ADDENDA

ANSI/ASHRAE Addendum e to
ANSI/ASHRAE Standard 55-2017

Thermal Environmental Conditions for Human Occupancy

Approved by ASHRAE and the American National Standards Institute on September 30, 2020.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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FOREWORD

Addendum e includes a bug fix to the shortwave solar calculation method explained in Section C1 and the corresponding consequential edits to the prescriptive tables in Section 5.3.2.2.1. The previous method discounted the contribution of diffuse solar radiation by using an incorrect formula for attributing horizontal diffuse radiation. At low angles of solar altitude, this change will increase the shortwave mean radiant temperature as compared to the previous version.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum e to Standard 55-2017

Modify Tables 5.3.2.2.1A, 5.3.2.2.1B, 5.3.2.2.1C, and 5.3.2.2.1D in Section 5.3.2.2.1 as shown.

Table 5.3.2.2.1A High-Performance (Low-e) Glazing Units

Representative Occupant Distance from Interior Window or Shade Surface, ft (m)	Fraction of Body Exposed to Sun (f_{bes}), %	Glazing Unit Total Solar Transmission (T_{sol}), %	Glazing Unit Indirect SHGC (SHGC – T_{sol}), %	Interior Shade Openness Factor, %	Interior Shade Solar Absorptance of Window-Facing Side, %
≥~~3.3~~4.8 (1.5)	≤50	≤35	≤4.5	≤9	≤65
≥~~3.3~~5.1 (1.6)	≤100	≤35	≤4.5	≤5	≤65

Table 5.3.2.2.1B Clear Low-Performance Glazing Units

Representative Occupant Distance from Interior Window or Shade Surface, ft (m)	Fraction of Body Exposed to Sun (f_{bes}), %	Glazing Unit Total Solar Transmission (T_{sol}), %	Glazing Unit Indirect SHGC (SHGC – T_{sol}), %	Interior Shade Openness Factor, %	Interior Shade Solar Absorptance of Window-Facing Side, %
≥~~9.9~~11.0 (3.3)	≤50	≤83	≤10	≤1	≤25
≥~~13.2~~14.5 (4.4)	≤50	≤83	≤10	≤1	≤65
≥~~11.2~~12.2 (~~3.4~~3.7)	≤100	≤83	≤10	≤1	≤25
≥~~14.5~~15.9 (~~4.4~~4.9)	≤100	≤83	≤10	≤1	≤65

Table 5.3.2.2.1C Tinted Glazing Units

Representative Occupant Distance from Interior Window or Shade Surface, ft (m)	Fraction of Body Exposed to Sun (f_{bes}), %	Glazing Unit Total Solar Transmission (T_{sol}), %	Glazing Unit Indirect SHGC (SHGC – T_{sol}), %	Interior Shade Openness Factor, %	Interior Shade Solar Absorptance of Window-Facing Side, %
≥~~3.3~~5.3 (1.6)	≤50	≤10	≤20	≤8	≤25
≥~~3.3~~6.1 (1.9)	≤50	≤10	≤20	≤1	≤65
≥~~4~~5.9 (~~1.2~~1.8)	≤100	≤10	≤20	≤1	≤25
≥~~4.9~~7.4 (~~1.5~~2.3)	≤100	≤10	≤20	≤1	≤65
>~~9.2~~7.3 (~~2.8~~2.2)	≤50	<15	≤8	No shade	No shade

Table 5.3.2.2.1D Dynamic Glazing Units (Increasing T_{sol} Represents Decreasing Tint)

Representative Occupant Distance from Interior Window or Shade Surface, ft (m)	Fraction of Body Exposed to Sun (f_{bes}), %	Glazing Unit Total Solar Transmission (T_{sol}), %	Glazing Unit Indirect SHGC (SHGC – T_{sol}), %	Interior Shade Openness Factor, %	Interior Shade Solar Absorptance of Window-Facing Side, %
≥~~3.3~~6.1 (1.9)	≤50	≤0.5	≤10	N/A	No shade
≥~~3.3~~6.1 (1.9)	≤100	≤0.5	≤10	N/A	No shade
≥~~4.9~~7.9 (~~1.5~~2.4)	≤50	≤3	≤10	N/A	No shade
≥~~6.6~~9.5 (~~2~~2.9)	≤100	≤3	≤10	N/A	No shade
≥~~7.6~~9.8 (~~2.3~~3.0)	≤50	≤6	≤10	N/A	No shade
≥~~9.9~~10.3 (~~3~~3.1)	≤50	≤9	≤10	N/A	No shade

Modify Section C1 as shown.

C1. CALCULATION PROCEDURE

[. . .]

The total outdoor solar radiation on the horizontal is filtered by both T_{sol} and f_{svv} and multiplied by the reflectance of the floor and lower furnishings R_{floor}.

$$E_{refl} = 0.5 f_{eff} f_{svv} T_{sol} I_{TH} R_{floor} \quad \text{(C-4)}$$

where I_{TH} is the total horizontal direct and diffuse irradiance outdoors (W/m^2 [Btuh/ft^2]) and the floor reflectance R_{floor} is 0.6.

Direct radiation is incident only on the projected fraction of the body f_p, which depends on solar altitude β, the sun's horizontal angle relative to the front of the person (SHARP), and posture (seated, standing). The f_p values are tabulated in the computer program in Section C4.

The direct radiation is also reduced by any shading of the body provided by the indoor surroundings, quantified by the body exposure fraction f_{bes} (see Figure C2-1).

$$E_{dir} = f_p f_{eff} f_{bes} T_{sol} I_{dir} \quad \text{(C-5)}$$

I_{dir} is the direct-beam (normal) solar radiation (W/m^2 [Btuh/ft^2]). The meteorological radiation parameters are related as follows:

$$I_{TH} = I_{dir} \sin\beta + I_{diff}$$

I_{diff} is approximated as (0.~~17~~2 I_{dir} ~~sinβ~~).

Modify Section C3 as shown.

C3. COMPUTER PROGRAM FOR CALCULATING COMFORT IMPACT OF SOLAR GAIN ON OCCUPANTS

The following code is one implementation of the SET calculation using JavaScript in SI units.

```
function find_span(arr, x){

[...]

   var DEG_TO_RAD = 0.0174532925;
   var hr = 6;
   var Idiff = 0.~~175 ~~2 * Idir~~ * Math.sin(alt * DEG_TO_RAD)~~;

[...]

}
```

Modify Table C4-1 as shown.

Table C4-1 Computer Code Validation Table

alt	sharp	posture	Idir	tsol	fsvv	fbes	asa	ERF	trsw
0	120	Seated	800	0.5	0.5	0.5	0.7	~~26.9~~ 42.9	~~6.4~~ 10.3
60	120	Seated	800	0.5	0.5	0.5	0.7	~~59.2~~ 63.7	~~14.2~~ 15.3
90	120	Seated	800	0.5	0.5	0.5	0.7	~~63.3~~ 64.9	~~15.2~~ 15.5
30	0	Seated	800	0.5	0.5	0.5	0.7	~~53.8~~ 62.7	~~12.9~~ 15.0
30	30	Seated	800	0.5	0.5	0.5	0.7	~~53.1~~ 62.7	~~12.7~~ 15.0
30	60	Seated	800	0.5	0.5	0.5	0.7	~~51.3~~ 59.8	~~12.3~~ 14.3
30	90	Seated	800	0.5	0.5	0.5	0.7	~~48~~ 56.8	~~11.5~~ 13.6
30	150	Seated	800	0.5	0.5	0.5	0.7	~~42.5~~ 52.4	~~10.2~~ 12.6
30	180	Seated	800	0.5	0.5	0.5	0.7	~~39.8~~ 49.5	~~9.5~~ 11.8
30	120	Standing	800	0.5	0.5	0.5	0.7	~~49.7~~ 59.6	~~11.4~~ 13.7
30	120	Seated	400	0.5	0.5	0.5	0.7	~~22.8~~ 27.7	~~5.5~~ 6.6
30	120	Seated	600	0.5	0.5	0.5	0.7	~~34.2~~ 41.5	~~8.2~~ 9.9
30	120	Seated	1000	0.5	0.5	0.5	0.7	~~56.9~~ 69.2	~~13.6~~ 16.6
30	120	Seated	800	0.1	0.5	0.5	0.7	~~9.1~~ 11.1	~~2.2~~ 2.7
30	120	Seated	800	0.3	0.5	0.5	0.7	~~27.3~~ 33.2	~~6.5~~ 8.0
30	120	Seated	800	0.7	0.5	0.5	0.7	~~63.8~~ 77.5	~~15.3~~ 18.6
30	120	Seated	800	0.5	0.1	0.5	0.7	~~27.5~~ 29.9	~~6.6~~ 7.2
30	120	Seated	800	0.5	0.3	0.5	0.7	~~36.5~~ 42.7	~~8.7~~ 10.2
30	120	Seated	800	0.5	0.7	0.5	0.7	~~54.6~~ 68.1	~~13.1~~ 16.3
30	120	Seated	800	0.5	0.5	0.1	0.7	~~27.2~~ 36.5	~~6.5~~ 8.7
30	120	Seated	800	0.5	0.5	0.3	0.7	~~36.4~~ 45.9	~~8.7~~ 11.0
30	120	Seated	800	0.5	0.5	0.7	0.7	~~54.7~~ 64.8	~~13.1~~ 15.5
30	120	Seated	800	0.5	0.5	0.5	0.3	~~19.5~~ 23.7	~~4.7~~ 5.7
30	120	Seated	800	0.5	0.5	0.5	0.5	~~32.5~~ 39.6	~~7.8~~ 9.5
30	120	Seated	800	0.5	0.5	0.5	0.9	~~58.6~~ 71.2	~~14~~ 17.0
30	120	Seated	800	0.5	0.5	0.5	0.7	~~45.5~~ 55.4	~~10.9~~ 13.3

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