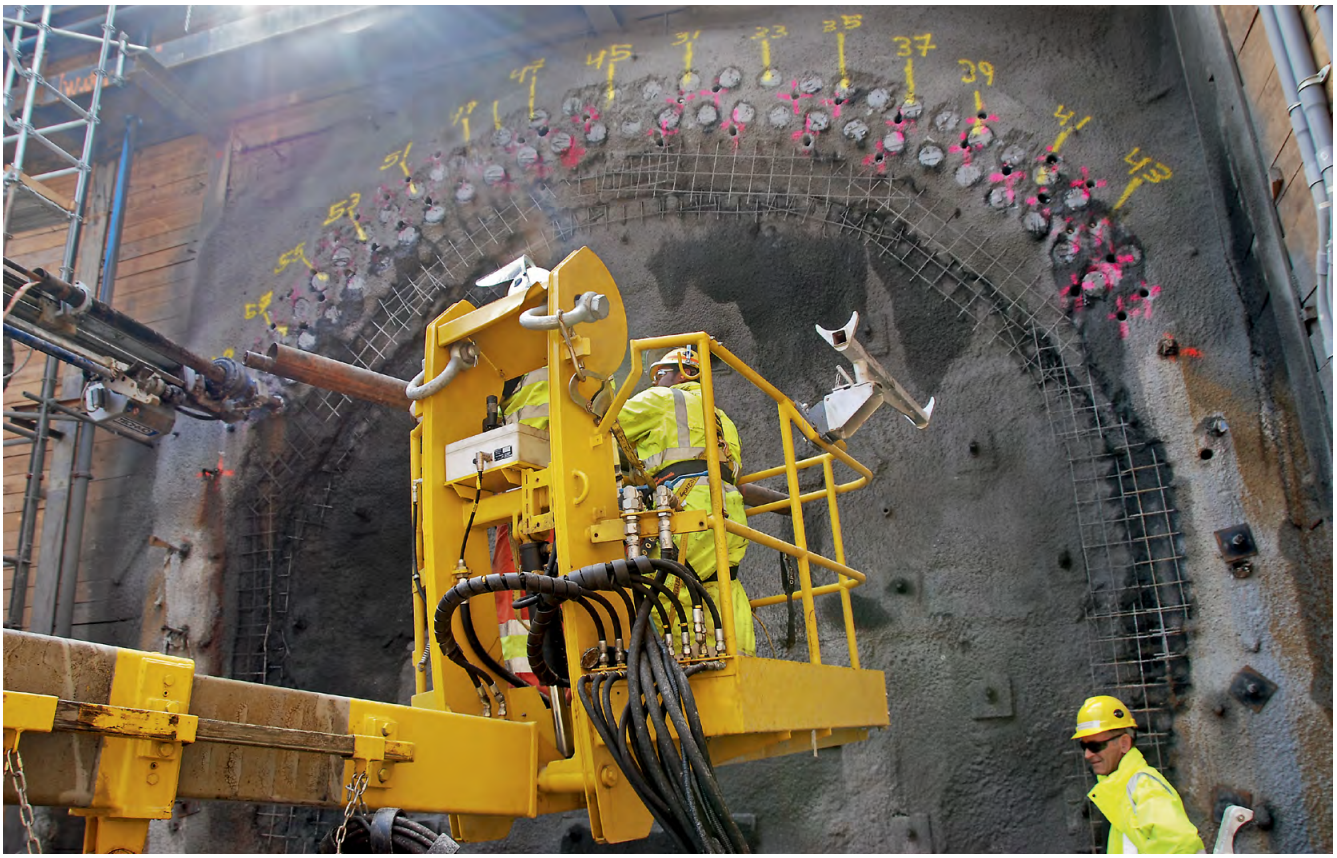
DYWIDAG

SAFER. STRONGER. SMARTER

Product Range

Tunneling



Our engineering team, built on over 150 years of civil engineering expertise, is building the future of smart infrastructure.

Our Vision

From the steel in our first reinforced bridge in 1903, anchor systems for ground and infrastructure stabilization, to today's infrastructure intelligence, we're extending the lifespan of the world's new and aging structures.

Deep and extensive excavations for cross-city road and rail tunnels are integral to our cities' growth and transportation needs. Combining our geotechnical and post–tensioning products we have expanded into data systems, transforming new and aging infrastructure into responsive, smart assets. Beyond steel bars and cables, we're also investing in technology to smarten infrastructure's lifespan management.

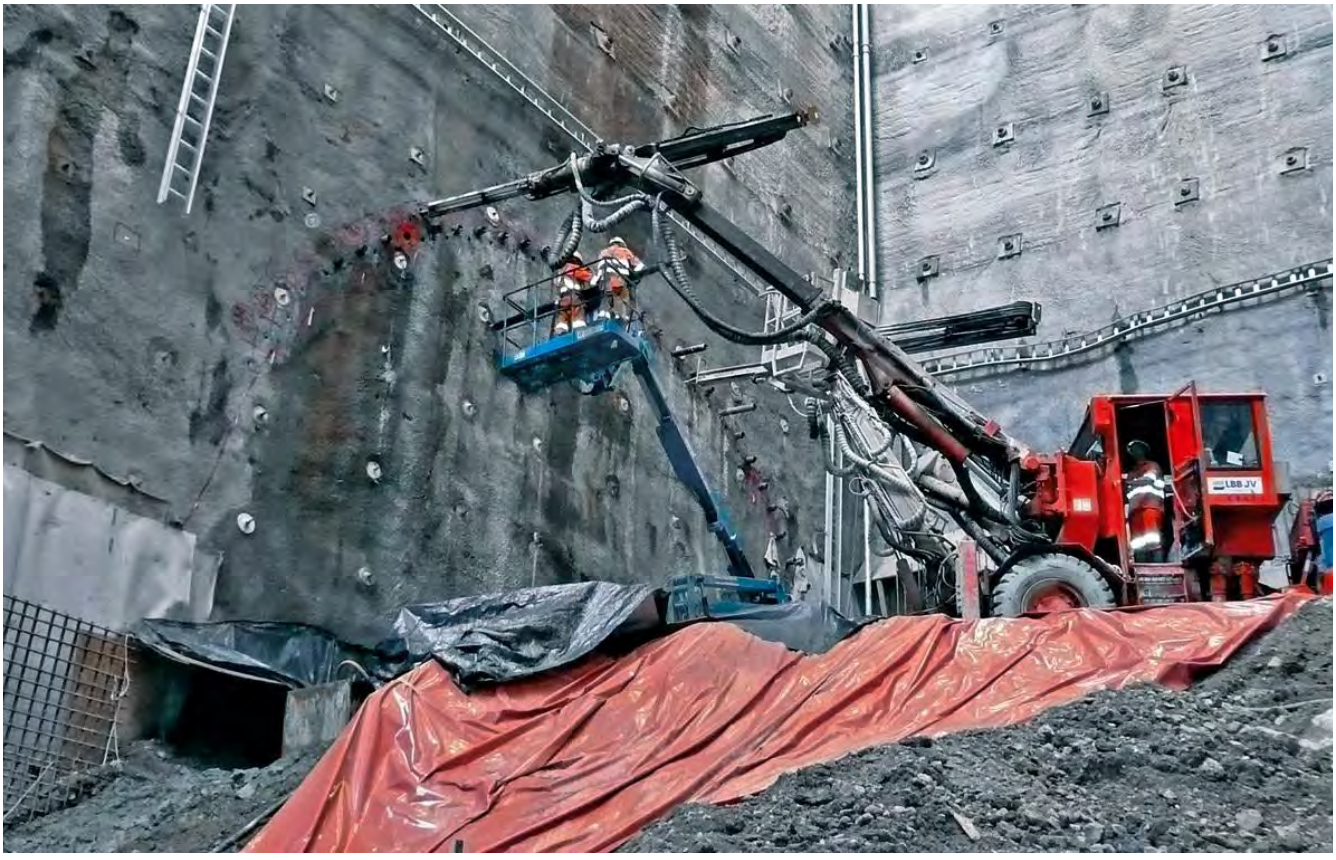
Deep and extensive excavations and city tunnels are becoming increasingly important in intra-urban areas.

Anchoring Systems

DYWIDAG's geotechnical systems, like ground anchors, provide sufficient stability during the entire excavation life-cycle. For wall-to-ceiling connections, reinforcing systems - like DYWIDAG's rebar connector - aid construction progress, while post-tensioning supports the construction of large-span ceilings.

Secure and stable

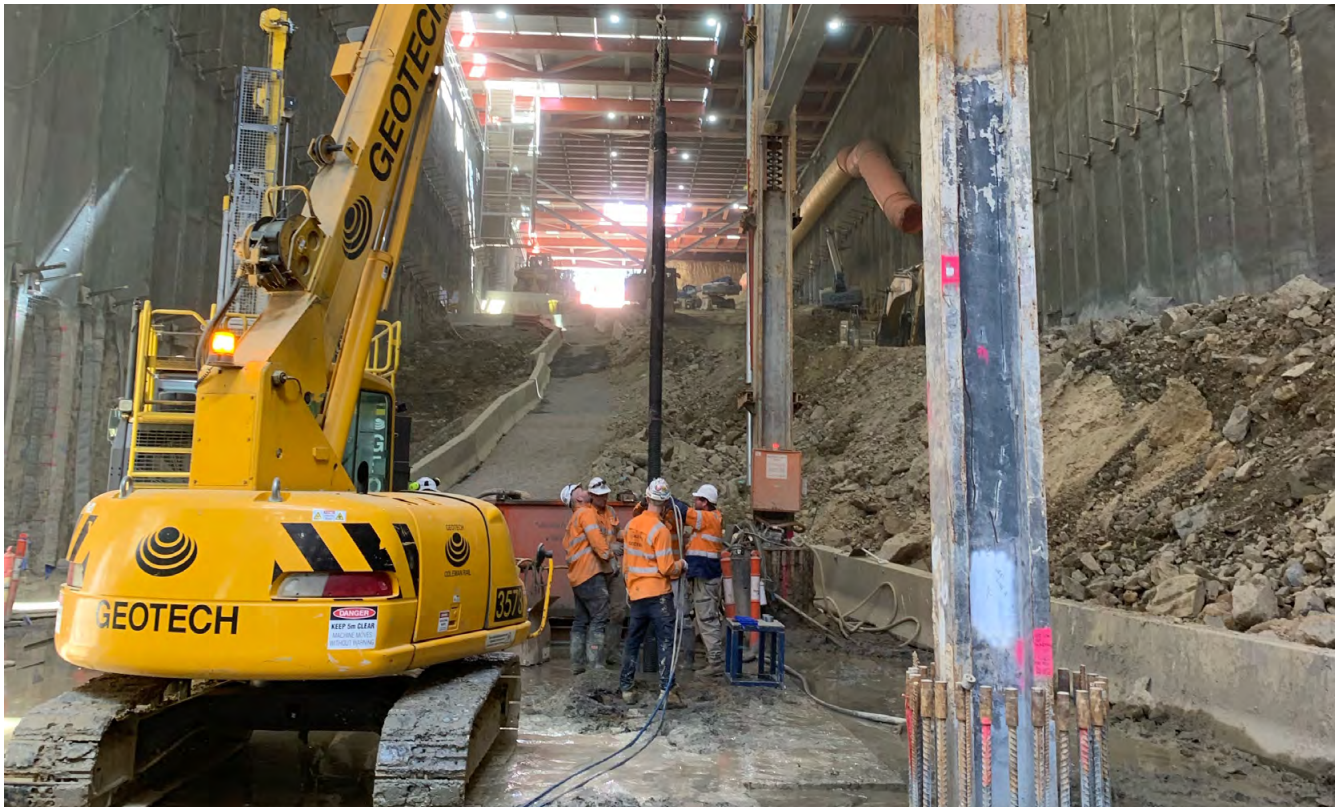
Bar anchors, soil nails, and rock bolts secure slurry walls at tunnel entrances and stabilize rock faces and vaults in main and access tunnels. Post-tensioning tendons support the construction of immersed tunnels—and the formation of wide ceilings in tunnels with high applying loads.



Z-Morh Tunnel

The Z-Morh tunnel is a 6.5 km single-tube highway tunnel with two traffic lanes. The tunnel will provide connection during all weather conditions between Srinagar and Kargil, in India, Jammu, and Kashmir.

Due to fragile Himalayan geology, this tunnel is being constructed using NATM method of tunneling. DYWIDAG has been involved since the beginning, supplying more than 18,000 DYWIDAG Expandable Rock Bolts and GEWI® Rock Bolts for portal protection, and six grout pumps at this project site.



KEY FEATURES

Cut and cover Tunnel/station box including DYWIDAG Threadbar, Micro piles, strand anchors & GFRP bar.

Melbourne Metro Tunnel

The Melbourne Metro Project is a 9 km twin TBM tunnel with five new stations across the central business district. DYWIDAG worked on the project from design to installation, providing technical advice, manufacturing, and supplying more than 1,000 strand anchors and 1,000 permanent pre-grouted DCP micro piles against hydrostatic uplift of the station boxes, and GFRP and High-strength Threadbar® Systems. DYWIDAG was recognized as a quality manufacturer and supplier.

Micro Piles

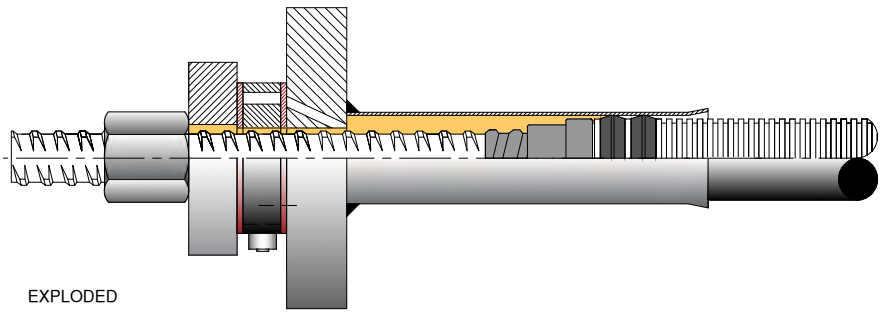
DYWIDAG specializes in the manufacturing of micro pile systems based on the standard 120-year design lifespan, using hollow bar and thread bar systems in combination with several corrosion protection options.

Robotic Inspection

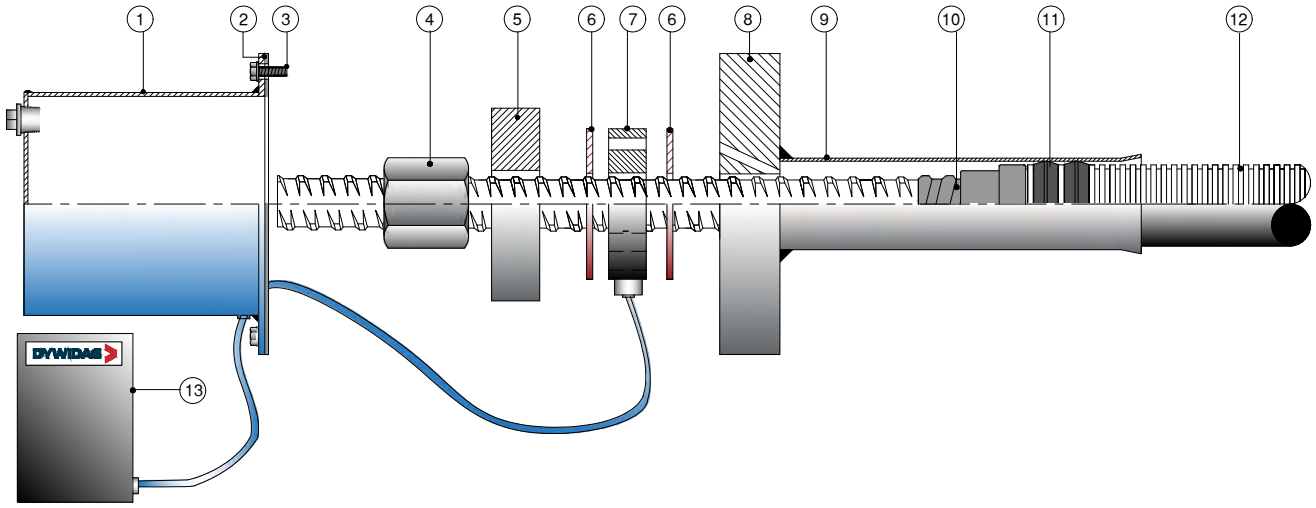
DYWIDAG's visual inspection devices automatically scan the inner shell of a tunnel and provide real-time data in Infrastructure Intelligence platform. Using a tunnel module, DYWIDAG's ATIS cable robot conducted visual inspections of the Hai Van Tunnel in Vietnam, the Great Belt tunnel in Denmark, and the City Tunnel in Leipzig, Germany.

Smart Anchor

- Smart Anchor records changes in force, showing actual load fluctuations.
- Deliver an integrated view of the structure and connects to DYWIDAG's smart IoT system.
- Monitors live loads upon installation.
- Provides constant monitoring, detailed analytics, and reporting.
- Gives real-time assessment of remaining functionality after an event.
- Tracks and measures temperature, weather, impact, and movement changes.



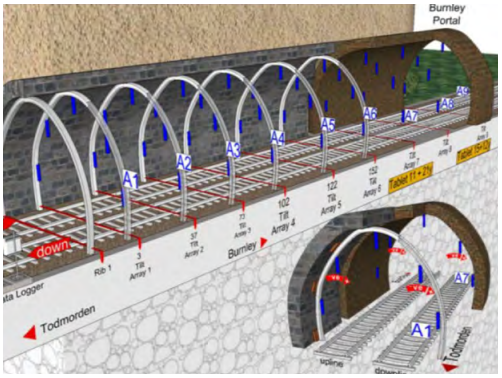
EXPLODED



1	Steel Cap – 1950 x 200 mm
2	Gasket
3	M8 bolt
4	Hex LB nut
5	1600 distribution plate
6	Gasket
7	Monitoring Ring
8	Anchor plate
9	Seamless steel lube L = 350mm
10	Grout sleeve
11	Rubber seals
12	Ribbed sheating
13	Transmitter

Digital Twin

Infrastructure Intelligence
by DYWIDAG



Monitoring

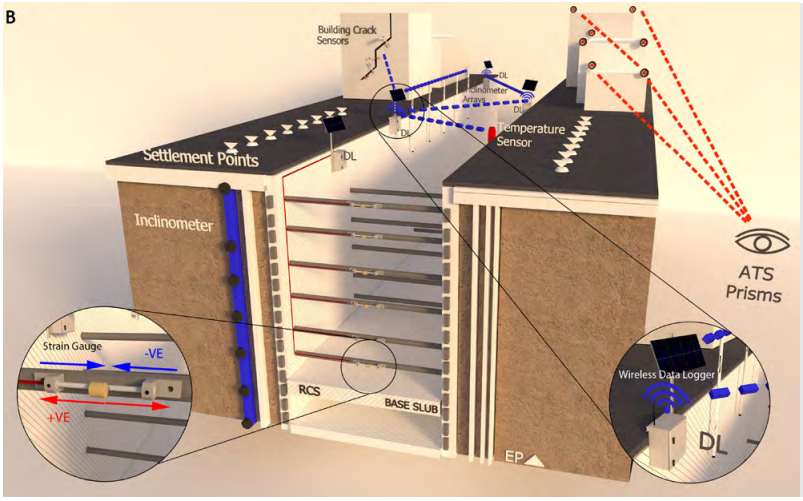
DYWIDAG Infrastructure Intelligence offers a simple, smart approach to infrastructure management.

Validation made simple

Critical data feeds into DYWIDAG's cloud-based Infrastructure Intelligence platform, providing 24/7 access to detailed analytics and reporting, so users can easily monitor a structure's performance remotely in real-time from any connected device.

Why Infrastructure Intelligence?

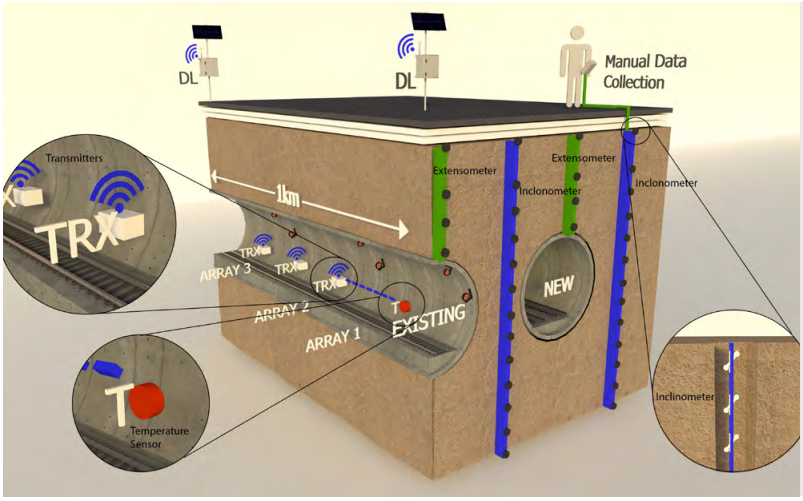
- Clear alert notifications and an escalating alarm system.
- Personalized view of data.
- Use DYWIDAG or third-party sensors.
- Track and measure temperature, weather, impact, and movement changes.
- Identify issues for better planning.



Open Cut Excavation

Instrumentation may include:

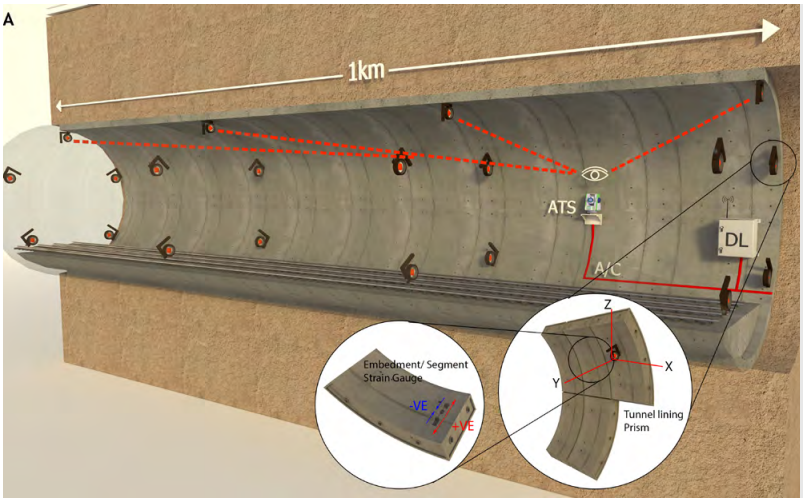
- Inclinometers
- Extensometers
- Strain gauges
- ATS
- Joint and crack displacements
- Temperature



Subsurface Instrumentation

Instrumentation may include:

- Inclinometers
- Extensometers
- ATS
- Joint and crack displacements
- Temperature



Tunnel Instrumentation

Our Tunnel Monitoring includes:

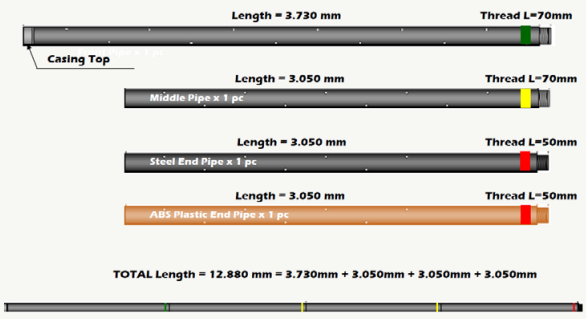
- Convergence
- Settlement/Heave
- Structural strains and loads
- Joint and crack displacements
- Temperature

DYWIDAG Canopy System

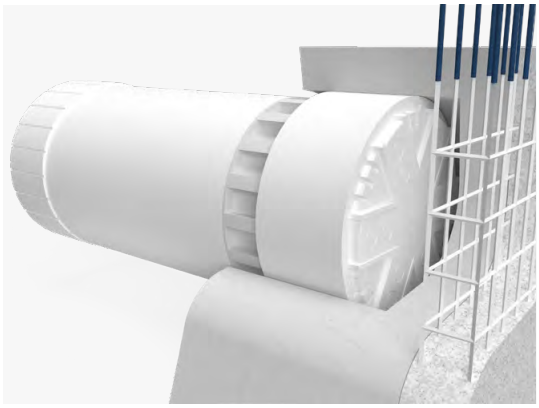
The DWYDIAG Canopy System is used in weak ground conditions in both conventional and mechanized tunneling. Long forepoling using the pipe umbrella or canopy method is applied to increase safety and stability in the working area portals. Pipe umbrellas installed in the ground prior to excavation increase the stability of the working area and decrease excavation-induced deformations.

Advantages

- Different connection types (standard thread, squeezed, and nipple) available to maximize capacity and limit settlement deformation.
- Increases stability of the working area and decreases excavation-induced deformations.



DYWIDAG GFRP



The DYWIDAG GRiP glass fiber reinforced Threadbar is a composite material made of high-performance resins and high-strength glass fiber.

The lightweight system allows for easy application in challenging conditions while also providing a high tensile loadbearing capacity. DYWIDAG GRiP can be cut on site and is highly resistant to corrosion and rust with a 100-year design life.

Advantages

- High tensile loadbearing capacity.
- Cuttable, lightweight system.
- Continuous rope thread allows for cutting to a required length.
- Corrosion-resistant.
- May be used in conjunction with steel components for higher strength.
- Tunnel portals and temporary rock reinforcement to be removed by excavators or TBM.
- Ground stabilization in slopes and special foundations.

Applications

- Mechanical excavations – TBM, roadheaders, and continuous miners.
- Cuttable ground control system for underground tunneling and penetration of TBMs.
- Injection lance for injectable grout and resin systems.
- Forepoling element.
- Tunnel portals and temporary rock reinforcement to be removed by excavators.
- Ground stabilization in slopes and special foundations or aggressive soils.

Available in different versions:

CS

Fully threaded solid bars

CH

Fully threaded hollow bars

CR

Fully threaded self-drilling hollow bars with advanced, resistant composite structure

DYWIDAG Combo-Bolt

The DYWIDAG Combo-Bolt is a reliable technology to permanently stabilize rock masses during the excavation of tunnels and caverns, as well as slope reinforcement. The assembly bolting system adopts combination technology, providing the superior advantages of immediate mechanical support for unstable rock masses and optimization of the borehole size. The prefabricated polyethylene sheathing and grouting bell allow the pressured grout to be pumped from the inner sheathing to the end of bolt, fully and efficiently grouting the borehole.

Key Features

- Durable lifetime, up to 120 years.
- Favorable system for upward installation and grouting.
- Immediate ground support for anchoring rock mass.
- Angle compensation at anchor head.
- Adopt ductile rebar material.
- High shear performance.
- Available using feasible material upon request.

MAIN APPLICATION

Tunnels, Caverns & Slope stabilisation

Corrosion Protection

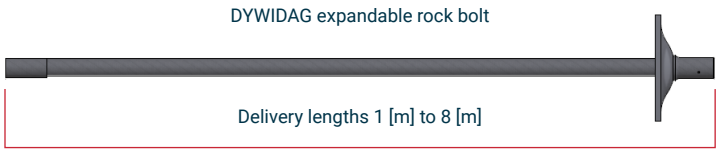
- Plastic sheathing and hot-dip galvanized (HDG) rebar.
- Plastic sheathing and epoxy powder coating of rebar.
- Plastic sheathing, hot-dip galvanizing, zinc phosphating, and epoxy powder coating of rebar.

DYWIDAG Expandable Friction Bolt

The DYWIDAG Expandable Friction Bolt is a temporary rock reinforcement for underground applications. Bonding forces between the rock bolt and the ground are caused by form closure (mechanical interlocking) and friction transfer between the borehole wall and the bolt, which is expanded by hydraulic pressure. The DYWIDAG Friction Bolt is made from a deformed steel tube which is expanded after the installation process using a pneumatic or electric high-pressure pump to inject water. The expanded profile adjusts to the irregularities of the borehole wall and variations in the borehole diameter.

Key Features:

- Immediate full loadbearing capacity over the entire installed bolt length.
- Trouble-free installation in water bearing boreholes.
- Low sensitivity against vibrations from blasting works.
- Maintains loadbearing capacity when undergoing deformations.
- Flexibility when varying borehole diameters.
- Fast installation.



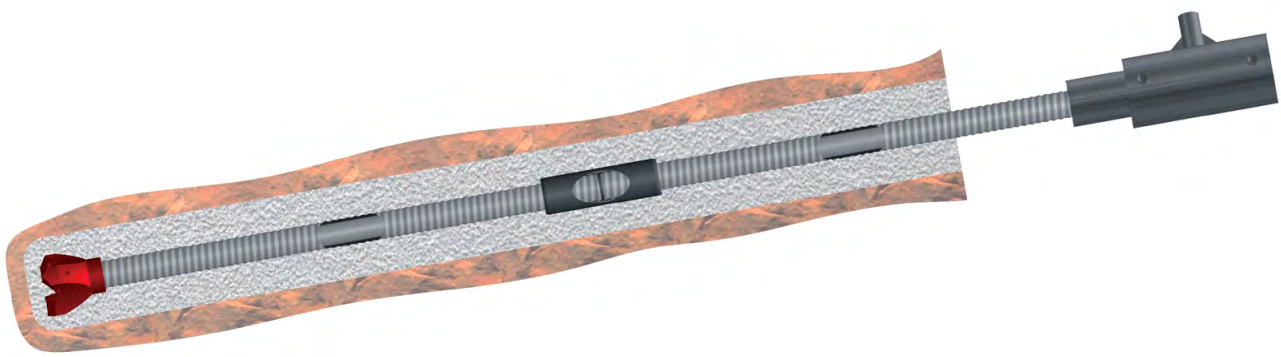
DYWI® Drill Hollow Bar

Systemic support is implemented to maintain the stability of surrounding rock and reduce deformation after tunnel excavation. The DYWI® Drill Hollow Bar system combines drilling and grouting into a single operation and complies fully with the EN 14490 European standard.

The DYWI® Drill Hollow Bar is used to stabilize tunnel portals, trenches and cut-and-cover areas, face stabilization, radial rock bolting, foot piles, roof and rib bolting, and injection works.

Key Features

- Fast and safe self-drilling installation without casings or drill bits.
- Suited to unstable boreholes and difficult ground conditions.
- Minimal ground disturbance.
- Grouting may be performed during or after drilling.



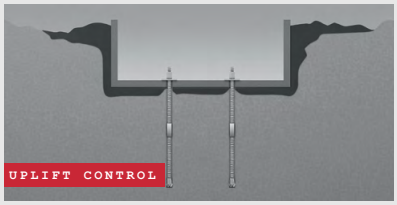
DYWIDAG Lattice Girders

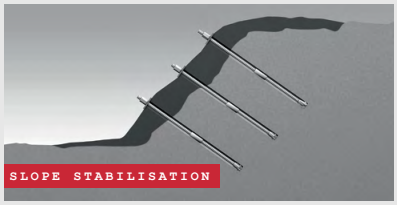
DYWIDAG Lattice Girders support the overall integrity of a tunnel, providing immediate support in the excavation area. They are easy and quick to assemble, requiring simple adjustments to shape to the excavation geometry.

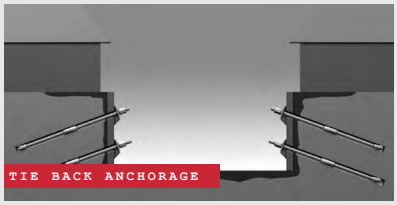
They are used as a template when applying shotcrete, creating the optimum bond and interconnection with the shotcrete lining.

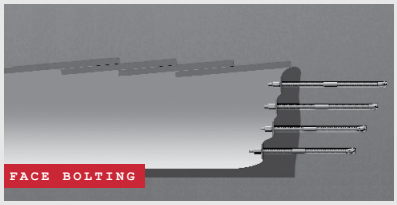
Spiles may be installed above or through the Lattice Girders and do not require investment in major equipment for installation.

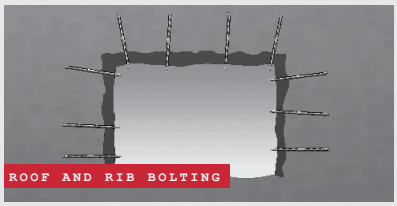
Fields of Application

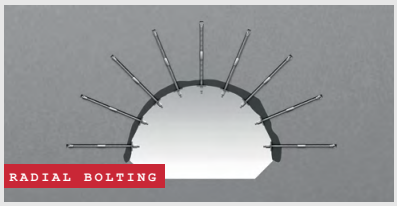


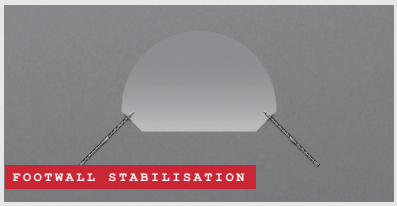


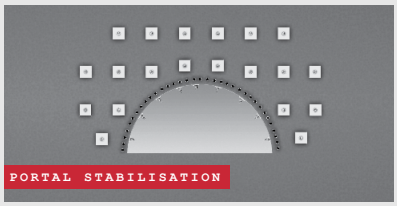












Other products from the DYWIDAG global portfolio

- Resin cartridges
- Injectable resins
- Mesh
- Geofabrics
- Waterproofing
- Spiling Bar
- Strand or cable bolt
- Steel Sets
- Rock and soil nails
- Ground anchors: strand or bar
- Micropiles

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