

KEE vs. PVC & TPO

How do these thermoplastic membranes stack up against one another?



KEE



PVC



TPO



At first glance, all three roof systems appear to be the same
 – smooth, clean & white.

Where they differ is in performance
 – the most critical factor in the protection of your building.

Ketone Ethylene Ester (KEE)
 is a highly elastic, naturally flexible, solid polymer that is an ideal modifier for PVC membranes. A high-performance solid like KEE is permanently bonded within the membrane's formula, creating permanent flexibility and providing a longer, stronger product performance.

Polyvinyl Chloride (PVC)
 roofing uses a low molecular weight liquid polymer that is drawn to the surface of the membrane over time by UV, heat and environmental contaminants. Then, it's washed away by wind and rain, reducing flexibility and leaving the membrane susceptible to damage.

Thermoplastic Polyolefin (TPO)
 membranes were designed as a cost-effective alternative to PVC and KEE membranes. The early versions of TPO didn't contain enough plasticizer, leading to premature cracking and failing. In later versions, TPO had fire resistant issues with several occurrences of roof fires caused by heat welding TPO seams.

DIFFERENTIATING FACTORS

CHEMISTRY

KEE

According to ASTM D 6754, the standard for KEE-based sheet roofing, a membrane must utilize a minimum of 50 percent KEE polymer content adhered to a high-quality base fabric. KEE locks the plasticizer within the membrane to prevent damaging migration that causes lesser materials to dry and crack under UV exposure.

PVC

The traditional issue with PVC membranes (ASTM D 4434) is liquid plasticizer migration caused by heat, UV and rain, which draw plasticizers out of the membrane over time. The result is a roof system that is less pliable and more prone to damage from thermal shock, foot traffic, hail impact and wind.

TPO

TPO membranes (ASTM D 6878) contain additives that are required for fire resistance properties to the roof membrane. Increased fire resistance not only increases the cost but also makes the membrane less flexible and susceptible to UV exposure. The formulas of TPO membranes have been changing for years in an attempt to find the right balance of additives to provide fire resistance and long-term flexibility.

UV RESISTANCE

KEE

KEE is a solid polymer that is permanently locked in the membrane, ensuring long-term resistance to harsh UV exposure. Using a solid polymer will eliminate plasticizer migration, allowing the membrane to maintain its UV resistance and not break down as it ages.

PVC

UV exposure causes liquid plasticizers to migrate out of PVC membranes, eventually causing the membranes to break down, wear away and crack. This will lead to early failure of the membrane in the face of UV exposure.

TPO

The additives used in TPO membranes to provide fire resistance decrease the membrane's resistance to UV exposure. UV and high heat will cause TPO membranes to wear away and break down quicker, making the membrane less flexible and more prone to cracking.

MEMBRANE DURABILITY

KEE

KEE is both flexible and exceptionally tough. The technology used to manufacture KEE is closely related to a process DuPont uses to make Surlyn®, the tough material found on the many of the world's finest golf balls. Elvaloy KEE has been so effective in roofing applications that engineers developed and recognize an ASTM test standard (D 6754) to assure membranes contain KEE – a standard that literally redefines expectations for roofing membrane performance. Different KEE products use different qualities of KEE material, with the strongest products using high-performance KEE. Products also use varying amounts of KEE material; some high-quality sheets use up to 50 percent.

PVC & TPO

PVC & TPO membranes generally bypass using fabric reinforcement to provide structure to the membrane in favor of using increased membrane thickness to provide the illusion of durability. This lack of reinforcement leads to these membranes shrinking and wrinkling, which decreases the life of the roof system.

EASE AND QUALITY OF REPAIR

KEE

Since the KEE backbone is naturally flexible and a permanent solid polymer, KEE membranes retain their pliability to be heat welded throughout the life of the membrane. This allows repairs to be made on aged membranes by heat welding, which creates a monolithic surface that is extremely strong compared to using tapes or adhesives.

PVC & TPO

As plasticizers migrate out of PVC & TPO membranes, they lose pliability and their subsequent ability to be effectively heat welded. These membranes require repairs to be made with peel and stick materials instead of the preferred heat welding repair material.