

INTRODUCTION

Specifying underlayments for metal roofing often comes down to three basic needs. The first need for the installer and general contractor is to “dry the building in” so other work can proceed within the building. Second is for the owner and pursuer of a weathertightness warranty is to protect against the chance that moisture will penetrate the metal roof system and act as a secondary moisture barrier. Third is to allow a means of escape for ‘back side’ condensation which may occur in certain metal roof applications; this condensation must be directed out of the system. In all three cases the underlayment is intended to ultimately direct any moisture to the outside of the building envelope.

This technical bulletin will look at the different types of underlayments used with metal roofing. The discussion of underlayments within this document does not include internally driven vapor barriers; those used to block moisture originating from inside the building (ie. such as a natatorium). The main types of underlayment reviewed within this bulletin are: felts, rosin paper, polyethylene plastic, synthetic underlayments, and self-adhering membranes.

ASPHALT SATURATED FELT

The selection of this felt is often driven by the project specifications and cost. 30# asphalt saturated felt is perhaps the most widely used underlayment and most readily available. 30# felt installed and lapped horizontally with roofing nails and caps is adequate as a moisture barrier. Alternatively, two layers of 15# felt can be used but it does not lend itself to installation activity and wind conditions. Often one layer of 15# is installed and then shortly before the panel installation another layer is added. The down side of felt is that it may not be a durable, lasting underlayment for metal panel installation activities, it is not durable during windy conditions and has a relatively short life when exposed to the elements.

The use of asphalt saturated felt under metal roofing is perhaps the cheapest, most accessible, and most widely used. Unfortunately, even after a few short weeks of exposure, it will have less and less effectiveness as a water shedding material. Exposed and weathered felt eventually becomes a liability and must either be replaced or covered. The use of asphalt felt may work well if metal roofing can be installed within a few weeks. Asphalt roofing felts that have been over-exposed, dried out, curling, wrinkled, torn from wind damage, and/or patched may not provide the protection and performance that is needed. Extremely weathered felt may actually retain moisture under the metal roofing and exacerbate water infiltration damages. Additionally, temperatures reached in certain conditions underneath the metal roof may cause the asphaltic material to become viscous and “run”, potentially leaving unsightly streak marks outside of the building envelope.”

ROSIN PAPER

Rosin paper is not considered a moisture barrier under metal roofing. The discussion of rosin paper within this bulletin is to clarify its use as a slip sheet. Slip sheets are traditionally used to prevent adhesion of asphalt felt to the back side of metal roof panels. As the metal roofing expands and contracts during the daily thermal cycle the movement can displace, and even tear, the asphalt felt underlayments. Because aluminum and copper have much higher thermal expansion rates than steel the use of a rosin paper slip sheeting is more prevalent with these roofing materials. The use of a slip sheet under steel roofing is not a requirement for roofing warranties. There are questions as to whether rosin paper could actually retain any moisture that may infiltrate into the system rather than encouraging moisture to migrate out of the building envelope.

POLYETHYLENE PLASTIC

Polyethylene plastic is not a recommended underlayment for metal roofing. Even though polyethylene is an effective water barrier and is inexpensive, the material does not hold up well under prolonged exposure to sun and heat. The long-term effects from radiant heat under metal panels is unknown with this product. Polyethylene does not perform well with fastener penetrations and has poor resistance to tears in the installation process. Plastic also does not provide adequate slip resistance on sloped surfaces and gets worse with the presence of dust and moisture. The perm rate for this material is very high, to the point that it can possibly trap moisture at its' surface.

SYNTHETIC UNDERLAYMENT

Synthetic underlayments are relatively new in the U.S. and have continued to evolve over the last ~20 years. A number of these polymer based synthetic underlayments have been used with considerable success. The initial aim of synthetic underlayments was to replace asphalt saturated felt in the market. The success of these products has been overwhelming. The cost of synthetic underlayments is roughly double that of asphalt felt. That said, the list of advantages that synthetic has over asphalt felt is significant. Some of the key advantages:

Lighter Weight: Synthetics are roughly 1/5 the weight of asphalt felt. This allows for bigger rolls, and significantly more coverage per roll, resulting in lower installation costs.
Resistance to tearing – These underlayments have up to 10X the tear strength of asphalt felt. The tear resistance is very effective against winds as well as installation traffic and other construction activity.

Exposure or UV Resistance: Most synthetic brands list acceptable exposure times of up to six months. The much improved tear resistance and long-term exposure are perhaps the biggest advantages of synthetics.

Moisture Penetration: Appears to be very good for synthetic underlayments with data sheets indicating perm rates such as .05. Perm rates for asphalt felt in good condition are in the range of .02.

Some concerns exist regarding how well the synthetics manage fastener penetration. With 30# asphalt felts the theory is that the fastener head compression against the felt will cause the oil in the felt to flush together creating an added level of moisture protection. With synthetic underlayments the protection is less clear; underlayment manufacturers strongly encourage the use of plastic capped underlayment fasteners to both reduce the opportunity for water intrusion, as well as improve the retention of the underlayment to substrate. Synthetic underlayments don't have to be used across the entirety of the roof; they can be used in combination with self-adhering membranes in the lower slopes, valleys, eaves, etc. (the more risk prone areas) to provide a more complete, cost effective underlayment solution.

Future use of synthetic underlayments will only continue to expand and continued product improvements will occur as well. Note that exact compositions of synthetic underlayments are very proprietary and vary notably from one manufacture to another. Proper research should be done to select the most appropriate underlayment for the application.

SELF-ADHERING MEMBRANE

Self-adhering membranes are considered the foremost underlayment for metal roofing. The key attributes of these products provide for the best protection. Some of these attributes are:

Self Healing: Holes created by fasteners installed through membrane underlayments tend to seal around the fasteners, reducing the possibility of moisture penetration.

Preparation: Each of these products have specific requirements at installation such as surface priming of substrates. Thorough cleaning of substrates and removal of protrusions, decking voids, etc. may be required to improve adhesion and reduce opportunity for underlayment damage.

Exposure Time: Ranges from 30 to 90 days. Longer exposure times may produce uneven underlayment surfaces.

Temperature Resistance: Self-adhering, high-temperature underlayments are designed specifically for use under metal roofing systems in order to protect against the high temperatures that are possible under metal roofing systems.

Variations: Some versions of this product are only made for composition shingles and may not have enough temperature ratings or flow temperature to be suited for metal roof applications.

Targeted Usage: Self adhering membranes are often used in combination with felts or synthetics such that eaves, valleys and perhaps hips and ridges are stripped with several feet of membrane and the balance of the roof with the less expensive product.

Compatibility: Some self-adhering underlayment manufacturers caution against physical contact with EPDM, creosote, wood pitch (resin), gasoline/oil/diesel fuels, flexible PVC and numerous solvents. Adhesion can also be an issue for some substrates such as polystyrene (Styrofoam).

As with any underlayment usage, consult all product usage and installation requirements with the manufacturer and also ensure the product's compatibility with metal roofing.

RADIANT BARRIERS

In recent years, radiant barriers with very low perm rates are also being utilized under metal roofing. These radiant barriers not only act as vapor barriers but also provide resistance to heat transfer into or out of the building envelope.

SPECIAL CONSIDERATIONS

Fire Rated Underlayments

Most underlayments on the market have fire resistance ratings. These fall into two primary categories:

- Those that specifically boost a metal roofing assembly to a Class A fire resistance rating when the product is installed over combustible wood substrates. A couple of the select industry underlayments that meet these stringent requirements include:
 - o GAF "VersaShield Underlayment"
 - o Polyglass USA Inc "Polystick XFR"
- Underlayments that may be used as a component of a Class A rated assembly, but their inclusion does not impact the rating of the fire rated assembly. UL typically defines these products as follows: "Ply Sheet (Optional): — Any UL Classified Type G1, G2 or G3 base/ply sheet, Type 15, 20 or 30 felt or UL Classified prepared roofing accessory." AEP Span Underlayment HT falls into this category.

Consult the AEP Span UL listings for approved underlayments and constructions for Class A rated assemblies.

AEP Span Weathertightness Warranties

- **Full System Weathertightness Limited Warranties** issued by AEP Span require the use of AEP Span Underlayment HT. AEP Span Underlayment HT may be omitted on warranty projects if a project is installed over open framing which does not require underlayment usage. Projects specifying Class A fire rated assemblies may require an alternate roof underlayment or a combination of underlayments to satisfy fire resistance requirements.

- **Side Seam Warranties** issued by AEP Span have reduced underlayment restrictions. AEP Span Underlayment HT is acceptable for use. Most other underlayment types described within this bulletin are also allowed for Side Seam Warranty purposes if specified and approved for use under metal roofing by the underlayment manufacturer.

AEP Span Coating/Substrate Warranties

The only requirement for AEP Span coating and substrate warranties is that the underlayment directly below the roofing panels not have a granular surface. There is a significant concern that the granular surface may scratch and damage the wash coat and metallic coating on the underside of the metal panels allowing any moisture to deteriorate the panel substrate integrity.

IN SUMMARY

There are a few primary types of roofing underlayments used with metal roofing – asphalt saturated felt, rosin paper (slip sheeting), synthetic underlayments, and self-adhering membranes. There is also a large number of variations/formulations to these as well, especially with the synthetics. This bulletin provides some general guidance however it is ultimately the responsibility of the specifier or design professional to select the proper underlayment based on each project's physical and environmental requirements.