^a	6	St Mary ^a	3	Harford	10	Chippewa	16	Muskegon	14
Bossier ^a	6	St Tammany ^a	4	Howard	10	Clare	15	Newaygo	15
Caddo ^a	6	Tangipahoa ^a	4	Kent	10	Clinton	14	Oakland	14
Calcasieu ^a	4	Tensas ^a	5	Montgomery	10	Crawford	15	Oceana	15
Caldwell ^a	6	Terrebonne ^a	3	Prince Georges	10	Delta	16	Ogemaw	15
Cameron ^a	4	Union ^a	6	Queen Annes	9	Dickinson	16	Ontonagon	17
Catahoula ^a	5	Vermilion ^a	4	Somerset	9	Eaton	14	Osceola	15
Claiborne ^a	6	Vernon ^a	5	St Marys	9	Emmet	15	Oscoda	15
Concordia ^a	5	Washington ^a	4	Talbot	9	Genesee	14	Otsego	15
De Soto ^a	5	Webster ^a	6	Washington	11	Gladwin	15	Ottawa	14
East Baton Rouge ^a	4	West Baton Rouge ^a	4	Wicomico	9	Gogebic	17	Presque Isle	15
East Carroll ^a	6	West Carroll ^a	6	Worcester	9	Grand Traverse	15	Roscommon	15
East Feliciana ^a	4	West Feliciana ^a	4	MASSACHUSETTS		Gratiot	14	Saginaw	14
Evangeline ^a	4	Winn ^a	5	Barnstable	12	Hillsdale	14	Sanilac	14
Franklin ^a	6	MAINE		Berkshire	14	Houghton	17	Schoolcraft	16
Grant ^a	5	Androscoggin	15	Bristol	12	Huron	14	Shiawassee	14
Iberia ^a	4	Aroostook	17	Dukes	12	Ingham	14	St Clair	14
Iberville ^a	4	Cumberland	15	Essex	13	Ionia	14	St Joseph	14
Jackson ^a	6	Franklin	16	Franklin	14	Iosco	15	Tuscola	14
Jefferson ^a	3	Hancock	15	Hampden	14	Iron	17	Van Buren	14
Jefferson Davis ^a	4	Kennebec	15	Hampshire	14	Isabella	15	Washtenaw	13
								Wayne	13

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Wexford	15	Mahnomen	17	MISSISSIPPI		Madison ^a	6	Bates	11
MINNESOTA		Marshall	17	Adams ^a	5	Marion ^a	4	Benton	11
Aitkin	17	Martin	15	Alcorn	7	Marshall	17	Bollinger	10
Anoka	16	McLeod	15	Amite ^a	4	Monroe ^a	6	Boone	11
Becker	17	Meecker	16	Attala ^a	6	Montgomery ^a	6	Buchanan	12
Beltrami	17	Mille Lacs	16	Benton	7	Neshoba ^a	6	Butler	9
Benton	16	Morrison	16	Bolivar ^a	6	Newton ^a	6	Caldwell	12
Big Stone	16	Mower	15	Calhoun ^a	6	Noxubee ^a	6	Callaway	11
Blue Earth	15	Murray	15	Carroll ^a	6	Oktibbeha ^a	6	Camden	11
Brown	15	Nicollet	15	Chickasaw ^a	6	Panola	7	Cape Girardeau	9
Carlton	17	Nobles	15	Choctaw ^a	6	Pearl River ^a	4	Carroll	12
Carver	15	Norman	17	Claiborne ^a	5	Perry ^a	5	Carter	10
Cass	17	Olmsted	15	Clarke ^a	5	Pike ^a	4	Cass	11
Chippewa	16	Otter Tail	17	Clay ^a	6	Pontotoc	7	Cedar	11
Chisago	16	Pennington	17	Coahoma	7	Prentiss	7	Chariton	12
Clay	17	Pine	16	Copiah ^a	5	Quitman	7	Christian	10
Clearwater	17	Pipestone	15	Covington ^a	5	Rankin ^a	6	Clark	13
Cook	17	Polk	17	De Soto	7	Scott ^a	6	Clay	11
Cottonwood	15	Pope	16	Forrest ^a	5	Sharkey ^a	6	Clinton	12
Crow Wing	17	Ramsey	15	Franklin ^a	5	Simpson ^a	5	Cole	11
Dakota	15	Red Lake	17	George ^a	4	Smith ^a	5	Cooper	11
Dodge	15	Redwood	15	Greene ^a	5	Stone ^a	4	Crawford	10
Douglas	16	Renville	15	Grenada ^a	6	Sunflower ^a	6	Dade	10
Faribault	15	Rice	15	Hancock ^a	4	Tallahatchie	7	Dallas	10
Fillmore	15	Rock	15	Harrison ^a	4	Tate	7	Daviess	12
Freeborn	15	Roseau	17	Hinds ^a	6	Tippah	7	De Kalb	12
Goodhue	15	Scott	15	Holmes ^a	6	Tishomingo	7	Dent	10
Grant	16	Sherburne	16	Humphreys ^a	6	Tunica	7	Douglas	10
Hennepin	15	Sibley	15	Issaquena ^a	6	Union	7	Dunklin	9
Houston	15	St Louis	17	Itawamb ^a	7	Walthall ^a	4	Franklin	10
Hubbard	17	Stearns	16	Jackson ^a	4	Warren ^a	6	Gasconade	11
Isanti	16	Steele	15	Jasper ^a	5	Washington ^a	6	Gentry	13
Itasca	17	Stevens	16	Jefferson ^a	5	Wayne ^a	5	Greene	10
Jackson	15	Swift	16	Jefferson Davis ^a	5	Webster ^a	6	Grundy	12
Kanabec	16	Todd	16	Jones ^a	5	Wilkinson ^a	4	Harrison	13
Kandiyohi	16	Traverse	16	Kemper ^a	6	Winston ^a	6	Henry	11
Kittson	17	Wabasha	15	Lafayette	7	Yalobusha	7	Hickory	11
Koochiching	17	Wadena	17	Lamar ^a	4	Yazoo ^a	6	Holt	12
Lac Qui Parle	15	Waseca	15	Lauderdale ^a	6	MISSOURI		Howard	11
Lake	17	Washington	15	Lawrence ^a	5	Adair	12	Howell	9
Lake Of The Woods	17	Watonwan	15	Leake ^a	6	Andrew	12	Iron	10
Le Sueur	15	Wilkin	17	Lee	7	Atchison	13	Jackson	11
Lincoln	15	Winona	15	Leflore ^a	6	Audrain	12	Jasper	9
Lyon	15	Wright	16	Lincoln ^a	5	Barry	9	Jefferson	10
		Yellow Medicine	15	Lowndes ^a	6	Barton	10	Johnson	11

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Knox	12	Shelby	12	Liberty	16	Butler	13	Logan	14
Laclede	10	St Charles	10	Lincoln	15	Cass	13	Loup	14
Lafayette	11	St Clair	11	Madison	15	Cedar	14	Madison	14
Lawrence	10	St Francois	10	McCone	15	Chase	13	Mcpherson	14
Lewis	12	St Louis	10	Meagher	15	Cherry	14	Merrick	13
Lincoln	11	St Louis City	10	Mineral	15	Cheyenne	14	Morrill	14
Linn	12	Ste Genevieve	10	Missoula	15	Clay	13	Nance	13
Livingston	12	Stoddard	9	Musselshell	15	Colfax	13	Nemaha	13
Macon	12	Stone	9	Park	15	Cuming	14	Nuckolls	13
Madison	10	Sullivan	12	Petroleum	15	Custer	14	Otoe	13
Maries	11	Taney	9	Phillips	16	Dakota	14	Pawnee	13
Marion	12	Texas	10	Pondera	16	Dawes	15	Perkins	13
Mcdonald	9	Vernon	11	Powder River	15	Dawson	13	Phelps	13
Mercer	13	Warren	11	Powell	16	Deuel	14	Pierce	14
Miller	11	Washington	10	Prairie	15	Dixon	14	Platte	13
Mississippi	9	Wayne	10	Ravalli	15	Dodge	13	Polk	13
Moniteau	11	Webster	10	Richland	15	Douglas	13	Red Willow	13
Monroe	12	Worth	13	Roosevelt	16	Dundy	13	Richardson	13
Montgomery	11	Wright	10	Rosebud	15	Fillmore	13	Rock	14
Morgan	11	MONTANA		Sanders	15	Franklin	13	Saline	13
New Madrid	9	Beaverhead	15	Sheridan	16	Frontier	13	Sarpy	13
Newton	9	Big Horn	15	Silver Bow	16	Furnas	13	Saunders	13
Nodaway	13	Blaine	16	Stillwater	15	Gage	13	Scotts Bluff	14
Oregon	9	Broadwater	15	Sweet Grass	15	Garden	14	Seward	13
Osage	11	Carbon	15	Teton	15	Garfield	14	Sheridan	15
Ozark	9	Carter	15	Toole	16	Gosper	13	Sherman	14
Pemiscot	9	Cascade	15	Treasure	15	Grant	14	Sioux	15
Perry	10	Chouteau	15	Valley	16	Greeley	14	Stanton	14
Pettis	11	Custer	15	Wheatland	15	Hall	13	Thayer	13
Phelps	10	Daniels	16	Wibaux	15	Hamilton	13	Thomas	14
Pike	12	Dawson	15	Yellowstone	15	Harlan	13	Thurston	14
Platte	11	Deer Lodge	16	Yellowstone National Park	15	Hayes	13	Valley	14
Polk	10	Fallon	15	NEBRASKA		Hitchcock	13	Washington	13
Pulaski	10	Fergus	15	Adams	13	Holt	14	Wayne	14
Putnam	13	Flathead	16	Antelope	14	Hooker	14	Webster	13
Ralls	12	Gallatin	15	Arthur	14	Howard	14	Wheeler	14
Randolph	12	Garfield	15	Banner	14	Jefferson	13	York	13
Ray	11	Glacier	16	Blaine	14	Johnson	13	NEVADA	
Reynolds	10	Golden Valley	15	Boone	14	Kearney	13	Carson City	12
Ripley	9	Granite	16	Box Butte	15	Keith	14	Churchill	12
Saline	11	Hill	16	Boyd	14	Keya Paha	14	Clark	5
Schuyler	13	Jefferson	15	Brown	14	Kimball	14	Douglas	13
Scotland	13	Judith Basin	15	Buffalo	13	Knox	14	Elko	15
Scott	9	Lake	15	Burt	14	Lancaster	13	Esmeralda	12
Shannon	10	Lewis And Clark	15			Lincoln	14	Eureka	15

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Humboldt	13	NEW MEXICO		Chenango	15	Suffolk	11	Durham	8
Lander	13	Bernalillo	9	Clinton	15	Sullivan	15	Edgecombe	7
Lincoln	12	Catron	11	Columbia	13	Tioga	15	Forsyth	8
Lyon	13	Chaves	7	Cortland	15	Tompkins	15	Franklin	8
Mineral	12	Cibola	12	Delaware	15	Ulster	15	Gaston	7
Nye	12	Colfax	13	Dutchess	13	Warren	15	Gates	7
Pershing	12	Curry	9	Erie	14	Washington	15	Graham	9
Storey	12	De Baca	9	Essex	16	Wayne	14	Granville	8
Washoe	12	Dona Ana	7	Franklin	16	Westchester	12	Greene	7
White Pine	15	Eddy	7	Fulton	15	Wyoming	14	Guilford	8
NEW HAMPSHIRE		Grant	9	Genesee	14	Yates	14	Halifax	7
Belknap	15	Guadalupe	9	Greene	14	NORTH CAROLINA		Harnett	7
Carroll	15	Harding	11	Hamilton	16	Alamance	8	Haywood	9
Cheshire	15	Hidalgo	7	Herkimer	15	Alexander	8	Henderson	9
Coos	16	Lea	7	Jefferson	15	Alleghany	11	Hertford	7
Grafton	15	Lincoln	9	Kings	10	Anson	7	Hoke	7
Hillsborough	15	Los Alamos	13	Lewis	15	Ashe	11	Hyde ^a	6
Merrimack	15	Luna	7	Livingston	14	Avery	11	Iredell	8
Rockingham	15	Mckinley	13	Madison	14	Beaufort ^a	6	Jackson	9
Strafford	15	Mora	15	Monroe	14	Bertie	7	Johnston	7
Sullivan	15	Otero	7	Montgomery	14	Bladen ^a	6	Jones ^a	6
NEW JERSEY		Quay	8	Nassau	11	Brunswick ^a	6	Lee	7
Atlantic	10	Rio Arriba	12	New York	10	Buncombe	9	Lenoir	7
Bergen	12	Roosevelt	8	Niagara	14	Burke	8	Lincoln	7
Burlington	11	San Juan	12	Oneida	15	Cabarrus	7	Macon	9
Camden	10	San Miguel	12	Onondaga	14	Caldwell	8	Madison	9
Cape May	10	Sandoval	13	Ontario	14	Camden	7	Martin	7
Cumberland	10	Santa Fe	13	Orange	12	Carteret ^a	6	Mcdowell	8
Essex	11	Sierra	8	Orleans	14	Caswell	8	Mecklenburg	7
Gloucester	10	Socorro	9	Oswego	14	Catawba	8	Mitchell	11
Hudson	11	Taos	15	Otsego	15	Chatham	8	Montgomery	7
Hunterdon	12	Torrance	11	Putnam	12	Cherokee	9	Moore	7
Mercer	11	Union	11	Queens	10	Chowan	7	Nash	7
Middlesex	11	Valencia	10	Rensselaer	14	Clay	9	New Hanover ^a	6
Monmouth	11	NEW YORK		Richmond	11	Cleveland	7	Northampton	7
Morris	12	Albany	14	Rockland	12	Columbus ^a	6	Onslow ^a	6
Ocean	11	Allegany	15	Saratoga	14	Craven ^a	6	Orange	8
Passaic	12	Bronx	11	Schenectady	14	Cumberland	7	Pamlico ^a	6
Salem	10	Broome	15	Schoharie	15	Currituck	7	Pasquotank	7
Somerset	12	Cattaraugus	15	Schuyler	15	Dare ^a	6	Pender ^a	6
Sussex	13	Cayuga	14	Seneca	14	Davidson	8	Perquimans	7
Union	11	Chautauqua	13	St Lawrence	15	Davie	8	Person	8
Warren	12	Chemung	15	Steuben	15	Duplin ^a	6	Pitt	7

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Polk	7	Grand Forks	17	Brown	11	Medina	13	Caddo	8
Randolph	8	Grant	16	Butler	12	Meigs	11	Canadian	8
Richmond	7	Griggs	17	Carroll	13	Mercer	13	Carter ^a	6
Robeson	7	Hettinger	16	Champaign	13	Miami	13	Cherokee	8
Rockingham	8	Kidder	17	Clark	13	Monroe	12	Choctaw ^a	6
Rowan	7	La Moure	16	Clermont	11	Montgomery	12	Cimarron	10
Rutherford	7	Logan	16	Clinton	12	Morgan	12	Cleveland	7
Sampson ^a	6	Mchenry	17	Columbiana	13	Morrow	13	Coal	7
Scotland	7	Mcintosh	16	Coshocton	12	Muskingum	12	Comanche	7
Stanly	7	Mckenzie	16	Crawford	13	Noble	12	Cotton	7
Stokes	9	Mclean	17	Cuyahoga	13	Ottawa	13	Craig	9
Surry	9	Mercer	16	Darke	13	Paulding	14	Creek	8
Swain	9	Morton	16	Defiance	14	Perry	12	Custer	8
Transylvania	9	Mountrail	17	Delaware	13	Pickaway	12	Delaware	8
Tyrrell ^a	6	Nelson	17	Erie	13	Pike	11	Dewey	9
Union	7	Oliver	16	Fairfield	12	Portage	13	Ellis	9
Vance	8	Pembina	17	Fayette	12	Preble	12	Garfield	8
Wake	7	Pierce	17	Franklin	12	Putnam	13	Garvin	7
Warren	8	Ramsey	17	Fulton	14	Richland	13	Grady	7
Washington	7	Ransom	16	Gallia	11	Ross	12	Grant	9
Watauga	11	Renville	17	Geauga	13	Sandusky	13	Greer	7
Wayne	7	Richland	16	Greene	12	Scioto	11	Harmon	7
Wilkes	9	Rolette	17	Guernsey	12	Seneca	13	Harper	9
Wilson	7	Sargent	16	Hamilton	11	Shelby	13	Haskell	7
Yadkin	8	Sheridan	17	Hancock	13	Stark	13	Hughes	7
Yancey	11	Sioux	16	Hardin	13	Summit	13	Jackson	7
NORTH DAKOTA		Slope	16	Harrison	13	Trumbull	13	Jefferson ^a	6
Adams	16	Stark	16	Henry	14	Tuscarawas	13	Johnston ^a	6
Barnes	17	Steele	17	Highland	11	Union	13	Kay	9
Benson	17	Stutsman	17	Hocking	12	Van Wert	13	Kingfisher	8
Billings	16	Towner	17	Holmes	13	Vinton	11	Kiowa	7
Bottineau	17	Traill	17	Huron	13	Warren	12	Latimer	7
Bowman	16	Walsh	17	Jackson	11	Washington	11	Le Flore	7
Burke	17	Ward	17	Jefferson	13	Wayne	13	Lincoln	7
Burleigh	16	Wells	17	Knox	13	Williams	14	Logan	8
Cass	17	Williams	17	Lake	13	Wood	14	Love ^a	6
Cavalier	17	OHIO		Lawrence	11	Wyandot	13	Major	9
Dickey	16	Adams	11	Licking	12	OKLAHOMA		Marshall ^a	6
Divide	17	Allen	13	Logan	13	Adair	8	Mayes	8
Dunn	16	Ashland	13	Lorain	13	Alfalfa	9	Mcclain	7
Eddy	17	Ashtabula	13	Lucas	14	Atoka	7	Mccurtain	7
Emmons	16	Athens	11	Madison	12	Beaver	10	Mcintosh	7
Foster	17	Auglaize	13	Mahoning	13	Beckham	8	Murray	7
Golden Valley	16	Belmont	12	Marion	13	Blaine	7	Muskogee	7

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Noble	8	Lake	15	Forest	15	Providence	14	Sumter ^a	6
Nowata	9	Lane	10	Franklin	11	Washington	12	Union	7
Okfuskee	7	Lincoln	11	Fulton	12	SOUTH CAROLINA		Williamsburg ^a	6
Oklahoma	8	Linn	10	Greene	12	Abbeville	7	York	7
Okmulgee	8	Malheur	12	Huntingdon	12	Aiken ^a	6	SOUTH DAKOTA	
Osage	8	Marion	10	Indiana	13	Allendale ^a	5	Aurora	15
Ottawa	9	Morrow	12	Jefferson	15	Anderson	7	Beadle	15
Pawnee	8	Multnomah	10	Juniata	12	Bamberg ^a	5	Bennett	14
Payne	8	Polk	10	Lackawanna	14	Barnwell ^a	5	Bon Homme	14
Pittsburg	7	Sherman	13	Lancaster	11	Beaufort ^a	5	Brookings	16
Pontotoc	7	Tillamook	11	Lawrence	14	Berkeley ^a	5	Brown	16
Pottawatomie	7	Umatilla	12	Lebanon	12	Calhoun ^a	6	Brule	15
Pushmataha ^a	6	Union	13	Lehigh	12	Charleston ^a	5	Buffalo	15
Roger Mills	9	Wallowa	15	Luzerne	13	Cherokee	7	Butte	15
Rogers	9	Wasco	13	Lycoming	13	Chester	7	Campbell	15
Seminole	7	Washington	10	Mckean	15	Chesterfield	7	Charles Mix	14
Sequoyah	7	Wheeler	13	Mercer	14	Clarendon ^a	6	Clark	16
Stephens	7	Yamhill	10	Mifflin	12	Colleton ^a	5	Clay	14
Texas	10	PENNSYLVANIA		Monroe	13	Darlington ^a	6	Codington	16
Tillman	7	Adams	11	Montgomery	11	Dillon ^a	6	Corson	15
Tulsa	8	Allegheny	12	Montour	13	Dorchester ^a	5	Custer	15
Wagoner	8	Armstrong	13	Northampton	12	Edgefield ^a	6	Davison	15
Washington	9	Beaver	12	Northumberland	13	Fairfield	7	Day	16
Washita	8	Bedford	13	Perry	12	Florence ^a	6	Deuel	16
Woods	9	Berks	12	Philadelphia	10	Georgetown ^a	5	Dewey	15
Woodward	9	Blair	13	Pike	13	Greenville	7	Douglas	14
OREGON		Bradford	15	Potter	15	Greenwood	7	Edmunds	15
Baker	15	Bucks	11	Schuylkill	13	Hampton ^a	5	Fall River	15
Benton	10	Butler	14	Snyder	13	Horry ^a	5	Faulk	15
Clackamas	10	Cambria	13	Somerset	13	Jasper ^a	5	Grant	16
Clatsop	11	Cameron	15	Sullivan	14	Kershaw	7	Gregory	14
Columbia	11	Carbon	13	Susquehanna	15	Lancaster	7	Haakon	15
Coos	9	Centre	13	Tioga	15	Laurens	7	Hamlin	16
Crook	14	Chester	11	Union	13	Lee ^a	6	Hand	15
Curry	9	Clarion	14	Venango	14	Lexington ^a	6	Hanson	15
Deschutes	14	Clearfield	15	Warren	14	Marion ^a	6	Harding	15
Douglas	9	Clinton	13	Washington	12	Marlboro ^a	6	Hughes	15
Gilliam	12	Columbia	13	Wayne	15	Mccormick ^a	6	Hutchinson	14
Grant	15	Crawford	14	Westmoreland	13	Newberry ^a	6	Hyde	15
Harney	15	Cumberland	12	Wyoming	14	Oconee	7	Jackson	14
Hood River	12	Dauphin	12	York County	11	Orangeburg ^a	6	Jerauld	15
Jackson	11	Delaware	10	RHODE ISLAND		Pickens	7	Jones	15
Jefferson	13	Elk	15	Bristol	12	Richland ^a	6	Kingsbury	15
Josephine	9	Erie	14	Kent	12	Saluda ^a	6	Lake	15
Klamath	14	Fayette	12	Newport	12	Spartanburg	7	Lawrence	15

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Lincoln	15	Davidson	8	Moore	8	Bee ^a	3	Dawson	7
Lyman	15	De Kalb	9	Morgan	10	Bell ^a	5	De Witt ^a	3
Marshall	16	Decatur	8	Obion	9	Bexar ^a	4	Deaf Smith	9
Mccook	15	Dickson	9	Overton	9	Blanco ^a	5	Delta	6
Mcpherson	16	Dyer	8	Perry	8	Borden	7	Denton	5
Meade	15	Fayette ^a	7	Pickett	10	Bosque ^a	5	Dickens	7
Mellette	14	Fentress	10	Polk	8	Bowie	6	Dimmit ^a	3
Miner	15	Franklin	8	Putnam	9	Brazoria ^a	3	Donley	8
Minnehaha	15	Gibson	9	Rhea	8	Brazos ^a	4	Duval ^a	3
Moody	15	Giles	8	Roane	9	Brewster ^a	5	Eastland	6
Pennington	15	Grainger	9	Robertson	9	Briscoe	8	Ector	6
Perkins	15	Greene	9	Rutherford	8	Brooks ^a	3	Edwards ^a	4
Potter	15	Grundy	9	Scott	10	Brown ^a	5	El Paso	6
Roberts	16	Hamblen	9	Sequatchie	8	Burleson ^a	4	Ellis ^a	5
Sanborn	15	Hamilton	8	Sevier	9	Burnet ^a	5	Erath	5
Shannon	15	Hancock	10	Shelby ^a	7	Caldwell ^a	4	Falls ^a	5
Spink	15	Hardeman	8	Smith	9	Calhoun ^a	3	Fannin	6
Stanley	15	Hardin	8	Stewart	9	Callahan	6	Fayette ^a	4
Sully	15	Hawkins	9	Sullivan	9	Cameron ^a	2	Fisher	6
Todd	14	Haywood	8	Sumner	9	Camp	6	Floyd	8
Tripp	14	Henderson	8	Tipton	8	Carson	9	Foard	7
Turner	15	Henry	9	Trousdale	9	Cass	6	Fort Bend ^a	4
Union	14	Hickman	9	Unicoi	10	Castro	9	Franklin	6
Walworth	15	Houston	9	Union	9	Chambers ^a	4	Freestone ^a	5
Yankton	14	Humphreys	9	Van Buren	9	Cherokee ^a	5	Frio ^a	3
Ziebach	15	Jackson	9	Warren	9	Childress	7	Gaines	7
TENNESSEE		Jefferson	9	Washington	9	Clay	6	Galveston ^a	3
Anderson	9	Johnson	10	Wayne	8	Cochran	8	Garza	7
Bedford	8	Knox	8	Weakley	9	Coke	6	Gillespie ^a	5
Benton	9	Lake	9	White	9	Coleman ^a	5	Glasscock	6
Bledsoe	8	Lauderdale	8	Williamson	8	Collin	5	Goliad ^a	3
Blount	8	Lawrence	8	Wilson	9	Collingsworth	7	Gonzales ^a	4
Bradley	8	Lewis	8	TEXAS		Colorado ^a	4	Gray	9
Campbell	10	Lincoln	8	Anderson ^a	5	Comal ^a	4	Grayson	6
Cannon	9	Loudon	8	Andrews	6	Comanche ^a	5	Gregg	6
Carroll	9	Macon	9	Angelina ^a	4	Concho ^a	5	Grimes ^a	4
Carter	10	Madison	8	Aransas ^a	3	Cooke	6	Guadalupe ^a	4
Cheatham	9	Marion	8	Archer	6	Coryell ^a	5	Hale	8
Chester	8	Marshall	8	Armstrong	9	Cottle	7	Hall	8
Claiborne	10	Mauzy	9	Atascosa ^a	3	Crane ^a	5	Hamilton ^a	5
Clay	9	Mcminn	8	Austin ^a	4	Crockett ^a	5	Hansford	9
Cocke	9	Mcnaury	8	Bailey	9	Crosby	7	Hardeman	7
Coffee	8	Meigs	8	Bandera ^a	4	Culberson	6	Hardin ^a	4
Crockett	8	Monroe	8	Bastrop ^a	4	Dallam	9	Harris ^a	4
Cumberland	9	Montgomery	9	Baylor	7	Dallas ^a	5	Harrison	6

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Hartley	9	Lipscomb	9	Real ^a	4	Ward	6	Wayne	14
Haskell	6	Live Oak ^a	3	Red River	6	Washington ^a	4	Weber	12
Hays ^a	4	Llano ^a	5	Reeves	6	Webb ^a	3	VERMONT	
Hemphill	8	Loving	6	Refugio ^a	3	Wharton ^a	3	Addison	15
Henderson ^a	5	Lubbock	7	Roberts	9	Wheeler	8	Bennington	15
Hidalgo ^a	2	Lynn	7	Robertson ^a	4	Wichita	7	Caledonia	16
Hill ^a	5	Madison ^a	4	Rockwall	5	Wilbarger	7	Chittenden	15
Hockley	8	Marion	6	Runnels ^a	5	Willacy ^a	2	Essex	16
Hood ^a	5	Martin	6	Rusk ^a	5	Williamson ^a	4	Franklin	15
Hopkins	6	Mason ^a	5	Sabine ^a	5	Wilson ^a	4	Grand Isle	15
Houston ^a	5	Matagorda ^a	3	San Augustine ^a	5	Winkler	6	Lamoille	16
Howard	6	Maverick ^a	3	San Jacinto ^a	4	Wise	5	Orange	16
Hudspeth	6	Mcculloch ^a	5	San Patricio ^a	3	Wood	3	Orleans	16
Hunt	6	Mclennan ^a	5	San Saba ^a	5	Yoakum	8	Rutland	15
Hutchinson	9	Mcmullen ^a	3	Schleicher ^a	5	Young	6	Washington	16
Irion ^a	5	Medina ^a	4	Scurry	7	Zapata ^a	2	Windham	15
Jack	6	Menard ^a	5	Shackelford	6	Zavala ^a	3	Windsor	15
Jackson ^a	3	Midland	6	Shelby ^a	5	UTAH		VIRGINIA	
Jasper ^a	4	Milam ^a	4	Sherman	9	Beaver	14	Accomack	8
Jeff Davis	6	Mills ^a	5	Smith ^a	5	Box Elder	12	Albemarle	9
Jefferson ^a	4	Mitchell	6	Somervell ^a	5	Cache	15	Alleghany	10
Jim Hogg ^a	3	Montague	6	Starr ^a	2	Carbon	14	Amelia	9
Jim Wells ^a	3	Montgomery ^a	4	Stephens	6	Daggett	15	Amherst	9
Johnson ^a	5	Moore	9	Sterling	6	Davis	12	Appomattox	9
Jones	6	Morris	6	Stonewall	7	Duchesne	15	Arlington	10
Karnes ^a	3	Motley	7	Sutton ^a	5	Emery	14	Augusta	11
Kaufman	5	Nacogdoches ^a	5	Swisher	9	Garfield	14	Bath	11
Kendall ^a	5	Navarro ^a	5	Tarrant ^a	5	Grand	10	Bedford	9
Kenedy ^a	2	Newton ^a	4	Taylor	6	Iron	12	Bland	11
Kent	7	Nolan	6	Terrell ^a	5	Juab	12	Botetourt	9
Kerr ^a	5	Nueces ^a	3	Terry	7	Kane	10	Brunswick	8
Kimble ^a	5	Ochiltree	9	Throckmorton	6	Millard	13	Buchanan	10
King	7	Oldham	9	Titus	6	Morgan	15	Buckingham	9
Kinney ^a	4	Orange ^a	4	Tom Green ^a	5	Piute	13	Campbell	9
Kleberg ^a	2	Palo Pinto	6	Travis ^a	4	Rich	15	Caroline	9
Knox	7	Panola ^a	5	Trinity ^a	4	Salt Lake	12	Carroll	11
La Salle ^a	3	Parker	5	Tyler ^a	4	San Juan	13	Charles City	8
Lamar	6	Parmer	9	Upshur	6	Sanpete	14	Charlotte	9
Lamb	8	Pecos ^a	5	Upton ^a	5	Sevier	13	Chesterfield	9
Lampasas ^a	5	Polk ^a	4	Uvalde ^a	4	Summit	15	Clarke	11
Lavaca ^a	4	Potter	9	Val Verde ^a	4	Tooele	12	Craig	10
Lee ^a	4	Presidio ^a	5	Van Zandt	5	Uintah	15	Culpeper	10
Leon ^a	5	Rains	6	Victoria ^a	3	Utah	12	Cumberland	9
Liberty ^a	4	Randal	19	Walker ^a	4	Wasatch	15	Dickenson	10
Limestone ^a	5	Reagan ^a	5	Waller ^a	4	Washington	10	Dinwiddie	8

(continued)

TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Essex	9	Patrick	10	Franklin	8	King	10	Lincoln	10
Fairfax	10	Pittsylvania	9	Fredericksburg	10	Kitsap	11	Logan	10
Fauquier	10	Powhatan	9	Galax	11	Kittitas	14	Marion	12
Floyd	11	Prince Edward	9	Hampton	8	Klickitat	12	Marshall	12
Fluvanna	9	Prince George	8	Harrisonburg	11	Lewis	11	Mason	11
Franklin	10	Prince William	10	Hopewel	18	Lincoln	15	Mcdowell	11
Frederick	11	Pulaski	11	Lexington	9	Mason	11	Mercer	11
Fredericksburg		Rappahannock	11	Lynchburg	9	Okanogan	15	Mineral	12
Giles	10	Richmond	8	Manassas	10	Pacific	11	Mingo	10
Gloucester	8	Roanoke	9	Manassas Park	10	Pend Oreille	15	Monongalia	12
Goochland	9	Rockbridge	9	Martinsville	10	Pierce	11	Monroe	11
Grayson	11	Rockingham	11	Newport News	8	San Juan	12	Morgan	11
Greene	10	Russell	10	Norfolk	8	Skagit	11	Nicholas	12
Greensville	8	Scott	10	Norton	10	Skamania	11	Ohio	12
Halifax	9	Shenandoah	11	Petersburg	8	Snohomish	11	Pendleton	13
Hampton	8	Smyth	11	Poquoson	8	Spokane	14	Pleasants	11
Hanover	9	Southampton	8	Portsmouth	8	Stevens	15	Pocahontas	13
Henrico	8	Spotsylvania	10	Radford	11	Thurston	11	Preston	13
Henry	10	Stafford	10	Richmond	8	Wahkiakum	11	Putnam	10
Highland	11	Surry	8	Roanoke	9	Walla Walla	11	Raleigh	12
Isle Of Wight	8	Sussex	8	Salem	9	Whatcom	12	Randolph	13
James City	8	Tazewell	11	South Boston	9	Whitman	14	Ritchie	11
King And Queen	9	Virginia Beach	8	Staunton	11	Yakima	12	Roane	11
King George	9	Warren	11	Suffolk	8	WEST VIRGINIA		Summers	12
King William	9	Washington	11	Virginia Beach	8	Barbour	13	Taylor	12
Lancaster	8	Westmoreland	8	Waynesboro	11	Berkeley	11	Tucker	13
Lee	10	Wise	10	Williamsburg	8	Boone	10	Tyler	11
Loudoun	10	Wythe	11	Winchester	11	Braxton	11	Upshur	12
Louisa	9	York	8	WASHINGTON		Brooke	12	Wayne	10
Lunenburg	9	VIRGINIA		Adams	12	Cabell	10	Webster	12
Madison	11	INDEPENDENT		Asotin	12	Calhoun	11	Wetzel	12
Mathews	8	CITIES		Benton	11	Clay	11	Wirt	11
Mecklenburg	9	Alexandria	10	Chelan	12	Doddridge	12	Wood	11
Middlesex	8	Bedford	9	Clallam	12	Fayette	12	Wyoming	11
Montgomery	11	Bristol	11	Clark	11	Gilmer	11	WISCONSIN	
Nansemond	8	Buena Vista	9	Columbia	12	Grant	13	Adams	15
Nelson	9	Charlottesville	9	Cowlitz	11	Greenbrier	12	Ashland	17
New Kent	8	Chesapeake	8	Douglas	14	Hampshire	11	Barron	16
Newport News	8	Clifton Forge	10	Ferry	15	Hancock	12	Bayfield	17
Norfolk	8	Colonial Hts	9	Franklin	11	Hardy	12	Brown	15
Northampton	8	Covington	10	Garfield	12	Harrison	12	Buffalo	15
Northumberland	8	Danville	9	Grant	12	Jackson	11	Burnett	17
Nottoway	9	Emporia	8	Grays Harbor	11	Jefferson	11	Calumet	15
Orange	10	Fairfax	10	Island	12	Kanawha	10	Chippewa	15
Page	11	Falls Church	10	Jefferson	11	Lewis	12	Clark	15

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TABLE N1101.2—continued
CLIMATE ZONES BY STATES AND COUNTIES

County	Zone	County	Zone	County	Zone	County	Zone	County	Zone
Columbia	15	Juneau	15	Pepin	15	Walworth	15	Johnson	15
Crawford	15	Kenosha	15	Pierce	15	Washburn	17	Laramie	15
Dane	15	Kewaunee	15	Polk	16	Washington	15	Lincoln	17
Dodge	15	La Crosse	15	Portage	15	Waukesha	15	Natrona	15
Door	15	Lafayette	15	Price	17	Waupaca	15	Niobrara	15
Douglas	17	Langlade	17	Racine	15	Waushara	15	Park	15
Dunn	15	Lincoln	17	Richland	15	Winnebago	15	Platte	14
Eau Claire	15	Manitowoc	15	Rock	15	Wood	15	Sheridan	15
Florence	17	Marathon	15	Rusk	16	WYOMING		Sublette	17
Fond Du Lac	15	Marinette	15	Sauk	15	Albany	16	Sweetwater	16
Forest	17	Marquette	15	Sawyer	17	Big Horn	15	Teton	17
Grant	15	Menominee	15	Shawano	15	Campbell	15	Uinta	16
Green	15	Milwaukee	15	Sheboygan	15	Carbon	16	Washakie	15
Green Lake	15	Monroe	15	St Croix	15	Converse	15	Weston	15
Iowa	15	Oconto	15	Taylor	17	Crook	15		
Iron	17	Oneida	17	Trempealeau	15	Fremont	15		
Jackson	15	Outagamie	15	Vernon	15	Goshen	14		
Jefferson	15	Ozaukee	15	Vilas	17	Hot Springs	15		

a. A moisture vapor retarder is not required in these counties. See Section R322.1.

SECTION N1102 BUILDING ENVELOPE

N1102.1 Thermal performance criteria. The minimum required insulation R -value or the area-weighted average maximum required fenestration U -factor (other than opaque doors which are governed by Section N1102.1.3) for each element in the building thermal envelope (fenestration, roof/ceiling, opaque wall, floor, slab edge, crawl space wall and basement wall) shall be in accordance with the criteria in Table N1102.1.

Detached one-and two-family dwellings with greater than 15-percent glazing area; townhouses with greater than 25-percent glazing area; and any residential building in climates with heating degree days equal to or greater than 13,000; shall determine compliance using the building envelope requirements of Chapter 4 or 5 of the *International Energy Conservation Code*.

N1102.1.1 Exterior walls. The minimum required R -value in Table N1102.1 shall be met by the sum of the R -values of the insulation materials installed in framing cavities and/or insulating sheathing applied, and not by framing, drywall, structural sheathing, or exterior siding materials. Insulation separated from the conditioned space by a vented space shall not be counted towards the required R -value.

N1102.1.1.1 Mass walls. Mass walls shall be permitted to meet the mass wall criteria in Table N1102.1.1.1(1), based on the insulation position and the climate zone

where the building is located. Other mass walls shall meet the frame wall criteria for the building type and the climate zone where the building is located, based on the sum of interior and exterior insulation. Walls with exterior insulation position have the entire effective mass layer interior to an insulation layer. Walls with integral insulation position have either insulation and mass materials well mixed as in wood (logs); or substantially equal amounts of mass material on the interior and exterior of insulation as in concrete masonry units with insulated cores or masonry cavity walls. Walls with interior insulation position have the mass material located exterior to the insulating material. Walls not meeting either of the above descriptions for exterior or integral positions shall meet the requirements for "Other mass walls" in Table N1102.1.1.1(1). The R -value of the mass assembly for typical masonry constructions shall be taken from Table N1102.1.1.1(2). The R -value for a solid concrete wall with a thickness of 4 inches (102 mm) or greater is R-1.1. R -values for other assemblies are permitted to be based on hot box tests referenced in ASTM C 236 or ASTM C 976, two dimensional calculations or isothermal planes calculations.

N1102.1.1.2 Steel-frame walls. The minimum required R -values for steel-frame walls shall be in accordance with Table N1102.1.1.2.

**TABLE N1102.1
SIMPLIFIED PRESCRIPTIVE BUILDING ENVELOPE THERMAL COMPONENT CRITERIA
MINIMUM REQUIRED THERMAL PERFORMANCE (U -FACTOR AND R -VALUE)**

BUILDING LOCATION		MAXIMUM GLAZING U -FACTOR [Btu/(hr·ft ² ·°F)]	MINIMUM INSULATION R -VALUE [(hr · ft ² · °F) / Btu]					
Climate Zone	HDD		Ceilings	Walls	Floors	Basement walls	Slab perimeter R -value and depth	Crawl space walls
1	0-499	Any	R-13	R-11	R-11	R-0	R-0	R-0
2	500-999	0.90	R-19	R-11	R-11	R-0	R-0	R-4
3	1,000-1,499	0.75	R-19	R-11	R-11	R-0	R-0	R-5
4	1,500-1,999	0.75	R-26	R-13	R-11	R-5	R-0	R-5
5	2,000-2,499	0.65	R-30	R-13	R-11	R-5	R-0	R-6
6	2,500-2,999	0.60	R-30	R-13	R-19	R-6	R-4, 2 ft.	R-7
7	3,000-3,499	0.55	R-30	R-13	R-19	R-7	R-4, 2 ft.	R-8
8	3,500-3,999	0.50	R-30	R-13	R-19	R-8	R-5, 2 ft.	R-10
9	4,000-4,499	0.45	R-38	R-13	R-19	R-8	R-5, 2 ft.	R-11
10	4,500-4,999	0.45	R-38	R-16	R-19	R-9	R-6, 2 ft.	R-17
11	5,000-5,499	0.45	R-38	R-18	R-19	R-9	R-6, 2 ft.	R-17
12	5,500-5,999	0.40	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-19
13	6,000-6,499	0.35	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-20
14	6,500-6,999	0.35	R-49	R-21	R-21	R-11	R-11, 4 ft.	R-20
15	7,000-8,499	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft.	R-20
16	8,500-8,999	0.35	R-49	R-21	R-21	R-18	R-14, 4 ft.	R-20
17	9,000-12,999	0.35	R-49	R-21	R-21	R-19	R-18, 4 ft.	R-20

For SI: 1 Btu/(hr·ft²·°F) = 5.68W/m²·K, 1 (hr·ft²·°F)/Btu = 0.176m²·K/W.

TABLE N1102.1.1.1(1)
MASS WALL PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS

BUILDING LOCATION		MASS WALL ASSEMBLY R-VALUE ^a (hr · ft ² · °F) / Btu	
Zone	HDD	Exterior or integral insulation	Other mass walls
1	0-499	R-3.8	R-9.7
2	500-999	R-4.8	R-9.7
3	1,000-1,499	R-4.8	R-9.7
4	1,500-1,999	R-8.1	R-10.8
5	2,000-2,499	R-8.9	R-10.8
6	2,500-2,999	R-8.9	R-10.8
7	3,000-3,499	R-8.9	R-10.8
8	3,500-3,999	R-8.9	R-10.8
9	4,000-4,499	R-8.9	R-10.9
10	4,500-4,999	R-10.4	R-12.3
11	5,000-5,499	R-11.9	R-15.2
12	5,500-5,999	R-11.9	R-15.2
13	6,000-6,499	R-11.9	R-15.2
14	6,500-6,999	R-15.5	R-18.4
15	7,000-8,499	R-15.5	R-18.4
16	8,500-8,999	R-18.4	R-18.4
17	9,000-12,999	R-18.4	R-18.4

For SI: 1 (hr · ft² · °F)/Btu = 0.176 m² · K/W.

a. The sum of the value in Table N1102.1.1.1(2) and additional insulation layers.

TABLE N1102.1.1.1(2)
MASS ASSEMBLY R-VALUES

ASSEMBLY TYPE	UNGROUTED CELLS NOT INSULATED (hr · ft ² · °F) / Btu	UNGROUTED CELLS INSULATED (hr · ft ² · °F) / Btu		
		No grout	Vertical cells grouted at 10 feet o.c. or greater	Vertical cells grouted at less than 10 feet o.c.
6" Light weight concrete block	2.3	5.0	4.5	3.8
6" Medium weight concrete block	2.1	4.2	3.8	3.2
6" Normal weight concrete block	1.9	3.3	3.1	2.7
8" Light weight concrete block	2.6	6.7	5.9	4.8
8" Medium weight concrete block	2.3	5.3	4.8	4.0
8" Normal weight concrete block	2.1	4.2	3.8	3.3
12" Light weight concrete block	2.9	9.1	7.9	6.3
12" Medium weight concrete block	2.6	7.1	6.4	5.2
12" Normal weight concrete block	2.3	5.6	5.1	4.3
Brick cavity wall	3.7	6.7	6.2	5.4
Hollow clay brick	2.0	2.7	2.6	2.4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 (hr · ft² · °F)/Btu = 0.176 m² · K/W.

TABLE N1102.1.1.2
STEEL-FRAME WALL MINIMUM PERFORMANCE REQUIREMENTS (R-VALUE)

CLIMATE ZONES	HDD	EQUIVALENT STEEL-FRAME WALL CAVITY AND SHEATHING R-VALUE ^a (hr · ft ² · °F) / Btu
1-4	0-1999	R-11+R-5, R-15+R-4, R-21+R-3
5-8	2,000-3,999	R-11+R-5, R-15+R-4, R-21+R-3
9-12	4,000-5,999	R-11+R-9, R-15+R-8, R-21+R-7
13-15	6,000-8,499	R-13+R-10, R-19+R-9, R-25+R-8
16 and 17	8,500-12,999	R-13+R-10, R-19+R-9, R-25+R-8

For SI: 1 (hr · ft² · °F)/Btu = 0.176 m² · K/W.

a. The cavity insulation R-value requirement is listed first, followed by the sheathing R-value requirement.

N1102.1.2 Ceilings. The required “Ceiling R-value” in Table N1102.1 assumes standard truss or rafter construction and shall apply to all roof/ceiling portions of the building thermal envelope, including cathedral ceilings. Where the construction technique allows the required R-value of ceiling insulation to be obtained over the wall top plate, R-30 shall be permitted to be used where R-38 is required and R-38 shall be permitted to be used where R-49 is required.

N1102.1.3 Opaque doors. Opaque doors separating conditioned and unconditioned space shall have a maximum U-factor of 0.35. One opaque door shall be permitted to be exempt from this U-factor requirement.

N1102.1.4 Floors. The required R-value in Table N1102.1 shall apply to all floors, except any individual floor assembly with over 25 percent of its conditioned floor area exposed directly to outside air shall meet the R-value requirement in Table N1102.1 for “Ceilings.”

N1102.1.5 Basement walls. When the basement is a conditioned space, the basement walls shall be insulated in accordance with Table N1102.1. When the basement is not a conditioned space, either the basement walls or the ceilings separating the basement from conditioned space shall be insulated in accordance with Table N1102.1. When insulating basement walls, the required R-value shall be applied from the top of the basement wall to a depth of 10 feet (3048 mm) below grade or to the top of the basement floor, whichever is less.

N1102.1.6 Slab-on-grade floors. For slabs with a top edge above finished grade or 12 inches (305 mm) or less below finished grade, the required R-value in Table N1102.1 shall be applied to the outside of the foundation or the inside of the foundation wall. The insulation shall extend downward from the top of the slab, or downward to the bottom of the slab and then horizontally in either direction, until the distance listed in Table N1102.1 is reached.

When installed between the exterior wall and the edge of the interior slab, the top edge of the insulation shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Insulation extending horizontally away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil.

In locations of 500 HDD or greater, R-2 shall be added to the values in Table N1102.1 where uninsulated hot water

pipes, air distribution ducts or electric heating cables are installed within or under the slab.

Exception: Slab perimeter insulation is not required for unheated slabs in areas of very heavy termite infestation probability as shown in Figure R301.2(6). Where this exception is used, building envelope compliance shall be demonstrated by (a) using *International Energy Conservation Code* Section 502.2.2 or *International Energy Conservation Code* Chapter 4 with the actual slab insulation R-value in Table N1102.1, or (b) using *International Energy Conservation Code* Section 502.2.4.

N1102.1.7 Crawl space walls. Where the floor above the crawl space is uninsulated, insulation shall be installed on crawl space walls when the crawl space is not vented to outside air. The required R-value in Table N1102.1 shall be applied inside of the crawl space wall, downward from the sill plate to the exterior finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). The exposed earth in all crawl space foundations shall be covered with a continuous vapor retarder having a maximum permeance rating of 1.0 perm [(57 mg)/(s · m² · Pa)], when tested in accordance with ASTM E 96.

N1102.1.8 Masonry veneer. For exterior foundation insulation, that horizontal portion of the foundation that supports a masonry veneer shall not be required to be insulated.

N1102.1.9 Protection. Exposed insulating materials applied to the exterior of foundation walls shall be protected. The protection shall extend at least 6 inches (152 mm) below finished grade level.

N1102.1.10 Air leakage. All joints, seams, penetrations; site-built windows, doors, and skylights; openings between window and door assemblies and their respective jambs and framing; and other sources of air leakage (infiltration and exfiltration) through the building thermal envelope shall be caulked, gasketed, weatherstripped, wrapped, or otherwise sealed to limit uncontrolled air movement.

N1102.1.11 Recessed lighting fixtures. When installed in the building envelope, recessed lighting fixtures shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling

cavity and sealed or gasketed to prevent air leakage into the unconditioned space.

2. Type IC or non-IC rated, installed inside a sealed box constructed from a minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or constructed from a pre-formed polymeric vapor barrier, or other air-tight assembly manufactured for this purpose, while maintaining required clearances of not less than 0.5 inch (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.
3. Type IC rated, in accordance with ASTM E 283 admitting no more than 2.0 cubic feet per minute (cfm) (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. The lighting fixture shall be tested at 1.57 psi (75 Pa) pressure difference and shall be labeled.

N1102.2 Maximum solar heat gain coefficient for fenestration products. The area-weighted-average solar heat gain coefficient (SHGC) for glazed fenestration installed in locations with 3,500 or fewer heating degree days shall not exceed 0.40.

N1102.3 Fenestration exemption. Up to 1 percent of the total glazing area shall be exempt from *U*-factor requirement.

N1102.4 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with an entirely new replacement fenestration product, including frame, sash and glazed portion, in an existing building, the replacement fenestration product shall have a *U*-factor that does not exceed the “Maximum fenestration *U*-factor” and an SHGC that does not exceed the “Maximum fenestration SHGC” in Table N1102.1 applicable to the climate zone (HDD) where the building is located. Replacement skylights and roof windows shall be permitted to have a maximum *U*-factor of 0.60 when installed in any location above 1,999 HDD. The replacement fenestration products must also satisfy the air leakage requirements of Section N1101.3.2.2.

**TABLE N1102.4
REPLACEMENT FENESTRATION REQUIREMENTS**

HEATING DEGREE DAYS	MAXIMUM	
	Fenestration <i>U</i> -factor	Fenestration SHGC
0 – 1,999	0.75	0.40
2,000 – 3,999	0.50	0.40 ^a
4,000 – 5,999	0.40	Any
6,000 – 8,499	0.35	Any
8,500 – 12,999	0.35	Any

a. Up to but not including 3,500 HDD.

SECTION N1103 MECHANICAL SYSTEMS

[E] N1103.1 Heating and air conditioning appliance and equipment performance. Performance of equipment listed in Table N1103.1 is covered by preemptive Federal law. Appliances and equipment not listed in Table N1103.1 shall meet the minimum efficiency requirements of Section 503.2 of the *International Energy Conservation Code*.

N1103.2 Controls. At least one thermostat shall be provided for each separate heating, cooling, or combination heating and cooling system. Heat pumps shall have controls that prevent supplementary electric resistance heater operation when the heating load can be met by the heat pump alone. Supplementary heater operation shall be permitted during outdoor coil defrost cycles not exceeding 15 minutes.

N1103.3 Duct insulation. All portions of the air distribution system shall be installed in accordance with Section M1601 and be insulated to an installed R-5 when system components are located within the building but outside of conditioned space, and R-8 when located outside of the building. When located within a building envelope assembly, at least R-8 shall be applied between the duct and that portion of the assembly furthest from conditioned space.

Exception: Exhaust air ducts and portions of the air distribution system within appliances or equipment.

N1103.4 Duct sealing. All ducts shall be sealed in accordance with Section M1601.3.1.

[E] N1103.5 Piping insulation. All mechanical system piping shall be insulated in accordance with Table N1103.5.

Exceptions: Piping installed within appliances and equipment or piping serving fluids between 55°F (13°C) and 120°F (49°C).

SECTION N1104 SERVICE WATER HEATING

[E] N1104.1 Water heating appliance and equipment performance. Performance of equipment listed in Table N1104.1 is covered by preemptive Federal law. Appliances and equipment not listed in Table N1104.1 shall meet the minimum efficiency requirements of Section 504.2 of the *International Energy Conservation Code*.

**TABLE N1103.1
MINIMUM EQUIPMENT PERFORMANCE**

EQUIPMENT CATEGORY	SUB-CATEGORY ^e	REFERENCED STANDARD	MINIMUM PERFORMANCE
Air-cooled heat pumps heating mode < 65,000 Btu/h cooling capacity	Split systems	ARI 210/240	6.8 HSPF ^{a,b}
	Single package		6.6 HSPF ^{a,b}
Gas-fired or oil-fired furnace < 225,000 Btu/h	—	DOE 10 CFR Part 430, Subpart B, Appendix N	AFUE 78% ^b E ¹ 80% ^c
Gas-fired or oil-fired steam and hot-water boilers < 300,000 Btu/h	—	DOE 10 CFR Part 430, Subpart B, Appendix N	AFUE 78% ^{b,d}
Air-cooled air conditioners and heat pumps cooling mode < 65,000 Btu/h cooling capacity	Split systems	ARI 210/240	10.0 SEER ^b
	Single package		9.7 SEER ^b

For SI: 1 Btu/h = 0.2931 W.

- a. For multicapacity equipment, the minimum performance shall apply to each capacity step provided. Multicapacity refers to manufacturer-published ratings for more than one capacity mode allowed by the product's controls.
- b. This is used to be consistent with the National Appliance Energy Conservation Act (NAECA) of 1987 (Public Law 100-12).
- c. These requirements apply to combination units not covered by NAECA (three-phase power or cooling capacity 65,000 Btu/h).
- d. Except for gas-fired steam boilers, for which the minimum AFUE shall be 75 percent.
- e. Seasonal rating.

**TABLE N1103.5
MINIMUM HVAC PIPING INSULATION THICKNESSES^a**

PIPING SYSTEM TYPES	FLUID TEMP RANGE (°F)	INSULATION THICKNESS (inches) ^b
Heating systems		
Low pressure/temperature	201-250	1.5
Low temperature	120-200	1.0
Steam condensate (for feed water)	Any	1.5
Cooling systems		
Chilled water, refrigerant or brine	40-55	0.75
	Below 40	1.25

For SI: 1 inch = 25.4 mm, °C = [(°F)-32]/1.8.

- a. The pipe insulation thicknesses specified in this table are based on insulation *R*-values ranging from R-4 to R-4.6 per inch of thickness. For materials with an *R*-value greater than R-4.6, the insulation thickness specified in this table may be reduced as follows:

$$\text{New Minimum Thickness} = \frac{4.6 \times \text{Table Thickness}}{\text{Actual } R - \text{Value}}$$

For materials with an *R*-value less than R-4, the minimum insulation thickness shall be increased as follows:

$$\text{New Minimum Thickness} = \frac{4.0 \times \text{Table Thickness}}{\text{Actual } R - \text{Value}}$$

- b. For piping exposed to outdoor air, increase thickness by 0.5 inch.

**TABLE N1104.1
REQUIRED PERFORMANCE OF DOMESTIC HOT WATER HEATING EQUIPMENT
SUBJECT TO MINIMUM FEDERAL STANDARDS**

CATEGORY	MAXIMUM INPUT RATING	MINIMUM EFFICIENCY
Electric; storage instantaneous	12 kW	0.93 - 0.00132 × V ^a
Gas; storage	75,000 Btu/h	0.62 - 0.0019 × V ^a
Gas; instantaneous	200,000 Btu/h	0.62 - 0.0019 × V ^a
Oil; storage	105,000 Btu/h	0.59 - 0.0019 × V ^a
Oil; instantaneous	210,000 Btu/h	0.59 - 0.0019 × V ^a

For SI: 1 Btu/h = 0.2931 W, 1 gallon = 3.785.

- a. *V* is the rated storage volume in gallons as specified by the manufacturer.

