



**Calculated Thermal Resistances for Building Envelope Assemblies
Containing AstroShield I or AstroShield II**

Background

Thermal resistances (R-values) have been calculated using the method described in ASTM STP 1116^a for assemblies containing either AstroShield I or AstroShield II. The calculations were done for a mean insulated region temperature of 75 °F and a temperature difference across the insulated region of 30 °F. The material R-values for the AstroShield reflective insulations are contained in reports RD09332 and RD08421.^b

Description of Assemblies

<u>Designation</u>	<u>Description</u>	<u>Insulation</u>
Assembly 1-1	Nominal 2x6 in. framing 24 in. on center insulation in center of region (2 air spaces)	AstroShield I
1-2	Nominal 2x6 in. framing 24 in. on center insulation in center of region (2 air spaces)	AstroShield II
Assembly 2-1	Nominal 2x4 in. framing 16 in. on center insulation in center of region (2 air spaces)	AstroShield I
2-2	Nominal 2x4 in. framing 16 in. on center insulation in center of region (2 air spaces)	AstroShield II
Assembly 3-1	Nominal 1x2 in. framing 16 in. on center insulation on interior side of cavity (1 air space)	AstroShield I
3-2	Nominal 1x2 in. framing 16 in. on center insulation on interior side of cavity (1 air space)	AstroShield II

Physical Properties and Bounding Temperatures

Table 1 contains the physical properties used in the calculations and the temperatures of the warm side and cool side of the insulated regions.

^a ASTM STP 1116, "Insulation Materials" (1991) pp.24-43.

^b R&D Services, Inc. Report, 102 Mill Drive, Cookeville, TN 38501

Table 1. Physical Properties and Temperatures

<u>Item</u>	<u>Value</u>
R-value for AstroShield I	0.80 ft ² ·h·°F/Btu
R-value for AstroShield II	1.21 ft ² ·h·°F/Btu
Emittance of facing on Insulation	0.033
Emittance of wood surface	0.87
Emittance of concrete block	0.90
Cool-side temperature	60 °F
Warm-side temperature	90 °F

Thermal Resistance Results

Table 2 contains the calculated thermal resistances for the assemblies and properties shown above. The R-values are for one-dimensional heat flow through the insulated regions.

Table 2. Calculated R-values

<u>Assembly</u>	<u>Heat Flow Direction</u>	<u>R-value (ft²·h·°F/Btu)</u>
1-1	up	5.9
	horizontal	7.5
	down	18.1
1-2	up	6.3
	horizontal	7.9
	down	18.3
2-1	up	5.6
	horizontal	7.7
	down	13.8
2-2	up	6.1
	horizontal	8.2
	down	13.9
3-1	horizontal	3.8
3-2	horizontal	4.2

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