



STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

2015 Washington State Energy Code Development Energy Code Proposal Short Form

For editorial **Coordination, Clarifications & Corrections** only,
without substantive energy or cost impacts

May 2018

Log No. 19-WSEC-R21

TAG Rev 5/31

Code being amended: [Commercial](#) Provisions [Residential](#) Provisions
(A MS Word version of the code is linked to the name)

Code Section # R402

Brief Description: Create consistent and enforceable building envelope section. This change provides clarifications, but not change the requirements of the code.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

SECTION R402 BUILDING THERMAL ENVELOPE

R402.1 General (Prescriptive). The *building thermal envelope* shall meet the requirements of Sections R402.1.1 through R402.1.56.

Exception: The following buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this code shall be exempt from the building thermal envelope provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft² (10.7 W/m²) or 1.0 watt/ft² of floor area for space conditioning purposes.
2. Those that do not contain conditioned space.
3. Greenhouses isolated from any conditioned space and not intended for occupancy.

R402.1.1 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table R402.1.1 based on the climate zone specified in Chapter 3.

R402.1.2 R-value computation. Insulation R-value shall be determined as specified in Section R303.1.4. Insulation material used in layers, such as framing cavity insulation or continuous insulation, shall be summed to compute the corresponding component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films. ~~Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.1, the manufacturer must supply an ICC Report that the R factor has been certified, or use R-5 per inch for extruded polystyrene, and R-6 per inch for polyisocyanurate rigid insulation.~~ Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.2, the manufacturer's labeled R-value for insulated siding shall be reduced by R-0.6.

R402.1.3 U-factor alternative. An assembly with a U-factor equal to or less than that specified in Table R402.1.3 shall be permitted as an alternative to the R-value in Table R402.1.1. U-factors shall be determined as specified in section R402.1.5.

R402.1.4 Total UA alternative. If the ~~total proposed building thermal envelope UA (sum of U-factor times assembly area) is less than or equal to the total target UA resulting from using the U-factors in Table R402.1.3 (multiplied by the same assembly area as in the proposed building)~~, the building shall be considered in compliance with Table R402.1.1. The proposed UA shall be calculated as specified by Equation 2. The target UA shall be calculated as specified by Equation 1. U-factors shall be determined as specified in Section R402.1.5.

R402.1.5 U-factor reference and calculations. The U-factors for typical construction assemblies are included in Appendix A in chapter 51-11C WAC. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Appendix A, values shall be calculated in accordance with the ASHRAE *Handbook of Fundamentals* using the framing factors listed in Appendix A where applicable and shall include the thermal bridging effects of framing materials. Fenestration U-factors shall comply with Section R303.1.3, Fenestration product rating. The SHGC requirements shall be met in addition to UA compliance. When using REScheck, the U-factors calculated by the software based on component R-value descriptions are acceptable. For the base building UA calculation, the maximum glazing area is 15% of the floor area.

R402.1.5.6 Vapor retarder. Wall assemblies in the *building thermal envelope* shall comply with the vapor retarder requirements of Section R702.7 of the *International Residential Code* or Section 1405.3 of the *International Building Code*, as applicable.

**TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	5 AND MARINE 4
FENESTRATION U-FACTOR ^b	0.30
SKYLIGHT ^b U-FACTOR	0.50
GLAZED FENESTRATION SHGC ^{b,e}	NR
CEILING R-VALUE ^{ke}	49
WOOD FRAME WALL ^{g, m, n, l, q} R-VALUE	21 int
Mass Wall R-Value ⁱ	21/21
FLOOR R-VALUE	30
BELOW-GRADE ^{c,m} WALL R-VALUE	10/15/21 int + 5 TB
SLAB ^d R-VALUE & DEPTH	10, 2 ft

For SI: 1 foot = 304.8 mm, ci = continuous insulation, int = intermediate framing.

^a R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the compressed R-value of the insulation from Appendix Table A101.4 shall not be 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.~~

^c "10/15/21 + 5 TB" means R-10 continuous insulation on the exterior of the wall, or R-15 continuous insulation on the interior of the wall, or R-21 cavity insulation plus a thermal break between the slab and the basement wall at the interior of the basement wall. "10/15/21 + 5 TB" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous

insulation on the interior or exterior of the wall. "TB" means R-5 thermal break between floor slab and basement wall.

^d R-10 continuous insulation is required under heated slab on grade floors. See R402.2.9.1.

^e ~~Reserved. There are no SHGC requirements in the Marine Zone.~~

~~^f Reserved.~~

~~^g Reserved.~~

~~^h Reserved.~~

ⁱ ~~Mass walls shall be in accordance with Section R402.2.5. The second R-value applies when more than half the insulation is on the interior of the mass wall.~~

^j Reserved.

^{k-e} For single rafter- or joist-vaulted ceilings, the insulation may be reduced to R-38 if the full insulation depth extends over the top plate of the exterior wall.

~~^l Reserved.~~

^m Int. (intermediate framing) denotes framing and insulation as described in Section A103.2.2 including standard framing 16 inches on center, 78 percent of the wall cavity insulated and with headers insulated with a minimum of R-10 insulation.

^{n-g} Log and solid timber walls with a minimum average thickness of 3.5 inches are exempt from this insulation requirement.

**TABLE R402.1.3
EQUIVALENT U-FACTORS^a**

CLIMATE ZONE 5 AND MARINE 4	
FENESTRATION U-FACTOR	0.30
SKYLIGHT U-FACTOR	0.50
CEILING U-FACTOR	0.026
ABOVE-GRADE WOOD FRAME WALL U-FACTOR	0.056
Mass Wall U-FACTOR ^b	0.056
FLOOR U-FACTOR	0.029
BELOW-GRADE WALL U-FACTOR	0.042
Slab on Grade F-factor	<u>0.54</u>
<u>Below Grade</u> <u>2' Depth:</u> <u>Wall U-factor</u> <u>Slab F-factor</u>	<u>0.042</u> <u>0.59</u>
<u>Below Grade</u> <u>3.5' Depth:</u> <u>Wall U-factor</u> <u>Slab F-factor</u>	<u>0.040</u> <u>0.57 0.56</u>
<u>Below Grade 7' Depth:</u> <u>Wall U-factor</u> <u>Slab F-factor</u>	<u>0.035</u> <u>0.50</u>

^a ~~Nonfenestration~~ *U*-factors or *F*-factors shall be obtained from measurement, calculation or an approved source or as specified in Section ~~R402.1.5~~ **R402.1.3**.

^b ~~Reserved.~~

~~_____~~^e ~~Reserved.~~

R402.2 Specific insulation requirements (Prescriptive). In addition to the requirements of Section R402.1, insulation shall meet the specific requirements of Sections R402.2.1 through R402.2.11.

R402.2.1 Ceilings with attic spaces. Where Section R402.1.1 would require R-49 in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

R402.2.1.1 Loose insulation in attic spaces. Open-blown or poured loose fill insulation may be used in attic spaces where the slope of the ceiling is not more than 3 feet in 12 inches and there is at least 30 inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge.

R402.2.2 Reserved.

R402.2.3 Eave baffle. For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal to or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.

R402.2.4 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed *R*-value of the loose fill insulation.

Exception: Vertical doors that provide access from conditioned to unconditioned spaces shall be permitted to meet the fenestration requirements of Table R402.1.1.

R402.2.6 Steel-frame ceilings, walls, and floors. Steel-frame ceilings, walls, and floors shall comply with the *U*-factor requirements of Table R402.1.3.

R402.2.7 Floors. Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking. Insulation supports shall be installed so spacing is no more than 24-inches on center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

Exceptions:

1. The floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum Wood Frame *R*-value in Table R402.1.1 and extends from the bottom to the top of all perimeter floor framing members.
2. When foundation vents are not placed so that the top of the vent is below the lower surface of the floor insulation, a permanently attached baffle shall be installed at an angle of 30° from horizontal, to divert air flow below the lower surface of the floor insulation.
3. Substantial contact with the surface being insulated is not required in enclosed floor/ceiling assemblies containing ducts where full *R*-value insulation is installed between the duct and the exterior surface.

R402.2.8 Below-grade walls. Below-grade exterior wall insulation used on the exterior (cold) side of the wall shall extend from the top of the below-grade wall to the top of the footing and shall be approved for below-grade use. Above-grade insulation shall be protected. Insulation used on the interior (warm) side of the wall

shall extend from the top of the below-grade wall to the below-grade floor level and shall include R-5 rigid board providing a thermal break between the concrete wall and the slab.

R402.2.9 Slab-on-grade floors. The minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors shall be as specified in Table R402.1.1. The insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. A two-inch by two-inch (maximum) pressure treated nailer may be placed at the finished floor elevation for attachment of interior finish materials. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil.

R402.2.9.1 Heated slab-on-grade floors. The entire area of a heated slab-on-grade floor shall be thermally isolated from the soil with a minimum of R-10 insulation. The insulation shall be an approved product for its intended use. If a soil gas control system is present below the heated slab-on-grade floor, which results in increased convective flow below the heated slab-on-grade floor, the heated slab-on-grade floor shall be thermally isolated from the sub-slab gravel layer. R-10 heated slab-on-grade floor insulation is required for all compliance paths.

R402.2.10 Reserved.

R402.2.11 Masonry veneer. Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

R402.3 Fenestration (Prescriptive). In addition to the requirements of Section R402, fenestration shall comply with Sections R402.3.1 through R402.3.5.

R402.3.1 *U*-factor. An area-weighted average of fenestration products shall be permitted to satisfy the *U*-factor requirements.

R402.3.2 Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50 percent glazed shall be permitted to satisfy the SHGC requirements.

R402.3.3 Glazed fenestration exemption. Up to 15 square feet (1.4 m²) of glazed fenestration per dwelling unit shall be permitted to be exempt from *U*-factor and SHGC requirements in Section R402.1.1. This exemption shall not apply to the *U*-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

R402.3.4 Opaque door exemption. One side-hinged opaque door assembly up to 24 square feet (2.22 m²) in area is exempted from the *U*-factor requirement in Section R402.1.1. This exemption shall not apply to the *U*-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

R402.3.5 Reserved.

EQUATION 1 — GROUP R OCCUPANCY
TARGET UA

$$U_{AT} = U_W A_W + U_{BGW} A_{BGW} + U_{VG} A_{VG} + U_{OG} A_{OG} + U_F A_F + U_{RC} A_{RC} + U_D A_D + F_S P_S + F_{BGS} P_{BGS}$$

Where:

U_{AT} = the target combined thermal transmittance of the gross exterior wall, floor and roof/ceiling area.

U_W = the thermal transmittance value of the opaque above grade wall found in Table R 402.1.3.

A_W = opaque above grade wall area.

U_{BGW} = the thermal transmittance value of the below grade opaque wall found in Table R 402.1.3.

A_{BGW} = opaque below grade wall area.

U_{VG} = the thermal transmittance value of the fenestration found in Table R 402.1.3.

A_{VG} = (a) The proposed glazing area; where proposed fenestration glazing area is less than 15% of the conditioned floor area, minus A_{OG} .

(b) 15% of the conditioned floor area; where the proposed fenestration glazing area is 15% or more of the conditioned floor area, minus A_{OG} .

U_{OG} = the thermal transmittance value of the skylight glazing found in Table R 402.1.3.

A_{OG} = skylight glazing area (if the proposed A_{OG} exceeds 15 percent, the target A_{OG} shall be 15 percent of the total floor area of the conditioned space).

U_F = the thermal transmittance value of the floor found in Table R 402.1.3.

A_F = floor area over unconditioned space.

U_{RC} = the thermal transmittance value of the ceiling found in Table R 402.1.3.

A_{RC} = roof/ceiling area.

U_D = the thermal transmittance value of the fenestration found in Table R 402.1.3.

A_D = opaque door area.

F_S = concrete slab on grade component F-factor found in Table R 402.1.3.

P_S = lineal ft. of concrete slab on grade perimeter.

F_{BGS} = concrete below grade slab component F-factor found in Table R 402.1.3.

P_{BGS} = lineal ft. of concrete below grade slab perimeter.

EQUATION 2 — GROUP R OCCUPANCY
PROPOSED UA

$$UA = U_W A_W + U_{BGW} A_{BGW} + U_{VG} A_{VG} + U_{OG} A_{OG} + U_F A_F + U_{RC} A_{RC} + U_D A_D + F_S P_S + F_{BGS} P_{BGS}$$

Where:

UA = the combined thermal transmittance of the gross exterior wall, floor and roof/ceiling assembly area.

U_W = the thermal transmittance of the opaque above grade wall area.

A_W = opaque above grade wall area.

U_{BGW} = the thermal transmittance value of the below grade opaque wall.

A_{BGW} = opaque below grade wall area.

U_{VG} = the thermal transmittance value of the fenestration glazing.

A_{VG} = fenestration glazing area, including windows in exterior doors.

U_{OG} = the thermal transmittance value of the skylight glazing.

A_{OG} = skylight glazing area.

U_F = the thermal transmittance of the floor.

A_F = floor area over unconditioned space.

U_{RC} = the thermal transmittance of the ceiling.

A_{RC} = ceiling area.

U_D = the thermal transmittance value of the opaque door area.

A_D = opaque door area.

F_S = concrete slab on grade component F-factor.

P_S = lineal ft. of concrete slab on grade perimeter.

F_{BGS} = concrete below grade slab component F-factor.

P_{BGS} = lineal ft. of concrete below grade slab perimeter.

NOTE: Where more than one type of wall, window, roof/ceiling, door and skylight is used, the U and A terms for those items shall be expanded into sub-elements as:

$$U_{W1} A_{W1} + U_{W2} A_{W2} + U_{W3} A_{W3} + \dots \text{etc.}$$

NOTE: Below Grade Walls: The wall is assumed to extend from the slab upward to the top of the mud sill for the distance specified in Table A104.1, with 6 inches of concrete wall extending above grade. This will be calculated separately from above grade walls using the wall height that best describes the system.

**TABLE A104.1
DEFAULT WALL U-FACTORS AND SLAB F-FACTORS FOR BASEMENTS**

	Below Grade Wall U-factor	Below Grade Slab F-factor
2 Foot Depth Below Grade		
Uninsulated	0.350	0.59
R-11 Interior	0.065	0.59
R-11 Interior w/TB	0.070	0.60
R-19 Interior	0.043	0.69
R-19 Interior w/TB	0.045	0.61
R-10 Exterior	0.070	0.60
R-12 Exterior	0.061	0.60
3.5 Foot Depth Below Grade		
Uninsulated	0.278	0.53
R-11 Interior	0.062	0.63
R-11 Interior w/TB	0.064	0.57
R-19 Interior	0.041	0.64
R-19 Interior w/TB	0.042	0.57
R-10 Exterior	0.064	0.57
R-12 Exterior	0.057	0.57
7 Foot Depth Below Grade		
Uninsulated	0.193	0.46
R-11 Interior	0.054	0.56
R-11 Interior w/TB	0.056	0.42
R-19 Interior	0.037	0.57
R-19 Interior w/TB	0.038	0.43
R-10 Exterior	0.056	0.42
R-12 Exterior	0.050	0.42

TB = Thermal Break

**TABLE A104.1
DEFAULT WALL U-FACTORS AND SLAB F-FACTORS FOR BASEMENTS**

	Below Grade Wall U-factor	Below Grade Slab F-factor
2 Foot Depth Below Grade		
Uninsulated	<u>0.331</u>	<u>0.58</u>
R-11 Interior	<u>0.063</u>	<u>0.67</u>
R-11 Interior w/TB	0.070 <u>0.065</u>	0.60 <u>0.59</u>
R-19 Interior	<u>0.042</u>	<u>0.68</u>
R-19 Interior w/TB	<u>0.045</u>	0.61 <u>0.59</u>
R-21 Interior	<u>0.040</u>	<u>0.68</u>
R-21 Interior w/TB	0.045 <u>0.042</u>	<u>0.59</u>
R-21+R-5 ci Interior	0.029 <u>0.031</u>	<u>0.68</u>
R-21+R-5 Interior w/TB	0.042 <u>0.032</u>	<u>0.59</u>

<u>R-21 plus R-7 ci Interior</u>	<u>0.029</u>	<u>0.68</u>
<u>R-21+R-7 Interior w/TB</u>	<u>0.030</u>	<u>0.59</u>
<u>R-10 Exterior</u>	<u>0.089</u>	<u>0.56</u>
<u>R-12 Exterior</u>	<u>0.061</u>	<u>0.60</u>
3.5 Foot Depth Below Grade		
<u>Uninsulated</u>	<u>0.271</u>	<u>0.51</u>
<u>R-11 Interior</u>	<u>0.058</u>	<u>0.61</u>
<u>R-11 Interior w/TB</u>	<u>0.061</u>	<u>0.55</u>
<u>R-19 Interior</u>	<u>0.041</u>	<u>0.62</u>
<u>R-19 Interior w/TB</u>	<u>0.042</u>	<u>0.53 0.55</u>
<u>R-21 Interior</u>	<u>0.038</u>	<u>0.63</u>
<u>R-21 Interior w/TB</u>	<u>0.044 0.040</u>	<u>0.56</u>
<u>R-21+R-5 Interior</u>	<u>0.030</u>	<u>0.632</u>
<u>R-21+R-5 Interior w/TB</u>	<u>0.031</u>	<u>0.56</u>
<u>R-21 plus R-7 ci</u>	<u>0.027</u>	<u>0.63</u>
<u>R-21 plus R-7 ci w/TB</u>	<u>0.029</u>	<u>0.56</u>
<u>R-10 Exterior</u>	<u>0.075</u>	<u>0.52</u>
<u>R-12 Exterior</u>	<u>0.057</u>	<u>0.57</u>
7 Foot Depth Below Grade		
<u>Uninsulated</u>	<u>0.185</u>	<u>0.43</u>
<u>R-11 Interior</u>	<u>0.051</u>	<u>0.541</u>
<u>R-11 Interior w/TB</u>	<u>0.053</u>	<u>0.49</u>
<u>R-19 Interior</u>	<u>0.036</u>	<u>0.54</u>
<u>R-19 Interior w/TB</u>	<u>0.037</u>	<u>0.50</u>
<u>R-21 Interior</u>	<u>0.035</u>	<u>0.56</u>
<u>R-21 Interior w/TB</u>	<u>0.035</u>	<u>0.50</u>
<u>R-21+R-5 Interior</u>	<u>0.027</u>	<u>0.56</u>
<u>R-21+R-5 Interior w/TB</u>	<u>0.028</u>	<u>0.50 0.51</u>
<u>R-21+R-7 Interior</u>	<u>0.025</u>	<u>0.57</u>
<u>R-21+R-7 Interior w/TB</u>	<u>0.026</u>	<u>0.51</u>
<u>R-10 Exterior</u>	<u>0.058</u>	<u>0.47</u>
<u>R-12 Exterior</u>	<u>0.050</u>	<u>0.42</u>

TB = R-5 Thermal Break

Purpose of code change:

Create consistent and enforceable building envelope section. This change provides clarifications, but not change the requirements of the code. The current code language does not provide specific instruction in the application of the R-value and U-factor alternative approaches. Updates to footnotes.

R402.1.2 R-value computation. This language was adopted from the 2018 IECC. The reference to section R303 is in addition to the IECC language.

R402.1.3 U-factor alternative. Added a pointer to the source of u-factors - appendix A.

R402.1.4 Total UA alternative.

The primary objective of this code change is to clarify the Total UA alternative. It begins with the changes in this paragraph.

This proposal adopts with modifications equation 1 and equation 2 from the 2009 WSEC. The primary modification is the adoption of the 15% glazing area language from the existing standard and as represented in the systems analysis approach. "For the base building UA calculation, the maximum glazing area is 15% of the floor area".

NEW R402.1.5 U-factor reference and calculations. This section has been separated from R402.1.4 because it *also* applies to section R402.1.3 and many other UA references in the code.

TABLE R402.1.1

Deleted SHGC row. This is not used in the WSEC
Deleted Mass Wall row. This is not any different than other above grade walls. Walls other than wood frame should comply with the prescriptive U-factor requirement R402.1.3 U-factor alternative.
Modified below grade wall R-value to include the required R-5 thermal break requirement.

Modified table footnotes to provide clarifications.
b. modified to be consistent with the deleted SHGC requirements
c. modified to include the required R-5 thermal break requirement
e,f,g,h,i,j and l Deleted footnotes. No longer used
k. added detail to the footnote for clarity. Based on the text from section R402.2.1 Now footnote e in the table and reference.
m. added detail to clarify the requirements for "int" framing based on the description in appendix a. Now footnote f in the table and reference.
n. Now footnote g in the table and reference.

TABLE R402.1.3

Changed Wood Frame Wall U-factor to above grade wall u-factor providing reference u for all above grade walls.

Deleted mass wall u-factor. It is no different than other walls in the WSEC.

Deleted below grade wall u-factor row. Replaced with below grade wall u-factors and F-factors found in appendix A of the code book. This is consistent with the method used in the WSEC 2009.

Footnote changes:

- a. Updated the language consistent with changes in section R402.1.5
- b. and c. Deleted.

R402.2.1.1 Add "inches" to the roof slope

Added equation 1 and 2. These equations were added to clarify the required calculation method. This proposal adopts with modifications equation 1 and equation 2 from the 2009 WSEC. The primary modification is the adoption of the 15% glazing area language from the existing standard and as represented in the systems analysis approach. "For the base building UA calculation, the maximum glazing area is 15% of the floor area".

TABLE A104.1. Update the below grade wall u-factor table to support existing rules. Code requires R-21 + R5 TB. This and other values were added based on the Super Good Cents Heat Loss Reference Guide IV, 1991. Target U-factors in Table R402.1.3 were updated to be consistent with these reference values.

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