Understanding Roof Underlayment

A complete roof system is more than just the final roofing material. A roof system is comprised of multiple components, and roof underlayment is an important element of an effective roof system designed to protect both life and property.

There are three basic types of underlayment used beneath roofing materials:

- Asphalt-Saturated Felt
- Rubberized Asphalt (including Polymer-Modified Bitumen)
- Non-Bitumen Synthetic

Building codes require the installation of roof underlayment for several reasons – with all roofing types:

- **It repels water**
  When generalizing for any roofing type, wind-driven rain or snow can trap water under roofing, putting a roof deck and inner residence at risk of damaging leaks, rot and mold. Roof underlayment helps to ensure that water drains off the roof.
- **It provides backup protection in the event of ice or water damage**
  In Northern climates, ice or snow dams are another common cause of home water damage. When heat from your home rises to melt snow or ice on your roof, water can then seep into your roof's nooks and crannies, then ultimately into your home to cause damage. The best protection in this situation is the use of a specialty roof underlayment – a self-sealing "peel-and-stick" membrane that can seal around fastener shanks for a leak-resistant fit.
- **It provides extra weather protection**
  Some roof materials are more susceptible to wind uplift damage. In these incidences, the roof underlayment becomes a backup layer of weather protection to guard against rain until the roof can be repaired or replaced.
- **It may be necessary to use to meet a target fire rating**
  When a roof system is evaluated for a fire rating, the choice of roof underlayment is an important component for the entire roof system achieving a particular target rating. Be sure to select the underlayment approved and compatible with the overlying roofing materials and therefore comply with building codes.

- **It protects your roof deck while you work on it**
  Roof underlayment prevents the roof deck from being exposed to the elements, before, or while, the roofing material is being installed. Ideally, the roof-covering material would be installed as soon as possible, but in reality, the roof may be protected by only the underlayment for days, weeks, or sometimes months. It also needs to resist the wear and tear that occurs when the roof-covering material is being installed.

Asphalt Felt Underlayment

Asphalt felt underlayment has been in use for a long time, and for good reason. It's widely available, is inexpensive, is simple to install with common tools, and is the original "smart" vapor retarder, changing its permeance depending on whether it's dry or wet. Asphalt felt is still the product of choice for roofers who are drying in and installing a finished roofing with only short exposure to the elements in between.

Manufacturing organic asphalt-saturated felt underlayment is a pretty straight-forward process. Recycled paper is processed into a roll. Hot asphalt is then added to the roll and asphalt saturated underlayment is formed.

In the past, the felt number designation was correlated to the weight of the felt (i.e., a 15# felt weighed 15 lbs/100 square feet. Today, that correlation no longer exists. By shifting the 'pound' symbol, 15# felt became #15 felt, which may actually weight 7.5 to 12.5 lbs/square; #30 felt today can weigh between 16 and 27 lbs/square. The math shows that a single layer of #30 felt today could weigh more or less than 2 layers of #15 felt depending on which end of the min/max spectrum the two types of underlayment fall. In fact, today the terms Type I and Type II are used within the industry, respectively, making it much easier to understand when it's appropriate to use which type of underlayment.

The need to apply two asphalt felt layers is driven more by the roof deck slope and water management – rather than actual weight. Only applying one layer of underlayment on a lower sloped roof is cautioned. One should consider slopes of 3:12 to 4:12 to receive two underlayment layers in a shingle fashion where the top layer overlaps the bottom layer by about 19 inches to create a stronger barrier.

Synthetic Roof Underlayment

When compared to asphalt felt, synthetic roofing underlayment has many of the advantages of house-wrap – it installs quicker and is far more durable in high winds, or when left exposed for long time periods. Synthetics also offer better foot traction than asphalt felt for safety precaution. These benefits must be balanced against the higher cost of synthetics, though, especially for vapor-permeable underlayment. The need for cap fastening also means a standard hammer-stapler is no longer an option.

While asphalt felt wrinkles when wet; cracks and splits in cold weather – synthetic underlayment stays pliable and resilient; can be exposed to cold weather for generally 4-12 months without issue.

Underlayment Permeance – the Ability to Pass Water Vapor (But Not Liquid Water)
Most synthetic underlayments have permeance (perm) ratings under 1 perm, making them effective vapor (moisture) barriers – much like ice and water dam membranes. Because these underlayments don't allow roof sheathing to dry upward, manufacturers recommend that they be used only over ventilated spaces – that is, vented cathedral ceilings or vented attics – that allow downward drying.

And, just because an attic is currently vented doesn't mean it will stay that way. A few years later, a homeowner may decide to install spray polyurethane foam on the underside roof sheathing. At that point, the sheathing

will no longer be able to dry downward. If this is a concern, stay with asphalt felt underlayment. After all, it is the original "smart" vapor retarder, having a perm rating of about 5 perms when dry, but a much higher rating of 60 perms when wet. Having a vapor-permeable underlayment is important if you have a roof like DECRA Metal Roofing – a roof that allows free-flow air between the roof material and the exterior roof deck – assembled like a vented rain screen. It's very beneficial to be able to dry the roof deck upwards.

Although most synthetic underlayments are vapor barriers, there are exceptions. Synthetics are manufactured with a vapor permeance that can be as high, or higher than asphalt felt underlayment. Any material with a perm rating of 10 or greater is highly permeable. They are also generally more expensive. Or, just stick with asphalt felt underlayment if you want a vapor-permeable product.

Roof Underlayment Test Compliance

ASTM D 226: Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing & Waterproofing

CSA 123.3: Asphalt Saturated Organic Roofing Felt

CAN 2-51.32: Sheathing, Membrane, Breather Type Paper

ASTM D 4869: Standard Specification for Asphalt-Saturated Organic Felt Underlayment used in Steep-slope Roofing

ASTM D 6757: Standard Specification for Underlayment Felt Containing inorganic Fibers Used in Steep-slope Roofing

CSA A123.22: Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection (refer to CASMA Technical Bulletin #10)

ASTM D 1970: Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection (refer to CASMA Technical Bulletin #10)

Note: The proper application instructions recommended by the product manufacturers should be followed to ensure optimum underlayment performance under the roofing system.

Rubberized Asphalt Underlayment

Various rubber-like materials are also used as underlayment, generally referred to as "rubberized asphalt". These typically have adhesive on one side, which is protected by a peel-off membrane, making them self-adhering. The rubber-like qualities of these underlayments make them self-healing, meaning that they seal well around fasteners.

In areas where ice often forms along the eaves – causing melt-water to back up under the roof material (or ice dams) – the ice barrier underlayment must be installed at the roof edge. An ice barrier underlayment is typically a self-sealing, self-adhering waterproof underlayment. On roofs with steep pitches, this may require up to four courses of ice barrier underlayment to install at at least 24" (horizontal measure) outward from the exterior surface of the exterior wall.

In roof areas where roof planes meet to form valleys, which naturally channel high water flow in wet weather, and other roof penetrations – such as skylights, plumbing vents, roof-to-wall intersections – are also important roof areas that can benefit from peel-and-stick membrane underlayment installation.

Rubberized asphalt underlayments are manufactured to meet different requirements:

- They may have polyethylene or polyester bonded to the upper-surface to provide non-skid and weather resistant qualities
- They may have a polymer film bonded to the weather surface to improve moisture resistance
- They may be fiberglass-reinforced
- They may have a mineral granule coating on the weather surface
- They may be formulated for use in high-temperature situations – some developed to resist heat up to 250˚ F without adhesive degradation

Polymer-Modified Bitumen

This term is often used when referring to asphaltic roofing materials. It is often shortened to "mod-bit". The term "bitumen" is a generic name applied to various mixtures of hydrocarbons. One of these mixtures is the asphalt used in underlayment, asphalt shingles , and built-up roofing. To improve various characteristics such as strength and elasticity, bitumen is often modified using polymers to give it rubber-like properties. Polymers are used to increase resistance to damage and deterioration.

Tailor the Underlayment Installation to the Roof

Asphalt felt underlayment has specific installation instructions outlined in the code book. For synthetic underlayments, it's best to follow the installation instructions provided by the product's manufacturer. Here are some more generic 'tips' for applying underlayment:

- Underlayment typically has reference lines to help determine horizontal course-run overlaps, usually around 4".
- Avoid end laps if possible, but where unavoidable, lap the underlayment at least 6 inches.
- Peel-and-stick "ice and water dam" membrane is required in cold-weather markets, installing at roof eaves – should be lapped under the drip edge, and must cover the entire overhang. It then must extend up the roof deck at least 2 feet (horizontal measure), past the front wall of the house (best measured from the interior wall surface outward).
- When drying in, lap underlayment over ridges and hips. When it comes time to install the ridge vents (if used) for vented roofs, cut back the underlayment.
- To protect against wind-driven rain, lap the underlayment under the rake edge.
- Most synthetic underlayments are approved for roofs as low-sloped as 3:12 – provided that the material is overlapped by about 50%. A better approach is to cover low slopes completely with peel-and-stick membrane.

Summary

Roofing underlayment plays an important role in how well your roof system performs in numerous exposure elements: rain, wind, snow, ice, fire – to name the most important forces your roof may face. Seek to understand underlayment choices and applications that are common for your market. Building codes will guide proper application. And, always seek usage instruction from the underlayment manufacturer to avoid negating warranty coverage. Finally, review the **DECRA Installation Guide** for the DECRA roof system style that you are installing – whether new construction or a reroof project – to ensure a complete roof system install, including underlayment, is integrated well within the entire roof system and its accessory components.