

COMPARATIVE ASSESSMENT of COMMON INSULATION TYPES

Insulation reduces the heat transfer through roofs, walls, the floor and windows.

Depending on the temperature difference between inside and outside the heat flows through the building envelope from inside to outside or vice versa.

The second law of thermodynamics states that energy (heat) transfer can only take place in one direction, from a higher grade to lower grade state. This means that heat will only flow from hot to cold, never the other way. The tendency will always be towards an even distribution of heat energy within any environment such that, with no additional heat input, all objects will eventually end up the same temperature. Heat flow between objects occurs in three ways: conduction, convection and radiation

Insulation usually comes in four forms: blankets and batts, loose-fill blown or sprayed-in-place, foamed-in-place, and rigid boards.

The marketplace is full of contradictory claims concerning relative strengths and weaknesses of various types of thermal insulation

Insulation is characterized by the type of material it is made from, the form or shape it takes, and the effectiveness of limiting heat transfer.

Insulation is at the heart of the thermal envelope; however it is part of the entire thermal boundary including siding, sheathing, sheet rock and other materials. How well insulation works

in resisting heat flow depends on where and how it is placed and on what, and how much material is used.

The type and amount of material used also affect how well the insulation works. Insulation material is rated by two measurements:

- Its R-Value or resistance to heat flow. The higher the R-value, the better the insulation reduces heat flow.
- Its Density, or the consistent thickness of the insulating material.

Fiberglass is the most widely used insulation in residential construction. It comes in rolls, batts, and loose fill forms. Insulation, including fiberglass, is rated in terms of R-value or resistance to heat flow. The higher the R-value, the greater the thermal resistance of the insulation. U-value (also known as thermal transmittance) is also an expression of thermal efficiency and is the value most referred to in building codes

Insulation rolls and batts are placed in cavities between studs, rafters, trusses, etc. around the perimeter of the home to form a “thermal boundary”. The insulation’s effectiveness is highly dependent upon the skill of the installer. Gaps or voids, and compressed insulation are common application errors resulting in decreased effective R-value of the insulation. It is a well documented fact that low density fiberglass is ineffective in reduced heat loss due to convection. Fiberglass also comes compressed into rigid panels. Loose fill fiberglass is typically used in ceilings. It is generally blown into the space. As with roll or batt insulation, the thickness of the material determines the R-value. Care must be taken that thickness is uniform and coverage complete and the insulation is not compressed

Cellulose insulation is a second common material used for homes and, like fiberglass, can be blown in. Commonly made from recycled newsprint and although treated with a borate-based fire retardant, it is combustible. Cellulose shares many of the same characteristics of loose-fill fiberglass. Cellulose has a higher R-value per inch when compared to fiberglass batts or blankets. Cellulose will settle over time thus diminishing its thermal performance.

Foam insulation, has several severe drawbacks. Building codes mandate a fire barrier over plastic foam to retard combustion and the generation of smoke laden with toxic gasses, in the event of ignition. It has also been noted that spray foam insulations may not be sprayed to the manufacturers recommended thickness necessary to achieve required R Values due to the fire hazards of foams applied at a thickness over 4 inches. Certain foams are also prone to spontaneous combustion.

Secondly, foam can be deteriorated by ultraviolet (UV) rays from sunlight requiring protection from exposure to sun. Thirdly, foam, while not used as a food source, is easily excavated by ants and termites and might obscure these insects from visual detection in a pest management program. Degradation by insects also reduces the R-value of foam. Additionally, spray foam

requires specialized application equipment and operator protection gear to apply the foam to surfaces and prevent accidental exposure of harmful material to workers eyes, skin, or lungs.

ATI™ differentiates itself from all other products by virtue of its unique physical properties

- High Thermal performance
- R value 5
- High Density of 10 lbs/Cu ft. combats heat loss by thermal convection
- Effective against air infiltration
- Does not compress No reduction of effective R value
- Retains thermal performance in cold temperatures
- Will not shrink
- Non Combustible
- Non Corrosive
- No hazardous chemicals or VOC's to off gas inside building
- Made from 100% recycled materials: Is 100% recyclable
- No special equipment required for installation
- Interior or exterior application
- Eliminates thermal bridging