

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

The “component performance alternative” (also known as UA tradeoff) is intended to allow some thermal envelope assemblies not meeting code to be balanced against other assemblies that are better than code, provided that the net overall heat loss through the building envelope is not increased beyond that allowed by the prescriptive code requirements.

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 table cells on the explanatory table 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.

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

where:

Proposed total UA = UA-glaz-prop + UA sky-prop + UA-opaque-prop + FL-slab-prop

Allowable total UA = UA-glaz-allow + UA-glaz-excess + UA sky-allow + UA-sky-excess + UA-opaque-allow + FL-slab-allow

UA-glaz-prop = Sum of (proposed U-value x proposed area) for each distinct vertical fenestration type, up to code maximum area

UA-sky-prop = Sum of (proposed U-value x proposed area) for each distinct skylight type, up to the code maximum area

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

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

UA-glaz-allow = Sum of (code maximum vertical fenestration U-value from Table C402.4 x proposed area) for each distinct vertical fenestration type, not to exceed the code maximum area ¹

UA-glaz-excess = U-0.051 x vertical fenestration area in excess of the code maximum area ¹

UA-sky-allow = Sum of (code maximum skylight U-value from Table C402.4 x proposed area) for each distinct skylight type proposed, not to exceed the code maximum area ²

UA-sky-excess = U-0.021 x skylight area in excess of the code maximum area ²

UA-opaque-allow = Code maximum opaque envelope U-value from Table C402.1.4 for each opaque door, wall, roof, and floor assembly x proposed area.

FL-slab-allow = Code maximum F-value for each slab-on-grade perimeter assembly x proposed length

1. Where multiple vertical fenestration types are proposed and the code maximum area is exceeded, the areas with the highest allowable U-values shall be assigned to UA-glaz-allow, and the areas with the lowest allowable U-values shall be assigned to UA-glaz-excess.
2. Where multiple skylight types are proposed and the code maximum area is exceeded, the areas with the highest allowable U-values shall be assigned to UA-sky-allow, and the areas with the lowest allowable U-values shall be assigned to UA-sky-excess.

Proposed total SHGCxA ≤ Allowable total SHGCxA (Equation 4-3)

where:

Proposed total SHGCxA = SHGCxA-glaz-prop + SHGCxA sky-prop

Allowable total SHGCxA = SHGCxA-glaz-allow + SHGCxA-sky-allow

SHGCxA-glaz-prop = Sum of (proposed SHGC x proposed area) for each distinct vertical fenestration type

SHGCxA-sky-prop Sum of (proposed SHGC x proposed area) for each distinct skylight type

SHGCxA-glaz-allow = Sum of (code maximum vertical fenestration SHGC from Table C402.4 x proposed area) for each distinct vertical fenestration type, not to exceed the code maximum area

SHGCxA-sky-allow = Sum of (code maximum skylight SHGC from Table C402.4 x proposed area) for each distinct skylight type, not to exceed the code maximum area

Related code changes are required in the following sections:

C406.8 Enhanced envelope performance. The Proposed total UA of the building thermal envelope shall be 15 percent lower than the (~~maximum~~) Allowable total UA for a building of identical configuration and fenestration area in accordance with Section C402.1.5 and Equation 4-2, where UA equals the sum of the *U*-values of each distinct envelope assembly multiplied by the area in square feet of that assembly.

C503.2 Change in space conditioning. Any nonconditioned space that is altered to become conditioned space or semi-heated space shall be required to be brought into full compliance with this code. Any semi-heated space that is altered to become conditioned space shall be required to be brought into full compliance with this code.

Exceptions: 1. Where the component performance building envelope option in Section C402.1.5 is used to comply with this Section, the Proposed total UA is allowed to be up to 110 percent of the (~~Target~~) Allowable total UA.

2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption of the proposed design is allowed to be 110 percent of the annual energy consumption otherwise allowed by Section C407.3.

C505.1 General. Spaces undergoing a change in occupancy shall be brought up to full compliance with this code in the following cases:

1. Any space that is converted from an F, S or U occupancy to an occupancy other than F, S or U.
2. Any space that is converted to a Group R dwelling unit or portion thereof, from another use or occupancy.
3. Any Group R dwelling unit or portion thereof permitted prior to July 1, 2002, that is converted to a commercial use or occupancy.

Where the use in a space changes from one use in Table C405.4.2 (1) or (2) to another use in Table C405.4.2 (1) or (2), the installed lighting wattage shall comply with Section C405.4.

Exceptions:

1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed total UA is allowed to be up to 110 percent of the ((~~target~~)) Allowable total UA.

2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy consumption of the proposed design is allowed to be 110 percent of the annual energy consumption otherwise allowed by Section C407.3.

Explanatory Table for Proposed total UA ≤ Allowable total UA (Equation 4-2)

Proposed Total UA Sum the following:	Allowable Total UA Sum the following:
UA-glaz-prop Sum of (proposed U-value x proposed area) for each distinct vertical fenestration type	UA-glaz-allow Sum of (code maximum allowable U-value x proposed area) up to the code maximum area
	+ UA-glaz-excess U-0.051 (this is the code maximum U-value for a typical above-grade wall) x vertical glazing area in excess of the code maximum area (if any)
+ UA-sky-prop Sum of (proposed U-value x proposed area) for each distinct skylight type proposed	+ UA-sky-allow Sum of (code maximum skylight U-value x proposed area) up to code maximum area
	+ UA-sky-excess U-0.021 (this is the code maximum U-value for a typical roof) x proposed area in excess of the code maximum area
+ UA-opaque-prop Sum of (proposed U-value x proposed area) for each distinct opaque assembly	+ UA-opaque-allow Sum of (code maximum opaque envelope assembly U-value x proposed area) for each distinct opaque assembly
+ FL-slab-prop Sum of (proposed F-value x proposed length) for each distinct slab edge condition	+ FL-slab-allow Sum of (code maximum slab edge F-value x proposed length) for each distinct slab edge condition
= Proposed total UA	= Allowable total UA

Explanatory Table for Proposed total SHGCxA ≤ Allowable total SHGCxA (Equation 4-3)

Proposed Total SHGCxA Sum the following:	Allowable Total SHGCxA Sum the following:
SHGCxA-glaz-prop Sum of (proposed SHGC x proposed area) for each distinct vertical fenestration type	SHGCxA-glaz-allow Sum of (code maximum vertical fenestration SHGC x proposed area), not to exceed code maximum area
+ SHGCxA-sky-prop Sum of (proposed SHGC x proposed area) for each distinct skylight type	+ SHGCxA-sky-allow Sum of (code maximum skylight SHGC x proposed area), not to exceed code maximum area
= Proposed total SHGCxA	= Allowable Total SHGCxA