

Insulation Factsheet

EEM-01454

Materials	Advantages	Disadvantages	Applications*										Thermal Properties		Density (lb.ft. ³)	Effectiveness as a Vapor Barrier*	Resistance To:*				Maximum Service Temperature (°F)	Packaging				
			Roof, cathedral ceiling	Attic floor, flat ceiling	Walls: between framing	Walls: sheathing	Floors over unheated spaces	Masonry walls (interior surface)	Masonry walls (exterior surface above ground)	Masonry walls (exterior surface below ground)	R-Value		Water Absorption	Moisture Damage			Direct Sunlight	Fire								
ROLLS BATTS & BLANKETS																										
Fiberglass (many brands)	Easy to install in many locations, especially standard frame construction. Fairly inexpensive per R-value point. Good fire resistance. Widely available.	Hard to install properly in tight or cramped spaces. Cannot be installed in enclosed cavities. "Vapor barrier" facings hard to install effectively; additional vapor/infiltration barriers usually required. Moisture and infiltration degrade R-value of insulation. Insulation "dust" during installation can irritate eyes, skin, and lungs: Installer should wear eye protection, respirator, gloves, and full-coverage clothing. Most facings are flammable; some nonflammable facings may be available. Multiple layering of batts/blankets in horizontal space (attic floors) can degrade R-value of lower layer because of compression.	1	1	1	4	2	3	4	4	3.14 (3.0-3.8)	C	0.3-2.0	Unfaced: not a vapor/infiltration barrier. Faced: poor vapor barrier, which requires sealed polyethylene vapor barrier in Alaska's climate.	B	A	A	B	180°	Batts up to 8' long Rolls up to 70' long Widths: 11" to 48". Thicknesses: 1" to 13" Available with kraft- paper or aluminized-paper facings, or unfaced.						
Rock Wool (slag wool) (Many brands)	Same as fiberglass except has excellent fire resistance.	Same as fiberglass.	1	1	1	4	2	3	4	4	3.14 (3.0-3.7)	C	0.3-2.0	Unfaced: Not a vapor/infiltration barrier. Faced: same as above.	B	A	A	A	Over 500°	Batts and rolls Widths: 11" to 24" Thickness: 3" to 8"						

*Rating System: 1 = recommended, 4 = not recommended

*A = Excellent B = Good C = Fair D = Poor

†Includes cost of installation by a contractor.

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LOOSE FILL (FOR POURING/BLOWING)																					
Fiberglass (e.g., Fiberglas, Insul-safe, Retrofil, and others)	Can be poured or blown into enclosed, inaccessible, and oddly shaped cavities. In horizontal spaces like attic floors, pour-in is faster to install than batts/blankets. Blown insulation is often the only retrofit option for woodframe walls. Widely available. Good fire-resistance. Does not absorb water.	Does not provide a vapor/infiltration barrier. Moisture and infiltration in cavity can degrade R-values. Blow-in installation not usually practical for do-it yourself applications; contractor or experienced help usually needed. Generates more dust during installation than batts/blankets. Installer should wear eye protection, respirator, gloves, and full-coverage clothing. Blown fiberglass has lowest R-value per inch of all loose-fill materials. Blown fiberglass can get hung up on wires and nails. Settling and voids can occur if blown at too low density.	1	1	3	4	1	4	4	4	2.8 (2.2-4.0)	C	0.61-2.5	Not a vapor/ infiltration barrier.	B	A	A	B	180°	Bags: 15-30 lb.	
Rock wool (Many brands)	Same as fiberglass except has about 25% higher R-value per inch than loose-fill fiberglass.	Same as fiberglass, except has lower R-value per inch than batt/blanket rock wool.	2	1	2	4	2	4	4	4	3.1 (2.8-3.7)	C	1.5-2.5	Not a vapor/ infiltration barrier.	B	A	A	A	Over 500°	Bags: 25-35 lb.	
Cellulose (Many brands)	Highest R-value per inch of all loose-fill materials. Can be blown through smaller holes than fiberglass. More impervious to air infiltration than fiber-glass or rock wool. Can be blown or poured. Widely available.	Requires careful chemical treatment to avoid fire hazards. (Look for class "A" fire rating.) Absorbs water, dries very slowly. Can deteriorate under prolonged exposure to moisture. Settling and voids can occur if blown at too low density.	2	1	2	4	3	4	4	4	3.2 (2.8-3.7)	C	2.2-3.0	Not a vapor/ infiltration barrier.	D	D	B	C	180°	Bags: 15-30 lb.	
Perlite (Many brands)	Very good fire resistance. Widely available.	Must be poured; not suitable for blow-in installation.	4	1	3	4	1	4	4	4	2.7 (2.5-4.0)	C	2-11	Not a vapor/ infiltration barrier.	C	B	A	B	200°	Bags	
Treated Perlite and "Ceramics" (e.g., Fire-Guard Lite Ceramic Products)	Very good fire resistance.	Same as perlite, except more expensive.	4	1	3	4	1	4	4	4	3.4 (NA)‡	B	4-6.8	Not a vapor/ infiltration barrier.	B	B	A	B	200°	Bags: 26 lb.	
Vermiculite	Exceptionally good fire resistance. Widely available.	Absorbs water, dries slowly. Seldom used to insulate houses because of relatively low R-value and heavy weight.	4	2	4	4	1	4	4	4	2.13		7.0-8.2	Use polyethylene vapor barrier	B	C	N/A	A	Over 500°	?	
Expanded Polystyrene (beads or shredded)	High R-value per inch. Can be blown or poured. Settling not a serious problem.	Potentially combustible, cannot be used near chimneys or flues. Must be covered with fire-resistant sheathing. Not widely available.	4	2	2	4	4	4	4	4	4.0		1.8	with these insulations	B	C	D	D	165°	Various	

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RIGID BOARD																					
Extruded Polystyrene (e.g., styrofoam, foamular)	Same as expanded polystyrene except: Good for exterior insulation of foundations and basement walls because of high moisture resistance and compressive strength. Closed-cell structure provides excellent moisture resistance.	Same as expanded polystyrene except: Some products contain fluorocarbons, which may damage the environment. Higher cost.	2	3	3	1	2	1	1	1	5.0 (5.0)	A	1.6-2.0	B	A	A	D	D	165°	Lengths: 8', 9' Widths: 16", 24", 48" Thicknesses: 3/4" to 2" Tongue-and-groove edges, special mastics and fasteners available.	
Expanded Polystyrene (e.g., Cellulite, R-Wall, Insulfoam, Zonolite, many others)	High R-value per inch. Sometimes sold pre-bonded to various facing materials to provide heat-reflective surface, vapor/infiltration barrier, fire resistance finished wall surface, etc. Air infiltration does not degrade R-value as much as loose fills or batts/blankets. Lowest cost per R-value of all board insulations. Available in several density grades; higher density provides better thermal resistance & moisture resistance. Widely available.	Hard to install in corners and odd-shaped spaces. Combustible; must be covered with fire-resistant sheathing. Less mechanical strength and rigidity than extruded polystyrene.	2	3	2	1	2	1	1	3	4.0 (3.6-4.4)	A	0.9-1.6	D	D	B	D	D	165°	Panels: 2' x 8', 4' x 8', many other sizes. Thicknesses: 3/4" to 6" Tongue-and-groove edges, foil facings, composite panels, and many other special treatments available.	
Urethane, Isocyanurate (e.g., Thermax, Trymer, Thermitite, Plus High-R, many others)	Same as expanded polystyrene, except urethane has highest R-value per inch of all insulation materials.	Same as extruded polystyrene.	2	3	3	1	2	1	1	3	7.2 (7.1-7.7)	A	1.6-2.0	B Foil face is perfect vapor barrier but edge must be sealed.	B	C	D	D	200°	Lengths: 8', 9' others available Widths: 4', others available Thicknesses: 1/2" to 3" Tongue-and-groove edges, foil facings, composite panels, and many other special treatments available.	
High-density Fiberglass (e.g., Insul-quick, many others)	Highest R-value per inch of all forms of fiberglass. Good fire-resistance. Conforms to slight irregularities in the framing better than plastic foam boards, which are more rigid.	Hard to fit in complex corners or odd-shaped spaces.	2	3	3	1	1	1	3	4	4.4 (3.85-4.76)	C	4-9	C	B	A	A	B	180°	Panels: 4' x 8' Thicknesses: 1" to 3" Available with facings of paper, plastics, metals, and unfaced.	

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SPRAYED IN PLACE																					
CELLULOSE (Many brands)	Can be used as a fire-resistant covering for sprayed urethane. Provides a continuous, air-tight seal around penetrations, gaps in framing, etc. Ideally suited for rough, irregular surfaces.	Must be installed by qualified contractor with special equipment. Requires careful chemical treatment to avoid fire hazards. (Look for Class "A" fire rating.)	4	4	4	4	4	1	1	4	3.5 (3.0-4.0)	B	varies	B	D	D	B	C	180°	Many different formulations available for specific applications.	
FOAMED IN PLACE																					
Urethane (Many brands)	High R-value per inch. Provides a continuous, air-tight seal around penetration, gaps in framing, etc. Ideally suited for rough, irregular surfaces. Very useful in specialty designs (e.g., earth-bermed walls, underground construction, etc.)	Must be installed by qualified contractor with special equipment. Combustible; must be covered with fire-resistant sheathing, cannot be used near chimneys or flues. Ultimately will be phased out because it contains CFC's.	1	3	1	4	3	1	1	3	6.2 (5.8-6.8)	B	2	A	A	C	D	D	165°	Many different formulations available for specific applications	
Polyicynene	Not restricted because air is used as inflation gas. Small inflation pressure water based foam provides continuous fill for wide range of applications, particularly: •fireproof •good air retarder properties •contains no formaldehyde or CFC's.	Because water-based, should be used when and where drying can take place. Low expansion pressure doesn't guarantee complete filling of cavity. Effectiveness as vapor barrier/retarder.	2	2	1	4	1	n/a	n/a	4	3.6	B	varies	?	C	A	N/A	A	No information	Sprayed in place	

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New insulation materials are constantly being developed. This Factsheet can be a guide to help you determine the advantages and disadvantages of new products. Always check independent test results to confirm product claims.

Major reference: ASHRAE Handbook of Fundamentals, 1985, Chapter 23.