



**BSR/ASHRAE Addendum f  
to ANSI/ASHRAE Standard 55-2020**

**Public Review Draft**

# **Proposed Addendum f to Standard 55-2020, Thermal Environmental Conditions for Human Occupancy**

**First Public Review (April 2021)  
(Draft shows Proposed Changes to Current Standard)**

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**(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)**

## FOREWORD

*Addendum f to Standard 55-2020 proposes changes to the air speed definition to account for moving occupants. Additionally, activity-generated air speed and clothing insulation adjustment for an active person are now included within the PMV code of Normative Appendix B, in order to align with ISO 7730 and the original intent of the PMV model.*

*[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]*

## Addendum f to 55-2020

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***Revise Section 3 Definitions as shown below. The remainder of Section 3 is unchanged.***

***air speed, average ( $V_a$ ):*** the average air speed surrounding a representative occupant. The average is with respect to location and time. The spatial average is for three heights as defined for average air temperature  $t_a$ . For an occupant moving in a space the sensors shall follow the movements of the occupant. The air speed is averaged over an interval not less than one and not more than three minutes. Variations that occur over a period greater than three minutes shall be treated as multiple different air speeds.

***Revise Section 5.2.2.2 Insulation Determination as shown below. The remainder of Section 5.2.2.2 is unchanged.***

[...]

~~e. For moving occupants, it is permitted but not required to adjust any of the previous methods using the following formula:~~

$$~~I_{cl, active} = I_{cl} \times (0.6 + 0.4/M)~~$$

$$~~1.2 \text{ met} < M < 2.0 \text{ met}~~$$

~~where  $M$  is the metabolic rate in mets and  $I_{cl}$  is the insulation without movement.~~

~~f. Interpolate between or extrapolate from the values given in Tables 5-3 and 5-4.~~

~~g. Use Figure 5-1 to determine the clothing insulation  $I_{cl}$  of a representative occupant for a day as a function of outdoor air temperature at 06:00 a.m.,  $t_{a(out,6)}$ .~~

Clothing insulation  $I_{cl}$  determined in accordance with Figure 5-1 is permitted but not required to be adjusted to account for unique dress code or cultural norms using other methods in Section 5.2.2.2 or approved engineering methods.

hg. Use measurement with thermal manikins or other approved engineering methods.

**Revise Normative Appendix B as shown below. The remainder of Normative Appendix B is unchanged.**

## NORMATIVE APPENDIX B COMPUTER PROGRAM FOR CALCULATION OF PMV-PPD

The following code is one implementation of the PMV-PPD calculation using JavaScript in SI units. This calculation does not include discomfort risk due to local discomfort factors. The input variable *clo* in the PMV function shall be calculated using the following equation:

$$\begin{aligned} clo &= I_{cl} \times (0.6 + 0.4 / M) \text{ for } M \geq 1.2 \\ clo &= I_{cl} \text{ for } M < 1.2 \end{aligned}$$

where *M* is the metabolic rate in met units and *I<sub>cl</sub>* is the clothing insulation.

The input variable *vel* in the PMV function is the sum of the average air speed (*V*) plus the activity-generated air speed (*V<sub>ag</sub>*) (m/s). Where *V<sub>ag</sub>* is the activity-generated air speed caused by motion of individual body parts. It is a function of metabolic rate and is added to the average air speed to determine convective cooling of the body. *V<sub>ag</sub>* is assumed to be 0 for metabolic rates equal and lower than 1 met and otherwise equal to:

$$\begin{aligned} V_{ag} &= 0.3 (M - 1) \text{ (m/s, } ^\circ\text{C)} \\ V_{ag} &= 59.1 (M - 1) \text{ (fpm, } ^\circ\text{F)} \\ &\text{for } M > 1 \text{ met.} \end{aligned}$$

```
pmv = function(ta, tr, vel, rh, met, clo, wme) {  
  /*  
  returns [pmv, ppd]  
  ta, air temperature (°C)  
  tr, mean radiant temperature (°C)  
  vel, relative air speed(m/s) average air speed (Va)+ activity-generated air speed (Vag)(m/s)  
  rh, relative humidity (%) Used only this way to input humidity  
  met, metabolic rate (met)  
  clo, clothing (clo)  
  wme, external work, normally around 0 (met)  
  /*  
  [...]
```

**Revise Informative Appendix G as shown below. The remainder of Informative Appendix G is unchanged.**

## INFORMATIVE APPENDIX G CLOTHING INSULATION

[...]

Tables 5-2 and 5-3 are for a person that is not moving. Body motion decreases the insulation of a clothing ensemble by pumping air through clothing openings and/or causing air motion within the clothing. This effect varies considerably, depending on the nature of the motion (e.g., walking versus lifting) and the nature of the clothing (stretchable and snug fitting versus stiff and loose fitting). Because of this variability, accurate estimates of clothing insulation *I<sub>cl</sub>* for an active person are not available unless measurements are made for the specific clothing under the conditions in question (e.g., with a walking manikin). An approximation of the clothing insulation for an active person is:

$$I_{cl, active} = I_{cl} \times (0.6 + 0.4/M)$$

$1.2 \text{ met} < M < 2.0 \text{ met}$   
for  $M \geq 1.2$

where  $M$  is the metabolic rate in met units and  $I_{cl}$  is the insulation without activity. For metabolic rates less than or equal to 1.2 met, no adjustment for motion is required. This clothing adjustment for an active person is applied automatically as part of the PMV code as described in Normative Appendix B.  
[...]