Tunnel Lovstakk (NO)
Light membrane vault - Water & frost protection

Country	Norway
Type	Railway, Bicycle and Pedestrian Tunnel
Client	Hordaland fylkeskommune, Bybanen Utbygging
Main Contractor	Marti Tunnel Ltd.
Execution of the work	Renesco GmbH -NUF
Designer	SWECO
Construction Period	2020-2022

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Project Description

The Løvstakktunnel project, construction lot D15, as part of the extension of Bergen's tramway network, comprises the excavation of a 3km long tramway tunnel using traditional drilling and blasting methods with a parallel pedestrian and cycle tunnel (also serves as an evacuation tunnel) and 6 cross-passages, 2 x 150m long caverns as a railway depot, a rock cut for access buildings to the depot as well as extensive outdoor concrete work such as a cut & cover portal structure and numerous retaining wall structures. With its nearly 3,000 meters, the tunnel will be the world's second longest, and Europe's longest cycle and pedestrian tunnel.

Scope of Service

Supply & Install of the water & frost protection system with a 0.6mm thick reinforced cloth (RTM 700-RP), a coated polyester reinforced sheet waterproofing membrane, both sides acrylic lacquered and self-extinguishing according to N500/ ISO 9705, suspended in steel pipe arches which are secured with rock bolts.

- Drilling services for mounting of the tunnel lining system with a full automatized AMV bolting/ drilling-rig, controlled by a Trimble navigation technology to ensure accurate and systematic drilling of the holes, based on BIM.
- Installation of anchor bolts M16 and technical bolts M33 for KL-mast (foundation for train power supply), galvanized/ epoxy coated (HDG).
- Installation of steel frames from back and front pipes, bottom plates and GVUL points, all HDG coated.
- Inspection hatches with zip and Velcro
- More than 600 theoretical profiles and around 200 different shaped steel arches required a data transfer from BIM to CAD to design the construction frames, to navigate the full automatized drilling rig (AMV 236T) via Bever Control System and to allow a precise anchoring with a tolerance < 3cm (1cm). All controlled by a surveyor team.

1. Drilling with AMV 236T drill rig and Trimble navigation with accuracy less than 10mm
2. Anchor bolt installation with Leica navigation with accuracy less than 20mm
3. Membrane and steel frame installation from AMV lifting platform, Manitou 160+ ATJ and Renesco movable gantry