

## **Built up Roofing**

**Built up Roofing**, also known as BURM (Built Up Roofing Membrane), is an old, generic term for any system that is composed of multiple layers of felts that are adhered together with either an asphalt (hot or cold), coal tar, emulsion, or any other adhesive. Because of modern technology and this definition of BUR, any stem that uses reinforcement felt and adhesive can be called a BUR roof. Here we will restrict the term BUR or Built Up Roofing to mean any system that is composed of and installed with a bitumen. This restriction or definition is commonly called Traditional Built Up Roofing. Traditional BUR systems are generally those using a bitumen saturated felt installed, in multiple layers in the field and optionally surfaced with an aggregate, finishing felt, or coating.

**Coal Tar Pitch** is a material that is the by-product of the coal refining process and in practice works like asphalt with some minor variations. Coal Tar Pitch is a “high end” bitumen and is usually specified on commercial, industrial and government facilities requiring long term warranties. Coal Tar Pitch is nearly always installed on “dead level” roof decks. Coal Tar Pitch may be surfaced with an aggregate or left smooth. Note that although Coal Tar Pitch products may be used on other BUR systems, it is not recommended to mix system types. Any cross use of materials should be considered temporary.

**Cold Applied BUR** systems are similar to regular bitumen based BUR systems. The difference is that the adhesive is applied cold and the felts are coated with additional bitumen at the factory. Fiberglass felts are required to be pre-cut to a length no greater than 20’ prior to installation. Polyester and organic felts are installed in the same fashion restoration system over an existing smooth surface BUR system and on facilities where the bitumen odor and smoke are of concern.

**Hot Asphalt** is the more common of the BUR systems. Asphalt is a by-product of the oil refining process. Hot Asphalt systems can be installed on low slope roofs with an incline up to 6 inches with Special Steep Asphalt Type IV. Most installations are less dramatic in slope and are between ½ and 3 inches of incline. Hot Asphalt systems can be composed of organic or inorganic ply felts. The surfacing options are smooth, aggregate, roll (cap), or coated. The Hot Asphalt roofing system is the workhorse of the industry and can be traced back to the late 1800’s.

**Hybrid BUR** systems are traditional Hot Asphalt base and ply felts (described previously) with a Modified Bitumen Cap Sheet (described following).

**Modified Bitumen** systems are found in two varieties, APP (torch applied) and SBS (Hot Mopped with Asphalt). A Modified Bitumen system can be installed as a single or multiply system. Modified Bitumen roofing membranes are reinforced with either a fiberglass or polyester scrim. The Modified Bitumen cap sheet or top layer may be left smooth, surfaced with an aggregate or granule, foiled from the factory, or coated.

## **Liquid Applied**

**Liquid Applied** Roofing can refer to a liquid applied membrane, coating, or even paint by some manufacturers. Here we will define Liquid Applied Roofing systems as those systems that were designed and manufactured as waterproofing agents, optionally incorporating a reinforcement scrim at installation. Liquid Applied systems have many inherent advantages as well as disadvantages. The key to success when using these systems is to properly identify the correct application and substrate preparation. Nearly all of these systems should never be installed where water ponding is a problem. The expected life of most systems is 5 years, with signs of aging showing around the third year. These systems are usually applied as a recovery application over an existing system in one or more coats or directly to the deck.

**Acrylic Elastomeric** is a product that has the advantages of a traditional elastomeric coating with the added benefit of performing in ponding conditions. This system usually incorporates a polyester reinforcement fabric providing excellent flexibility and strength.

**Acrylic Modified Urethane** systems have many advantages such as flexibility, chemical and traffic resistance, potable water storage, and can be applied over most roof systems. The different applications can yield a system with an expected life cycle of 15 years.

**Elastomeric** coatings are typically water based and are used as a recovery application to extend the life of an existing system. The most common applications are on walls, metal roof systems, smooth surface BUR, shingles, single ply and concrete.

**Epoxy** systems have always been an excellent waterproofing agent. The inherent hardness in the product has limited their use. A flexible epoxy coating, which is available, solves this problem and has the advantages of thin layer application and use in wet areas. Epoxy systems can be installed over any smooth roofing system (except silicone) or directly to concrete decks.

**Polyurethane** Foam Spray (PUF) is a system that is very similar to a liquid insulation. The systems themselves are installed directly on the deck or existing roof membrane. The PUF has a high level of failure when exposed to ultra-violet light therefore requires a surface coating be applied. Until recently coatings have only lasted about 5-7 years and unless periodically inspected and maintained, premature failure of a PUF system as a result of UV exposure can occur. This system can be thought of as insulation as well as waterproofing.

## **Metal**

**Metal Roofing Systems** are available in a variety of materials and formations. These systems are generally used on commercial, industrial, or governmental facilities. The most common types of metal used are aluminum, galvanized, galvalume, or copper. An optional paint or coating is factory applied to reduce oxidation and improve aesthetic qualities, known as pre-finished.

A metal roofing system is generally classified as either an Architectural or Structural Panel. A structural panel is one that is sufficient in design and strength to span the roof

joists without a sub-deck. An architectural panel is generally of thinner gauge and must be installed over a sub-deck. As a rule, structural panel fasteners are exposed and architectural panel fasteners are concealed. The vertical height of the panel seams are 1" to 1-1/2" for an architectural panel and 1-1/2" to 3-1/2" for a structural panel. The maximum width of an architectural panel is 24" and 36" for a structural panel. With few exceptions the joints of the systems are sealed with some type of waterproof sealant. Each of the classes of metal roof systems can be further identified by the seam formation as follows:

**Standing Seam** systems is that in which panel edges rise vertically. These vertical edges can be capped or machine formed. All of these incorporated a concealed clip that is mechanically fastened to the substrate.

**Batten Seam** systems are also known as "Board and Batten" panel systems. A continuous vertical metal clip is fastened to the substrate and clipped into the panel edges. A metal batten cover is installed over the seam area.

**Flat Seam** systems are used on flat, low slope, very steep, or unusual shaped roofs.

**Bermuda** systems are those in which the joints are horizontal instead of vertical and are installed from the bottom eave to the ridge.

### **Shingles**

**Shingle** roofs are systems that are composed of a small unit that is installed in an overlapping fashion to direct the water flow off the roof. The composition, size, and style of the shingles can vary. Shingles are installed on an inclined roof of at least 3" in 12" of rise. In some areas of the country a shingle may be installed directly over the roof deck. However, there is usually an asphaltic "dry-in" sheet installed. Shingles are attached to the roof deck with a mechanical fastener, which is concealed when the next "course" or row is installed. A shingle can have "tabs" cut into them at the factory, presenting an appearance of smaller units when installed. Some of the more popular types of shingles are listed below.

**Asphalt** shingles are generally those that are composed of an organic material that is saturated with asphalt and surfaced with a granule. These shingles are the predecessors of today's inorganic shingle. An asphalt shingle can have 1, 2, or 3 tabs. The life span is usually less than 20 years.

**Fiberglass** shingles are inorganic, are generally lighter in weight than asphalt shingles, and can be laminated to provide a "three dimensional" appearance. There are even some companies that produce a fiberglass shingle to look like wood, slate, or copper roofs. Fiberglass shingles typically have a longer life span than traditional asphalt shingles. You can expect a Fiberglass shingle roof to last 30 to 40 years if installed properly.

**Metal** shingles are sometimes called a metal tile roof. These shingles are usually made of aluminum, galvanized, copper, or tin. The use of metal shingles has declined greatly

since the early 1900's. It is not uncommon even today to find metal shingle roofs still in service after 50 years.

**Wood Shingles & Shakes.** The basic difference between these two is that a shake is split from a block of wood and a shingle is sawn. Red cedar is the predominant wood used in North America for this shingle. Wood shingles require special deck venting considerations and should never be installed on a solid roof deck. Venting, sometimes called "breathing" is required or else cupping of the shingles occurs as well as fungus growth and rotting. Because of the recent fire resistance regulations there has been a rapid decline of wood shingles used in the United States.

### **Single Ply**

**Single Ply** roof systems are generally those that are factory fabricated and installed in the field as a single layer. Single ply roofing systems come on a roll and can be loose-laid, adhered, or mechanically attached to the substrate. The laps of these systems are heat or chemically welded or glued together with an adhesive. Single ply roofing systems offer ease of installation, lighter weight, and usually a lower cost because of labor installation savings. Some of the concerns are puncture resistance, ponding water, delamination, and chemical resistance. The following are the major categories of single ply systems available today.

**CPE** (Chlorinated Polyethylene) is a membrane consisting of polyethylene that has been chlorinated to increase its fire resistance. A CPE membrane is an uncured membrane that does not require a plasticizer to achieve an elastomeric or flexible quality. A CPE membrane can be heat welded during initial installation and after aging. CPE edges may require an edge sealant to prevent an exposed polyester scrim from wicking.

**CSPE** (Chlorosulphanated Polyethylene – Hypalon) is a membrane with the same characteristics as CPE with the following differences. A sulphur is added to improve the weathering ability, the membrane begins to cure immediately after exposure to the elements, and adhesives must be used after the initial installation instead of heat.

**EPDM** (Ethylene Propylene Diene Monomer) is a membrane that is essential rubber with an additive to provide tensile strength. In the case of black EPDM the major additive is carbon black. Black EPDM is one of the least expensive roofing systems to manufacture and install, and as a result accounts for one half of the single ply industry. The EPDM membrane is available in very large sheets; therefore the quick covering of large roof areas is possible. EPDM membrane is available in several thicknesses and optionally reinforced with a polyester scrim. EPDM cures after weathering and requires cleaning and priming before repairs are possible.

**PIB** (Polyisobutylene) is a membrane that is composed of Polyethylene, Isobutylene, fillers, and a polyester fleece backing. The membrane is on a roll and has a self-adhesive lap. The installation method often uses Hot Asphalt as an adhesive applied in a serpentine fashion. This system performs well and its limited chemical resistance is the only major concern.

**PVC** (Polyvinyl Chloride) is a membrane that is thermoplastic material that is available in a variety of thicknesses and optional reinforcements. Like most single ply systems the material can be formed into many shapes and conditions using heat and adhesives. PVC membranes are prone to plasticizer migration and should be monitored.

### **Slate**

**Slate** is a stone that can be split into small sheets or shingles. This material is absolutely impervious to water and resistant to heat and frost. As a result a slate roof will last as long as the sub-deck or structure beneath it. There are some slate roofs in Europe over 1000 years old. Slate is graded as S1, S2, or S3. This grading system represents the number of years that the material is rated for: S1 – 75 to 100, S2 – 40 to 75, S3 – 20 to 40. Failures of slate roofs are a result of cracks or fractures in the material or a deteriorated substrate. Slate can be formed into a variety of shapes, widths, and thicknesses. Slate is installed on an underlayment and nailed or clipped much like a flat concrete tile. Plastic roofing cement is incorporated to minimize water penetration through joints between slates and to cover the copper nails.

All aspects of slate quarrying, forming, and installation are highly technical and require a long-term investment of training. The slate industry is relatively small and generally restricted to the geographical locations where the slate is mined due to shipping costs. A roofer can expect to apprentice for at least four years to become a slate installer.

In the United States slate is quarried in Vermont, Pennsylvania, Maine, and New York.

### **Tile**

**Tile** is a term to describe a variety of small units that range in length and width. These tiles can be composed of concrete or clay, finished or unfinished and shaped flat or sculptured. The method of attachment is nailed, glued, mud-on, or a combination of these. In some areas of Florida a clip or wire may also be required. In Florida, tile is typically installed over a substrate that has been dried-in and a 90lb mineral surface felt has been hot-mopped on.. Most tile systems if properly manufactured and installed can be expected to last 30-40 years. The typical failures of these systems are around penetrations and valleys. Tile systems also tend to “slide” with age and can cause splitting of the 90lb sheet underneath.. The point of failure of the 90lb is usually at the selvage edge. Tile is available in a variety of colors and finishes. Tile can be made to interlock or butt joint.

**Clay Tile** is pressed into molds or extruded. The tiles are typically left natural in color and fired in a kiln to cure. Clay tile is usually barrel-shaped and can be straight or tapered.

**Concrete Tile** is the most economical tile and is available in many colors, shapes, and textures. This tile can be made to look like wood shakes or clay tile. The coloring of a concrete tile can be integrated during the mixing of the concrete or sprayed on as a coating. Concrete tile can also be made into larger shapes than clay tile.

**Glazed Tile** is the high end of the tile products. Clay tile is sprayed with the glazing compound prior to firing in a kiln. The glazing compound becomes vitreous (glass-like) and bonds with the clay material. Because of the many variables in the successful manufacture of glazed tile, the cost is higher than normal clay or concrete tile.