



VIP

Tunnel Segment Gaskets

Innovative gaskets contribute to Shieldhall Tunnel success

The construction phase of Scotland's biggest waste water tunnel has been completed with the benefit of innovative tunnel segment sealing gasket developed by VIP-Polymers Ltd.

The 3.1-mile-long Shieldhall Tunnel beneath Glasgow has been one of the first projects to make use of the rubber gaskets manufactured by VIP which are designed to reduce the risk of segment cracking during installation.

The tunnel boring machine broke through in October after spending 15 months creating the 4.7m-diameter tunnel, on behalf of Scottish Water, in a journey from Craighton to Queen's Park across the south of Glasgow. Completing the largest diameter bored tunnel in Scotland.

Global seals and gaskets manufacturer VIP, based in Huntingdon, Cambridgeshire, was commissioned to provide all the tunnel segment gaskets (TSGs) by construction joint venture Costain VINCI Construction Grands Projets.

The Cast-In TSGs used incorporated VIP's new patented compliant compressible corner technology, which eliminates the risk of a build-up of pressure at one or more of the gasket's corners during installation. This can contribute to segment cracking.

Matthew Levitt, VIP Technical Business Development Manager, said:

"Our new Cast-In TSGs have performed very well throughout the Shieldhall Tunnel construction process, demonstrating high levels of performance and reliability."

"Segment cracking is a concern for all partners in tunnel construction projects as it can result in delays and additional cost. Clients have welcomed the opportunity to make use of a new technology designed specifically to minimise these risks."

Sam Simons, Tunnel Lining Supply Manager for Costain said:

"The decision to manufacture segments with VIP gaskets for Shieldhall was taken late in the approval process when it became clear that only VIP gaskets could meet the specified requirement for compressible corners to prevent hard spots."

"The steel fibre reinforced concrete segment manufacturing process was achieved within the tightest of specifications and all manufactured rejections were less than 0.25%, including exact gasket positioning."

"Overall, the VIP gaskets contributed to an exceptionally well built tunnel with no reported segment cracking, meeting the tunnel lining specification without compromise."

Sam Simons - Tunnel Lining Supply Manager for Costain



The VIP028CI profile used on the Glasgow Shieldhall project

Overall, the VIP gaskets contributed to an exceptionally well built tunnel with no reported segment cracking arising from high corner contact pressure or segment ram loading transfer, cracks or leakage, meeting the tunnel lining specification without compromise."

Conventional shot-joining of TSGs can result in the compression cavities within the extruded profile filling with rubber. This greatly limits compression, increasing the risk of corner point loading, and cracking.

VIP's new corner joint, which has a UK patent, with international patents pending, maintains the TSG compression cavity profile right to the corner edge.

Extensive testing has shown this eliminates the risk of a build-up of pressure at one or more of the gasket's corners during installation, which could contribute to segment cracking.

Prior to manufacturing any gaskets, members of the Costain Waterproofing team witnessed corner loading (T and Cruciform) and pressure testing at VIP's headquarters.

Over the last 18 months, VIP has manufactured more than 19,500 individual TSGs for the project. These have been cast into each tunnel segment at FP McCann's site in Drakelow, England.

Dave Derbyshire, Operations Manager – Underground Products at FP McCann, said:

"For this contract we used Cast-In gaskets for the first time which were supplied by VIP.

The geometry of the segments meant that the gaskets required intricately formed corners in order for the complete gasket profile to fit the steel moulds correctly and provide a draft angle to the sealing face of the key and adjacent segments along the Z axis.

Technical representatives from VIP visited our facility at Drakelow prior to segment production, to ensure the correct fit was achieved on all six segment types. Once they, and ourselves were satisfied with the gasket fit, they went into production.

During the segment manufacturing programme VIP delivered gaskets on time, and to a consistent quality. Their technical back-up team were always on hand if required, but rarely needed."

The £100-million Shieldhall Tunnel is one of the most important wastewater infrastructure projects in Glasgow since Victorian times. It will help tackle flooding and improve river water quality across the city.

The 1,000-tonne tunnel boring machine, longer than 14 buses and named Daisy the Driller by a Glasgow schoolboy, began the process of creating the tunnel in July 2016, and completed it on 13 October 2017, when it emerged at the bottom of a 16-metre-deep shaft.

The giant sewer will provide 90,000 cubic metres of extra storm water storage, equivalent to 66 Olympic swimming pools.

Captions: Top & Middle - Installation of Cast-In gaskets into the segment moulds at FP McCann's site in Drakelow. Bottom - Finished segments awaiting delivery to the tunnel site in Glasgow.

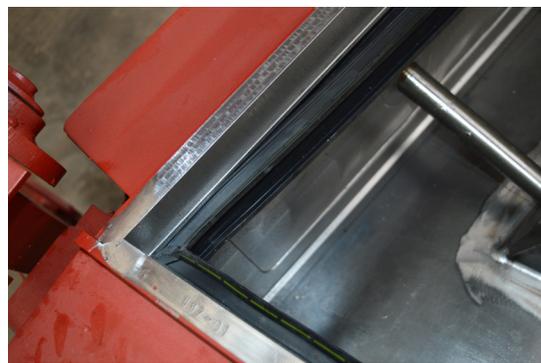
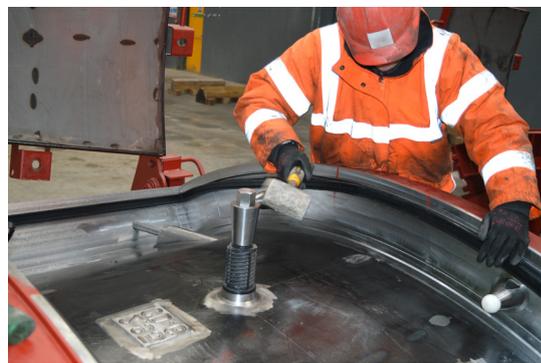
About VIP Polymers Ltd

Established in 1923, VIP Polymers Ltd is a UK-based, World Class manufacturer of globally approved sealing solutions for a range of applications including:

- Pipelines - for the transportation of pressurised and non-pressurised drinking and dirty water;
- Tunnels - sealing gaskets that ensure tunnel segments remain watertight;
- Rail - including noise suppression and anti-vibration components.

VIP Polymers utilises the latest rubber injection, compression and extrusion technology. It is a preferred seal supplier to leading global pipe manufacturers operating in the ductile iron, clay, plastic, GRP, and concrete pipeline market sectors.

VIP Polymers manufactures more than 3,000 products, and has introduced many new proprietary products for pipeline applications, notably VIP-Weco, VIPSeal®, and TYTON-SIT EXTRA®. It has an extensive international distribution network with products approved for use in markets around the world. www.vip-polymers.com



Project in Numbers

Profile: VIP028CI EPDM rubber

No. of segments in a ring: 6

Number of ring sets supplied: 19,500>

Segment Shape: Trapezoidal with a tapered key (x, y and z draft angles)

Tunnel Diameter: 4.7m

Tunnel Length: 3.1 miles

Tunnel Use: Wastewater Management