

Build Strong. Northern Michigan Style.

Wood bevel siding, 1/2 x 8 lapped	R-0.81	Air spaces (3/8")		
Wood siding shingles, 16", 7-1/2" exposure	R-0.87	Heat flow UP		
Asbestos-cement shingles	R-0.03	Non-reflective		R-0.87
Stucco per inch	R-0.20	Reflective, one surface		R-2.23
Building Paper	R-0.06	Heat flow DOWN		
1/2" nail-base insul. board sheathing	R-1.14	Non-reflective		R-1.02
1/2" insul. board sheathing, regular density	R-1.32	Reflective, one surface		R-3.55
25/32" insul. board sheathing, reg. density	R-2.04	Heat flow HORIZONTAL		
1/8" plywood	R-0.31	Non-reflective (also same for 4" thick)		R-1.01
3/8" plywood	R-0.47	Reflective, one surface		R-3.48
1/2" plywood	R-0.62	NOTE: The addition of a second reflective surface facing the first reflective surface increases thermal 1/4" resistance values of an air space only 4 to 7 percent.		
5/8" plywood	R-0.78			
hardboard	R-0.18			
Softwood, per inch	R-1.25			
Softwood board, 3/4" thick	R-0.94	Surface Air Films		
		INSIDE (still air)		
Concrete blocks, three oval cores		Heat flow UP (through horizontal surface)		
Cinder aggregate, 4" thick	R-1.11	Non-reflective		R-0.61
Cinder aggregate, 12" thick	R-1.89	Reflective		R-1.32
Cinder aggregate, 8" thick	R-1.72	Heat flow DOWN (through horizontal surface)		
Sand and gravel aggregate, 8" thick	R-1.11	Non-reflective		R-0.92
Lightweight aggregate (expanded clay, shale, slag, pumice, etc.), 8" thick	R-2.00	Reflective		R-4.55
		Heat flow HORIZONTAL (through vertical surface)		
Concrete blocks, two rectangular cores		Non-reflective		R-0.68
Sand and gravel aggregate, 8" thick	R-1.04	OUTSIDE		
Lightweight aggregate, 8" thick	R-2.18	Heat flow any direction, surface any position		
Common brick, per inch	R-0.20	15 mph wind (winter)		R-0.17
Face brick, per inch	R-0.11	7.5 mph wind (summer)		R-0.25
Sand-and-gravel concrete, per inch	R-0.08	Example calculations		
Sand-and-gravel concrete, 8" thick	R-0.64	(to determine the U value of an exterior wall)		
1/2" gypsum board	R-0.45		Uninsulated	Insulated
5/8" gypsum board	R-0.56		Wall	Wall
1/2" lightweight-aggregate gypsum plaster	R-0.32	Wall Construction	Resistance	Resistance
25/32" hardwood finish flooring	R-0.68	Outside surface (film), 15	0.17	0.17
Asphalt, linoleum, vinyl, or rubber floor tile	R-0.05	mph wind		
Carpet and fibrous pad	R-2.08	Wood bevel siding, lapped	0.81	0.81
Carpet and foam rubber pad	R-1.23	1/2" ins. bd. sheathing, reg.	1.32	1.32
Asphalt roof shingles	R-0.44	density		
Wood roof shingles	R-0.94	3-1/2" air space	1.01	
3/8" built-up roof	R-0.33	R-11 insulation		11.00
		1/2" gypsumboard	.045	0.45
		Inside surface (film)	0.68	0.68
Glass		Totals	4.44	14.43
Single glass (winter)	U = 1.13			
Single glass (summer)	U = 1.06	For uninsulated wall, U = 1/R = 1/4.44 = U = 0.22		
Insulating glass (double		For insulated wall, U = 1/R = 1/14.43 = U = 0.07		
1/8" air space (winter)	U = 0.65	* Additional resistance values can be obtained from		
1/8" air space (summer)	U = 0.61	ASHRAE Handbook of Fundamentals published by the		
1/2" air space (winter)	U = 0.58	American Society of Heating, Refrigerating and Air		
1/2" air space (summer)	U = 0.56	Conditioning Engineers.		
Storm windows				
1" to 4" air space (winter)	U = 0.56			
1" to 4" air space (summer)	U = 0.54			
Insulation				
2" - 2-1/2" thick	R-7.00			
3" - 4" thick	R-11.00			
5" - 7" thick	R-19.00			

U/Factor — (Overall Coefficient of Heat Transmission) — The combined thermal value of all of the materials in a building section, air spaces, and surface air films. U is expressed in Btu-h per sq. ft. of area per F temperature difference. The lower the U, the higher the insulating value. FHA Minimum Property Standards are expressed in U factors.

R/Factor — (Thermal Resistance) — a measure of ability to retard heat flow rather than ability to transmit heat. R is the numerical reciprocal of U or C, thus R = 1/U or 1/C. A wall with a U value of 0.07 has 14.3 units of resistance.

(R = 1U = 1/0.07 = 14.3). In this Manual, thermal resistance, R, is used in combination with numerals to designate thermal resistance values: R-11 equals 11 resistance units. The higher the R, the higher the insulating value. All insulation products having the same R, regardless of material and thickness, are equal in insulating value.