



BALTIMORE

# spec NEWS

# Felt Tips

THERMAL PROPERTIES OF WALLS

Feb 1977  
Issue 40  
Page 1

Wall Section	Wall Description	Weight Pounds Per Square Foot	U Value (Winter)	Heat Gain Btu/Hour/Square Foot (Dark Color)		Time Lag (Hours)	Amplitude Decrement Factor
				Average Orientation	West Orientation		
	10" Brick and brick cavity wall with 2" polyurethane insulation board in cavity	79.0	0.058	1.17	1.06	8	0.14
	10" Brick and light-weight concrete (100-pound density) block cavity wall with 2" polystyrene insulation board in cavity	62.0	0.071	1.72	1.35	6	0.32
	4" Brick veneer, 1/2" insulation board sheathing, wood studs, full batt (R-11) insulation, 1/2" gypsumboard	43.0	0.077	2.18	1.95	4	0.62
	6" Brick wall (solid units), 2" polystyrene board, 1/2" gypsumboard	63.5	0.080	2.25	1.91	4	0.40
	4" Brick curtain wall (partially reinforced or with highbond mortar), 2" polystyrene insulation board 1/2" gypsumboard	42.0	0.082	2.77	2.84	3	0.51
	6" Precast concrete (140-pound density) sandwich panel, 2" polyurethane core	47.5	0.065	1.82	1.55	4	0.40
	1/2" Plywood siding, 1/2" insulation board sheathing, wood studs, full batt (R-11) insulation, 1/2" gypsumboard	5.0	0.076	3.05	4.60	2	0.75
	Metal panel curtain wall 2-layers 18-gauge steel, 2" polyurethane insulation (between steel layers)	4.5	0.066	3.17	5.73	1	0.99
	8" Brick wall (solid units), 2" polystyrene insulation board, 1/2" gypsumboard	81.0	0.079	1.90	1.49	6	0.32

The Thermal Properties of double glazed reflective plate glass: U value (Winter) = 0.32; Heat Gain for Average Orientation = 15.92 Btu/hr./sq. ft.; Heat Gain for West Orientation = 34.08 Btu/hr./sq. ft.; no appreciable Time Lag.

The Thermal Properties of single clear plate glass: U value (Winter) = 0.98; Heat Gain for Average Orientation = 93.35 Btu/hr./sq. ft.; Heat Gain for West Orientation = 234.60 Btu/hr./sq. ft.; no appreciable Time Lag.

The most common terms relating to heat transmission are defined below. Most of these definitions are given as they appear in the 1972 edition of the ASHRAE Handbook of Fundamentals.

Amplitude Decrement Factor: The difference between the maximum and the mean temperatures of a heat wave passing through a wall, roof or floor; dependent upon the thickness, mass, specific heat and orientation of the wall or roof.

Btu: British thermal unit; approximately the heat required to raise one pound of water from 59 to 60 degrees Fahrenheit.

Thermal Conductance: The time rate of heat flow expressed in Btu per (hour) (square foot) (Fahrenheit degree.)

Thermal Conductivity: The time rate of heat flow through a homogeneous material under steady-state conditions, through unit area, per unit temperature gradient in the direction perpendicular to an isothermal surface; expressed in Btu per (hour) (square foot) (Fahrenheit degree per inch of thickness.)

Thermal Inertia: The property which modifies the effect of the U value on the heat transmission of a building element by expanding the time scale or time lag.

Thermal Resistance: The reciprocal of a heat transfer coefficient, as expressed by U, thermal conductance, or film or surface conductance. Its unit is Fahrenheit degrees per Btu (hour) (square foot); thus a wall with a U value of 0.25 would have resistance value of  $1/U = 1/0.25 = 4.0$ .

Time Lag: The delay caused by heat storage and its subsequent release by the structure; increases as the mass of the wall increases.

U: Overall coefficient of heat transmission or thermal transmittance (air to air); time rate of heat flow usually expressed in Btu per (hour) (square foot) (Fahrenheit degree temperature difference between air on the inside and air on the outside of wall, floor, roof or ceiling.)

For additional information, refer to the article by Alan H. Yorkdale and Dean C. Patterson in the December 1975 issue of "Construction Specifier."