

### Roofing Materials

The roof of a house should be attractive, waterproof durable, and contribute to sustainability, having a long lifetime, promoting energy efficiency and able to be recycled. Traditional materials for pitched roofs include: wood, metal, slate, tile, asphalt and concrete. Low pitched and flat roofs have relied on built-up and polymer membranes. Further, green roof systems, for use in all roofs, are gaining wider use.

On pitched roofs in the US, asphalt is used most. Used in lightweight composition shingles, at 200 pounds per square (100 square feet), they last up to 20 years, are cheap and address concerns of fire safety and moisture resistance. They can be recycled at the end of a useful life. New technologies allow these shingles to reflect light, reducing rooftop temperatures and energy bills (California Energy Commission). Slate, clay tile, and concrete have similar properties, but are much heavier (1000 pounds per square). They last 50 to 100 years or more, and are very expensive. Some engineered materials, such as fiber concrete give all the benefits of concrete at a lower weight. Further, the same look can be achieved with metals. Metals are lightweight, weighing less than asphalt ([www.gerardusa.com](http://www.gerardusa.com)). They can last up to 50 years, and may only be about 3 times the cost of asphalt. Wood provides excellent insulation, but is not recommended due to fire concerns and high maintenance. In addition, solar technologies have been integrated into shingle and tile roof materials, providing an alternate source of energy.

Low pitched and flat roofs are typically built-up or polymer membranes. These materials can last 20 years or more. Built-up roofing consists of layers of roofing felts, saturated with bitumen. While lightweight, they cannot be reused or recycled. Some polymers used as membranes are elastomeric, thermoplastic, and PVC polymers. These weigh less than 200 pounds per square, may have reflective properties and are fairly inexpensive. Elastomeric and thermoplastic roofing materials can be recycled if attached mechanically ([www.greenspec.co.uk](http://www.greenspec.co.uk))

Green roofs provide waterproofing, insulation and can effectively lower roof temperature for energy savings (Greenroofs.com). Further, they capture green house gases and improve air quality. Green roofs may be very heavy; they are minimally composed of a root barrier, insulation, drainage, filter fabric, and soil, and last at least 20 years. There are two types of green roof. Extensive green roofs are ideal for homes; with plants tolerant of extreme conditions they are low maintenance. Intensive green roofs are ideal for large buildings. They may have variety of plant species including trees and be designed for use as public parks and habitats for local wildlife.

The house of the future, a system, will require roofing materials that are durable, reusable, and energy efficient. Metals and polymers are ideal for smaller projects because they are lightweight, possess insulating and light reflecting properties when installed, and are easily reused or recycled. Green roofs provide innumerable benefits for the environment and building owner and should be incorporated into large-scale projects.