



STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

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June 13, 2013

TO: Mechanical Ventilation and Energy Codes Committee Members and All Interested Parties
FROM: Energy Code Technical Advisory Group
SUBJECT: **Energy Code TAG Report**

The Energy Code TAG has completed their review of the proposed changes to the 2012 WSEC. The following is a summary of their recommendations for Council action.

Code Change Proposals

The Energy Code TAG had two meetings, on May 3 and May 31, to discuss five code change proposals.

The first three proposals (Log# 13- E01, E02, E03) concerned the changing residential gas furnace standard and its impact on the residential energy code.

The TAG discussed the impact of the change in federal standard. The representative of builders and business interests indicated he would be satisfied with leaving both the additional credit tables and the number of credits unchanged. This position has since been confirmed with Building Industry Association of Washington. The proposals were withdrawn by the proponent.

The second set of issues regarded two proposals (Log# 13-E04, E05) submitted by Vulcan, Inc and Rushing Company, to create pathways to provide additional glazing beyond the limit of 30 percent of exterior wall area that is in the 2012 code. After considerable discussion at the first TAG meeting, the TAG asked the proponents to clarify several technical issues and return to present the revised proposals at the second meeting.

Proposal Log# 13-E04, is intended to substantially extend use of an exception in the 2012 WSEC that allows additional glazing for a building that has over half of its floor area in a daylight zone with automatic lighting controls. The extension of the use of this exception was accomplished by removing various floor area categories from the gross floor area of the building for the purposes of calculating what constituted half of the floor area, and by allowing floor areas to be considered as part of the daylight zone even if they were separated from the windows by permanent partitions.

Proposal Log# 13-E05, allows additional glazing area for buildings that provide fenestration systems with lower U-values. The TAG found that the proposal would reduce energy efficiency gain from the 2012 WSEC, but would allow more options for designers and developers to use additional glazing up to 40 percent of exterior wall area.

The TAG lacked a quorum at the May 31 meeting. The proponent had revised proposals 13-E04 and 13-E05 based on TAG discussion.

The TAG suggested further revisions to Log # 13-E04 to further shorten the list of areas not in the daylight zone, and to apply this section only to nonresidential buildings. The TAG also suggested that a better approach would be to reduce the area required to be in the daylight zone. The chair commented that this proposal has nowhere near the benefit or reasonable trade for the increased glazing area as proposal #13-E05. One participant stated the proposed would only be acceptable if the daylight zone were restricted to a dimension equal to the fenestration head height.

The TAG further revised and consolidated proposal Log #13-E05 to streamline the language and delete some provisions judged to be the redundant or unnecessary. The maximum SHGC was revised to 0.35, and the reference to the ratio of visible transmittance (VT) and SHGC was eliminated. The one unresolved technical issue was whether to impose an absolute glazing area cap at 40% of the exterior wall area when using this provision, or to allow the provision to determine the target UxA value in the component performance approach. This latter option would allow developers to increase the glazing area above the 40% limit through the use of higher-performance building envelope systems. It was decided that the compliance path outlined in this proposal should not be allowed to determine the “reference case” in a Total Building Performance calculation. Instead, the reference case will be calculated per the current code, using the 30% wall area cap.

This was felt by several members to be more in the spirit of the code, providing additional options for designers and developers. Other TAG members commented that the proposal is a step backwards.

Lacking a quorum, the TAG did not vote on either proposal. This report is being sent forward to the standing committee and the Council for the next step to approve, disapprove or modify the proposals for proposed rule making.

The 2012 State Energy Code is effective on July 1, 2013. Any changes will follow standard rulemaking procedures during the coming year. However, the Council will be asked to provide “interpretations” for these changes along with several other discrepancies that have been found in the text, and will provide links to these interpretations in both the printed and the online versions of the code.

2013 Proposed changes to 2012 Energy Code

Log #	Proponent	Code Section(s)	Title or Subject	TAG Review			Committee Action
				Meet Criteria?	Economic Impact	Recommendation	
13-E01	Gary Nordeen	R405.3	Res Performance based compliance			Withdrawn by proponent	
13-E02	Gary Nordeen	R406.2	Additional Efficiency requirements			Withdrawn by proponent	
13-E03	Gary Nordeen	R406.2	Option 3A High efficiency HVAC equip			Withdrawn by proponent	
13-E04	Rushing/ Vulcan	C402.3.1.1	Conditioned Space/day light zone				

Add the following definitions to Section C202:

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the *conditioned space*.

CONDITIONED FLOOR AREA, ADJUSTED. The horizontal projection of the floors associated with the *adjusted conditioned space*.

CONDITIONED SPACE. An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent *conditioned space*

CONDITIONED SPACE, ADJUSTED. An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent *conditioned space* that is not one of the following spaces:

1. Below Grade Conditioned Spaces
2. Elevator Hoistway Shafts
3. Shafts
4. Mechanical Rooms
5. Elevator Machine Rooms
6. Electrical Rooms
7. Storage Rooms, Unoccupied
8. Janitor Closets
9. Trash Rooms
10. Elevator Lobbies, that are not directly adjacent to an above grade wall that is part of the building envelope
11. Stairwells, that are not directly adjacent to an above grade wall that is part of the building envelope
12. Corridors, that are not directly adjacent to an above grade wall that is part of the building envelope
13. Toilet Rooms, that are not directly adjacent to an above grade wall that is part of the building envelope

Make the following changes to C402.3:

C402.3 Fenestration (Prescriptive). Fenestration shall comply with Table C402.3. Automatic daylighting controls specified by this section shall comply with Section C405.2.2.3.2.

C402.3.1 Maximum area. The vertical fenestration area (not including opaque doors and opaque spandrel panels) shall not exceed 30 percent of the gross above-grade wall area. The skylight area shall not exceed 3 percent of the gross roof area.

C402.3.1.1 Increased vertical fenestration area with daylighting controls. In Climate Zones 1 through 6, a maximum of 40 percent of the gross above-grade wall area shall be permitted to be vertical fenestration, provided:

1. No less than 50 percent of the adjusted conditioned floor area is within ~~a~~ the primary and secondary daylight zones;
2. The occupancy of the space is other than Group R. For mixed-use projects utilizing C402.3.1.1 compliance path that include both Group R and other than Group R occupancies separate envelope calculations would be required for the each occupancy group (Group R and other than Group R);
- ~~3.~~ In other than Group R occupancies Automatic daylighting controls are installed in for the primary and secondary daylight zones; ~~or in Group R occupancies automatic daylighting controls are:~~
 - ~~a.~~ Installed for all lights in the daylight zones or
 - ~~a.b.~~ Provided to control dedicated, labeled receptacles for occupant task lighting for all rooms in the daylight zones; and
- ~~2.4.~~ Visible transmittance (VT) of vertical fenestration is greater than or equal to ~~1+~~ 1.25 times solar heat gain coefficient (SHGC).

Exception: Fenestration that is outside the scope of NFRC 200 is not required to comply with Item 3.

For other than Group R occupancies the calculation for the adjusted conditioned floor area to primary and secondary daylight zone ratio is performed solely based on the definitions of adjusted conditioned floor area and the daylight zone. There is no required consideration for the impact of interior partition layouts within the daylight zones on the daylight zone unless interior partitions are part of the rooms or spaces that are exempted as part of the adjusted conditioned floor area definition.

13-E05	Rushing/ Vulcan	C402.3.1.3	Increased window/wall ratio		
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TAG Revision

C402.3.1.2 Increased vertical fenestration area with high-performance fenestration. The vertical fenestration area (not including opaque doors and opaque spandrel panels) is permitted to exceed 30% but shall not exceed 40% of the gross above grade wall area, *for the purpose of prescriptive compliance with Section C402.1.2 or for the Target UA calculation in Equation C402-1*, provided that each of the following conditions are met:

1. The vertical fenestration shall have the following U-factors:
 - a. Non-metal framing (all) = 0.28
 - b. Metal framing (fixed) = 0.34
 - c. Metal framing (operable) = 0.36
 - d. Metal framing (entrance doors) = 0.60
2. The SHGC of the vertical fenestration shall be less than or equal to 0.35, adjusted for projection factor in compliance with C402.3.3.1.

The compliance path described in this Section C402.3.1.2 is not permitted to be used for the Total Building Performance compliance path as set out in Section C407.

NOTE: Changes to Equation C402-1 and C402-3, with related text, would remain as shown in the final revised version of code change proposal 13-E05.

NOTE: Some TAG members felt that there should be an absolute glazing limit of 40% of above-grade wall area for the use of this option. The phrase “*for the purpose of prescriptive compliance with Section C402.1.2 or for the Target UA calculation in Equation C402-1*” in red italics above would be deleted if the Council chose to impose this limit.

NOTE: Changes to Equation C402-1 and C402-3, with related text, would remain as shown in the final revised version of code change proposal 13-E05.

EQUATION C402-1 TARGET UA_T

$$UA = U_{\text{radt}}A_{\text{radt}} + U_{\text{mrt}}A_{\text{mrt}} + U_{\text{rat}}A_{\text{rat}} + U_{\text{mwt}}(A_{\text{mwt}} + A_{\text{mwbgt}}) + U_{\text{mbwt}}(A_{\text{mbwt}} + A_{\text{mbwbgt}}) + U_{\text{sftwt}}(A_{\text{sftwt}} + A_{\text{sftwbgt}}) + U_{\text{wftwt}}(A_{\text{wftwt}} + A_{\text{wftwbgt}}) + U_{\text{fmt}}A_{\text{fmt}} + U_{\text{fjt}}A_{\text{fjt}} + F_{\text{st}}P_{\text{st}} + F_{\text{srt}}P_{\text{srt}} + U_{\text{dst}}A_{\text{dst}} + U_{\text{drt}}A_{\text{drt}} + U_{\text{vgt}}A_{\text{vgt}} + U_{\text{vgmt}}A_{\text{vgmt}} + U_{\text{vgmot}}A_{\text{vgmot}} + U_{\text{vgdt}}A_{\text{vgdt}} + U_{\text{ogt}}A_{\text{ogt}}$$

U_{at} = The target combined specific heat transfer of the gross roof/ceiling assembly, exterior wall and floor area.

Where:

U_{radt} = The thermal transmittance value for roofs with the insulation entirely above deck found in Table C402.1.2.

U_{mrt} = The thermal transmittance value for metal building roofs found in Table C402.1.2.

U_{rat} = The thermal transmittance value for attic and other roofs found in Table C402.1.2.

U_{mwt} = The thermal transmittance value for opaque mass walls found in Table C402.1.2.

U_{mbwt} = The thermal transmittance value for opaque metal building walls found in Table C402.1.2.

U_{sftwt} = The thermal transmittance value for opaque steel-framed walls found in Table C402.1.2.

U_{wftwt} = The thermal transmittance value for opaque wood framed and other walls found in Table C402.1.2.

U_{fmt} = The thermal transmittance value for mass floors over unconditioned space found in Table C402.1.2.

U_{fjt} = The thermal transmittance value for joist floors over unconditioned space found in Table C402.1.2.

F_{st} = The F-factor for slab-on-grade floors found in Table C402.1.2.

F_{srt} = The F-factor for radiant slab floors found in Table C402.1.2.

U_{dst} = The thermal transmittance value for opaque swinging doors found in Table C402.2.

U_{drt} = The thermal transmittance value for opaque roll-up or sliding doors found in Table C402.2.

- U_{vgt} = The thermal transmittance value for vertical fenestration with nonmetal framing found in Table C402.3 which corresponds to the proposed vertical fenestration area as a percent of gross exterior wall area. Buildings utilizing Section C402.3.1.3 shall use the thermal transmittance value specified there.
- U_{vgmt} = The thermal transmittance value for vertical fenestration with fixed metal framing found in Table C402.3 which corresponds to the proposed vertical fenestration area as a percent of gross exterior wall area. Buildings utilizing Section C402.3.1.3 shall use the thermal transmittance value specified there.
- U_{vgmot} = The thermal transmittance value for vertical fenestration with operable metal framing found in Table C402.3 which corresponds to the proposed vertical fenestration area as a percent of gross exterior wall area.
- U_{vgdt} = The thermal transmittance value for entrance doors found in Table C402.3 which corresponds to the proposed vertical fenestration area as a percent of gross exterior wall area. Buildings utilizing Section C402.3.1.3 shall use the thermal transmittance value specified there.
- U_{ogt} = The thermal transmittance for skylights found in Table C402.3 which corresponds to the proposed skylight area as a percent of gross exterior roof area.
- A_{fmt} = The proposed mass floor over unconditioned space area, A_{fm} .
- A_{fjt} = The proposed joist floor over unconditioned space area, A_{fj} .
- P_{st} = The proposed linear feet of slab-on-grade floor perimeter, P_s .
- P_{srt} = The proposed linear feet of radiant slab floor perimeter, P_{rs} .
- A_{dst} = The proposed opaque swinging door area, A_{ds} .
- A_{drt} = The proposed opaque roll-up or sliding door area, A_{dr} .
- and

If the vertical fenestration area as a percent of gross above-grade exterior wall area does not exceed the maximum allowed in Section C402.3.1.3:

- A_{mwt} = The proposed opaque mass above-grade wall area, A_{mw} .
- A_{mwbgt} = The proposed opaque below-grade mass wall area, A_{mwbg} .
- A_{mbwt} = The proposed opaque above-grade metal building wall area, A_{mbw} .
- A_{sfwbgt} = The proposed opaque below-grade steel framed wall area, A_{sfwbg} .
- A_{sfwt} = The proposed opaque above-grade steel framed wall area, A_{sfw} .
- A_{sfwbgt} = The proposed opaque below-grade steel framed wall area, A_{sfwbg} .
- A_{wfw} = The proposed opaque above-grade wall wood framed and other area, A_{wfw} .
- A_{wfwbgt} = The proposed opaque below-grade wall wood framed and other area, A_{wfwbg} .
- A_{vgt} = The proposed vertical fenestration area with nonmetal framing, A_{vg} .
- A_{vgmt} = The proposed vertical fenestration area with fixed metal framing, A_{vgm} .
- A_{vgmot} = The proposed vertical fenestration area with operable metal framing, A_{vgmo} .
- A_{vgdt} = The proposed entrance door area, A_{vgd} .

or

For buildings utilizing C402.3.1.3, vertical fenestration area as a percent of gross exterior above-grade wall may not exceed the amount allowed by that section. For all other buildings, if the vertical fenestration area as a percent of gross exterior above-grade wall area exceeds the maximum allowed in Section C402.3.1, the area of each vertical fenestration element shall be reduced in the base envelope design by the same percentage and the net area of each above-grade wall type increased proportionately by the same percentage so that the total vertical fenestration area is exactly equal to the allowed percentage per Section C402.3.1 of the gross above-grade wall area. The target wall area of a given wall type shall be the sum of the proposed below grade area and the increased above-grade area.

and

If the skylight area as a percent of gross exterior roof area does not exceed the maximum allowed in Section C402.3.1:

A_{radt} = The proposed roof area with insulation entirely above the deck, A_{rad} .

A_{mrt} = The proposed roof area for metal buildings, A_{mr} .

A_{rat} = The proposed attic and other roof area, A_{or} .

A_{ogat} = The proposed skylight area, A_{ogor} .

or

If the skylight area as a percent of gross exterior roof area exceeds the maximum allowed in Section C402.3.1, the area of each skylight element shall be reduced in the base envelope design by the same percentage and the net area of each roof type increased proportionately by the same percentage so that the total skylight area is exactly equal to the allowed percentage per Section C402.3.1 of the gross roof area.

Amend equation C402-3 below for target and proposed SHGC equation calculations for C402.3.1.3 as follows

**EQUATION C402-3
TARGET SHGC_t**

$$\text{SHGC}_{At} = \text{SHGC}_{Cogt}A_{ogort} + \text{SHGC}_{vgt} (\text{Avg}_t + \text{Avg}_{mt} + \text{Avg}_{mot} + \text{Avg}_{dt})$$

Where:

SHGC_{At} = The target combined specific solar heat gain of the target fenestration area.

SHGC_{vgt} = The solar heat gain coefficient for vertical fenestration found in Table C402.3 which corresponds to the proposed total fenestration area as a percent of gross exterior wall area, and ~~A_{ogort}~~, Avg_t, Avg_{mt}, Avg_{mot} and Avg_{dt} are defined under Equation C402-1. Buildings utilizing Section C402.3.1.3 shall use the SHGC value specified there. The SHGC may be adjusted for projection factors per the requirements of C402.3.3.

SHGC_{Cogt} = The solar heat gain coefficient for skylight fenestration found in Table C402.3, and A_{ogort} as defined under Equation C402-1.

**EQUATION C402-4
PROPOSED SHGC_{Ap}**

$$\text{SHGC}_{Ap} = \text{SHGC}_{Cog}A_{og} + \text{SHGC}_{vg}A_{vg}$$

Where:

SHGC_{Ap} = The combined proposed specific solar heat gain of the proposed fenestration area.

SHGC_{Cog} = The solar heat gain coefficient of the skylights.

A_{og} = The skylight area.

SHGC_{vg} = The solar heat gain coefficient of the vertical fenestration.

A_{vg} = The vertical fenestration area.