



Calculated Thermal Resistances for Two Fi-Foil Floor Assembly Designs

Background

Thermal resistances (R-values) have been calculated for two below-floor insulation systems that include a reflective insulation material from Fi-Foil Company. The reflective insulation material has an intrinsic R-value of 1.0. The low-emittance surfaces of the reflective insulation material when installed below the floor joists form an enclosed reflective air space with thermal resistance and a low-emittance surface facing down. The reflective air space R-values are calculated using correlations publishing in ASTM STP 1116¹ with two-dimensional adjustments.² Air-film resistances were taken from the 2009 ASHRAE Handbook of Fundamentals.³ The reflective insulation facer material was taken to have an emittance of 0.03.

Description of the Assemblies

<u>Assembly</u>	<u>Component</u>	<u>R-value (ft²·h·°F/Btu)</u>	
2x6 on 16 in. Centers	Inside air film	0.92 (winter) 0.61 (summer)	
	Carpet and sub-floor	1.30	
	Fiberglass batt	13.00	
	Reflective air space (2-in.)	calculated	
	Reflective insulation material	1.00	
	Outside air film	1.32 (winter) 4.55 (summer)	
	2x8 on 16 in. Centers	Inside air film	0.92 (winter) 0.61 (summer)
		Carpet and sub-floor	1.30
Fiberglass batt		13.00	
Reflective air space (3.75-in.)		calculated	
Reflective insulation material		1.00	
Outside air film		1.32 (winter) 4.55 (summer)	

¹ ASTM STP 1116 (1991) pp. 24-43.

² *J. of Thermal Insulation* 14 281-294 (1991).

³ Chapter 26, 2009 ASHRAE Handbook of Fundamentals.

Boundary Temperatures for the R-value Calculations

The inside air temperature was taken to be 70 °F for both summer and winter conditions. The below floor temperature was taken to be 30 °F for winter conditions and 100 °F for summer conditions.

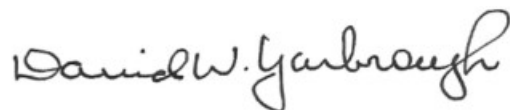
R-values for the Below Floor Assemblies

The following table contains the results calculated for the two floor assemblies described above. R-values are given for both summer and winter conditions.

Table 1. R-Values for Two Floor Assemblies with Enclosed Reflective Air Spaces

<u>Assembly</u>	<u>Region</u>	<u>R-value (ft²·h·°F/Btu)</u>	
		<u>Summer</u>	<u>Winter</u>
1	Above the reflective air space	14.9	15.2
	The reflective air space	3.2	6.0
	Below the reflective air space	2.3	5.6
	Total air-to-air	20.4	26.8
	Total surface-to-surface*	18.5	21.3
2	Above the reflective air space	14.9	15.2
	The reflective air space	3.4	7.0
	Below the reflective air space	2.3	5.6
	Total air-to-air	20.6	27.8
	Total surface-to-surface	18.7	22.3

* The surface-to-surface R-values do not include air-film resistances.



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