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ABSTRACT:
What are the common single-ply roofing membranes? What are the major differences between them? Selecting roofing membranes is a complex decision based on may project conditions. Understanding the available choices may help the decision process.

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KEYWORDS:
Single-ply, roofing, membrane, EPDM, TPO, PVC, CSPE, KEE, elastomeric, thermoplastic

REFERENCES:
EPDM Roofing Association
http://www.epdmroofs.org/

Single Ply Roofing Membranes

By David Stutzman, AIA, CSI, CCS, SCIP, LEED AP

Background

What single-ply roofing membrane should be used on a particular project? This is a complex decision governed by many project conditions - location, exposure, number and size of penetrations, potential contaminates, local craftsmen capabilities, and owner preference.

Imagine that - the building owner may have a preference about the roofing membrane. For institutional owners with more than one building, there may be a decided advantage to having all roofs in one location use the same materials.

- Existing maintenance contracts can simply be extended to cover a new roof;
- Only one set of maintenance materials need be stored for emergency repairs;
- And the maintenance staff only needs to be trained for one system.

Cost is always a consideration. However, the durability and maintenance of the systems must be weighed against the cost. The least expensive initial cost may not be the most cost effective for the useful life of the roofing system. For developers with short-term ownership, first cost may be the only consideration. For universities with long-term ownership, life cycle costs and maintenance capabilities may be the deciding factors.

So what are the single-ply roofing membranes?

Membrane Types

Single ply roofing membranes are classified as one of two broad type elastomeric or thermoplastic. As the names imply the elastomeric type is a flexible, synthetic rubber membrane; the thermoplastic type is a plastic sheet.

Each membrane type is governed by different ASTM standards because each has different properties. So there is no way to directly compare the performance of one membrane to another.

Commonly requested single-ply roofing membranes include EPDM, TPO, and PVC. Of these membranes the installed costs for black EPDM and TPO are similar. White EPDM will likely be more expensive than TPO. PVC roofing is more expensive than the other two membranes.

Other available membranes include CSPE and KEE, but from our experience, these have never been requested. Just because we never had a project with CSPE or KEE roofing does not mean they should be avoided.

The remainder of this Tech Tips will focus on the most commonly requested roofing membranes.

EPDM Membranes: ASTM D 4637; Type I - non-reinforced, Type II - scrim reinforced, Type III - fabric backed. Ethylene propylene diene terpolymer (EPDM) is an elastomeric, synthetic rubber. The two principal components, ethylene and propylene, are both

derived from oil and natural gas.

Membranes are available in two colors: black and white-on-black. Roofing membranes are available in widths up to 50 feet and four thicknesses, 45, 60, 75, and 90 mils.

The membranes may be reinforced or non-reinforced. EPDM membranes are available with a fabric backing for adhered installations using spray foam adhesives. EPDM has excellent resistance to heat, ozone, and weather - essential properties for roofing membranes.

TPO Membranes: ASTM D 6878. Thermoplastic polyolefin (TPO) thermoplastic membranes are, fabric reinforced membranes and may be fabric backed. They are available in 45, 60, and 80 mil thicknesses in black, white, tan, and gray colors. TPO sheets are available up to 12 feet wide.

PVC Membranes: ASTM D 4434; Type II - reinforced, Type III - fabric reinforced may have a fabric backing, Type IV - fabric reinforced may have a minimum 36 mil thick fabric backing. Polyvinyl chloride (PVC) thermoplastic membranes are fabric reinforced and may be fabric backed. They are available in 45 and 60 mil thicknesses in white and gray colors. Other thicknesses are available from selected manufacturers. PVC membranes are nominally 6 feet wide. We invite anyone using CSPE and KEE membranes to tell us about them and your success stories.
Joints

EPDM membranes are joined with liquid adhesives or adhesive tapes. The joints must be cleaned before applying the adhesives to ensure adequate bond. The adhesive joints may be protected from moisture intrusion by applying lap sealants along the joints. TPO, PVC, and KEE membranes are joined by heat welding. Welders use hot air to soften the joint surfaces and create a mechanical bond between the joined sheets. Welded joints should be probed to ensure they are fully bonded to prohibit water intrusion.

Warranties

Single-ply roofing membranes are available with 10, 15, and 20 year warranties. Roof warranties are available as no dollar limit, total system warranties. EPDM manufacturers are offering up to 30 year warranties. All warranties may not be standard with every manufacturer, so be sure to check for the selected basis of design. Warranties are not free. Be sure to determine with the owner to appropriate warranty period balanced by the cost of the warranty and required maintenance.

Beware the limitations. Warranties typically require regular maintenance to remain in force. Owners must be aware of their obligations under the warranty terms and conditions.

Pros and Cons

EPDM sheets are available in widths greater than other single-ply membranes. For large roofs, this can mean significantly fewer joints. Wide sheets on roofs with many penetrations may complicate the installation.

Petroleum based contaminates and animal fats will attack EPDM. Be careful when selecting EPDM for roofs in airport approach flight paths and for areas with hydraulic fluid laden rooftop equipment and areas with commercial kitchen exhausts. TPO is similar to a marriage between EPDM and PVC membranes. TPO is flexible like EPDM with heat welded joints like PVC. TPO manufacturers have a reputation of tinkering with the formulations to improve performance while reducing manufacturing costs.

This has caused the performance to be somewhat unpredictable, even when buying membrane from the same manufacturer.

PVC membranes are the most chemically resistant of the three. PVC will resist a broad range of contaminates without loss of performance. Before selecting PVC verify any specific resistance that will be required with the membrane manufacturer. As PVC ages, it will lose its plasticizers and may become brittle.

Of the three membranes, EPDM is the most often requested.

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