

2021 City of Houston Construction Codes Addendum 1

Date: May 22, 2023

Addendum to the 2021 Houston Amendments

The following Amendments have been approved to be adopted with the current 2021 Houston Amendments and are provided as an addendum to the approved 2021 Houston Amendments.

TFG3 2021 Houston Energy Code Amendments

R403.6.4 Sampling options for R2 multifamily dwelling units. Sample Testing must follow Chapter 6 of the Mortgage Industry National Home Energy Rating Systems Standards. For buildings with eight or more testing units that must be tested as required by R403.6.3, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit, a middle floor unit, and a unit with the largest testing unit floor area. For each tested unit that does not meet the minimum ventilation rate, an additional three units shall be tested, including a mixture of testing unit types and locations.

Where buildings have fewer than eight testing units, each testing unit shall be tested.

R403.3.8 Sampling options for R2 multifamily dwelling units. Sample Testing must follow Chapter 6 of the Mortgage Industry National Home Energy Rating Systems Standards For buildings with eight or more testing units that must be tested as required by R403.3.5, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit, a middle floor unit, and a unit with the largest testing unit floor area. For each tested unit that exceeds the maximum duct leakage rate, an additional three units shall be tested, including a mixture of testing unit types and locations. Where buildings have fewer than eight testing units, each testing unit shall be tested.

Amend Table R406.5 to reflect the following Energy Rating Index

Climate Zone Energy Rating Index

2 59

Effective until August 31, 2025

Climate Zone Energy Rating Index

2 57

Effective from September 1, 2025 to August 31, 2028

Climate Zone Energy Rating Index

Effective on or after September 1, 2028 to September 1, 2031

TFG1 2021 Houston Building Code Amendments

15111512.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement or roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage and meet the requirements of Section 1608.3 and Section 1611.2.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 for roofs that provide for positive roof drainage and meet the requirements of Section 1608.3 and Section 1611.2. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.

TFG4 2021 Houston Mechanical Code Amendments

1103.1.1 Safety Group. Table 1102.3 classifies refrigerants by toxicity and flammability, and assigns safety groups using combinations of toxicity class and flammability class. For the purposes of this chapter, the refrigerant Groups A1, A2L, A2, A3, B1, B2L, B2, and B3 shall be considered to be individual and distinct safety groups, as shown in Table 1103.1.1. Each refrigerant is assigned into not more than one group.

Table 1103.1.1

Refrigerant Safety Group Classifications

<u>Higher Flammability</u>	<u>A3</u>	<u>B3</u>
<u>Flammable</u>	<u>A2</u>	<u>B2</u>
<u>Lower Flammability</u>	<u>A2L</u>	<u>B2L</u>
<u>No Flame Propagation</u>	<u>A1</u>	<u>B1</u>
	<u>Lower Toxicity</u>	<u>Higher Toxicity</u>

1104.2 Refrigerant Concentration Limit. The concentration of refrigerant in a complete discharge of an independent circuit of high-probability systems shall not exceed the amounts shown in Table 1102.3, except as provided in Section 1104.3, ~~and~~ Section 1104.4 and Section 1104.6. The volume of occupied space shall be determined in accordance with Section 1104.2.1 through Section 1104.2.3.

Exceptions:

(1) Listed equipment containing not more than 6.6 pounds (2.99 kg) of refrigerant, regardless of the refrigerant safety classification, provided the equipment is installed in accordance with the listing and with the manufacturer's installation instructions.

(2) Listed equipment for use in laboratories with more than 100 square feet (9.29 m²) of space per person, regardless of the refrigerant safety classification, provided that the equipment is installed in accordance with the listing and the manufacturer's installation instructions. ~~{{ASHRAE 15:7.2}}~~

1104.6 Group A2L Refrigerants for Human Comfort. High-probability systems using Group A2L refrigerants for human comfort applications shall comply with this section. [ASHRAE 15:7.6]

1104.6.1 Refrigerant Concentration Limits. Occupied spaces shall comply with the releaseable charge limitations of the equipment listing. Unoccupied spaces with refrigerant containing equipment, not including continuous piping or tubing, shall comply with the releaseable charge limitations of the equipment listing or Section 1104.6.4. {ASHRAE 15:7.6.1-7.6.1.2}

1104.6.2 Listing and Installation Requirements. Refrigeration systems shall be listed and shall be installed in accordance with listing, the manufacturer's instructions, and any markings on the equipment restricting the installation. [ASHRAE 15:7.6.2]

1104.6.2.1 Nameplate. The nameplate required by Section 1115.5 shall include a symbol indicating that a flammable refrigerant is used, as specified by the product listing. [ASHRAE 15:7.6.2.1]

1104.6.2.2 Labeling. A label indicating a flammable refrigerant is used shall be placed adjacent to service ports and other locations where service involving components containing refrigerant is performed, as specified by the product listing. [ASHRAE 15:7.6.2.2]

1104.6.2.3 Refrigerant Detection Systems. Refrigerant detection systems shall be in accordance with the listing and ASHRAE 15. 1104.6.2.4 Refrigerant Concentration Above Limit. When the refrigerant

detection system senses a refrigerant concentration exceeding its setpoint, the following actions shall be taken:

(1) The supply air fan of the equipment shall activate with a minimum airflow rate specified by the manufacturer.

(2) Turn off the compressor and all other electrical devices, excluding the control power transformers, control systems, and the supply air fan. The supply air fan shall continue to operate for at least five minutes after the refrigerant detection system has sensed a drop in the refrigerant concentration below the value specified in Section 1104.6.5(2).

(3) Any device that controls airflow located within the product or in ductwork that supplies air to the occupied space shall be fully open. Any device that controls airflow shall be listed.

(4) Mitigation action required by the equipment shall be initiated. {ASHRAE 15:7.6.2.4} 1104.6.3 Ignition Sources Located in Ductwork. Open-flame-producing devices shall not be permanently installed in the ductwork that serves the space. Unclassified electrical devices shall not be located within the ductwork that serves the space. Devices containing hot surfaces exceeding 1290°F (700°C) shall not be located in the ductwork that serves the space unless there is a minimum airflow of 200 ft/min (1.0 m/s) across the heating device(s) and there is proof of airflow before the heating device(s) is energized. [ASHRAE 15:7.6.3-7.6.3.3]

1104.6.4 Compressors and Pressure Vessel Located Indoors. For refrigeration compressors and pressure vessels located in an indoor space that is accessible only during service and maintenance, the refrigerant charge shall be in accordance with the equipment listing where all of the following provisions are met:

a. Mechanical ventilation shall be provided that will remove leaked refrigerant from the space where refrigerant leaking from the equipment is expected to accumulate if the equipment is not labeled as enhanced tightness refrigerating system. The space shall be provided with an exhaust or transfer fan. Fans used to exhaust air from the space or transfer circulate the air to another indoor space shall in accordance comply with the following equation:

$$Q_{min} = QREQ/CLFL$$

where Q_{min} = minimum mechanical ventilation airflow rate, ft^3/min (m^3/h)

$QREQ$ = the required ventilation, as determined from Table 1104.6.4-1

CLFL = the lower flammability limit conversion factor, as determined from Table 1104.6.4-2

Table 1104.6.4-1 Required Ventilation for A2L Systems^a

<u>Excluded Charge (M – MVOL)^b</u>		<u>QREQ</u>		<u>Excluded Charge (M – MVOL)^b</u>		<u>QREQ</u>	
<u>lb</u>	<u>kg</u>	<u>ft³/min</u>	<u>m³/hr</u>	<u>lb</u>	<u>kg</u>	<u>ft³/min</u>	<u>m³/hr</u>
<u>3.8</u>	<u>1.7</u>	<u>100</u>	<u>170</u>	<u>91.8</u>	<u>41.6</u>	<u>2400</u>	<u>4080</u>
<u>7.6</u>	<u>3.5</u>	<u>200</u>	<u>340</u>	<u>95.6</u>	<u>43.4</u>	<u>2500</u>	<u>4250</u>
<u>11.5</u>	<u>5.2</u>	<u>300</u>	<u>510</u>	<u>99.4</u>	<u>45.1</u>	<u>2600</u>	<u>4420</u>
<u>15.3</u>	<u>6.9</u>	<u>400</u>	<u>680</u>	<u>103.2</u>	<u>46.8</u>	<u>2700</u>	<u>4590</u>
<u>19.1</u>	<u>8.7</u>	<u>500</u>	<u>850</u>	<u>107.1</u>	<u>48.6</u>	<u>2800</u>	<u>4760</u>
<u>22.9</u>	<u>10.4</u>	<u>600</u>	<u>1020</u>	<u>110.9</u>	<u>50.3</u>	<u>2900</u>	<u>4930</u>
<u>26.8</u>	<u>12.1</u>	<u>700</u>	<u>1190</u>	<u>114.7</u>	<u>52.0</u>	<u>3000</u>	<u>5100</u>
<u>30.6</u>	<u>13.9</u>	<u>800</u>	<u>1360</u>	<u>118.5</u>	<u>53.8</u>	<u>3100</u>	<u>5270</u>
<u>34.4</u>	<u>15.6</u>	<u>900</u>	<u>1530</u>	<u>122.4</u>	<u>55.5</u>	<u>3200</u>	<u>5440</u>
<u>38.2</u>	<u>17.3</u>	<u>1000</u>	<u>1700</u>	<u>126.2</u>	<u>57.2</u>	<u>3300</u>	<u>5610</u>
<u>42.1</u>	<u>19.1</u>	<u>1100</u>	<u>1870</u>	<u>130.0</u>	<u>59.0</u>	<u>3400</u>	<u>5780</u>
<u>45.9</u>	<u>20.8</u>	<u>1200</u>	<u>2040</u>	<u>133.8</u>	<u>60.7</u>	<u>3500</u>	<u>5950</u>
<u>49.7</u>	<u>22.5</u>	<u>1300</u>	<u>2210</u>	<u>137.6</u>	<u>62.4</u>	<u>3600</u>	<u>6120</u>
<u>53.5</u>	<u>24.3</u>	<u>1400</u>	<u>2380</u>	<u>141.5</u>	<u>64.2</u>	<u>3700</u>	<u>6290</u>
<u>57.4</u>	<u>26.0</u>	<u>1500</u>	<u>2550</u>	<u>145.3</u>	<u>65.9</u>	<u>3800</u>	<u>6460</u>
<u>61.2</u>	<u>27.7</u>	<u>1600</u>	<u>2720</u>	<u>149.1</u>	<u>67.6</u>	<u>3900</u>	<u>6630</u>
<u>65.0</u>	<u>29.5</u>	<u>1700</u>	<u>2890</u>	<u>152.9</u>	<u>69.4</u>	<u>4000</u>	<u>6800</u>
<u>68.8</u>	<u>31.2</u>	<u>1800</u>	<u>3060</u>	<u>156.8</u>	<u>71.1</u>	<u>4100</u>	<u>6970</u>
<u>72.6</u>	<u>32.9</u>	<u>1900</u>	<u>3230</u>	<u>160.6</u>	<u>72.8</u>	<u>4200</u>	<u>7140</u>
<u>76.5</u>	<u>34.7</u>	<u>2000</u>	<u>3400</u>	<u>164.4</u>	<u>74.6</u>	<u>4300</u>	<u>7310</u>
<u>80.3</u>	<u>36.4</u>	<u>2100</u>	<u>3570</u>	<u>168.2</u>	<u>76.3</u>	<u>4400</u>	<u>7480</u>
<u>84.1</u>	<u>38.1</u>	<u>2200</u>	<u>3740</u>	<u>172.1</u>	<u>78.0</u>	<u>4500</u>	<u>7650</u>
<u>87.9</u>	<u>39.9</u>	<u>2300</u>	<u>3910</u>	<u>175.5</u>	<u>79.6</u>	<u>4590</u>	<u>7803</u>

Note: a. Charge sizes and ventilation rates shown in this table are based on R-32.

a. (M – MVOL) is the amount of refrigerant charge that is removed by mechanical ventilation and is therefore not included in calculations to determine compliance with Section 1104.2. M and MVOL are as defined below.

Table 1104.6.4-2 Lower Flammability Limit Conversion Factor

<u>Refrigerant Number</u>	<u>CLFL</u>
<u>R-32</u>	<u>1.00</u>
<u>R-452B</u>	<u>1.02</u>
<u>R-454A</u>	<u>0.92</u>
<u>R-454B</u>	<u>0.97</u>
<u>R-454C</u>	<u>0.95</u>
<u>R-457A</u>	<u>0.71</u>

When the refrigerant charge necessary to be removed by ventilation is known, in order to be compliant with Section 1104.2, an alternative method to determine QREQ uses the following equations. This alternative method shall be used for all A2L refrigerants not listed in Table 7-2.

$$Q_REQ = (M - M_VOL) / (4 \times LFL) \times \text{SF} \times \text{Vent} \quad \text{(I-P)}$$

$$Q_REQ = (M - M_VOL) / (4 \times LFL) \times \text{SF} \times \text{Vent} \times 60$$

$$\text{(SI) } MVOL = RCL \times V \times FOCC$$

where QREQ = required minimum mechanical ventilation airflow rate, ft³/min (m³/h)

M = refrigerant charge of the largest independent circuit of the system, lb (kg)

MVOL = refrigerant charge permitted in the space

RCL = refrigerant concentration limit, lb/ft³ (kg/m³)

V = volume of space established in accordance with Section 7.3, ft³ (m³)

FOCC = occupancy adjustment factor. For all occupancies other than institutional, FOCC has a value of 1. For institutional occupancies, FOCC has a value of 0.5.

LFL = lower flammability limit, lb/ft³ (kg/m³)

4 = assumed leak time (4 minutes)

SFVent = safety factor, value of 2

60 = conversion of minutes to hours

If the equipment is a listed and labeled enhanced tightness refrigerating system, mechanical ventilation shall be provided according to the following formula unless the releasable charge of the equipment complies with Section 1104.6.1.:

$$Q_REQ = \dot{m} / LFL \times \text{SF} \times \text{Vent}$$

where

QREQ = required minimum mechanical ventilation airflow rate, ft³/min (m³/h)

\dot{m} = the expected maximum leak rate, value of 0,37 in lb/min (10 in kg/h)

LFL = lower flammability limit, lb per 1 000 ft³ (kg/m³)

SFVent = safety factor, value of 4

b. *Mechanical ventilation shall be permitted to be continuous or activated by a refrigerant detection system. Building fire and smoke systems may override this function.

1. Continuous Ventilation. Where continuous ventilation is provided, ventilation function shall be continuously verified per Section 1104.6.4(b)(3).

2. Refrigerant Detection System Activated Ventilation. Upon refrigerant detection system activation, the mechanical ventilation shall be started and shall continue to operate for at least five minutes after the refrigerant detection system has sensed a drop in the refrigerant concentration below the setpoint value. Ventilation function of refrigerant detection system activated ventilation shall be verified in accordance with Section 1104.6.4(b)(3) by a monthly self-test.

3. Verification of Ventilation Function. Ventilation function shall be verified by a method that confirms operation of the required fans. Upon detection of a ventilation system failure, compressor operation shall be stopped, and a notification shall be provided. The notification shall be to an operator workstation through a building automation system or by a local audible alarm.

c. While the ventilation system is operating, makeup air shall be provided, and the volume of makeup air shall not exceed the volume of air being exhausted or transferred out of the space. Openings for makeup air shall be positioned to facilitate mixing of makeup air with leaked refrigerant. Inlets for exhaust air and inlets used to mechanically transfer air to another indoor location shall be located such that the bottom of the inlet is within 12 in. (30 cm) of the lowest elevation in the space where leaked refrigerant would be expected to accumulate.

d. The refrigerant concentration of an indoor effective dispersal volume shall not exceed the limit specified in Section 1104.6.1.

e. In addition to the requirements of Section 1104.6.3, there shall be no open-flame-producing devices that do not contain a flame arrestor, or hot surfaces exceeding 1290°F (700°C), installed within the space where the equipment is located.

f. Electric motors larger than 1 hp driving fans located in the airstream of the discharge side of the ventilation system shall be of the totally enclosed or hermetically sealed type.

g. Fan rotating elements shall be nonferrous or non-sparking, or the casing shall consist of or be lined with such material.

h. Ventilation fans shall be listed in accordance with UL 50720 or UL 70521. {ASHRAE 15:7.6.4}

1104.6.5 Refrigerant Sensors. Refrigerant sensors required by Section 1104.6.2 shall meet the following requirements:

(1) Refrigerant sensors shall be evaluated by the testing laboratory as part of the equipment listing.

(2) Refrigerant sensors shall be located such that refrigerant will be detected if the refrigerating system is operating or not operating.

(a) For refrigerating systems that are connected to the occupied space through ductwork, refrigerant sensors shall be located within the listed equipment.

(b) For refrigerating systems that are directly connected to the occupied space without ductwork, the refrigerant sensor shall be located in the equipment in accordance with the equipment listing. Additional remote refrigerant sensors shall be permitted within the occupied space when included as part of the equipment mitigation system.

{ASHRAE 15:7.6.5}

1104.6 1104.7 Applications for Human Comfort and for Nonindustrial Occupancies. In nonindustrial occupancies, Group A2, ~~A2L~~, A3, B1, B2L, B2, and B3 refrigerants shall not be used in high-probability systems for human comfort. Use of Group A2L refrigerants used in high-probability systems for human comfort shall be in accordance with Section 1104.6.

**TABLE 1701.1
REFERENCED STANDARDS**

Standard Number	Standard Title	Application	Referenced Sections
<u>ASTM B 68-2011</u>	<u>Specification for Seamless Copper Tube, Bright Annealed (Metric)</u>	<u>Miscellaneous</u>	<u>405.13.1</u>
NFPA 70-2020 14 *	National Electrical Code	Miscellaneous	301.4, 511.1.6, 512.2.5, 516.2.7, 516.2.9(4), 602.2.1, 905.10.2, 1104.4(6), 1217.7.1, 1311.14.5(2), 1312.6, E 503.5(11)(c)
<u>NFPA 92-2015</u>	<u>Standard for Smoke Control Systems</u>	<u>Smoke Control</u>	<u>405.7, 405.8</u>
<u>UL 864-2003</u>	<u>Standards for Control Units and Accessories for Fire Alarm Systems</u>	<u>Miscellaneous</u>	<u>405.12</u>
ASHRAE 15- 2016 <u>2022</u>	Safety Standard for Refrigeration Systems	Refrigeration Systems	1102.1, <u>1104.6.1</u> , <u>1104.6.2.3</u> , <u>1104.6.4</u> , <u>1104.6.5</u> , 1106.1, Table 1113.5
ASHRAE 34- 2016 <u>2022</u>	Designation and Safety Classification of Refrigerants	Refrigeration Classifications	1102.3, Table 1102.3, 1103.1, Table 1106.2.5.2
UL 60335-2-40- 2017 <u>2022</u>	Household and Similar Electrical Appliances — Safety — Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers	Appliances	903.1, 904.13
UL 60335-2-89- 2017 <u>2021</u>	Household and Similar Electrical Appliances — Safety — Part 2-89: Particular Requirements for Commercial Refrigerating Appliances with an Incorporated or Remote Refrigerant Unit or Compressor	Appliances	934.1, 934.2, 934.3

TFG3 IECC Residential Code

[Editorial Note: Delete and reserve Table R402.1.2 in its entirety and replace with the following.]

**TABLE R402.1.2
MAXIMUM ASSEMBLY U-FACTORS^a AND FENESTRATION REQUIREMENTS**

<u>CLIMATE ZONE</u>	<u>FENESTRATION U-FACTOR^f</u>	<u>SKYLIGHT U-FACTOR</u>	<u>GLAZED FENESTRATION SHGC^{d, e}</u>	<u>CEILING U-FACTOR</u>	<u>ATTIC ROOFLINE R-VALUE</u>	<u>WOOD FRAME WALL U-FACTOR</u>	<u>MASS WALL U-FACTOR^b</u>	<u>FLOOR U-FACTOR</u>	<u>BASEMENT WALL U-FACTOR</u>	<u>CRAWL SPACE WALL U-FACTOR</u>
2	0.40	0.65	0.25	0.026	0.045	0.084	0.165	0.064	0.360	0.477

For SI: 1 foot = 304.8 mm.

- a. Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall U-factor shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall U-factor shall not exceed 0.360.
- d. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- e. There are no SHGC requirements in Marine Zone.
- f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:
 1. Above 4,000 feet in elevation above sea level, or
 2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

[Editorial Note: Delete and reserve Table R402.1.2 in its entirety and replace with the following.]

**TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

<u>CLIMATE ZONE</u>	<u>FENESTRATION U-FACTOR^{b,i}</u>	<u>SKYLIGHT^b U-FACTOR</u>	<u>GLAZED FENESTRATION SHGC^{b,e}</u>	<u>CEILING U-FACTOR</u>	<u>ATTIC ROOFLINE R-VALUE</u>	<u>WOOD FRAME WALL R-VALUE^g</u>	<u>MASS WALL R-VALUE^h</u>	<u>FLOOR R-VALUE</u>	<u>BASEMENT^{c,g} WALL R-VALUE</u>	<u>SLAB^d R-VALUE & DEPTH</u>	<u>CRAWL SPACE WALL U-FACTOR</u>
2	0.40	0.65	0.25	49	25&0ci or 0&20ci	13 or 0&10ci	4/6	13	0	0	0

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

- a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.
- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.
- g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.
- h. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.
- i. A maximum U-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:
 1. Above 4,000 feet in elevation, or
 2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

R402.4.1.4 Sampling options for R2 multifamily dwelling units. For buildings with eight or more testing units that must be tested as required by R402.4.1.2 or R402.4.1.3, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit, a middle floor unit, and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional three units shall be tested, including a mixture of testing unit types and locations. Where buildings have fewer than eight testing units, each testing unit shall be tested.