The Pioneer Of Geosynthetics

S I N C E 1 9 7 2

Application Sheet

Tunnels

GSE'S EXPERIENCE

GSE's history is epitomized by some of the lining industry's most celebrated technical advances, boldest innovations and impressive success stories. It is not surprising that GSE has brought these same achievements to the complex business of membrane lining of tunnels. From standard setting membrane materials and inventive leak detection systems to proven installation techniques and welding procedures, GSE has emerged as the world leader in total tunnel membrane expertise and experience. And as our commitment to excellence continues to expand to new frontiers, look for GSE to remain at the forefront of tunnel membrane technology.

GSE WATERPROOFING GEOMEMBRANES

The demanding requirements of today's tunnel designs include sophisticated waterproofing membrane materials that are nonporous, chemically inert and completely waterproof. Full encapsulation of tunnels with such materials will ensure the tunnel remains dry at all times, thereby allowing for continued construction activities and an extended useful life.

A variety of tunnel geomembrane materials are available from GSE. High density polyethylene (HDPE) has seen widespread popularity as a tunnel membrane. Linaer low density polyethylene (LLDPE), which has greater flexibility than HDPE, may also be used.

GSE geomembranes are available in a smooth or textured surface.

GSE geomembranes are manufactured from the highest quality resins, carbon black, anti-oxidants and thermal stabilizers. Superior resins that make up GSE geomembranes are especially important in tunnel lining applications since underground deposits of hydrocabons and methane gas can break down many other types of membranes.

To ensure every sheet meets GSE's high standards of quality and performance, a battery of tests are conducted on the resins and the finished product before shipping. All results are recorded on Quality Assurance Certificates that accompany each roll when delivered to the site. Widths of GSE Geomembrane rolls are standard 6.9 m (22.5 ft), ranging in thickness from 0.51mm (20 mils) to 3.0 mm (120 mils) and available with a white surface.

GSE WHITE ENHANCES INSPECTION

Co-extrusion technology is behind a GSE innovation that improves visual inspection: GSE White. This state-of-the-art synthetic geomembrane is a white surfaced (HDPE or LLDPE) membrane with thickness of 0.75 to 3.0 mm (30 to 120 mil). This material provides substantial benefits to the tunnel engineer.

GSE round die extrusion process.

Damage detection is probably the most significant advantage. With GSE White, score marks and punctures from above or beneath are more visible than with conventional geomembranes. The result is an extra measure of leak prevention assurance. This is especially meaningful to regulators, inspectors and environmental groups concerned with the integrity of the geomembrane.

Another outstanding characteristic of GSE White is its reflective qualities which come into play in exposed, open cut and subsurface installations.

One of the few problems experienced with polyethylene membranes is their tendency to wrinkle when exposed to solar heat. GSE White reflects the heat of the sun and thereby reduces the expansion and contraction of the membrane. Reinforcing steel can then be installed and concrete can be placed without interference from wrinkles. The cooler geomembrane provided by GSE White also lowers moisture content beneath the sheet. The drier surface lessens the possibility of mildew, surface rotting and dampness within the tunnel environment.

When GSE White is installed inside tunnels, the

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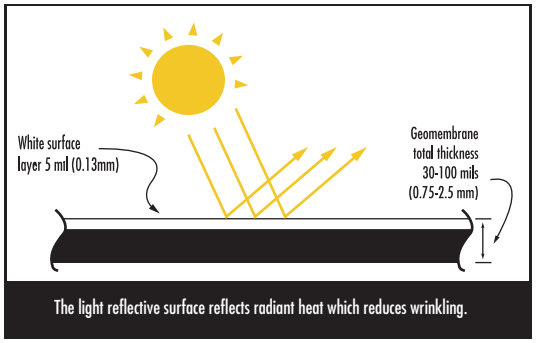
Application Sheet



The light reflective surface reflects radiant heat which reduces wrinkling.

white surface acts as a light enhancer, reflecting all artificial light within the tunnel. In any application, GSE White adds to the quality and aesthetics of the installation.

GSE White meets all the material specifications of GSE HDPE and LLDPE geomembranes. This innovative, white surfaced waterproofing geomembrane technology is also available in combination with spark testable electrically conductive smooth and textured surfaces.

TYPICAL TUNNEL LINING SYSTEMS

All of today's modern tunnels utilize lining systems with waterproofing geomembranes. The most widely used configuration, concrete/geomembrane/concrete, is employed for almost any type of tunnel construction. During construction the outer layer of concrete holds the tunnel open until the waterproofing geomembrane can be installed. The inner layer of concrete, which acts as the main structure of the tunnel, is then placed over the geomembrane.


GSE HD geomembranes are the world's environmental lining material of choice.

WEDGE WELDING

GSE combines the most reliable membranes with the industry's state-of-the-art seaming method. Known as "hot wedge" welding, this proven technique consists of melting opposing surfaces of membrane using a hot metal wedge. The hot wedge passes between the sheets, followed by pressure rollers which press the molten sheets together.

Nondestructive testing is also made more efficient because of air pressure testing for the "split" or "dual" wedge of the hot wedge welder system. The dual wedge system leaves a space between two separate weld tracks which is then pressurized with air. Continuity through the air space is ensured by releasing the pressure from the opposite end to which the air was introduced.

COMPLETE INSTALLATION SERVICES

No other company offers more experience installing geosynthetic products than GSE. GSE Installation Services is your one-stop source that offers the experience, training, expertise and complete range of geosynthetic products, fabrication and technical support on any project.

GSE installation crew.

ADDITIONAL INFORMATION

If you have an upcoming project please give us a call. We will provide you with recommendations for material and installation.

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