EPDM single-ply roof systems have represented a third of the volume of the low-sloped commercial market for close to twenty years. The majority of these roofs were installed to receive the manufacturer’s 10- or 15-year warranty, so many are either beyond the duration of the warranty or soon will be.

EPDM has achieved a reputation in the industry as a long-lasting material, and advancements in materials, techniques, and components have given manufacturers the confidence to offer the industry’s longest warranties of thirty years.¹

Many building owners and designers are considering restoring these existing EPDM systems in lieu of re-roofing (tear-off or retrofit). Restoration costs are typically 10% to 30% of the re-roofing cost, depending on the roof condition and the system attachment method.

There are many factors to consider when deciding between restoration and re-roofing such as cost, time, viability, codes, and environmental impact.² This paper discusses only certain restoration procedures, and these procedures should be considered in conjunction with the above factors. The information will also help in designing new or retrofit EPDM systems with provisions for longer service life and initial installations that will be easier to restore in the future.

Many manufacturers have prepared specifications for repair or restoration of their existing systems and may even offer an extension of the warranty coverage if the owner elects to restore in compliance with specifications. These proprietary specifications are comprehensive because manufacturers are conservative when assuming this additional warranty liability, and these types of restorations generally cost more.

Roof consultants who wish to control costs while optimizing the restoration may prepare restoration specifications specific to each EPDM system, based on existing conditions that may be driven by site-specific circumstances and the owner’s individual needs. These specifications are usually descriptive since there are no reference standards for restorations, and it would be difficult to specify and measure performance of the restoration work. It is also important to specify products that are compatible with one another. It may be possible to specify a different manufacturer’s EPDM products to restore an existing EPDM roof, but it is not recommended to use combinations of products from different manufacturers for the restoration. Most manufacturers offer similar products for their...
EPDM systems, but there are enough differences that the specifier will need to become familiar with the products of the manufacturer that is specified.

There are several important ideas to keep in mind when renovating EPDM. The first is that the primary reason for renovating the existing system is to extend the service life of an existing EPDM membrane that is still in good condition. Always try to preserve the integrity of the membrane sheet, or better put – don’t cut it. There are some exceptions when it may be necessary to cut the sheet, but most restoration procedures keep the sheet intact.

Also, don’t make coating the roof the number one priority. There are a number of benefits to applying a coating over the existing membrane or on the exposed wall flashing, but in most cases, the concern should be to bring the system back to a condition that provides additional service life. An existing installation may be exhibiting varied levels of distress. The coating should be the final step, applied after the other topical, membrane-specific restoration work is completed. Remember that repairs to a coated EPDM roof are much more difficult to execute than on a previously uncoated membrane and, therefore, are more expensive. Repairs to an uncoated EPDM surface are typically superior to those on a coated or partially coated surface.

There are three configurations to affix to the EPDM membrane: fully adhered, ballasted, and mechanically attached. Each is very different in regard to its overall restoration and the requirements for detailing. All three systems may be renovated, but the majority of restorations to date have been on fully adhered or ballasted systems. Restorations to mechanically attached systems involve additional requirements because of dynamic stresses on the seams and fastening components.

To receive the maximum benefit, restoration activity should be focused where problems are most likely to show up on the existing system. Historically, the two areas that have contributed to problems on EPDM systems are the seams and base tie-in attachments at transitions from the plane established by the roof and adjacent interfaces with walls, etc. As such, these two areas should be the primary focus of any EPDM restoration.

Seam technology for EPDM systems has improved, and it is important to identify the seaming techniques that were used on the initial installation as well as to identify the cause of seams showing signs of failure. The basic repair is to overlay seams with a tape adhesive-backed, uncured flashing. This is commonly referred to as “stripping in” the seams. Procedures and products to strip in seams vary, depending on the membrane manufacturer, system type, and existing conditions. The cost also varies, depending on the procedure utilized. With more substantial methods implemented, the cost could be double that of a routine method.

The first step in stripping in the seam involves cleaning the existing membrane. Many seams fail prematurely due to a failure to properly clean the splice area when the membrane is new, so proper cleaning of the in-service membrane is a top priority. The membrane should be cleaned with detergent and thoroughly rinsed with clean water at least 12 inches in each direction from the seam edge. On ballasted systems, pull the pavers or stone away to expose the membrane and to prevent additional dirt from entering the repair area. Sweeping away all loose dirt simplifies the cleaning process, and many contractors prefer to aggressively clean with a dry, stiff bristle brush or broom prior to applying detergent and water.

Some manufacturers offer cleaning solutions specific to aged membrane, while others offer solutions to clean the EPDM prior to the application of their respective roof coatings. These solutions are now recommended for cleaning EPDM membrane prior to repairs. The cleaners are easy to use, and provide excellent results, especially when rinsed with a powerwasher (2000 psi). Exercise care not to aim the power washer nozzle at the lap edge, thereby possibly opening the lap.

An additional cleaning of the dry membrane with the manufacturer’s solvent membrane cleaner and re-adhering any loose seam areas with splice adhesive are both recommended prior to the application of the splice adhesive or seam primer for the overlay.

The next step is application of the primer or adhesive used with the tape adhesive-backed flashing. It is generally best to use the primer recommended by the flashing manufacturer; however, there may be some instances in which using the standard splice adhesive prior to application of the tape adhesive backed flashing should be considered. The splice adhesive could be used instead of primer or as an additional application. The thicker application and higher
solids content of the splice adhesive offer better protection against small leaks occurring over irregular surfaces, but this additional application usually involves a higher cost.

The products to strip in the seams will vary, and many manufacturers will offer several. To determine the optimal product, decide whether strength and durability or a tightly bonded seam is the priority. Thinner, less cured flashing products give a tighter bond and conform better to surface irregularities, while the thicker flashing products that are more cured offer more strength and durability. If the seam is still bonded but there are leaks occurring at the factory seams or other irregularities, then the products with less cure would be a better choice. The less cured products are generally preferred to strip-in seams on newer installations. If the existing seams are open or there is tension on the membrane, then the thicker cured products would be a better choice. It's also a good idea to use the less cured products in conjunction with the cured products at all seam intersections. Most manufacturers require this, and some have developed specialized uncured patches for "T"-lap intersections.

Application of lap sealant or caulking to all exposed seam edges is also a good idea. Many manufacturers do not require this lap sealant on the edge of the flashing material on new EPDM installations, but do recommend or require lap-sealed edges on repairs to existing membranes. Procedures to apply the lap sealant also vary among manufacturers.

Mechanically fastened systems will usually require additional enhancements to prevent the underside or back edge of the seam from pulling apart. The fasteners in the seam and decking must also be evaluated for long-term performance. The evaluation of these seams is beyond the scope of this article.

Base tie-ins are the second major area to address on EPDM restorations. The base tie-ins are one of the three components of a wall or curb flashing. The other two components are the wall flashing and the final termination detail. If there are concerns with more than one of these components, then it may be more cost effective to remove all of the existing materials and install new flashing according to the manufacturer's specifications for new construction or re-roofing.

Base tie-in or membrane securement details are required on single-ply systems to keep the membrane tight in the angle change and to prevent the membrane from pulling away, resulting in a tented or bridged condition (See Photos 1 and 2). The cause of the force pulling on EPDM roofs is a subject of much debate. Some believe that cause is membrane shrinkage, while others believe that the cause is the thermal expansion and contraction of the membrane. Some believe that it is a combination of both of these forces. Many do believe that regardless of the cause of the forces on the EPDM, a properly constructed base tie-in detail will resist these forces and prevent the tented or bridged condition.4

The manufacturers’ details have evolved over the years, and most now recommend similar details intended to accommodate ample resistance to the forces on the field membrane. The details utilize a strip of reinforced EPDM membrane that is usually six inches wide, anchored to the deck or wall, and adhered to the bottom side of the field membrane. The field membrane continues up the wall and serves as the flashing. These securement strips are attached with the manufacturer's specified fasteners through stress plates or batten strips at a rate no greater than 12 inches apart. The stronger details incorporate a reinforced EPDM securement strip that has pressure-sensitive seam tape pre-applied to mate to the bottom side of the field membrane and resist forces ranging from 300 to 400 pounds per lineal foot. This is the base tie-in detail required by most manufacturers for 30-year warranties, and it is also the detail preferred by most contractors, regardless of the warranty length.

These securement strips with pressure-sensitive seam tape enhance the performance of marginal conditions at base tie-in details; however, installation requires cutting open the membrane to attach the strip. Cutting the membrane is often mandatory to relieve the tension if there is a failed base tie-in detail with a tented or bridged condition.

The common procedure is to clean the areas of the existing membrane 18" from the angle change onto the deck and 18" from the angle change up the wall. After the membrane is clean and dry, cut the membrane along the old row of fasteners. Allow the membrane to rest flat on the deck surface and against the wall. Snap a chalk line 5' from the angle change out onto the deck and up the
wall and cut along these lines. Remove existing fasteners, batten bars, and other material from the existing base tie-in detail. Install the fasteners in the new securement strip, utilizing a pattern and frequency consistent with that specified by the manufacturer. Requirements for fasteners, stress plates, batten bars, and position of the strip do vary between the manufacturers, so it is good practice to follow the particular manufacturer’s recommendations.

Re-adhere the backside of the existing flashing membrane and cover the open area with a minimum 18”-wide piece of seamless 60-mil membrane. Any loose existing deck membrane is re-adhered on fully adhered systems. See Photos 3 and 4. Many manufacturers offer this material precut for this purpose, and some produce the material with pressure-sensitive seam tape applied to one or both edges. Use the recommended primer to adhere the new membrane to the pressure-sensitive seam tape on the securement strip. Adhere the new membrane to the wall, and on fully-adhered systems, adhere it to the deck or insulation substrate. Seam the edges onto the clean existing flashing using the procedures mentioned earlier.

Existing base tie-in details that did not incorporate the securement strip or those that exhibit the tented or bridged condition should be addressed with the above procedure. Many EPDM roof systems installed since the late 1980s have base tie-in details with a securement strip that are functioning well and do not show signs of tenting or bridging. Depending on system type and how the base tie-in detail was constructed, the existing detail may not need to be rebuilt or may only require an enhancement.

One key factor is if the EPDM strip used in the detail has a pressure-sensitive seam tape pre-applied or if the strip was glued to the field membrane with seam adhesive. The detail where the strip was adhered to membrane with only seam adhesive should be enhanced or rebuilt because this seam strength is less than with seam tape. Another factor is the type of system. The base tie-in detail is most critical on the mechanically-fastened system, and least important for the fully-adhered system. The best combination is a fully-adhered system with a securement strip with pressure sensitive seam tape pre-applied for the base tie-in. This combination is typically the minimum requirement for the manufacturer’s 30-year warranty. Therefore, many existing base tie-in conditions should be rebuilt or enhanced to properly function for the expected life of the restoration.

One possible enhancement is to clean the membrane surface, add new fasteners and stress plates centered between the existing plates, and cover with a 6” to 9” uncured flashing material with pressure-sensitive seam tape pre-applied. If there is any doubt about the adhesion of the existing strip, proper fastener type, or fastener pull-out resistance, then the conservative approach would be to rebuild the detail.

Roof edge details were not identified as a major cause of EPDM problems; however, they must be addressed when restoring the system. There are three basic styles of edge details:

- Flanged drip edge or gravel stop metal stripped in with uncured EPDM flashing.
- Snap-on metal edges.
- Compression metal details (aluminum termination or drain bars in the gutter and extruded angle metal).

All roof edge details provide a watertight seal and securement at the edge of the membrane. These details also provide the first line of defense of wind uplift protection for the system. Performance of
these details is dependent on the condition of the metal, wood blocking, and fasteners. Until recently, there was no standard for roof edge performance. Many existing edge details would fall short of the minimum standards if all of the components were new, and are likely substandard, particularly with worn-out components. Replacement of the entire edge detail and the related components should be considered.

Penetration flashings must also be addressed. Another rule is that the best penetration flashing is no flashing at all. If a particular projection is no longer required, remove the projection and flashing, fill in the void, and install a cured EPDM patch over the area. Re-flash all other existing penetrations. Use non-penetrating supports for pipes and equipment whenever possible.

Roof drains are particularly important because of the amount of water that flows over these details. Drain details are also vulnerable to cuts and punctures due to the stress on the membrane at the drain fixture. The stress on the membrane increases as slope of the drain sump increases. Most manufacturers limit slope in the sump area to between 4:12 and 6:12 for non-reinforced membrane and between 1:12 and 2:12 for reinforced systems. If the existing sump exceeds these slope limitations, then the sump area should be reworked to achieve the proper slope.

Replace the membrane at all drains with a target patch that extends at least two feet out of the sump area. The target patch material should be the same thickness or thicker than the existing membrane and should be cut so that there are no factory seams on the patch material.

Cut the existing material around the outside of the drain ring and remove all of the material and sealant from the compression area of the drain bowl. Install the membrane in the compression area according to the manufacturer’s drain detail. Specify the use of a hole punch for the bolt holes through the membrane. Complete the seam around the target patch and then strip these seams in following the procedures outlined earlier.

Restorations of existing EPDM systems will continue to gain acceptance as more people become aware of the advantages of this option and as restoration procedures continue to improve. This article is limited to the common details. Sources for additional information for other details or unique situations include the EPDM manufacturers, roofing contractors that specialize in repair and maintenance of EPDM roofing systems, and the EPDM Roofing Association.

**REFERENCES**


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