



The Pioneer Of Geosynthetics

S I N C E 1 9 7 2

GSE Tunnelliner

THE ORGANIZATION

GSE Lining Technology GmbH manufactures, distributes and installs geomembrane lining systems and products used in landfills, industrial plants, underground lining and a wide range of other applications.

Gundle/SLT Environmental Inc., the parent company of GSE Lining Technology GmbH was formed in 1995 by the merger of Gundle Environmental Systems Inc. and SLT Environmental Inc. For over 30 years, the SLT and Gundle names have been synonymous with leadership worldwide in liner products and installation techniques.

EXPERTS IN TUNNEL LINING

GSE's expertise developed in underground lining systems has grown over the last twelve years, starting in the United States and extending throughout the world.

Building on experience gained in over a million square meters of reference projects in North America, GSE Lining Technology GmbH now offers a product range which fulfills the most stringent European standard requirements for tunnel lining technology.

This product range is made from highly flexible polyethylene resin, providing an outstanding combination of mechanical properties, weldability and durability.

EXPERTS IN TUNNEL LINING

GSE Tunnelliner consists of a three-layer coextruded structure: an inner black layer sandwiched between two outer white layers which greatly facilitate visual inspection for any damage resulting from installation. It is available in three fire resistance grades: B1, B2 and B3 (B1 has the highest fire resistance of the three grades).



GSE Tunnelliner product.

GSE Tunnelliner is also available in a translucent polyethylene version which allows visual control of weld integrity. Typically, the usual control is effected by introducing a colored liquid between the 2 wedge-welded seams and checking for passage of the liquid through the seam. GSE also provides a full range of accessory products including water-stops which prevent water pressure from concrete expansion joints and fixing buttons for mounting on the tunnel surface.

ACCESSORIES

GSE Buttons

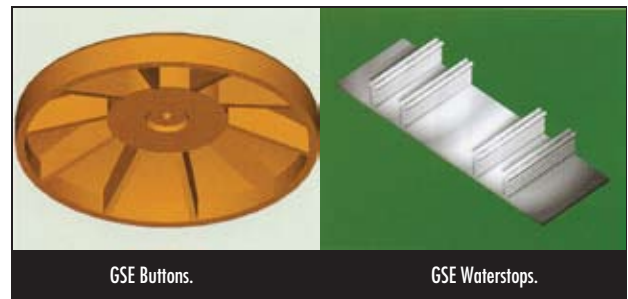
GSE Buttons are required to support the GSE Tunnelliner on the shot-crete surface.

They have been designed according to the Germany Guidelines DS 853 and fulfills European standards.

GSE Waterstops

GSE Waterstops prevent water pressure from pushing the GSE Tunnelliner into the concrete construction joints and provide waterflow limit sections in case of leakage. Different waterstops are used depending on the concrete joint types.

CERTIFICATION



GSE Buttons.

GSE Waterstops.

County	Guidlines / Norms	Description
Austria	Hefty 365	Tunnellining
France	Fascicule 67 (Testing)	Lining for Underground Structures
Germany	Guideline 853	Railway Tunnels
Germany	DIN 16726	Plastic Liners
Germany	ZTV Tunnel	Road Tunnels
Germany	EDT	Double Lining Systems
Germany	DIN 4102	Flame Resistance Rating
Russia	Tunnel & Underground	Underground Works
Switzerland	SIA 280	Plastic Liners
Slovakia	VUAPL, NITRA	Conformity Testing
Turkey	Highway	Tunnellining

CONTOURNEMENT DE MERSCH - LUXEMBOURG

The city of Mersch is located approximately 35 km north of Luxembourg. Due to the increasing traffic situation, a highway was designed around the city to improve these conditions.

The project was therefore named "Contournement (bypass) de Mersch".

The main contractor is the Ministère des Travaux Publics (Ministry of Public Works) and the Consultant Simon & Christiansen were responsible for the design.

The highway required the construction of a tunnel because of the geographical situation and road conflict.

The open trench technique and two types of tunnel structures, square and circular, were considered and accepted to satisfy the soil pressure conditions.

The groundwater level allowed the umbrella design for the lining systems which consists of - from bottom to the top:

Location:	Mersch/Luxembourg
Application:	Cut-and-cover Tunnel lining
GSE Product:	GSE TunnelLiner
	Thickness: 2.2 mm
	Width: 7.5 m
	Signal Layer: White
German Fire Classification:	B2
Total sqm:	20,000 m ²
Customer:	IRACO, Luxembourg

- Protection Geotextile 400 gr/m²
- HDPE Liner 2.2 mm
- Drainage Net

HIGHWAY TUNNEL BEHRINGEN

The reunification of Germany has promoted many construction projects in the last few years. One of



them is the traffic project for German reunification No. 16 which links two big German cities: Erfurt and Schweinfurt. It involves the construction of a 4-lane highway between these two cities. For ecological purposes the design of the route through the Thüringer forest will generate the construction of many bridges and tunnels.

Location:	Behringen, Germany
Application:	Tunnel Lining
GSE Product:	GSE TunnelLiner (top lining)
	trenches, 2.0 mm thickness, 1.85 m
	Signal layer white
	Fire classification B1
	23,000 m ²
GSE Accessories:	HDPE waterstops and buttons
Design:	Obermeyer Planungsgesellschaft, Munich
Construction:	GDPE Züblin AG
Customer:	Europroof Munich

The Behringen tunnel represents one of the important constructions . Two separate shafts for the highway over a distance of 465 m with a parallel pipe for the railroad constitutes the traffic requirement for this project.



Technical Information	
Length:	2 x 465 m
Road Cross Section:	Per tunnel 2 lanes with security lanes (1 m + 2 x 3.75 m + 1 m = 9.50 m)
Height:	4.50 m
Escape Exit:	Approximately 16 m long crosscut in the center of the tunnel
Type of Construction:	A new Austrian tunnel construction method
Cross Section:	Approximately 100 m ² per tunnel pipe
Construction Performance:	Approximately 3 m per working day
Ventilation:	Natural ventilation

ENGINEERING SUPPORT

The GSE Engineering Support Staff is comprised of multidisciplinary product professionals to support you across a range of project requirements. This includes knowledge in geomembrane, geosynthetic clay liners, geonet, geocomposite, nonwoven geotextile and concrete protection products and application solutions. Rely on our technical staff to help you solve your project issues.