ADDENDA

ANSI/ASHRAE/IES Addendum bo to
ANSI/ASHRAE/IES Standard 90.1-2013

Energy Standard for Buildings Except Low-Rise Residential Buildings

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FOREWORD

This addendum modifies the exceptions to Section 5.5.4.4.1 and Table 5.5.4.4.1 related to the SHGC credit for shading by permanent projections. New analysis by PNNL for office buildings meeting ASHRAE 90.1-2013 show that horizontal permanent projections over north-facing fenestration have minimal impact on total building energy use. As such, the SHGC multipliers for north-oriented fenestration in Table 5.5.4.4.1 are removed, and exceptions 1 and 2 are modified to only apply to south, east, and west-oriented fenestration. Additionally, this addendum corrects a technical flaw in the calculation where the previous SHGC multipliers could illogically require fenestration to have a lower SHGC on the north side of a building than on the west side of the building when projections are used. To correct this issue, exception 5 is changed to allow the same fenestration product SHGC to be used on the north side of the building as the area weighted average of the SHGC of fenestration products on the other orientations before any adjustments are made for projections. This addendum has no impact on cost effectiveness.

This addendum makes proposed changes to the current standard. These changes are indicated in the text by <u>underlining</u> (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes.

Addendum bo to 90.1-2013

Modify the standard as follows (I-P and SI):

5.5.4.4.1 SHGC of Vertical Fenestration. Vertical fenestration shall have an SHGC not greater than that specified in Tables 5.5-1 through 5.5-8.

Exceptions:

1. For demonstrating compliance for <u>south-, east-, or west-oriented</u> vertical fenestration shaded by opaque permanent projections that will last as long as the building itself, the SHGC <u>of the shaded vertical fenestration</u> in the proposed building <u>is permitted to</u> ~~shall~~ be reduced by using the multipliers in Table 5.5.4.4.1. Permanent projections consisting of open louvers shall be considered to provide shading, provided that no sun penetrates the louvers during the peak sun angle on June 21.
2. For demonstrating compliance for <u>south-, east-, or west-oriented</u> vertical fenestration shaded by partially opaque permanent projections (e.g., framing with glass or perforated metal) that will last as long as the building itself, the projection factor (PF) shall be reduced by multiplying it by a factor of O_s, which is derived as follows:

$$O_s = (A_i \times O_i) + (A_f \times O_f)$$

where

O_s = percent opacity of the shading device

A_i = percent of the area of the shading device that is a partially opaque infill

O_i = percent opacity of the infill for glass $O_i = (100\% - T_s)$, where T_s is the solar transmittance as determined in accordance with NFRC 300; for perforated or decorative metal panels, O_i = percentage of solid material

A_f = percent of the area of the shading device that represents the framing members

O_f = percent opacity of the framing members; if solid, then 100%

The SHGC <u>of the shaded vertical fenestration</u> in the proposed building <u>is permitted to</u> then ~~shall~~ be reduced by using the multipliers in Table 5.5.4.4.1 for each fenestration product.

3. Vertical fenestration that is located on the street side of the street-level story only, provided that
   a. the street side of the street-level story does not exceed 20 ft in height,
   b. the fenestration has a continuous overhang with a weighted average PF greater than 0.5, and

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c. the fenestration area for the street side of the street-level story is less than 75% of the gross wall area for the street side of the street-level story.

When this exception is utilized, separate calculations shall be performed for these sections of the building envelope, and these values shall not be averaged with any others for compliance purposes. No credit shall be given here or elsewhere in the building for not fully utilizing the fenestration area allowed.

4. For dynamic glazing, the minimum SHGC shall be used to demonstrate compliance with this section. Dynamic glazing shall be considered separately from other vertical fenestration, and area-weighted averaging with other vertical fenestration that is not dynamic glazing shall not be permitted.
5. ~~Vertical fenestration that is north-oriented shall be allowed to have a maximum solar heat gain coefficient SHGC 0.05 greater than that specified in Tables 5.5-1 through 5.5-8. When this exception is utilized, separate calculations shall be performed for these sections of the building envelope, and these values shall not be averaged with any others for compliance purposes.~~ *Vertical fenestration* that is *north oriented* shall be permitted to have an SHGC equal to or less than the area-weighted average SHGC of the south-, east-, and west-oriented *vertical fenestration* before any reductions made for permanent projections in Exceptions 1 and 2 of Section 5.5.4.4.1.

Table 5.5.4.4.1 SHGC Multipliers for Permanent Projections

Projection Factor	SHGC Multiplier (~~all Other~~ South, East, and West Orientations)	~~SHGC Multiplier (North-Oriented)~~
0-0.10	1.00	~~1.00~~
>0.10-0.20	0.91	~~0.95~~
>0.20-0.30	0.82	~~0.91~~
>0.30-0.40	0.74	~~0.87~~
>0.40-0.50	0.67	~~0.84~~
>0.50-0.60	0.61	~~0.81~~
>0.60-0.70	0.56	~~0.78~~
>0.70-0.80	0.51	~~0.76~~
>0.80-0.90	0.47	~~0.75~~
>0.90-1.00	0.44	~~0.73~~

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