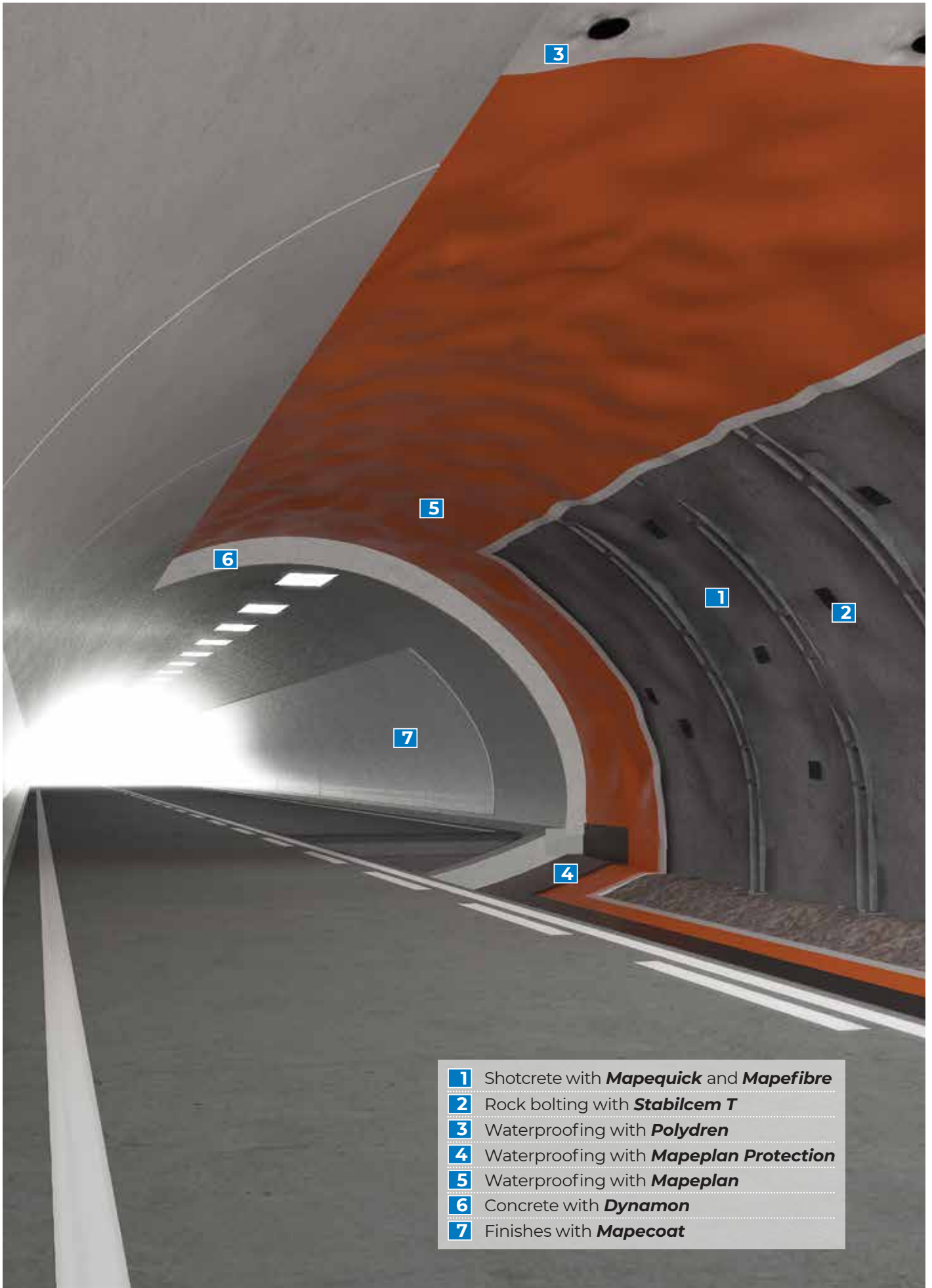


Products for tunneling, mining and underground construction





- 1 Shotcrete with **Mapequick** and **Mapefibre**
- 2 Rock bolting with **Stabilcem T**
- 3 Waterproofing with **Polydren**
- 4 Waterproofing with **Mapeplan Protection**
- 5 Waterproofing with **Mapeplan**
- 6 Concrete with **Dynamon**
- 7 Finishes with **Mapecoat**

“We’re in the tunnel with you, from start to finish”

The phrase above best summarizes how MAPEI contributes to the underground construction industry. We support tunnel construction from the initial steps right up until the last product is applied.

Our product line is the most complete you could wish to have: Pre-injection products for consolidating and waterproofing different types of rock and soil. Shotcrete technology with high-quality, alkali-free accelerators and super-plasticizers to control water/cement ratios and maintain workability. Rock-bolt injection technology, both cement-based and chemical-based.

As for the pervasive problem of water ingress in a tunnel, MAPEI offers all of the solutions needed:

- **Polyurethane resins**
- **Organic mineral resins**
- **Acrylic gel**
- **Engineering solutions and on-site technical support for each specific intervention**

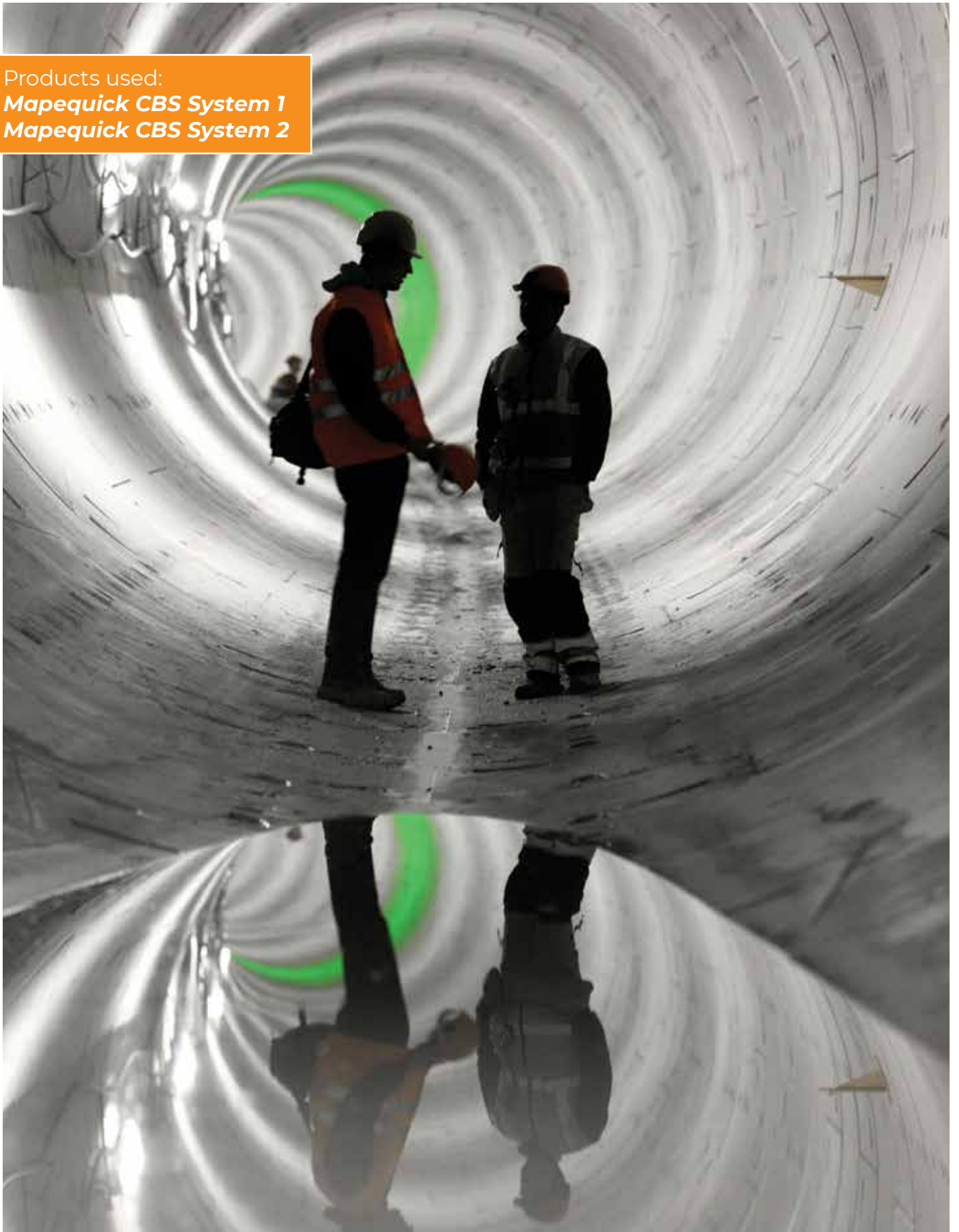
MAPEI also provides spray-applied waterproofing membranes and PVC-P waterproofing membranes. Combined with our engineering expertise and technical support, we can help design the most appropriate system in compliance with the strictest standards.

We also give “added value” to concrete technology through our expansive line of concrete admixtures, which produce high-performance concrete for cast in-situ linings and precast segmented linings.

MAPEI systems for finishing and coating tunnel surfaces help to improve the level of safety while reducing costs. All of these systems are approved and certified, with measurable results for ensuring durable, nontoxic environments with technology that is environment-friendly and economically sustainable.

We are proud to collaborate with prominent clients around the world and look forward to contributing to your success.

Products used:
Mapequick CBS System 1
Mapequick CBS System 2



Products for tunneling and underground construction

Our goal for MAPEI and UTT Group products and technologies is to completely satisfy all the technical requirements of our clients, from those who apply them, to the designers, to the owners.

Our products have been divided into 5 categories:

1. Concrete technologies

More than 70 products, ranging from super-plasticizers to accelerators and retarding agents to “accessory” products. These products cover every type of underground concrete application: Shotcrete, ready-mixed concrete and pre-cast concrete.

- Flash-setting accelerators for shotcrete
- Admixtures for shotcrete (mix base) and concrete
- Accelerators/anti-freeze agents

2. Injection systems for consolidation and anchoring

A complete range of ready-to-use cementitious mixes, chemical mixes and chemical resins for underground injection in different types of rock, soil and concrete structures. These products improve the properties of the ground, stop water leaks, improve internal cohesion, anchor, etc.

- Injection/consolidation
- Anchoring

3. Waterproofing systems

A wide range of waterproofing systems for all water conditions.

- Synthetic geomembranes and spray-applied waterproofing membranes
- Complementary products for waterproofing systems

4. Renovation, maintenance and repair technologies

Products for renovation, maintenance, repair and waterproofing activities, as well as equipment for ready-to-use shotcrete and injected products.

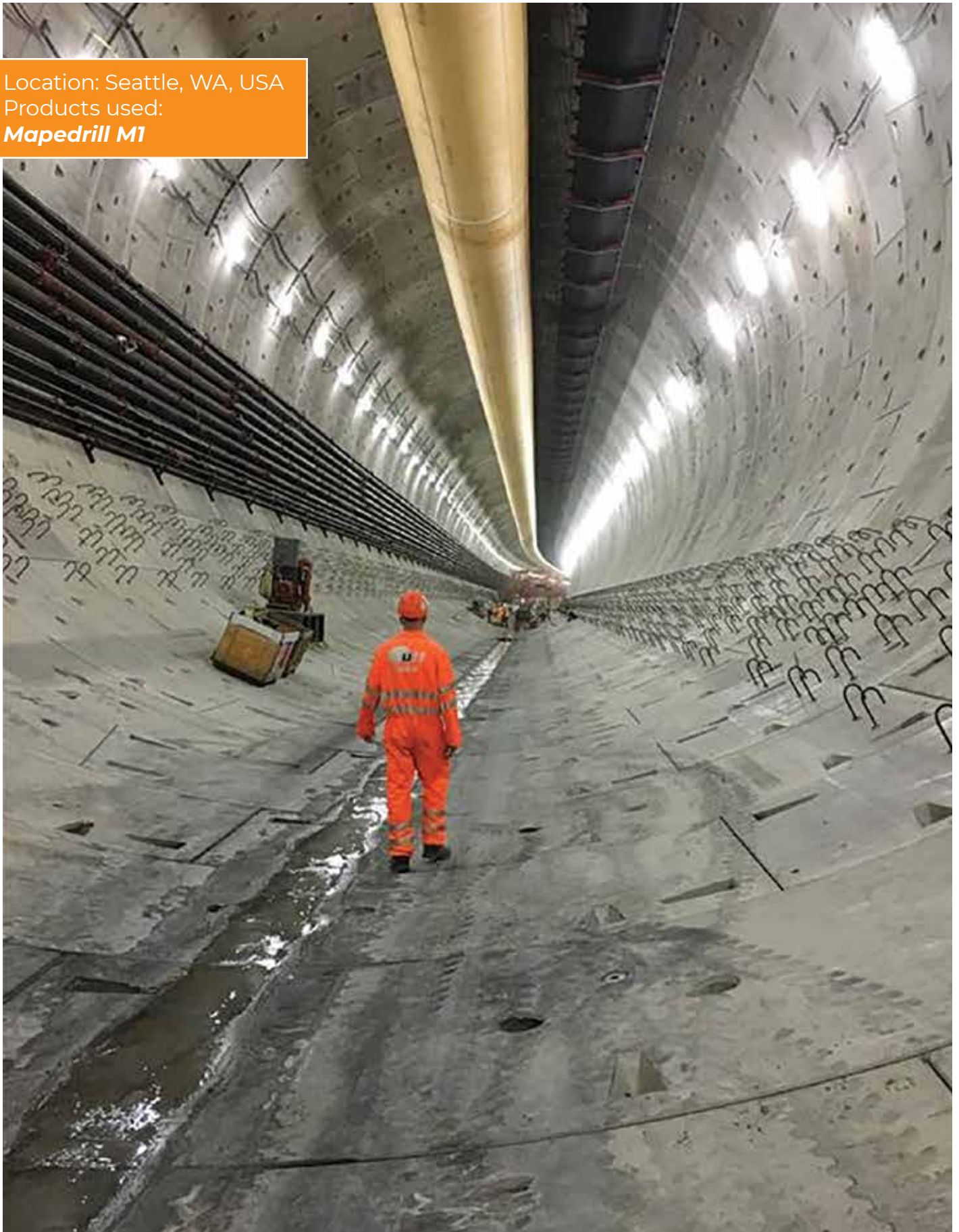
- Repairs to concrete
- Other products for repair work
- Fireproof mortar

5. Mechanized tunneling

Products and on-site technical assistance services to support clients throughout complete tunneling projects, from start to finish.

- Mechanized TBM tunneling
- A+B annulus grouting

Location: Seattle, WA, USA
Products used:
Mapedrill M1



Services for tunneling and underground construction

The **Underground Technology Team (UTT)** is the division of MAPEI dedicated to underground work. When undertaking underground work, it is strongly recommended to operate together with highly specialized technicians who, with their experience and technical knowledge, are able to handle the most unpredictable situations, thus ensuring the most appropriate technical and economic solution.

Lastly, we would like to highlight the importance of assessing each and every application on a case-by-case basis, especially for underground activities, typically characterized by extremes that set them apart from most other civil works. That is why we always recommend contacting our UTT Technical Service Staff, who are at your complete disposal for meetings in your office or directly on site.

Experience

Over 75 years of international on-site underground construction experience.

Technical consultancy

Technical consultancy service for the entire duration of your underground construction work.

Technical assistance

Worldwide network of highly trained technical assistants.

Our experience provides your solutions

We provide analyses and solutions on sites all over the world.

Formulations

Development and optimization of formulations and help in evaluating the right dosage for each ingredient.

Product classification and testing

Collaboration with external laboratories for product classification and testing in compliance with the most severe standards on the market.

Client training

Personalized practical and theoretical client training programs to suit your needs and requirements.

Research and product innovation for a high-speed market

A considerable portion of MAPEI's annual turnover is channeled into important R&D investments. MAPEI's proactive approach makes innovation a daily routine.





Shotcrete solutions

Alkali-free accelerators	Mapequick AFK 888	Alkali-free accelerator for shotcrete
	Mapequick AF 350	Alkali-free accelerator for shotcrete
	Mapequick AF-70	Alkali-free accelerator for sprayed shotcrete
	Mapequick AF 701 S	Alkali-free accelerator for shotcrete
	Mapequick AF 100 RP	Alkali-free re-dispersible powder for liquid accelerator for shotcrete
	Mapequick AF 300 Dry	Powder alkali-free setting accelerator for shotcrete
Dry-packaged concrete	Mapegrout Gunite	One-component pre-packed multipurpose non-accelerated cementitious mortar applied using either the dry or damp spraying technique
	Mapegrout Gunite 300 AF	Pre-packed one-component cementitious mortar with accelerated setting for dry-mix shotcrete
	Mapegrout Gunite Shotgun	Pre-packed, one-component, fiber-reinforced cementitious mortar with accelerated setting for dry-mix shotcrete
	Mapegrout Compact	Pre-mixed injecting grout characterized by great resistance to wash-out and controlled rheology and fluidity
Fibers	Mapefibre IT 39 NV	Structural polypropylene fibers for making high-ductility concrete and shotcrete



Admixtures for shotcrete and concrete

Retarders	<i>Polychem Renu</i>	Hydration-stabilizing admixture for concrete
	<i>Mapetard SD2000</i>	Set-retardant for concrete and mortar
	<i>Polychem R</i>	Set-retarding admixture for concrete
Accelerators	<i>Polychem Super Set</i>	Accelerating admixture
	<i>Polychem Super Set Plus</i>	Non-chloride accelerating admixture
Superplasticizers	<i>Dynamon NRG 1092</i>	High-range, water-reducing admixture
	<i>Dynamon SX</i>	Modified acrylic super-plasticizer for concrete, characterized by its low water/cement ratio, very high mechanical strength and long workability times
Viscosity-modifying agents	<i>Polychem VMA</i>	Viscosity-modifying admixture
Anti-washout	<i>DG-F</i>	Anti-washout and viscosity-modifying admixture



Location: Texas, USA
 Products used:
Silicajet EXP
Foamjet F

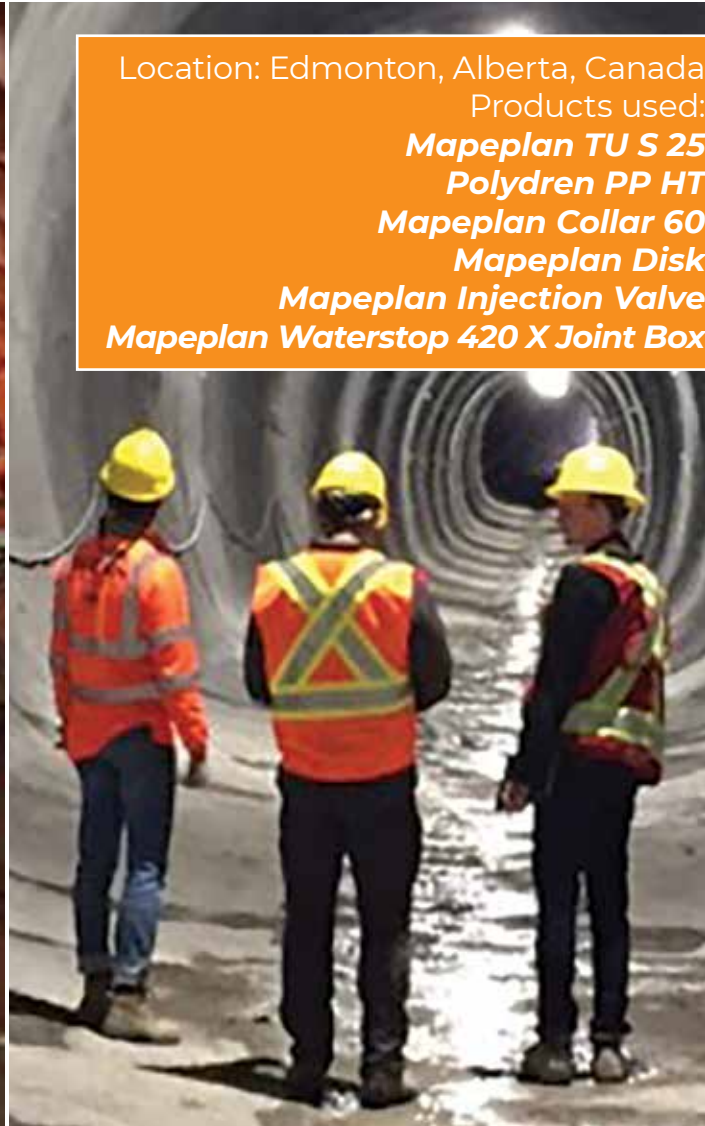
Injection solutions

A+B annulus grouting	Mapequick CBS System 1	Liquid-retarding admixture with plasticizing effect for cementitious-based injection systems
	Mapequick CBS System 1L	Liquid-retarding admixture for cementitious-based injection systems
	Mapequick CBS System 2	Liquid activator admixture used in extremely fluid cement-based grout systems
	Mapequick CBS System 3	Liquid activator admixture used in extremely fluid cement-based grout systems
	Mapebent CBS5	Natural sodic bentonite for use in all engineering applications
Polyurethanes	Foamjet F	Ultra rapid-setting, fluid-consistency, two-component polyurethane injection resin for consolidating and waterproofing various substrates.
	Foamjet T	Ultra rapid-setting, two-component polyurethane resin to be injected for waterproofing of structures and ground subject to strong water ingress
	Foamjet F ST	Modular-setting-time, two-component structural polyurethane resin, with high mechanical characteristics for consolidating and waterproofing structures subject to water ingress
	Foamjet 260 LV	Two-component, polyurethane flexible and low-viscosity resin for injection and waterproofing
	Foamjet 260 LV AKS	Accelerating admixture for <i>Foamjet 260 LV</i>
	Resfoam 1K-M	Ultra fluid, one-component, polyurethane injection resin with adjustable reaction times, for waterproofing structures, grounds and rocks subject to intense water seepage
	Resfoam 1 KM AKS	Ultra fluid, flexible, one-component, polyurethane injection resin for waterproofing structures
Polyurea silicates	Silicajet EXP	Two-component, organo-mineral, fast-reacting and high-foaming resin for void filling
	Silicajet EXP/E	Organic-mineral-based, two-component resin for injections, with high reaction speed and expansion rates
	Silicajet EXP/4	Two-component, organo-mineral, fast-reacting resin for injections with a moderate foaming ratio
	Silicajet ST	Two-component fluid resin used for injections in all types of soil, rock and concrete
	Silicajet ST HP	Modular-setting-time, two-component, structural, organo-mineral, non-expanding resin, with high mechanical characteristics, to be injected for consolidating and waterproofing of structures and ground subject to presence of water
Cementitious grouts	Cablejet	Plasticizing and high-performance anti-shrinkage agent for slurries for injection.
	Stabilcem AG	One-component anchor grout for cables and bolts
	Stabilcem T	One-component, pre-blended thixotropic mortar with controlled shrinkage for anchoring, by injection, of tie rods and bolts in all types of grounds
Acrylates	Mapegel UTT System (Mapegel UTT 1-3)	Three-component, flexible hydrophilic gel for waterproofing injection in underground structures
	Mapegel UTT 4	Copolymer enhancer for <i>Mapegel UTT System</i>
	Mapegel UTT HP Flex	Three-component, highly flexible, hydrophilic gel, for waterproofing injections in underground structures and grounds

Epoxies	Mapepoxy UV-S IT	Epoxy-based adhesive putty, suitable for underwater pours
	Epojet SLV	Two-component, injectable epoxy resin with very low viscosity, including at low temperatures, for sealing cracks, including in wet substrates
	Epoxy Speed	Solvent-free accelerator for epoxy primers
	Epojet LV	Two-component epoxy resin with a very low viscosity for injecting into micro-cracks, including in wet surfaces

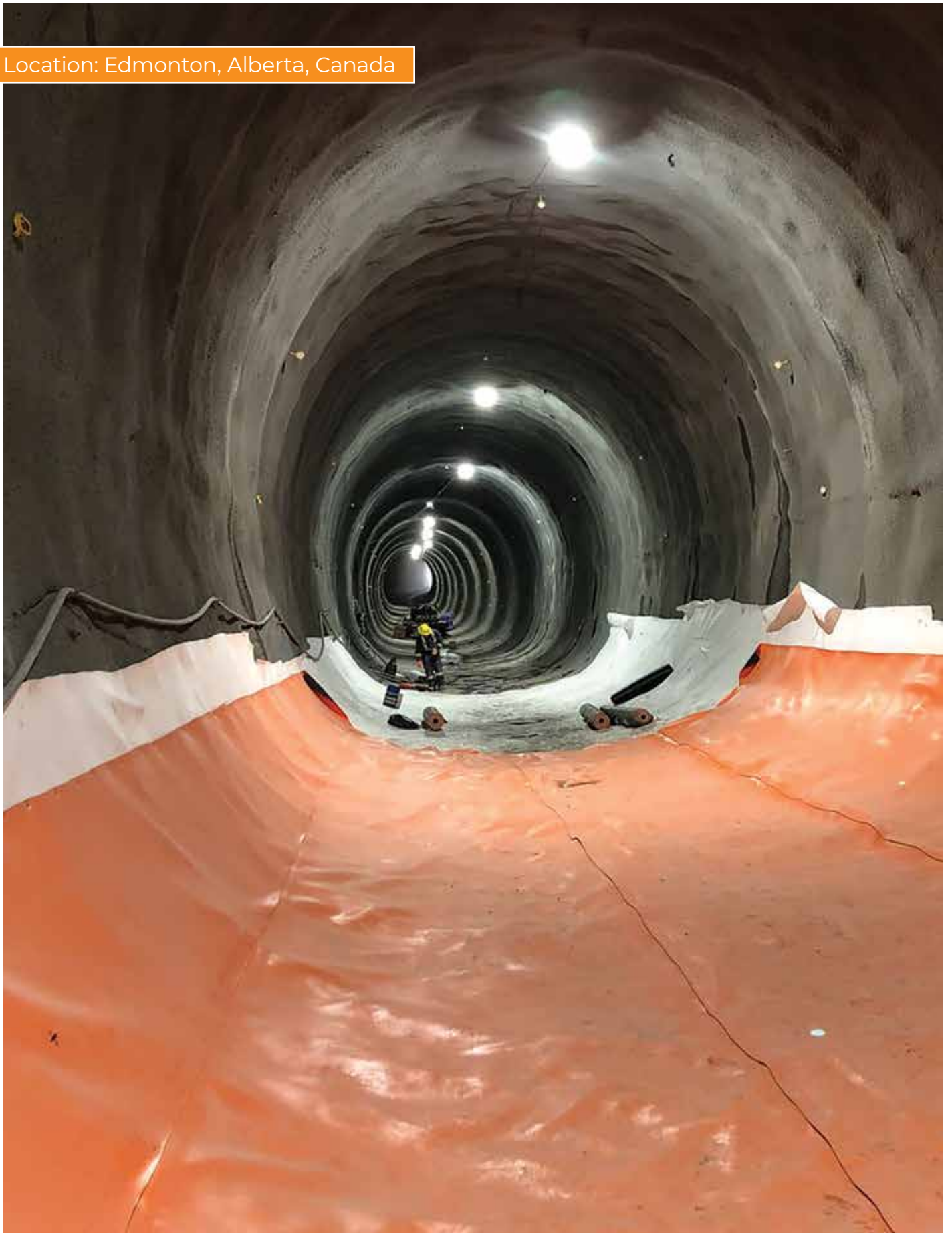
Mineral grouts	Mapejet System LP	Two-component, cement-free binder for low and very low permeable ground consolidation
	Mapejet System NS 15 HP	Cement-free binder for low and very low permeable ground consolidation

Microfine/ ultrafine cements	Microcem 8000	Micro-fine hydraulic binder with pozzolanic action for ground consolidation and ground waterproofing throughout injections of cementitious mixes
	Microcem 12000	Micro-fine hydraulic binder with pozzolanic action for ground consolidation and ground waterproofing throughout injections of cementitious mixes
	Microcem 12000/SR Plus	Sulphate-resistant, ultra fine cement for rock and soil injection



Location: Edmonton, Alberta, Canada
 Products used:
Mapeplan TU S 25
Polydren PP HT
Mapeplan Collar 60
Mapeplan Disk
Mapeplan Injection Valve
Mapeplan Waterstop 420 X Joint Box

Location: Edmonton, Alberta, Canada



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Waterproofing solutions

PVC membrane	Mapeplan Protection 15	Synthetic membrane for protection
	Polydren PP HT	High-tenacity, non-woven geotextile to be used as compensation, leveling, protection and filter layer
	Mapeplan TU S 20	Synthetic waterproofing membrane
	Mapeplan TU S 25	Synthetic waterproofing membrane
	Mapeplan Waterstop	PVC waterstop for sealing structural joints and expansion joints and creating compartments in waterproofing systems
Spray-applied membrane	Mapelastc TU System	One-component, ready-to-use, polymeric, sprayable membrane for waterproofing tunnels and underground structures
Self-adhesive sheet membrane	Mapeproof AL NA	Self-adhesive, synthetic waterproofing membrane
	Mapeproof Liquid Membrane	Two-component polyurethane elastomeric, thixotropic, liquid waterproofing membrane for sealing, filling and detailing <i>Mapeproof AL NA</i> and <i>Mapethene HT/LT</i> membranes
	Ultrabond Turf Catalyst	Accelerator for <i>Mapeproof</i> liquid membrane

Waterproofing ancillary products

Adesilex PG1	Two-component, thixotropic epoxy adhesive with modified rheology for bonding <i>Mapeband</i> , <i>Mapeband TPE</i> , PVC strips and Hypalon and for structural bonds
Idrostop	Hydrophilic, expanding rubber profiles for waterproofing working joints
Mapeflex PU 45	Paintable polyurethane sealant and adhesive with a high modulus of elasticity for movements up to 20%
Mapeplan Tape	Flexible PVC tape for waterproofing joints and membrane interruption
Mapeplan Disc	PVC-P fixing element
Idrostop Multi 11 / 19	PVC-P re-injectable hoses for waterproofing systems
Polydren PP	Non-woven geotextile to be used as compensation, leveling, protection and filter layer



Location: Bellevue, WA, USA
 Products used:
Mapelastc TU System

Location: Washington, D.C, USA
Products used:
Mapebent CBS 5
Mapequick CBS System 1
Mapequick CBS System 2
Polyfoamer FP/CC



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TBM solutions

Soil conditioners	Polyfoamer FP/CC	High-performance liquid foaming agent, based on biodegradable anionic surfactants, in combination with a natural lubricating polymer, for ground conditioning in mechanized tunneling
	Polyfoamer FP CC Plus	High-performance liquid foaming agent, based on biodegradable anionic surfactants, in combination with a natural lubricating polymer, for ground conditioning in TBM tunneling
	Polyfoamer FP/L	Liquid foaming agent based in combination with a lubricating polymer for ground conditioning
	Polyfoamer FLS	Liquid foaming agent, combined with an anti-clay polymer, based on biodegradable anionic surfactants for ground conditioning in mechanized tunneling
	Polyfoamer Eco 100 Plus	High-performance glycol-free foaming agent with a natural polymer that is quickly biodegradable and nontoxic for ground conditioning in mechanized tunneling

Polymers	Mapedrill M1	Synthetic polymer in liquid form for water-based fluids to be employed in mechanized tunneling and drilling
	Mapedrill M3	Synthetic polymer in liquid form for water-based fluids with exceptional lubricating properties to be employed in mechanized tunneling and drilling
	Mapedrill SV	Natural polymer in powder for mechanized tunneling with TBM and drilling machine
	Mapedrill SA1	Super absorbent liquid polymer
	Mapedrill FFT NA	Natural powder clay for soil stabilization in front of tunnel boring machines
	Mapedrill M1 P	Synthetic polymer in powder form for mechanized tunneling and drilling
	Mapedrill SA1 Powder	Super absorbent organic polymer in powder form
	Mapedrill EX1/P	Powder polymer to enhance the performance of bentonite slurries during mechanized tunneling
	Mapedrill M10W	Water-based liquid polymer to be employed in mechanized tunneling with TBMs

Lubricants and sealants	Mapeblox EP Eco 1	Biodegradable EP grease for mechanized TBM tunneling
	Mapeblox EP Eco 2	Biodegradable EP grease for mechanized TBM tunneling
	Mapeblox EP 2	EP greases for mechanized TBM tunneling
	Mapeblox/H	Main bearing sealant for TBMs
	Mapeblox PKG	Packing grease for mechanized tunneling with TBMs
	Mapeblox/T	Tail sealant for mechanized tunneling with shield TBMs
	Mapeblox/T FA	Tail sealant for mechanized tunneling with shield TBMs to be used in presence of significant amounts of water
	Mapeblox/T S	Hydrocarbon-free tail seal grease with flameproof properties for mechanized tunneling with TBMs
	Mapeoil HFR 46	High-performance hydraulic oil for TBMs
	Mapeoil HFR 68	High-performance hydraulic oil for TBMs

Slurry shield	Mapebent API 5	Sodium bentonite conforms to API standards for mechanized tunneling with SS and HS TBMs
	Mapecog 10 NA	Liquid coagulant to treat bentonite slurries used for drilling
	Mapeflock 10	Chemical flocculating agent in powder form to treat bentonite slurries used for drilling application
	Mapeblox PW 01	Nontreated, Wyoming Sodium bentonite used with plastic walls and diaphragms

CENTRAL SUBWAY TUNNELING PROJECT - San Francisco, CA, USA



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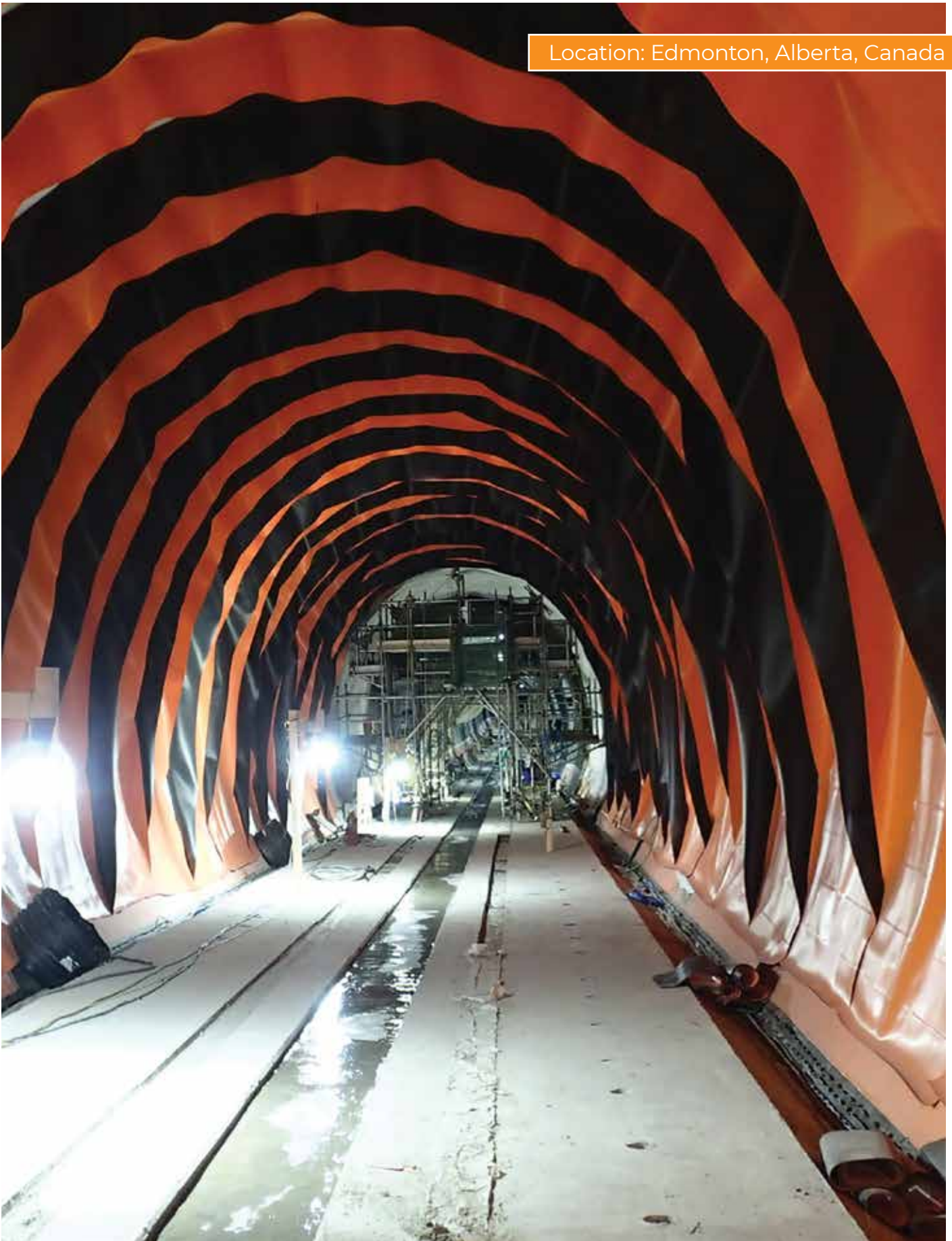


Location: Washington, D.C., USA



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BY **MAPEI**

Location: Edmonton, Alberta, Canada









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