RULE-MAKING ORDER
(RCW 34.05.360)

CR-103 (10/1/89)

Agency: State Building Code Council

☐ Permanent Rule
☒ Emergency Rule

(1) Date of adoption: January 14, 1994

(2) Purpose: To adopt revised requirements for complying with window thermal efficiency standards in the Washington State Energy Code.

(3) Citation of existing rules affected by this order:
Repealed: Chapter 51-11-1006 WAC
Amended: Chapter 51-11-0502 and 51-11-1011 WAC
Suspended:

(4) Authority for adoption:
Statute: RCW 19.27, 19.27A and 34.05
Other Authority:

(5.1) **PERMANENT RULE ONLY**
Pursuant to notice filed as WSR _____ on _____ (date).
Describe any changes other than editing from proposed to adopted version:

(5.2) **EMERGENCY RULE ONLY**
Pursuant to RCW 34.05.350 the agency for good cause finds:
☒ (a) That immediate adoption, amendment, or repeal of a rule is necessary for the preservation of the public health, safety, or general welfare, and that observing the time requirements of notice and opportunity to comment upon adoption of a permanent rule would be contrary to the public interest.
☐ (b) That state or federal law or federal rule or a federal deadline for state receipt of federal funds requires immediate adoption of a rule.

Reasons for this finding:
See Attached

(5.3) Any other findings required by other provisions of law as precondition to adoption or effectiveness of rule?
☒ Yes ☐ No If yes, explain:
Pursuant to RCW 34.05.350, subsection 2 and 19.27A.045; the permanent rule is set to go into effect on April 1, 1994, at the end of the legislative session. The purpose of filing this second emergency rule is to provide regulations during the time lapse between the expiration date of the first emergency rule and the effective date of the permanent rule.

(6) Effective date of rule:

Permanent Rules	Emergency Rules
☐ 31 days after filing	☒ Immediately
☐ Other (specify) _____ *	☐ Later (specify) _____

*(If less than 31 days after filing, specific finding in 5.3 under RCW 34.05.380(3) is required)

NAME (TYPE OR PRINT): Gene Colin
SIGNATURE:
TITLE: Chair
DATE: 2/03/94

CODE REVISER USE ONLY

CODE REVISER'S OFFICE
STATE OF WASHINGTON
FILED
FEB 03 1994
TIME 2:40
WSR 94-05-007

DECLARATION OF EMERGENCY AND FINDINGS TO SUPPORT EMERGENCY RULEMAKING

The State Building Code Council (Council), based on the following enumerated good cause, finds that an emergency affecting the general welfare of the state of Washington exists. The Council further finds that immediate adoption and repeal of certain Council rules is necessary for the public welfare and that observing the time requirements of notice and opportunity to comment would be contrary to the public interest.

The declaration of emergency affecting the general welfare of the state of Washington is based on the following findings:

In January 1993, the Federal Trade Commission (FTC) filed a lawsuit against Pacific Inspection and Research Laboratory, Inc. (PIRL) challenging the reliability of thermal value (U-value) tests conducted by PIRL on window products.

On August 30, 1993 the FTC and PIRL entered into a Settlement Agreement (FINAL JUDGMENT AND ORDER FOR PERMANENT INJUNCTION AND SETTLEMENT OF CLAIMS FOR RELIEF) whereby PIRL has agreed to retract the tested U-values for all thermal performance tests conducted between January 1, 1984 and March 16, 1992 and may either retract or correct thermal performance tests conducted after March 16, 1992. The Settlement Agreement will be entered as an order by the Federal Court having jurisdiction over the FTC v. PIRL lawsuit.

The Council, under RCW 19.27A.020(5), maintains a list of the tested U-values for glazing products available in the state (window list). 442 tests conducted by PIRL prior to March 16, 1992 and 31 tests conducted after March 16, 1992 have been submitted to the Council for placement on the window list.

The 473 PIRL tests comprise approximately 50% of the window list and according to testimony of representatives of Washington State window manufacturers, those 473 PIRL tests account for approximately 80% of the windows sold in the state of Washington. Following the retraction of the U-value test scores by PIRL, between 442 and 473 window products will be without tested U-values.

The Council is responsible for adoption of the Washington State Energy Code (Energy Code), chapter 51-11 WAC. The Energy

Code sets forth a requirement that thermal values be tested U-values and that all glazing and doors be labeled with an overall product U-value that is no less than the actual tested U-value. See WAC 51-11-502.1.5.1. The labeled U-value is used in all calculations to determine compliance with the Energy Code. The Energy Code also provides that untested glazing and doors can be assigned U-values under the Energy Code's default tables. See WAC 51-11-502.1.5.1, Exception 4.

The current Energy Code authorizing statute specifies AAMA or ASTM thermal testing of windows. However, the industry standards are changing to National Fenestration Rating Council (NFRC) testing standards. The Council has received testimony that only three laboratories in the United States are presently testing to AAMA standards. The lack of laboratory space, the costs of the tests and the change in the industry standard do not make retesting to AAMA standards feasible.

Currently, NFRC tested amd certified values can be used to satisfy Energy Code compliance. See WAC 51-11-502.1.5.1, Exception 7. However, few window manufacturers currently have completed product line testing to NFRC standards which would allow the sale of window products under that exception to the Code.

The current Energy Code default table contains punitive U-values for window products. Such a default table was adopted to encourage U-Value testing but is not usable to competitively sell windows in the marketplace.

The adoption of new interim default tables is required to allow the continued sale of existing PIRL-tested inventory to prevent chaos in the marketplace which would be caused by the inability of retailers and manufacturers to sell existing inventory and a shortage of window products.

The adoption of interim default tables will also prevent the immediate layoff of personnel in the window manufacturing industry which might otherwise occur in companies which have sold all or a majority of their products in reliance on PIRL tests and have not yet completed testing to NFRC standards.

The continuation of the sale of products under interim default tables will also preserve jobs in the construction industry, help assure that shortages of doors and window products are avoided and new housing is affordable and timely completed. A sufficient availability of windows is required for protection

from vandalism and from the elements in current construction which might otherwise occur if builders are unable to purchase adequate quantities of window products to place in structures currently under construction.

The adoption of interim default tables will also prevent confusion among inspectors and building officials who are responsible for reviews of Energy Code compliance.

The adoption of interim default tables will also help to offset a disproportionate impact of the PIRL test retraction on small businesses, many of whom sell all or a substantial portion of their inventory in reliance on PIRL tests. Without the interim default table, many small businesses would have no mechanism by which to sell their products and could go out of business.

The elimination of approximately 80% of the tested products on the market would have an adverse effect on participation in programs sponsored by regional electric utilities which are designed to encourage energy efficient homes and energy conservation. Less energy conservation is not in the best interests of the Northwest given the future rate increases being faced by electric utilities.

The adoption of interim default tables based on average performance values from the ASHRAE tables will help assure regional electric utilities that they are getting what they are paying for in current conservation payment programs.

The Council therefore adopts emergency rules under RCW 34.05.350 which are proposed in Attachment 2.

AMENDATORY SECTION (Amending WSR 92-01-140, filed 12/19/91, effective 7/1/92)

WAC 51-11-0502 Building envelope requirements.

502.1 General:

502.1.1: The stated U- or F-value of any component assembly, listed in Table 5-1 or 5-2, such as roof/ceiling, opaque wall or opaque floor may be increased and the U-value for other components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-values specified in this Section.

The U-values for typical construction assemblies are included in Chapter 10. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Chapter 10, values shall be calculated in accordance with Chapters 19-27 in RS-1 listed in Chapter 7, using the framing factors listed in Chapter 10 where applicable.

For envelope assemblies containing metal framing, the U-value shall be determined by one of the following methods:

1. Results of laboratory or field measurements.

2. Standard RS-25, listed in Chapter 7, where the metal framing is bonded on one or both sides to a metal skin or covering.

3. The zone method as provided in Chapter 22 of RS-1, listed in Chapter 7.

4. Effective framing/cavity R-values as provided from the following table for metal stud walls:

WALL FRAMING	CAVITY	INSULATION
	R-11	R-19
2 x 4 @ 16" o.c.	5.50	-
2 x 4 @ 24" o.c.	6.60	-
2 x 6 @ 16" o.c.	-	7.60
2 x 6 @ 24" o.c.	-	8.55

502.1.2: For consideration of thermal mass effects, see section 402.4.

502.1.3: When return air ceiling plenums are employed, the roof/ceiling assembly shall:

a. For thermal transmittance purposes, not include the ceiling proper nor the plenum space as part of the assembly; and

b. For gross area purposes, be based upon the interior face of the upper plenum surface.

502.1.4 Insulation:

502.1.4.1 General: All insulating materials shall comply with sections 1712 and/or 1713 of the Uniform Building Code. Substantial contact of the insulation with the surface being

insulated is requ. ed. All insulation materia. . shall be installed according to the manufacturer's instructions to achieve proper densities, and maintain uniform R-values. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value.

502.1.4.2 Insulation Materials: All insulation materials including facings such as vapor barriers or breather papers installed within floor/ceiling assemblies, roof/ceiling assemblies, walls, crawl spaces, or attics shall have a flame spread rating of less than twenty-five and a smoke density not to exceed four hundred fifty when tested in accordance with UBC Standard 42-1.

EXCEPTIONS:
1. Foam plastic insulation shall comply with section 1712 of the Uniform Building Code.
2. When such materials are installed in concealed spaces of Types III, IV, and V construction, the flame spread and smoke developed limitations do not apply to facing, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor, or wall finish.
3. Cellulose insulation shall comply with section 1713 of the Uniform Building Code.

502.1.4.3 Clearances: Where required, insulation shall be installed with clearances according to manufacturers specifications. Insulation shall be installed so that required ventilation is unobstructed. For blown or poured loose fill insulation clearances shall be maintained through installation of a permanent retainer.

502.1.4.4 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 which prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer must 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.

502.1.4.5 Roof/Ceiling Insulation: Open-blown or poured loose-fill insulation may be used in attic spaces where the slope of the ceiling is not more than three feet in twelve and there is at least thirty 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. When eave vents are installed, baffling of the vent openings shall be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be, rigid material, resistant to wind driven moisture. Requirements for baffles for ceiling insulation shall meet the Uniform Building Code section 3205(c) for minimum ventilation requirements. When feasible, the baffles shall be installed from the top of the outside of the exterior wall, extending inward, to a point six inches vertically above the height of noncompressed insulation, and twelve inches vertically above loose fill insulation.

502.1.4.6 Wall Insulation: Insulation installed in exterior walls shall comply with the provisions of this section. All wall insulation shall fill the entire cavity. Exterior wall cavities isolated during framing shall be fully insulated to the levels of the surrounding walls. All faced insulation shall be face stapled to avoid compression.

502.1.4.7 Floor Insulation: Floor insulation shall be installed in a permanent manner in substantial contact with the surface being insulated. Insulation supports shall be installed so spacing is no more than twenty-four inches on center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

EXCEPTION: Insulation may be omitted from floor areas over heated basements, heated garages, or underfloor areas used as HVAC supply plenums. See Uniform Mechanical Code section 1008 for underfloor supply plenum requirements. When foundation walls are insulated, the insulation shall be attached in a permanent manner. The insulation shall not block the airflow through foundation vents when installed. 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 thirty degrees from horizontal, to divert air flow below the lower surface of the floor insulation.

502.1.4.8 Slab-On-Grade: Slab-on-grade insulation, installed inside the foundation wall, shall extend downward from the top of the slab for a minimum distance of twenty-four inches or downward and then horizontally beneath the slab for a minimum combined distance of twenty-four inches. Insulation installed outside the foundation shall extend downward to a minimum of twenty-four inches or to the frostline. Above grade insulation shall be protected.

EXCEPTION: For monolithic slabs, the insulation shall extend downward from the top of the slab to the bottom of the footing.

502.1.4.9 Radiant Slabs: The entire area of a radiant slab 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 radiant slab, which results in increased convective flow below the radiant slab, the radiant slab shall be thermally isolated from the sub-slab gravel layer.

502.1.4.10 Below-Grade Walls:

a. 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.

b. 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.

502.1.5 Glazing and Door U-Values: For Group R Occupancy, glazing and door U-values shall be determined in accordance with

section 502.1.5.1. For other occupancies, glazing and door U-values shall be determined in accordance with either section 502.1.5.1 or 502.1.5.2.

502.1.5.1 Standard Procedure for Determination of Glazing and Door U-Values: U-values for glazing and doors, including all fire doors, shall be the tested U-values for thermal transmittance due to conduction resulting from either the AAMA 1503.1-88 test procedure or the ASTM C236-87 or C976-82 test procedures, provided that testing shall be conducted under established winter horizontal heat flow test conditions using fifteen mile per hour wind speed directed perpendicular to the exterior surface of the glazing as specified under AAMA 1503.1-88.

AAMA 1503.1-88 testing, shall be conducted by a laboratory accredited by AAMA to perform that test. ASTM C236-87 or C976-82 testing shall be conducted by an independent laboratory accredited by a nationally recognized accreditation program, independent of that laboratory. All tested U-values reported for listing by the state building code council after January 1, 1991, shall include certification by the manufacturer of gas content in the sealed insulated glass unit used for testing and in the production unit.

Product samples tested shall be production line units or representative of units as purchased by the consumer or contractor. Product sample sizes tested shall be in accordance with AAMA 1503.1-88, except that skylights shall be tested with a nominal two foot by four foot size, or a nominal four foot by four foot size. The installation of the test sample shall be in accordance with AAMA 1503.1-88, section 8.4. All testing performed after January 1, 1991, shall not include screens. All glazing and doors shall be identified with a label that states an overall product U-value that is no less than the actual tested <u>or default</u> U-value. The labeled U-value shall be used in all calculations to determine compliance with this Code. Sealed insulating glass shall conform to, or be in test for, ASTM E-774-81 level A.

EXCEPTIONS:

1. The exterior frame dimensions of the product sample size tested shall not deviate by more than three inches from the height and width specified, except that skylights are allowed to be tested in the closest production line size to that specified above.
2. Passive air inlets are not required to be part of the tested assembly.
3. Products tested prior to December 31, 1990, to AAMA 1503.1- 80, ASTM C236-80 or C976-82 which are not in compliance with the test size requirement above, and which are in compliance with the product sample sizes in AAMA 1503.1-80, shall be acceptable until December 31, 1994.
4. Untested glazing and doors shall be assigned the default U-values listed in Chapter 10. The default values for the opaque portions of doors shall be those listed in Chapter 10, provided that the U-value listed for a door with a thermal break shall only be allowed if

both the door and the frame have a thermal break.

5. The U-value of an insulated glazing product which has a 'grille pattern' installed between the glazing layers shall be deemed equal to the U-value of an insulated glazing product which is tested without a 'grille pattern' in between glazing layers, provided a minimum one-eighth inch air space exists between the 'grille pattern' and both glass lites.
6. For a glazing product which is manufactured with an alternative 'low-e coating' than the 'low-e coating' of the tested glazing product, the U-value shall be deemed equal provided that the alternative 'low-e coating' material has an equal or lower rated emissivity.
7. U-factors, either tested or simulated, labeled and certified in accordance with the National Fenestration Rating Council's (NFRC) procedure 100-91 are acceptable if based on model size AA.
8. (a) A vinyl or wood double-pane window, with a minimum 1/2 inch air space between glazing, and either a low-e glazing or an argon fill of no less than 90%, shall be deemed to satisfy where a 0.40 U-factor is required.
   (b) An aluminum, double-pane window, with a minimum 7/16 air space between glazing shall be deemed to satisfy the glazing U-factor for other fuels where a 0.65 U-factor is required.

502.1.5.2 Alternate Glazing and Door U-Values for Other Than Group R Occupancy: Glazing U-values for other than Group R Occupancy are also allowed to be taken from Table 13 of Chapter 27 of RS-1 listed in Chapter 7 or calculated in accordance with the procedures of Chapter 27 of RS-1 listed in Chapter 7 and door U-values are also allowed to be taken from Table 6 in Chapter 22 of RS-1 listed in Chapter 7.

502.1.6 Moisture Control:

502.1.6.1: Vapor retarders shall be installed on the warm side (in winter) of insulation as specified in the following cases.

EXCEPTION: Vapor retarder installed with not more than one-third of the nominal R-value between it and the conditioned space.

502.1.6.2 Floors: Floors separating conditioned space from unconditioned space shall have a vapor retarder installed. The vapor retarder shall have a one perm dry cup rating or less (i.e., four mil. polyethylene or kraft faced material).

502.1.6.3: Roof/ceiling assemblies where the ventilation space above the insulation is less than an average of twelve inches shall be provided with a vapor retarder. Faced batt insulation where used as a vapor retarder shall be face stapled. Single rafter joist vaulted ceiling ((~~cavaties [cavities]~~)) cavities shall be of sufficient depth to allow a minimum one inch vented air space above the insulation.

502.1.6.4: Vapor retarders shall not be required in roof/ceiling assemblies where the ventilation space above the insulation averages twelve inches or greater.

502.1.6.5: Vapor retarders shall not be required where all of the insulation is installed between the roof membrane and the structural roof deck.

502.1.6.6 Wall Insulation: Walls separating conditioned space from unconditioned space shall have a vapor retarder installed. Faced batt insulation shall be face stapled.

502.1.6.7 Ground Cover: A ground cover of six mil (0.006 inch thick) black polyethylene or approved equal shall be laid over the ground within crawl spaces. The ground cover shall be overlapped twelve inches minimum at the joints and shall extend to the foundation wall.

EXCEPTION: The ground cover may be omitted in crawl spaces if the crawl space has a concrete slab floor with a minimum thickness of three and one-half inches.

502.2 Thermal Criteria for Group R Occupancy:

502.2.1: The proposed UA as calculated using Equations 2 and 3 shall not exceed the Target UA as calculated using Equation 1. For the purpose of determining equivalent thermal performance, the glazing area for the target UA shall be calculated using figures in Table 5-1, and all the glazing shall be located in the wall area. The opaque door area shall be the same in the target UA and the proposed UA.

502.2.2 Space Heat Type: The following two categories comprise all space heating types:

1. Electric Resistance: Space heating systems which include baseboard units, radiant units, and forced air units as either the primary or secondary heating system.

EXCEPTION: Electric resistance systems for which the total electric heat capacity in each individual dwelling unit does not exceed the greater of: 1) One thousand watts per dwelling unit, or; 2) One watt per square foot of the gross floor area.

2. Other: All gas, wood, oil, and propane space heating systems, unless electric resistance is used as a secondary heating system, and all heat pump space heating systems. (See EXCEPTIONS, Electric Resistance, section 502.2.2 above.)

502.3 Thermal Performance Criteria For Other Than Group R Occupancies.

502.3.1: The overall thermal transmittance value (U^o) of the gross area of elements of the exterior building envelope of all buildings other than low-rise residential buildings shall not exceed the values given in Tables 5-2. Equations 2, 4 and 5 shall be used to determine acceptable combinations of building components and thermal properties to meet this requirement for heating. U^o and U^w are specified in units of:

$$\frac{\text{Btu}}{\text{hr.}\bullet\text{ft}^2\bullet^\circ\text{F}}$$

502.3.2 Slab on Grade Floors: For slab on grade floors the thermal resistance of the insulation around the perimeter of the floor shall not be less than the value given in Table 5-2.

502.3.3 Alternative Wall Allowance for Other Than Group R Occupancies: For other than Group R Occupancies, three stories or less, the maximum allowed value for average thermal transmittance (U_o) of the exterior walls may be increased to the values given in Table 5-2 BUILDINGS OVER THREE CONDITIONED STORIES provided that at least one of the following criteria is also met:

1. Mechanical supply of outside air and mechanical exhaust of building air shall be automatically shut off and the duct closed for at least eight hours per day during hours of nonoccupancy, or

2. The primary source of heating for the building shall be one or more heat pumps meeting the provisions of section 503.4.2 or gas or oil combustion heating equipment with a minimum combustion efficiency of eighty-five percent for central heating plants and eighty percent for room and space heaters. This efficiency shall be determined in accordance with the provisions of section 503.4.3.

Provided further: That if both criteria are met, the maximum allowed value for thermal transmittance (U^o) of the exterior walls used in Table 5-2 may be increased by 0.05 in determining compliance with the provisions of the Code.

For walls with a wall weight of at least thirty lbs. per ft^2 (provided that walls constructed of hollow masonry units have cores filled with either grout, concrete, or with an insulating material with resistance per inch (R) of at least 2.25 $ft^2/hr.-°F/Btu$) the calculated thermal resistance of the wall sections measured face to face on wall units which are exposed to inside air temperatures, not including the thermal resistance of air films or additional exterior wall elements may be increased by twenty-five percent in determining compliance with the provisions of the code provided that:

Heating and cooling set-point temperatures in the conditioned spaces or zones of the building shall be separated by at least five degrees F. The temperature control shall be designed to prevent new energy from being used to heat the space above the heating set-point temperature or cool the space below the cooling set-point temperature.

502.4 Air Leakage for All Occupancies:

502.4.1: The requirements of this section shall apply to all buildings and structures, or portions thereof, and only to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled.

502.4.2: Exterior doors and windows shall be designed to limit air leakage into or from the building envelope. Site-constructed doors and windows shall be sealed in accordance with Section 502.4.3.

502.4.3:

a. Exterior joints around windows and door frames, openings between walls and foundation, between walls and roof and wall panels; openings at penetrations of utility services through walls, floors, and roofs; and all other openings in the building envelope

for all occupancy and all other openings in between units in R-1 occupancy shall be sealed, caulked, gasketed, or weatherstripped to limit air leakage.

b. All exterior doors or doors serving as access to an enclosed unheated area shall be weatherstripped to limit leakage around their perimeter when in a closed position.

c. Site built windows are exempt from testing but shall be made tight fitting. Fixed lights shall have glass retained by stops with sealant or caulking all around. Operating sash shall have weatherstripping working against overlapping trim, and a closer/latch which will hold the sash closed. The window frame to framing crack shall be made tight with caulking, overlapping membrane, or other approved technique.

d. Openings that are required to be fire resistive are exempt from this section.

502.4.4 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 rated, installed inside a sealed box constructed from a minimum one-half inch thick gypsum wall board, or constructed from a preformed polymeric vapor barrier, or other air tight assembly manufactured for this purpose.

3. Type IC rated, certified under ASTM E283 to have no more than 2.0 cfm air movement from the conditioned space to the ceiling cavity. The lighting fixture shall be tested at seventy-five Pascals or 1.57 lbs/ft^2 pressure difference and have a label attached, showing compliance.

AMENDATORY SECTION (Amending WSR 91-01-112, filed 12/19/90, effective 7/1/91)

WAC 51-11-1006 Section 1006 ((~~Default U-values for glazing and doors~~)).

((~~1006.1 Untested Glazing and Doors: Untested glazing and doors shall be assigned the following U-values:~~

~~a. Manufactured glazing products:~~

~~single glazing (all):~~	~~U = 1.20;~~
~~double glazing:~~	
~~aluminum or steel framed:~~	~~U = 0.90;~~
~~wood or vinyl framed:~~	~~U = 0.75;~~

~~b. Nonmanufactured site built fixed lite glazing products with a minimum of one-half inch airspace in a wood frame only. All products supplied by manufacturers, such as kits for solariums, shall use the default U-values for manufactured glazing products cited above.~~

~~air filled: U = 0.60;~~
~~argon filled: U = 0.55;~~
~~low-e, air filled: U = 0.50;~~
~~low-e, argon filled: U = 0.40;~~

~~Products which do not comply with all of these criteria shall use the default U values listed under manufactured glazing products.~~

~~c. For Doors, see Table 10-6 on the next page.~~)) Reserved.

TABLE 10-6 TRANSMISSION COEFFICIENTS (U) FOR WOOD AND STEEL DOORS
Btu/hr•ft^2•°F

Nominal Door Thickness, Inches	Description	No Storm Door	Wood Storm Door[c]	Metal Storm Door[d]
Wood Doors[b]				
1-3/8	Panel door with 7/16 inch panels[e]	0.57	0.33	0.37
1-3/8	Hollow core flush door	0.47	0.30	0.32
1-3/8	Solid core flush door	0.39	0.26	0.28
1-3/4	Panel door with 7/16 inch panels[e]	0.57	0.33	0.36
1-3/4	Hollow core flush door	0.46	0.29	0.32
1-3/4	Panel door with 1-1/8 inch panels[e]	0.39	0.26	0.28
1-3/4	Solid core flush door	0.33	0.28	0.25
2-1/4	Solid core flush door	0.27	0.20	0.21
Steel Doors[b]				
1-3/4	Fiberglass or mineral wool core w/ steel stiffeners, no thermal break[f]	0.60	----	----
1-3/4	Paper honeycomb core without thermal break[f]	0.56	----	----
1-3/4	Solid urethane foam core without thermal break[a]	0.40	----	----
1-3/4	Solid fire rated mineral fiberboard core without thermal break[f]	0.38	----	----
1-3/4	Polystyrene core without thermal break(18 gage commercial steel)[f]	0.35	----	----
1-3/4	Polyurethane core without thermal break(18 gage commercial steel)[f]	0.29	----	----
1-3/4	Polyurethane core without thermal break(24 gage commercial steel)[f]	0.29	----	----
1-3/4	Polyurethane core w/ thermal break & wood perimeter(24 gage commercial steel)[f]	0.20	----	----
1-3/4	Solid urethane foam core with thermal break	0.19	0.16	0.17

Note: All U-factors for exterior doors in this table are for doors with no glazing, except for the storm doors which are in addition to the main exterior door. Any glazing area in exterior doors should be included with the appropriate glass type and analyzed. Interpolation and moderate extrapolation are permitted for door thicknesses other than those specified.

[a] Values are based on a nominal 32 by 80 in. door size with no glazing.

[b] Outside air conditions: 15 mph wind speed, 0°F air temperature; inside air conditions: natural convection, 70°F air temperature.

[c] Values for wood storm door are for approximately 50 percent glass area.

[d] Values for metal storm door are for any percent glass area.

[e] 55 percent panel area

[f] ASTM C-236 hotbox data on a nominal 3 by 7 ft door size with no glazing.

The U-factors in Table 6 are for exterior wood and steel doors. The values given for wood doors were calculated, and those for steel doors were taken from hot box tests (Sabine et al. 1975; Yellot 1965) or from manufacturer's test reports. An outdoor surface conductance of 6.0 Btu/hr•ft^2•°F was used, and the indoor surface conductance was taken as 1.4 Btu/hr•ft^2•°F for vertical surfaces with horizontal heat flow. All values given are for exterior doors without glazing. If an exterior door contains glazing, the glazing should be analyzed as a window.

NEW SECTION

WAC 51-11-1011 Default U-values for glazing and doors.

1011.1 Untested Glazing and Doors: Untested glazing and doors shall be assigned U-values from Tables 10-11A, 10-11B or 10-11C as appropriate.

TABLE 10-11A
APPROVED WINDOW AND SKYLIGHT DEFAULT TABLE[1,2]

DESCRIPTION[3, 4, 5, 6,7]	FRAME TYPE [8, 9]			
	ALUMINUM	ALUM. THERMAL BREAK[10]	WOOD/VINYL	ALUM. CLAD WOOD / REINFORCED VINYL10
Double, Clear 1/4"	0.82	0.66	0.56	0.59
Double, Clear 1/4" + argon	0.77	0.63	0.53	0.56
Double, Low-e4 1/4"	0.76	0.61	0.52	0.54
Double, Low-e21/4"	0.73	0.58	0.49	0.51
Double, Low-e1 1/4"	0.70	0.55	0.47	0.49
Double, Low-e4 1/4" + argon	0.70	0.55	0.47	0.49
Double, Low-e2 1/4" + argon	0.66	0.52	0.43	0.46
Double, Low-e1 1/4" + argon	0.64	0.50	0.41	0.43
Double, Clear 3/8"	0.78	0.63	0.54	0.57
Double, Clear 3/8" + argon	0.75	0.60	0.51	0.54
Double, Low-e4 3/8"	0.72	0.57	0.48	0.51
Double, Low-e2 3/8"	0.69	0.54	0.45	0.48
Double, Low-e1 3/8"	0.66	0.51	0.43	0.46
Double, Low-e4 3/8" + argon	0.68	0.53	0.44	0.47
Double, Low-e2 3/8" + argon	0.63	0.49	0.41	0.44
Double, Low-e1 3/8" + argon	0.61	0.47	0.39	0.41
Double, Clear 1/2"	0.75	0.60	0.50	0.54
Double, Clear 1/2" + argon	0.72	0.58	0.48	0.51
Double, Low-e4 1/2"	0.68	0.53	0.44	0.47
Double, Low-e2 1/2"	0.64	0.50	0.41	0.44
Double, Low-e1 1/2"	0.61	0.47	0.39	0.42
Double, Low-e4 1/2" + argon	0.65	0.50	0.42	0.44
Double, Low-e2 1/2" + argon	0.60	0.46	0.37	0.40
Double, Low-e1 1/2" + argon	0.58	0.43	0.35	0.38
Triple, Clear 1/4"	0.66	0.52	0.42	0.44
Triple, Clear 1/4" + argon	0.63	0.49	0.39	0.42
Triple, Low-e4 1/4"	0.64	0.50	0.40	0.40
Triple, Low-e2 1/4"	0.62	0.48	0.39	0.41
Triple, Low-e1 1/4"	0.61	0.47	0.38	0.40
Triple, Low-e4 1/4" + argon	0.60	0.46	0.37	0.39
Triple, Low-e2 1/4" + argon	0.58	0.43	0.34	0.37
Triple, Low-e1 1/4" + argon	0.57	0.42	0.34	0.36
Triple, Clear 1/2"	0.61	0.46	0.37	0.40
Triple, Clear 1/2" + argon	0.59	0.45	0.36	0.38
Triple, Low-e4 1/2"	0.58	0.43	0.35	0.37
Triple, Low-e2 1/2"	0.55	0.41	0.32	0.35
Triple, Low-e1 1/2"	0.54	0.39	0.31	0.33
Triple, Low-e4 1/2" + argon	0.55	0.41	0.32	0.35
Triple, Low-e2 1/2" + argon	0.52	0.38	0.30	0.32
Triple, Low-e1 1/2" + argon	0.51	0.37	0.29	0.31

Footnotes for Table 10-11A

1 The following exceptions shall apply to the default table:

(a) A vinyl or wood, double-pane window, with a minimum 1/2 inch air space between glazings, and either a low-e glazing or an argon fill of no less than 90%, shall be deemed to satisfy the glazing U-value for the electric resistance prescriptive paths III and IV in Table 6-1 and II and III in Table 6-3.

(b) An aluminum, double-pane window, with a minimum 7/16 inch air space between glazings shall be deemed to satisfy the glazing U-value for the other fuels prescriptive paths II and IV in Table 6-2 and II and III in Table 6-4.

2 Subtract 0.02 from the listed default U-value for non-aluminum spacer. Acceptable spacer materials may include but is not limited to fiberglass, wood and butyl or other material with an equivalent thermal performance.

3 1/4" = a minimum dead air space of 0.25 inches between the panes of glass.
3/8" = a minimum dead air space of 0.375 inches between the panes of glass.
1/2" = a minimum dead air space of 0.5 inches between the panes of glass.

Product with air spaces different than those listed above shall use the value for the next smaller air space; i.e. 3/4-inch = 1/2-inch U-factor, 7/16-inch = 3/8-inch U-factors, 5/16-inch = 1/4-inch U-factor.

4 low-e4 (emissivity) shall be 0.4 or less.
low-e2 (emissivity) shall be 0.2 or less.
low-e1 (emissivity) shall be 0.1 or less.

5 U-factors listed for argon shall consist of sealed, glass-filled insulated units for argon, CO2, SF6, and argon/SF6 mixtures.
The following conversion factor shall apply to Krypton gas-filled units:
1/4" or greater with krypton is equivalent to 1/2" argon.

6 Dividers placed between glazing: The U-factor listed shall be used where the divider has a minimum gap of 1/8-inch between the divider and lite of each inside glass surface. Add 0.03 to the listed U-factor for True Divided Lite windows.

7 "Glass block" assemblies may use a U-factor of 0.51.

8 Insulated fiberglass framed products shall use wood/vinyl U-factors.

9 Subtract 0.02 from the listed default values for solariums.

10 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/hr/ft2/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.

11 Aluminum clad wood windows shall use the U-values listed for Aluminum clad Wood/Reinforced Vinyl windows. Vinyl clad wood window shall use the U-values listed for Wood/Vinyl windows. Any vinyl frame window with metal reinforcement in more than one rail shall use the U-factors listed for Aluminum Clad Wood/Reinforced Vinyl window.

TABLE 10-11B TRANSMISSION COEFFICIENTS (U) FOR WOOD AND STEEL DOOR Btu/hr•ft²•°F

Nominal Door Thickness, Inches	Description	No Storm Door	Wood Storm Door[c]	Metal Storm Door[d]
Wood Doors[b]				
1-3/8	Panel door with 7/16 inch panels[e]	0.57	0.33	0.37
1-3/8	Hollow core flush door	0.47	0.30	0.32
1-3/8	Solid core flush door	0.39	0.26	0.28
1-3/4	Panel door with 7/16 inch panels[e]	0.57	0.33	0.36
1-3/4	Hollow core flush door	0.46	0.29	0.32
1-3/4	Panel door with 1-1/8 inch panels[e]	0.39	0.26	0.28
1-3/4	Solid core flush door	0.33	0.28	0.25
2-1/4	Solid core flush door	0.27	0.20	0.21
Steel Doors[b]				
1-3/4	Fiberglass or mineral wool core w/ steel stiffeners, no thermal break[f]	0.60	----	----
1-3/4	Paper honeycomb core without thermal break[f]	0.56	----	----
1-3/4	Solid urethane foam core without thermal break[a]	0.40	----	----
1-3/4	Solid fire rated mineral fiberboard core without thermal break[f]	0.38	----	----
1-3/4	Polystyrene core without thermal break(18 gage commercial steel)[f]	0.35	----	----
1-3/4	Polyurethane core without thermal break(18 gage commercial steel)[f]	0.29	----	----
1-3/4	Polyurethane core without thermal break(24 gage commercial steel)[f]	0.29	----	----
1-3/4	Polyurethane core w/ thermal break & wood perimeter(24 gage commercial steel)[f]	0.20	----	----
1-3/4	Solid urethane foam core with thermal break	0.19	0.16	0.17

Note: All U-factors for exterior doors in this table are for doors with no glazing, except for the storm doors which are in addition to the main exterior door. Any glazing area in exterior doors should be included with the appropriate glass type and analyzed. Interpolation and moderate extrapolation are permitted for door thicknesses other than those specified.

[a] Values are based on a nominal 32 by 80 in. door size with no glazing.

[b] Outside air conditions: 15 mph wind speed, 0°F air temperature; inside air conditions: natural convection, 70°F air temperature.

[c] Values for wood storm door are for approximately 50 percent glass area.

[d] Values for metal storm door are for any percent glass area.

[e] 55 percent panel area

[f] ASTM C 236 hotbox data on a nominal 3 by 7 ft door size with no glazing.

The U-factors in Table 6 are for exterior wood and steel doors. The values given for wood doors were calculated, and those for steel doors were taken from hot box tests (Sabine et al. 1975: Yellot 1965) or from manufacturer's test reports. An outdoor surface conductance of 6.0 Btu/h•ft²•°F was used, and the indoor surface conductance was taken as 1.4 Btu/h•ft²•°F for vertical surfaces with horizontal heat flow. All values given are for exterior doors without glazing. If an exterior door contains glazing, the glazing should be analyzed as a window.

Table 10–11C APPROVED GLAZED DOOR DEFAULT U-VALUES[2]

DESCRIPTION[2,3,4,5]	DOOR MATERIAL			
	INSULATED[6]		WOOD[7]	
	Full-Lite[8,9]	Half-Lite[10,11]	Full-Lite[8]	Half-Lite[10]
Double, Clear 1/4"	0.39	0.31	0.47	0.42
Double, Clear 1/4" + argon	0.37	0.30	0.45	0.41
Double, Low-e4 1/4"	0.36	0.30	0.44	0.41
Double, Low-e2 1/4"	0.35	0.29	0.43	0.40
Double, Low-e1 1/4"	0.24	0.28	0.41	0.39
Double, Low-e4 1/4" + argon	0.33	0.28	0.41	0.39
Double, Low-e2 1/4" + argon	0.31	0.26	0.39	0.38
Double, Low-e1 1/4" + argon	0.31	0.26	0.38	0.37
Double, Clear 3/8"	0.37	0.30	0.45	0.41
Double, Clear 3/8" + argon	0.36	0.29	0.44	0.41
Double, Low-e4 3/8"	0.34	0.28	0.42	0.40
Double, Low-e2 3/8"	0.33	0.28	0.41	0.39
Double, Low-e1 3/8"	0.21	0.26	0.38	0.37
Double, Low-e4 3/8" + argon	0.32	0.27	0.40	0.38
Double, Low-e2 3/8" + argon	0.29	0.25	0.37	0.37
Double, Low-e1 3/8" + argon	0.29	0.25	0.36	0.36
Double, Clear 1/2"	0.36	0.29	0.44	0.41
Double, Clear 1/2" + argon	0.34	0.28	0.42	0.40
Double, Low-e4 1/2"	0.32	0.27	0.40	0.38
Double, Low-e2 1/2"	0.30	0.26	0.38	0.37
Double, Low-e1 1/2"	0.19	0.25	0.36	0.36
Double, Low-e4 1/2" + argon	0.30	0.26	0.38	0.37
Double, Low-e2 1/2" + argon	0.28	0.25	0.36	0.36
Double, Low-e1 1/2" + argon	0.28	0.24	0.34	0.35
Triple, Clear 1/4"	0.31	0.26	0.39	0.38
Triple, Clear 1/4" + argon	0.29	0.25	0.37	0.37
Triple, Low-e4 1/4"	0.30	0.26	0.38	0.37
Triple, Low-e2 1/4"	0.29	0.25	0.37	0.36
Triple, Low-e4 1/4" + argon	0.27	0.24	0.35	0.35
Triple, Low-e2 1/4" + argon	0.26	0.24	0.34	0.35

1 Subtract 0.02 from the listed default U-value for insulated spacers. Insulated spacer material includes fiberglass, wood and butyl or other material with an equivalent ~~K- value.~~ Thermal performance.

2 1/4" = a minimum dead air space of 0.25 inches between the panes of glass.
3/8" = a minimum dead air space of 0.375 inches between the panes of glass.
1/2" = a minimum dead air space of 0.5 inches between the panes of glass.
Products with air spaces different than those listed above shall use the value for next smaller air space; i.e. 3/4-inch = 1/2-inch U-values, 7/16-inch = 3/8-inch U-values, 5/16-inch = 1/4-inch U-.values

3 Low-e4 (emissivity) shall be 0.4 or less.
Low-e2 (emissivity) shall be 0.2 or less.
Low-e1 (emissivity) shall be 0.1 or less.

4 U-values listed for argon shall consist of sealed, gas-filled, insulated units for argon, CO_2, SF_6, and argon/SF_6 mixtures.
The following conversion factor shall apply to Krypton gas-filled units:
1/4-inch or greater airspace of Krypton gas-fill = 1/2-inch airspace Argon gas-fill.

5 Dividers placed between glazing: The U-values listed shall be used where the divider has a minimum gap of 1/8-inch between the divider and lite of each inside glass surface. Add 0.03 to the listed U-value for True Divided Lite windows.

6 Insulated = Any urethane insulated foam core door with a thermal break. Thermal Break = A thermal break door 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/hr/ft^2/F°; and
b) The thermal break material shall not be less than 0.210 inches.

7 Wood = Any wood door.

8 Full Lite = A door that consists of more than 35 percent glazing.

9 Add 0.05 to the listed U-value for Full-Lite values if the insulated door does not have a thermal break.

10 Half Lite = A door that consists of 35 percent or less glazing.

11 Add 0.06 to the listed U-value for Half-Lite values if the insulated door does not have a thermal break.