Tunnel Drainage

A guide to the use of ABG Cavidrain in the drainage of tunnels

abg creative geosynthetic engineering
Cavidrain in Tunnel Drainage

ABG Cavidrain is designed to reduce water penetration and relieve the effects of hydrostatic pressure within tunnel constructions. It is a cusped HDPE sheet which forms a highly effective void through which collected water is able to flow freely to an outlet or collector pipe.

In modern tunnel construction traditional methods of groundwater exclusion are difficult to install with any degree of reliability. Cavidrain drainage geocomposite provides a drainage layer that collects infiltration water from behind tunnel lining systems and in the tunnel invert. In some hydrogeological conditions and with some forms of tunnel constructions Cavidrain may be used as a standalone drainage barrier or form part of a system incorporating geomembranes for waterproofing.

In typical tunnel lining installations Cavidrain is fixed to the excavated face of the tunnel and covered with shotcrete which adheres to the back of the Cavidrain sheet. Once installed the Cavidrain forms a free draining void with an impermeable barrier to prevent water ingress to the tunnel.

Cavidrain is used in invert drainage where the high strength core is specifically designed to withstand the compressive loads arising from placing wet concrete. Once poured the concrete fills the back of the cuspates and once the concrete is cured the ultimate load capacity is that of the concrete. The voids between the cuspates forms a free draining void that can often mitigate the requirement for pipe and gravel drainage systems.

Cavidrain in tunnel invert drainage

Cavidrain provides a pre-formed drainage layer into which the concrete floor slab may be cast and replaces crushed stone to collect infiltration water from the invert. Cavidrain S20 can be used to transport the water to a longitudinal collection pipe. Cavidrain S40 and S60 have a very high flow capacity and replace both the crushed stone and the pipe. Installation is fast and cost effective. The Cavidrain profile is optimized for maximum bearing area and flow and is strong enough to withstand normal installation loadings when installed in accordance with manufacturer’s instructions.

Benefits
• Replaces crushed stone in tunnel invert saving on excavation and material movements to and from site.
• High flow capacity is much greater than for an equivalent depth of crushed stone.
• Material supplied in rolls for rapid installation.
• Load capacity equivalent to concrete fill.

Cavidrain in tunnel wall drainage

In its most simple form, Cavidrain provides a drainage layer to collect infiltration water from behind tunnel linings. Cavidrain protects the waterproof liner from physical damage and water pressure. Cavidrain provides significantly more drainage capacity than a geotextile fleece.

Cavidrain S3 is also available as a drained liner enabling the Cavidrain sheets to be welded or taped together to form an integral waterproof liner. The sheets are easily fixed to the walls with sealed drill and fix or shot-fired pins.

Shotcrete adheres well to the back of the Cavidrain sheet and offers less rebound loss than a smooth PVC liner. This form of Cavidrain may be manufactured using LLDPE for ease of installation on uneven surfaces.

Benefits
• Combined drainage and protection layer which protects liner from physical damage and water pressure.
• Weldable sheets allow Cavidrain to be used as an effective lining system.
• Reduced rebound when spraying spray concrete.

Product information

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<tr>
<th>Depth</th>
<th>Cavidrain S3</th>
<th>Cavidrain S6</th>
<th>Cavidrain S10</th>
<th>Cavidrain S20</th>
<th>Cavidrain S40</th>
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<td>Roll width</td>
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<td>Material</td>
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<td>* Can be manufactured from LLDPE for ease of use on uneven surfaces</td>
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<td>Chemical resistance</td>
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Applications
• Tunnel wall drainage
• Tunnel invert drainage

Contact ABG Technical Department for specific design and installation guidance on the use of Caviline and Cavidrain in tunnel drainage applications.
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