



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

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

Code Section # [C402.1.5](#)

Brief Description: Restatement of component performance alternative Equation 4-2, for clarity and correctness. It isolates excess fenestration area in the calculation of the proposed UA, and replaces that with table values for wall and roof assemblies.

Proposed code change text:

C402.1.5 Component performance alternative. Building envelope values and fenestration areas determined in accordance with Equation 4-2 shall be permitted in lieu of compliance with the *U*-factors and *F*-factors in Table C402.1.4 and C402.4 and the maximum allowable fenestration areas in Section C402.4.1.

Proposed UA-sum ≤ Table UA-sum (Equation 4-2)

where:

Proposed UxA-sum = UA-fen-prop + UA-X-fen + UA sky-prop + UA-X-sky + UA-opaque-prop + FL-slab-prop

Table UxA-sum = UA-fen-table + UA-wall + UA sky-table + UA-roof + UA-opaque-table + FL-slab-table

UA-fen-prop = U-value x area for each distinct vertical fenestration type proposed, up to maximum area allowed by this code

UA-X-fen = U-value x area for each distinct vertical fenestration type proposed, for all area above the maximum allowed by this code

UA-sky-prop = U-value x area for each distinct skylight type proposed, up to maximum area allowed by this code

UA-X-sky = U-value x area for each distinct skylight type proposed, for all area above the maximum allowed by this code

UA-opaque-prop = U-value x area for each distinct opaque thermal envelope type proposed

FL-slab-prop = F-value x length for each distinct slab on grade perimeter assembly proposed

UA-fen-table = Maximum allowable vertical fenestration U-value from Table C402.4 x area

UA-wall = U-0.051 x the proposed vertical fenestration area above the maximum allowed by this code

UA-sky-table = Maximum allowable skylight U-value from Table C402.4 x area

UA-X-roof = U-0.021 x the proposed skylight area above the maximum allowed by this code

UA-opaque-table = Maximum allowable opaque thermal envelope U-value from Table C402.1.4 for each wall, roof, and floor assembly x area

FL-slab-table = Maximum allowable F-value for slab on grade perimeter x length

$$A + B + C + D \leq \text{Zero} \text{ (Equation 4-2)}$$

Where:

A = Sum of the (UA Dif) values for each distinct assembly type of the building thermal envelope, other than slabs on grade:

$$\text{UA Dif} = \text{UA Proposed} - \text{UA Table}$$

$$\text{UA Proposed} = \text{Proposed U value} \times \text{Area}$$

$$\text{UA Table} = (\text{U factor from Table C402.1.4 or C402.4}) \times \text{Area}$$

B = Sum of the (FL Dif) values for each distinct slab on grade perimeter condition of the building thermal envelope:

$$\text{FL Dif} = \text{FL Proposed} - \text{FL Table}$$

$$\text{FL Proposed} = \text{Proposed F value} \times \text{Perimeter length}$$

$$\text{FL Table} = (\text{F factor specified in Table C402.1.4}) \times \text{Perimeter length}$$

The maximum allowed prescriptive vertical fenestration area, identified as “Vertical Fenestration Area allowed” in factor CA below, as a percent of the gross above grade wall area ratio is either:

1. 30%
2. 40% if the building complies with Section C402.4.1.1; or
3. 40% if the U values used in calculating A for vertical fenestration are taken from Section C402.4.1.3 rather than Table C402.4

Where the proposed vertical fenestration area is less than or equal to the maximum allowed prescriptive vertical fenestration area, the value of C (Excess Vertical Glazing Value) shall be zero. Otherwise:

$$C = (CA \times UV) - (CA \times U_{\text{Wall}}), \text{ but not less than zero}$$

$$CA = (\text{Proposed Vertical Fenestration Area}) - (\text{Vertical Fenestration Area allowed})$$

$$UA_{\text{Wall}} = \text{Sum of the (UA Proposed) values for each opaque assembly of the exterior wall}$$

$$UAW = \text{Sum of the (UA Proposed) values for each above grade wall assembly}$$

$$U_{\text{Wall}} = UAW / \text{sum of wall area (excludes vertical fenestration area)}$$

$$UAV = \text{Sum of the (UA Proposed) values for each vertical fenestration assembly}$$

$$UV = UAV / \text{total vertical fenestration area}$$

Where the proposed skylight area is less than or equal to the skylight area allowed by Section C402.4.1, the value of D (Excess Skylight Value) shall be zero. Otherwise:

$$D = (DA \times US) - (DA \times U_{\text{Roof}}), \text{ but not less than zero}$$

$$DA = (\text{Proposed Skylight Area}) - (\text{Allowable Skylight Area from Section C402.4.1})$$

$$UAR = \text{Sum of the (UA Proposed) values for each roof assembly}$$

$$U_{\text{Roof}} = UAR / \text{sum of roof area (excludes skylight area)}$$

$$UAS = \text{Sum of the (UA Proposed) values for each skylight assembly}$$

$$US = UAS / \text{total skylight area}$$

Purpose of code change: The current formula appears to be flawed. This simplified formula is proposed to correct that error.

Your name Duane Jonlin Email address duane.jonlin@seattle.gov

Your organization City of Seattle Phone number 206-233-2781

Other contact name [Click here to enter text.](#)

Instructions: For use with Coordination, Clarifications & Corrections ONLY. Send this form as an email attachment, along with any other documentation available, to: sbcc@ga.wa.gov. For further information, call the State Building Code Council at 360-407-9277.

Jonlin Equation 4-2 Explanation and Terminology Change (Proposal Env-027-2018)

The “component performance alternative” (also known as U-A tradeoff) is intended to allow some envelope assemblies not meeting code to be balanced against other assemblies that exceed code, provided that the net overall heat loss through the building envelope is not increased beyond that allowed by the prescriptive code requirements. This proposed UA formula accomplishes that in a straightforward manner.

Where the area of vertical glazing or skylights exceeds the code limits, the total UA of the building should not exceed the total UA of a building with fenestration that does not exceed those limits. The highlighted cells below show that the U-value of any excess fenestration in the “proposed” column is replaced with the maximum U-value allowed for a typical wall or roof assembly.

Wording has been changed in response to stakeholder input – formula remains generally the same.

Proposed UA-sum ≤ Allowable UA-sum (Equation 4-2)

<u>Proposed Design</u>	<u>Max Allowable</u>	<u>Area Calculated</u>
UA-glaz-prop U-value x area for each distinct vertical fenestration type proposed, up to area limit	UA-glaz-allow max allowable U-value x area	Vertical glazing area up to the allowable area limit
+ UA-glaz-excess U-value x area for each distinct vertical fenestration type that’s <u>over</u> the area limit	+ UA-wall-excess max allowable U-value for a typical above-grade opaque wall assembly	Vertical glazing area in excess of the allowable area limit (if any)
+ UA-sky-prop U-value x area for each distinct skylight type proposed, up to area limit	+ UA-sky-allow max allowable skylight U-value x area	Skylight area up to the allowable area limit
+ UA-sky-excess U-value x area for each distinct skylight that’s <u>over</u> the area limit	+ UA-roof-excess max allowable U-value for a typical roof assembly x area	Skylight area in excess of the allowable area limit (if any)
+ UA-opaque-prop U-value x area for each distinct opaque assembly	+ UA-opaque-allow max allowable opaque envelope assembly U-value x area	Area of each roof, wall, or floor assembly
+ FL-slab-prop F-value x length for each distinct slab edge condition	+ FL-slab-allow max allowable slab edge F-value x area	Length of each slab edge condition
= Proposed UA-sum	= Allowable UA-sum	If Proposed UA-sum is less than or equal to Allowable UA-sum, the proposed design is acceptable

See (slightly) revised code formula next page

Proposed UA-sum ≤ Allowable UA-sum (Equation 4-2)

where:

Proposed UxA-sum = UA-glaz-prop + UA-glaz-excess + UA sky-prop + UA-sky-excess + UA-opaque-prop + FL-slab-prop

Allowable UxA-sum = UA-glaz-allow + UA-wall-excess + UA sky-allow + UA-roof + UA-opaque-allow + FL-slab-allow

UA-glaz-prop = U-value x area for each distinct vertical fenestration type proposed, up to maximum area allowed

UA-glaz-excess = U-value x area for each distinct vertical fenestration type proposed, for the fenestration area in excess of the maximum allowed

UA-sky-prop = U-value x area for each distinct skylight type proposed, up to maximum area allowed

UA-sky-excess = U-value x area for each distinct skylight type proposed, for skylight area in excess of the maximum allowed

UA-opaque-prop = U-value x area for each distinct opaque thermal envelope type proposed

FL-slab-prop = F-value x length for each distinct slab on grade perimeter assembly proposed

UA-glaz-allow = Maximum allowable vertical fenestration U-value from Table C402.4 x area for each distinct vertical fenestration type proposed

UA-wall-excess = U-0.051 x the proposed vertical fenestration area in excess of the maximum allowed

UA-sky-allow = Maximum allowable skylight U-value from Table C402.4 x maximum allowable area for each distinct skylight type proposed

UA-roof-excess = U-0.021 x the proposed skylight area in excess of the maximum allowed

UA-opaque-allow = Maximum allowable opaque thermal envelope U-value from Table C402.1.4 for each wall, roof, and floor assembly x area. These areas do not include "UA-wall-excess" and "UA-roof-excess" areas.

FL-slab-allow = Maximum allowable F-value for each slab on grade perimeter assembly x length