



Extended Discussion of September 10, 2009 Evaluation of a Wall Assembly

Reference: "Evaluation of Thermal Resistance of a Building Envelope Assembly", R&D Services, Inc. Report dated September 10, 2009.

The referenced report contains calculated U-values for a wall-assembly containing an enclosed reflective air space. The R-values for the reflective air space reported in the reference were calculated using a detailed correlation based on hot-box data from the U.S. National Bureau of Standards. For the purpose of compliance with the FTC Rule 460, the U-value calculation has been modified to use data from the ASHRAE Handbook of Fundamentals, Table 3 in Chapter 25. The thermal resistance entries for effective emittance 0.05, horizontal heat flow, mean temperature 50 °F, and temperature difference 30 °F were used to obtain R-value for a 0.375 in. enclosed reflective air gap from the entries for 0.5 and 0.75 inches. These conditions are specified in Section 460.8 (b) of the Federal Register (Vol. 70 No. 103 p 31275). Use of the tabulated values results in small changes in the R-value assigned to the reflective air space and the resulting U-values for the wall assembly. The U-values for the wall assembly described in the referenced document calculated using R-values obtained as specified by the FTC are shown below along with the originally reported U-values.

	Air-Space R		Air-Space U	
	<u>(Summer)</u>	<u>(Winter)</u>	<u>U (Summer)</u>	<u>U (Winter)</u>
From Reference	1.89	2.09	0.056	0.055
Hand-Book Value	2.31	2.31	0.054	0.055

The U-value calculated for the assembly described in the referenced report is adjusted to 0.055 Btu/ft²·h·°F when the procedure required by the Federal Trade Commission is used.

A handwritten signature in black ink that reads 'David W. Yarbrough'.

David W. Yarbrough, PhD, PE
September 10, 2012

Referenced Report



Evaluation of Thermal Resistance of a Building Envelope Assembly

The following evaluation is based on established guidelines published by ASHRAE along with results obtained using ASTM test methods and published procedures. The U-value for the assembly is based on the parallel-path method.

Description of the Building Assembly

Nominal 2x4 wood-frame wall constructed 16 in. OC. A diagram is attached that shows the sequence of elements in the assembly. Double top plate construction has been assumed. Both summer and winter conditions have been evaluated.

Summer Temperatures: Outside air 100 °F (Inside air 70 °F)

Winter Temperatures: Outside air 40 °F (Inside air 70 °F)

Framing factor (fraction of wall area that is wood): 0.136

The low-emittance material forming the reflective air space has emittance 0.03.

R-value units are $\text{ft}^2 \cdot \text{h} \cdot ^\circ\text{F} / \text{Btu}$. U-value units are $\text{Btu} / \text{ft}^2 \cdot \text{h} \cdot ^\circ\text{F}$.

Element	Cavity Path		Framing Path	
	Summer	Winter	Summer	Winter
Outside air film	0.25	0.17	0.25	0.17
Siding	0.61	0.61	0.61	0.61
0.375-in. reflective air space	1.89	2.09	1.89	2.09
Low-e Housewrap	1.03	1.03	1.03	1.03
0.5-in. OSB	0.66	0.66	0.66	0.66
R 15 batt insulation	15.00	15.00	-	-
Wood framing	-	-	4.38	4.38
0.5-in. gypsum	0.45	0.45	0.45	0.45
Inside air film	<u>0.68</u>	<u>0.68</u>	<u>0.68</u>	<u>0.68</u>
Path Total	20.57	20.69	9.95	10.07

U-value (air-to-air) 0.056 0.055

The calculations summarized in the above table indicate the assembly U-value of 0.056 $\text{Btu} / \text{ft}^2 \cdot \text{h} \cdot ^\circ\text{F}$ to be appropriate for both summer and winter conditions.

A handwritten signature in black ink that reads 'David W. Yarbrough'.

David W. Yarbrough, PhD, PE

President

September 10, 2009

References:

ASHRAE Handbook of Fundamentals (2009) Chapter 26.

American Society for Testing and Materials STP 1116, pp 24-43.

David W. Yarbrough, PhD, PE
September 6, 2012