

Envelope Component Performance Compliance

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This Tip provides guidance on use of the component performance method, sometimes referred to as “Target UA” or “UA tradeoff,” in Section C402.1.5. This method allows some building envelope components to have higher U-factors (more heat loss) than allowed by code, in exchange for other components that have lower U-factors (less heat loss) than are allowed.

Calculate the Target UA

To calculate the “Target UA”, multiply the area (A) of each component type (each type of window, wall, roof, etc.) in the proposed building by its heat loss rate (U). Then add those “UA” values to calculate the building’s total UA. The total heat loss (Total UA) of the proposed building cannot be any higher than if each component of the building had the maximum heat loss allowed by code.

The formula itself, $\text{Proposed Total UA} \leq \text{Allowable Total UA}$, appears to be straightforward, but gets more complicated, if the proposed building has more vertical fenestration (for example, window, curtain wall, and glazed entrance door) area than the code allows. In that case, compare that excess fenestration area to the opaque wall area that it replaces. (A similar rule applies to skylights.) In Equation 4-2, below, these excess areas are called “UA-glaz-excess” and “UA-sky-excess.”

Terminology: Fenestration vs. Windows

Windows are the most common type of fenestration, but fenestration also includes curtain wall, storefront glazing, glazed entrance doors, skylights, and other types of vision glazing.

Allowable Fenestration Area

The baseline maximum allowable fenestration area is 30 percent, and 40 percent for projects when using the options for optimized daylighting or high-performance fenestration.

Section C402.4.1.1 provides two paths that increase that allowable fenestration area to 40%:

First path - Section C402.4.1.1.1 allows the extra fenestration area, if more than half of a building’s conditioned floor area is within daylight zones. You can find the definition of “daylight zones” with diagrams in Chapter 2 of the 2021 Seattle Energy Code, and the lighting controls for daylight zones in Section C405.2.5. Low-rise buildings with plentiful skylights can often qualify for extra fenestration area, as well as taller buildings with narrow floorplates.

Second path - Section C402.4.1.1.2 allows the extra fenestration area if lower U-value (higher performance) fenestration is used, as shown in Section C402.4.1.1.2 of the 2021 Seattle Energy Code.

Section C402.1.5 in the 2021 Seattle Energy Code describes the component performance alternative. It refers to Equation 4-2, included below.

Definition of “UA-glaz-excess”

In the equation, “UA-glaz-excess” refers to the area of fenestration in excess of the maximum allowable area. You calculate that area using the actual fenestration U-factors for the Proposed Total UA but using wall U-factors for the Allowable Total UA. To balance the equation, some of the proposed U-factors must be lower (better) than the code maximums. Usually this is accomplished with higher-performance fenestration, but additional insulation might also work. The same logic applies to the term “UA-sky-excess.”

Equation 4-2**Proposed Total UA ≤ Allowable Total UA**

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 × proposed area) for each distinct vertical fenestration type, up to code maximum area
UA-sky-prop =	Sum of (proposed U-value × proposed area) for each distinct skylight type, up to the code maximum area
UA-opaque-prop =	Sum of (proposed U-value × proposed area) for each distinct opaque thermal envelope type
FL-slab-prop =	Sum of (proposed F-value × 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, or Section C402.4.1.1.2 if applicable, × proposed area) for each distinct vertical fenestration type, not to exceed the code maximum area <ul style="list-style-type: none"> ■ Where multiple vertical fenestration types are proposed and the code maximum area is exceeded, the U-value shall be the average Table C402.1.4 U-value weighted by the proposed vertical fenestration area of each type.
UA-glaz-excess =	U-value for the proposed wall type from Table C402.4 × vertical fenestration area in excess of the code maximum area <ul style="list-style-type: none"> ■ Where multiple wall types are proposed the U-value shall be the average Table C402.1.4 U-value weighted by the proposed above grade wall area of each type.
UA-sky-allow =	Sum of (code maximum skylight U-value from Table C402.4 × proposed area) for each distinct skylight type proposed, not to exceed the code maximum area
UA-sky-excess =	U-value for the proposed roof type from Table C402.4 × skylight area in excess of the code maximum area <ul style="list-style-type: none"> ■ Where multiple roof types are proposed the U-value shall be the average Table C402.1.4 U-value weighted by the proposed roof area of each type.
UA-opaque-allow =	Code maximum opaque envelope U-value from Table C402.1.4 for each opaque door, wall, roof, and floor assembly × proposed area
FL-slab-allow =	Code maximum F-value for each slab-on-grade perimeter assembly × proposed length