

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

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

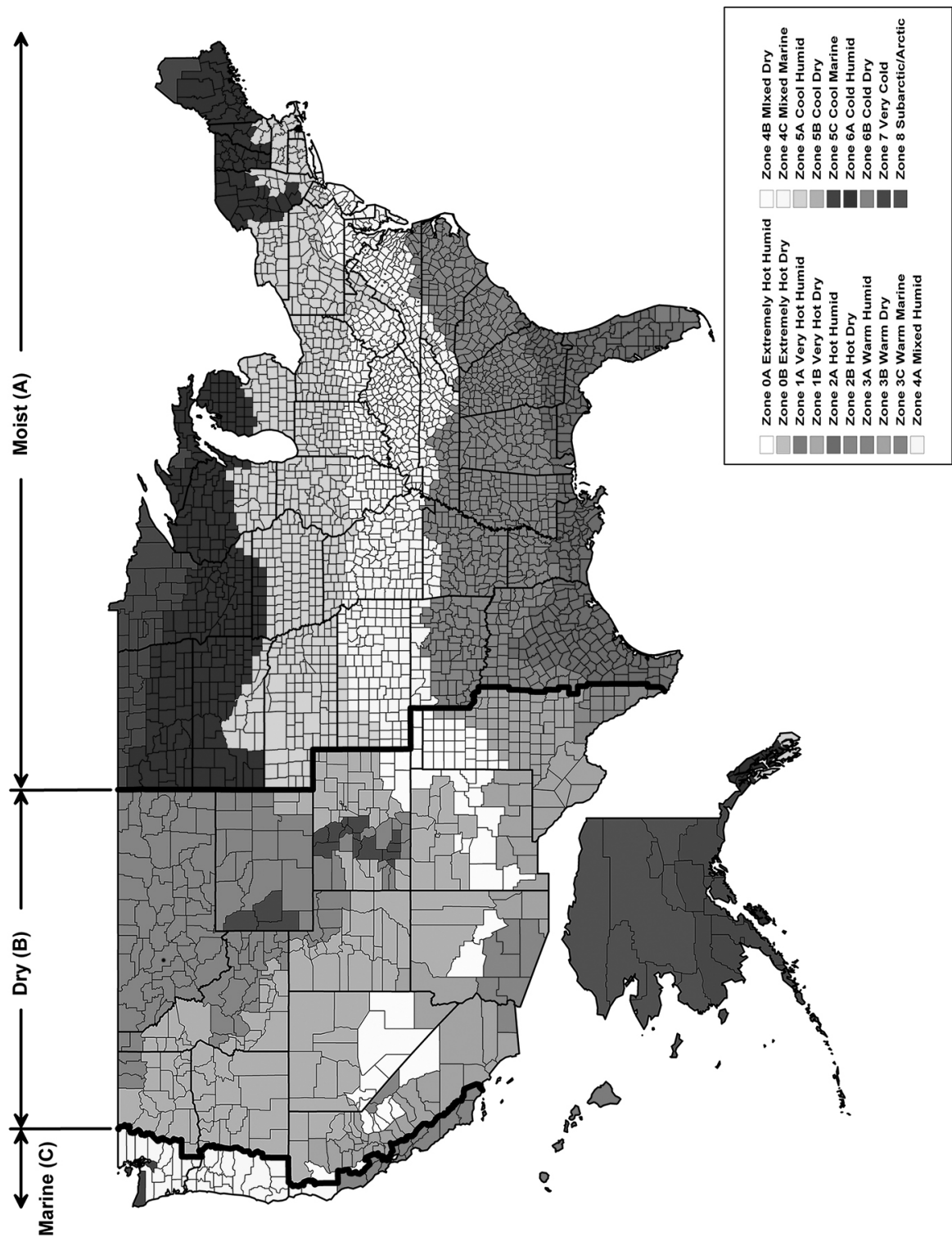


FIGURE C301.1
CLIMATE ZONES

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

NORTH CAROLINA	NORTH CAROLINA (continued)
3A Alamance	4A Haywood
3A Alexander	4A Henderson
5A Alleghany	3A Hertford
3A Anson	3A Hoke
5A Ashe	3A Hyde
5A Avery	3A Iredell
3A Beaufort	4A Jackson
3A Bertie	3A Johnston
3A Bladen	3A Jones
3A Brunswick*	3A Lee
4A Buncombe	3A Lenoir
4A Burke	3A Lincoln
3A Cabarrus	4A Macon
4A Caldwell	4A Madison
3A Camden	3A Martin
3A Carteret*	4A McDowell
3A Caswell	3A Mecklenburg
3A Catawba	4A Mitchell
3A Chatham	3A Montgomery
3A Cherokee	3A Moore
3A Chowan	3A Nash
3A Clay	3A New Hanover*
3A Cleveland	3A Northampton
3A Columbus*	3A Onslow*
3A Craven	3A Orange
3A Cumberland	3A Pamlico
3A Currituck	3A Pasquotank
3A Dare	3A Pender*
3A Davidson	3A Perquimans
3A Davie	3A Person
3A Duplin	3A Pitt
3A Durham	3A Polk
3A Edgecombe	3A Randolph
3A Forsyth	3A Richmond
3A Franklin	3A Robeson
3A Gaston	3A Rockingham
3A Gates	3A Rowan
4A Graham	3A Rutherford
3A Granville	3A Sampson
3A Greene	3A Scotland
3A Guilford	3A Stanly
3A Halifax	4A Stokes
3A Harnett	4A Surry

(continued)

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

4A Swain
4A Transylvania
3A Tyrrell
3A Union
3A Vance
3A Wake
3A Warren
3A Washington
5A Watauga
3A Wayne
4A Wilkes
3A Wilson
4A Yadkin
5A Yancey

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

C301.3 Climate zone definitions. To determine the climate zones for locations not listed in this code, use the following information to determine climate zone numbers and letters in accordance with Items 1 through 5.

1. Determine the thermal climate zone, 0 through 8, from Table C301.3 using the heating (HDD) and cooling degree-days (CDD) for the location.
2. Determine the moisture zone (Marine, Dry or Humid) in accordance with Items 2.1 through 2.3.
 - 2.1. If monthly average temperature and precipitation data are available, use the Marine, Dry and Humid definitions to determine the moisture zone (C, B or A).
 - 2.2. If annual average temperature information (including degree-days) and annual precipitation (i.e., annual mean) are available, use Items 2.2.1 through 2.2.3 to determine the moisture zone. If the moisture zone is not Marine, then use the Dry definition to determine whether Dry or Humid.
 - 2.2.1. If thermal climate zone is 3 and $CDD50^{\circ}\text{F} \leq 4,500$ ($CDD10^{\circ}\text{C} \leq 2500$), climate zone is Marine (3C).
 - 2.2.2. If thermal climate zone is 4 and $CDD50^{\circ}\text{F} \leq 2,700$ ($CDD10^{\circ}\text{C} \leq 1500$), climate zone is Marine (4C).
 - 2.2.3. If thermal climate zone is 5 and $CDD50^{\circ}\text{F} \leq 1,800$ ($CDD10^{\circ}\text{C} \leq 1000$), climate zone is Marine (5C).

2.3. If only degree-day information is available, use Items 2.3.1 through 2.3.3 to determine the moisture zone. If the moisture zone is not Marine, then it is not possible to assign Humid or Dry moisture zone for this location.

2.3.1. If thermal climate zone is 3 and $CDD50^{\circ}\text{F} \leq 4,500$ ($CDD10^{\circ}\text{C} \leq 2500$), climate zone is Marine (3C).

2.3.2. If thermal climate zone is 4 and $CDD50^{\circ}\text{F} \leq 2,700$ ($CDD10^{\circ}\text{C} \leq 1500$), climate zone is Marine (4C).

2.3.3. If thermal climate zone is 5 and $CDD50^{\circ}\text{F} \leq 1,800$ ($CDD10^{\circ}\text{C} \leq 1000$), climate zone is Marine (5C).

3. Marine (C) Zone definition: Locations meeting all the criteria in Items 3.1 through 3.4.

3.1. Mean temperature of coldest month between 27°F (-3°C) and 65°F (18°C).

3.2. Warmest month mean $< 72^{\circ}\text{F}$ (22°C).

3.3. Not fewer than four months with mean temperatures over 50°F (10°C).

3.4. 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.

4. Dry (B) definition: Locations meeting the criteria in Items 4.1 through 4.4.

4.1. Not Marine (C).

4.2. If 70 percent or more of the precipitation, P , occurs during the high sun period, defined as April through September in the Northern Hemisphere and October through March in the Southern Hemisphere, then the dry/humid threshold is in accordance with Equation 3-1.

$$P < 0.44 \times (T - 7) \\ [P < 20.0 \times (T + 14) \text{ in SI units}]$$

(Equation 3-1)

where:

P = Annual precipitation, inches (mm).

T = Annual mean temperature, $^{\circ}\text{F}$ ($^{\circ}\text{C}$).

4.3. If between 30 and 70 percent of the precipitation, P , occurs during the high sun period, defined as April through September in the Northern Hemisphere and October through

March in the Southern Hemisphere, then the dry/humid threshold is in accordance with Equation 3-2.

$$P < 0.44 \times (T - 19.5)$$

$$[P < 20.0 \times (T + 7) \text{ in SI units}]$$

(Equation 3-2)

where:

P = Annual precipitation, inches (mm).

T = Annual mean temperature, °F (°C).

- 4.4. If 30 percent or less of the precipitation, P , occurs during the high sun period, defined as April through September in the Northern Hemisphere and October through March in the Southern Hemisphere, then the dry/humid threshold is in accordance with Equation 3-3.

$$P < 0.44 \times (T - 32)$$

$$[P < 20.0 \times T \text{ in SI units}]$$

(Equation 3-3)

where:

P = Annual precipitation, inches (mm).

T = Annual mean temperature, °F (°C).

5. Humid (A) definition: Locations that are not Marine (C) or Dry (B).

TABLE C301.3
THERMAL CLIMATE ZONE DEFINITIONS

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
0	10,800 < CDD50°F	6000 < CDD10°C
1	9,000 < CDD50°F < 10,800	5000 < CDD10°C < 6000
2	6,300 < CDD50°F ≤ 9,000	3500 < CDD10°C ≤ 5000
3	CDD50°F ≤ 6,300 AND HDD65°F ≤ 3,600	CDD10°C < 3500 AND HDD18°C ≤ 2000
4	CDD50°F ≤ 6,300 AND 3,600 < HDD65°F ≤ 5,400	CDD10°C < 3500 AND 2000 < HDD18°C ≤ 3000
5	CDD50°F < 6,300 AND 5,400 < HDD65°F ≤ 7,200	CDD10°C < 3500 AND 3000 < HDD18°C ≤ 4000
6	7,200 < HDD65°F ≤ 9,000	4000 < HDD18°C ≤ 5000
7	9,000 < HDD65°F ≤ 12,600	5000 < HDD18°C ≤ 7000
8	12,600 < HDD65°F	7000 < HDD18°C

For SI: °C = [(°F) – 32]/1.8.

C301.4 Tropical climate region. Deleted.

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. Alternatively, 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-in or sprayed fiberglass and cellulose insulation, the initial installed thickness, settled thickness, settled R -value, installed density, coverage area and number of bags installed shall be indicated on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and R -value of installed thickness shall be indicated on the certification. For insulated siding, the R -value shall be labeled on the product's package and shall be indicated on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

Exception: For roof insulation installed above the deck, the R -value shall be labeled as required by the material standards specified in Table 1508.2 of the *International Building Code*.

C303.1.1.1 Blown-in or sprayed roof/ceiling insulation. The thickness of blown-in or sprayed fiberglass and cellulose roof/ceiling insulation shall be written in inches (mm) on markers and one or more of such markers shall be installed for every 300 square feet (28 m²) of attic area throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers not less than 1 inch (25 mm) in height. Each marker shall face the attic *access* opening. Spray polyurethane foam thickness and installed R -value shall be indicated 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. For insulation materials that are installed without an observable manufacturer's R -value mark, such as blown or draped products, an insulation certificate complying with Section C303.1.1 shall be left immediately after installation by the installer, in a conspicuous location within the building, to certify the installed R -value of the insulation material.

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C303.1.3 Fenestration product rating. *U*-factors of fenestration products shall be determined as follows:

1. For windows, doors and skylights, *U*-factor ratings shall be determined in accordance with NFRC 100.
2. Where required for garage doors and rolling doors, *U*-factor ratings shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined 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 Table 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). For Tubular Daylighting Devices, VT_{annual} shall be measured and rated in accordance with NFRC 203.

**TABLE C303.1.3(1)
DEFAULT GLAZED WINDOW, GLASS DOOR
AND SKYLIGHT *U*-FACTORS**

FRAME TYPE	WINDOW AND GLASS DOOR		SKYLIGHT	
	Single	Double	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 OPAQUE DOOR *U*-FACTORS**

DOOR TYPE	OPAQUE <i>U</i> -FACTOR
Uninsulated Metal	1.20
Insulated Metal (Rolling)	0.90
Insulated Metal (Other)	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

**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 US Federal Trade Commission *R*-value rule (CFR Title 16, Part 460) in units of h × ft² × °F/Btu at a mean temperature of 75°F (24°C).

C303.1.4.1 Insulated siding. The thermal resistance (*R*-value) of insulated siding shall be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's instructions.

C303.2 Installation. Materials, systems and equipment shall be installed in accordance with the manufacturer's 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 not less than 6 inches (153 mm) below grade.

C303.2.2 Multiple layers of continuous insulation board. 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. Where the continuous insulation board manufacturer's instructions do not address installation of two or more layers, the edge joints between each layer of continuous insulation boards shall be staggered.