

## CHAPTER 3 [CE]

# GENERAL REQUIREMENTS

### SECTION C301 CLIMATE ZONES

**C301.1 General.** Climate zones from Table C301.1 shall be used in determining the applicable requirements from Chapter 4. Seattle is in Zone 4-C (4-Marine).

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

| Key: A – Moist, B – Dry, C – Marine.<br>Absence of moisture designation indicates<br>moisture regime is irrelevant. |                 |
|---|-----------------|
| <b>WASHINGTON</b>   |                 |
| 5B Adams  | 4C Lewis        |
| 5B Asotin   | 5B Lincoln      |
| 5B Benton   | 4C Mason        |
| 5B Chelan   | 5B Okanogan     |
| 4C Clallam  | 4C Pacific      |
| 4C Clark  | 5B Pend Oreille |
| 5B Columbia   | 4C Pierce       |
| 4C Cowlitz  | 4C San Juan     |
| 5B Douglas  | 4C Skagit       |
| 5B Ferry  | 5B Skamania     |
| 5B Franklin   | 4C Snohomish    |
| 5B Garfield   | 5B Spokane      |
| 5B Grant  | 5B Stevens      |
| 4C Grays Harbor   | 4C Thurston     |
| 4C Island   | 4C Wahkiakum    |
| 4C Jefferson  | 5B Walla Walla  |
| 4C King   | 4C Whatcom      |
| 4C Kitsap   | 5B Whitman      |
| 5B Kittitas   | 5B Yakima       |
| 5B Klickitat  |                 |

### 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.

**C302.2 Exterior design conditions.** The heating or cooling outdoor design temperatures shall be ~~((selected from Appendix C))~~ 24°F for heating and 86°F dry bulb and 67°F wet bulb 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. For insulated siding, the *R*-value shall be labeled on the product's package and 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 m<sup>2</sup>) 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 *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.

**Exception:** Where required, garage door *U*-factors shall be determined in accordance with either NFRC 100 or ANSI/SASMA 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), C303.1.3(2) or C303.1.3(4). The solar heat gain coefficient (SHGC) and visible transmittance (VT) of glazed fenestration products (windows, glazed doors and sky-

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lights) 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).

**Exception:** Units without NFRC ratings produced by a *small business* may be assigned default *U*-factors from Table C303.1.3(5) for *vertical fenestration*.

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

| FRAME TYPE                            | SINGLE PANE | DOUBLE PANE | SKYLIGHT              |
|---------------------------------------|-------------|-------------|-----------------------|
| Metal                                 | 1.20        | 0.80        | See Table C303.1.3(4) |
| Metal with Thermal Break <sup>1</sup> | 1.10        | 0.65        |                       |
| Nonmetal or Metal Clad                | 0.95        | 0.55        |                       |
| Glazed Block                          | 0.60        |             |                       |

<sup>1</sup> Metal Thermal Break = A metal thermal break framed window shall incorporate the following minimum design characteristics:

- a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/h/ft<sup>2</sup>/°F;
- b) The thermal break material must produce a gap in the frame material of not less than 0.210 inches; and
- c) All metal framing members of the products exposed to interior and exterior air shall incorporate a thermal break meeting the criteria in a) and b) above.

**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 h x ft<sup>2</sup> x °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.

**C303.1.5 Spandrel panels in glass curtain walls.** Table C303.1.5 provides default *U*-factors for the spandrel sec-

tion of glass and other curtain wall systems. Design factors that affect performance are the type of framing, the type of spandrel panel and the R-value of insulation. Four framing conditions are considered in the table. The first is the common case where standard aluminum mullions are used. Standard mullions provide a thermal bridge through the insulation, reducing its effectiveness. The second case is for metal framing members that have a thermal break. A thermal break frame uses a urethane or other non-metallic element to separate the metal exposed to outside conditions from the metal that is exposed to interior conditions. The third case is for structural glazing or systems where there are no exposed mullions on the exterior. The fourth case is for the condition where there is no framing or the insulation is continuous and uninterrupted by framing. The columns in the table can be used for any specified level of insulation between framing members installed in framed curtain walls or spandrel panels.

**C303.1.5.1 Window wall application.** Where “window wall” or similar assembly that is discontinuous at intermediate slab edges is used, the slab edge *U*-value shall be as listed in Appendix Table A103.3.7.1(3) or as determined using an *approved* calculation.

**C303.1.5.2 Table value assumptions.** In addition to the spandrel panel assembly, the construction assembly *U*-factors assume an air gap between the spandrel panel and one layer of 5/8-inch gypsum board that provides the interior finish. The gypsum board is assumed to span between the window sill and a channel at the floor. For assemblies that differ from these assumptions, custom *U*-factors can be calculated to account for any amount of *continuous insulation* or for unusual construction assemblies using Equations 1, 2, or 3 where appropriate. Spandrel panel *U*-factors for assemblies other than those covered by this table or Equations 1-3 may be determined using an alternate *approved* methodology. Equations 1-3 do not calculate the value of any insulation inboard of the curtain wall assembly.

Aluminum without thermal break (Equation 1)

$$U_{gypsum} = \frac{1}{(R_{Gypsum} + R_{AirGap}) + \left[ \frac{1}{0.2798 + 0.8929 \times \left( \frac{1}{R_{AddedInsulation}} + U_{CenterofGlass} \right)} \right]}$$

Aluminum with thermal break (Equation 2)

$$U_{Overall} = \frac{1}{\left[ (R_{Gypsum} + R_{AirGap}) + \frac{1}{\left( 0.1808 + 0.8874 \times \left( \frac{1}{R_{AddedInsulation}} + U_{CenterofGlass} \right) \right)} \right]}$$

Structural glazing (Equation 3)

$$U_{Overall} = \frac{1}{\left[ (R_{Gypsum} + R_{AirGap}) + \frac{1}{\left( 0.1151 + 0.9487 \times \left( \frac{1}{R_{AddedInsulation}} + U_{CenterofGlass} \right) \right)} \right]}$$

**C303.2 Installation.** Materials, systems and equipment shall be installed in accordance with the manufacturer’s instructions and the *International Building Code* or the *International Residential Code*, as applicable.

**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.

**C303.3 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.

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

See Appendix A, Section A107

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

|      | SINGLE GLAZED |        | DOUBLE GLAZED |        | GLAZED BLOCK |
|------|---------------|--------|---------------|--------|--------------|
|      | Clear         | Tinted | Clear         | Tinted |              |
| SHGC | 0.40          | 0.40   | 0.40          | 0.40   | 0.40         |
| VT   | 0.6           | 0.3    | 0.6           | 0.3    | 0.6          |

**TABLE C303.1.3(4)  
DEFAULT U-FACTORS FOR SKYLIGHTS**

| Single Glazing                            |        |        |        |        |
|---|--------|--------|--------|--------|
| glass                                     | U-1.58 | U-1.51 | U-1.40 | U-1.18 |
| acrylic/polycarb                          | U-1.52 | U-1.45 | U-1.34 | U-1.11 |
| Double Glazing                            |        |        |        |        |
| air                                       | U-1.05 | U-0.89 | U-0.84 | U-0.67 |
| argon                                     | U-1.02 | U-0.86 | U-0.80 | U-0.64 |
| Double Glazing, $e=0.20$                  |        |        |        |        |
| air                                       | U-0.96 | U-0.80 | U-0.75 | U-0.59 |
| argon                                     | U-0.91 | U-0.75 | U-0.70 | U-0.54 |
| Double Glazing, $e=0.10$                  |        |        |        |        |
| air                                       | U-0.94 | U-0.79 | U-0.74 | U-0.58 |
| argon                                     | U-0.89 | U-0.73 | U-0.68 | U-0.52 |
| Double Glazing, $e=0.05$                  |        |        |        |        |
| air                                       | U-0.93 | U-0.78 | U-0.73 | U-0.56 |
| argon                                     | U-0.87 | U-0.71 | U-0.66 | U-0.50 |
| Triple Glazing                            |        |        |        |        |
| air                                       | U-0.90 | U-0.70 | U-0.67 | U-0.51 |
| argon                                     | U-0.87 | U-0.69 | U-0.64 | U-0.48 |
| Triple Glazing, $e=0.20$                  |        |        |        |        |
| air                                       | U-0.86 | U-0.68 | U-0.63 | U-0.47 |
| argon                                     | U-0.82 | U-0.63 | U-0.59 | U-0.43 |
| Triple Glazing, $e=0.20$ on 2 surfaces    |        |        |        |        |
| air                                       | U-0.82 | U-0.64 | U-0.60 | U-0.44 |
| argon                                     | U-0.79 | U-0.60 | U-0.56 | U-0.40 |
| Triple Glazing, $e=0.10$ on 2 surfaces    |        |        |        |        |
| air                                       | U-0.81 | U-0.62 | U-0.58 | U-0.42 |
| argon                                     | U-0.77 | U-0.58 | U-0.54 | U-0.38 |
| Quadruple Glazing, $e=0.10$ on 2 surfaces |        |        |        |        |
| air                                       | U-0.78 | U-0.59 | U-0.55 | U-0.39 |
| argon                                     | U-0.74 | U-0.56 | U-0.52 | U-0.36 |
| krypton                                   | U-0.70 | U-0.52 | U-0.48 | U-0.32 |

Notes for Table C303.1.3(4)

1. U-factors are applicable to both glass and plastic, flat and domed units, all spacers and gaps.
2. Emissivities shall be less than or equal to the value specified.
3. Gap fill shall be assumed to be air unless there is a minimum of 90% argon or krypton.
4. Aluminum frame with thermal break is as defined in footnote 1 to Table C303.1.3(1).

**TABLE C303.1.3(5)**  
**SMALL BUSINESS COMPLIANCE TABLE**  
**DEFAULT U-FACTORS FOR VERTICAL FENESTRATION**

| Double <sup>3</sup> | A                | Any              | Argon | 0.48 | 0.41 | 0.32                          |
|---------------------|------------------|------------------|-------|------|------|-------------------------------|
|                     | B                | Any              | Argon | 0.46 | 0.39 | 0.30                          |
|                     | C                | Any              | Argon | 0.44 | 0.37 | 0.28                          |
|                     | C                | High Performance | Argon | 0.42 | 0.35 | Deemed to comply <sup>5</sup> |
| Triple <sup>4</sup> | A                | Any              | Air   | 0.50 | 0.44 | 0.26                          |
|                     | B                | Any              | Air   | 0.45 | 0.39 | 0.22                          |
|                     | C                | Any              | Air   | 0.41 | 0.34 | 0.20                          |
|                     | Any double low-e | Any              | Air   | 0.35 | 0.32 | 0.18                          |

- <sup>1</sup> Low-eA (emissivity) shall be 0.24 to 0.16. Low-eB (emissivity) shall be 0.15 to 0.08. Low-eC (emissivity) shall be 0.07 or less.
- <sup>2</sup> Aluminum Thermal Break = An aluminum thermal break framed window shall incorporate the following minimum design characteristics:
  - a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/h/ft<sup>2</sup>/°F;
  - b) The thermal break material must produce a gap in the frame material of not less than 0.210 inches; and
  - c) All metal framing members of the products exposed to interior and exterior air shall incorporate a thermal break meeting the criteria in a) and b) above.
- <sup>3</sup> A minimum air space of 0.375 inches between panes of glass is required for double glazing.
- <sup>4</sup> A minimum air space of 0.25 inches between panes of glass is required for triple glazing.
- <sup>5</sup> Deemed to comply glazing shall not be used for performance compliance.

**Table C303.1.5**  
**U-factors for Spandrel Panels and Glass Curtain Walls**

| Frame Type                              | Spandrel Panel                           |           | Rated R-value of Insulation between Framing Members |       |       |       |       |       |       |       |
|---|--|-----------|---|-------|-------|-------|-------|-------|-------|-------|
|   |  |           | None  | R-4   | R-7   | R-10  | R-15  | R-20  | R-25  | R-30  |
|   |  |           | A   | B     | C     | D     | E     | F     | G     | H     |
| Aluminum without Thermal Break          | Single glass pane, stone, or metal panel | <b>1</b>  | 0.360   | 0.242 | 0.222 | 0.212 | 0.203 | 0.198 | 0.195 | 0.193 |
|   | Double glass with no low-e coatings      | <b>2</b>  | 0.297   | 0.233 | 0.218 | 0.209 | 0.202 | 0.197 | 0.194 | 0.192 |
|   | Triple or low-e glass                    | <b>3</b>  | 0.267   | 0.226 | 0.214 | 0.207 | 0.200 | 0.196 | 0.194 | 0.192 |
| Aluminum with Thermal Break             | Single glass pane, stone, or metal panel | <b>4</b>  | 0.350   | 0.211 | 0.186 | 0.173 | 0.162 | 0.155 | 0.151 | 0.149 |
|   | Double glass with no low-e coatings      | <b>5</b>  | 0.278   | 0.200 | 0.180 | 0.170 | 0.160 | 0.154 | 0.151 | 0.148 |
|   | Triple or low-e glass                    | <b>6</b>  | 0.241   | 0.191 | 0.176 | 0.167 | 0.159 | 0.153 | 0.150 | 0.148 |
| Structural Glazing                      | Single glass pane, stone, or metal panel | <b>7</b>  | 0.354   | 0.195 | 0.163 | 0.147 | 0.132 | 0.123 | 0.118 | 0.114 |
|   | Double glass with no low-e coatings      | <b>8</b>  | 0.274   | 0.180 | 0.156 | 0.142 | 0.129 | 0.122 | 0.117 | 0.114 |
|   | Triple or low-e glass                    | <b>9</b>  | 0.231   | 0.169 | 0.150 | 0.138 | 0.127 | 0.121 | 0.116 | 0.113 |
| No framing, or Insulation is Continuous | Single glass pane, stone, or metal panel | <b>10</b> | 0.360   | 0.148 | 0.102 | 0.078 | 0.056 | 0.044 | 0.036 | 0.031 |
|   | Double glass with no low-e coatings      | <b>11</b> | 0.297   | 0.136 | 0.097 | 0.075 | 0.054 | 0.043 | 0.035 | 0.030 |
|   | Triple or low-e glass                    | <b>12</b> | 0.267   | 0.129 | 0.093 | 0.073 | 0.053 | 0.042 | 0.035 | 0.030 |

