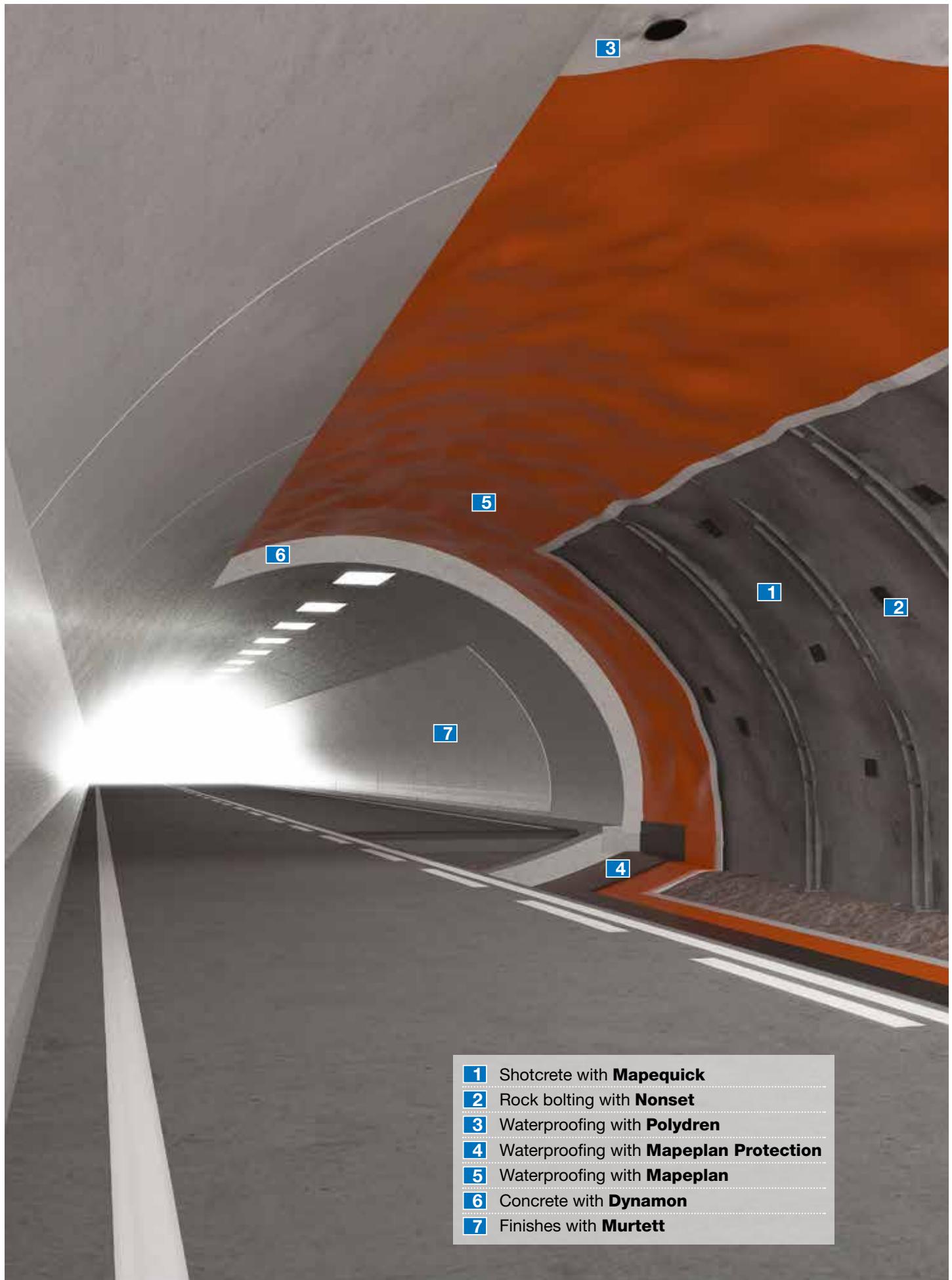




PRODUCTS FOR TUNNELLING, MINING AND UNDERGROUND CONSTRUCTION



www.utt-mapei.com



“WE ARE IN THE TUNNEL, WITH YOU, FROM THE START TO THE END OF THE JOB”

This phrase is the one that best sums up what Mapei has to offer for the underground construction industry.

As you can clearly see from the cover, we offer support for all your underground work, from the initial steps right up until the last of the materials is applied in a tunnel construction.

Our range of products is the most complete you could wish to have, “TO COMPLETE YOUR WHOLE”. Our technologies are available right from the very start of the job, with every product you need for pre-injection for consolidating and waterproofing different types of rock and soil, our shotcrete technology with high quality, alkali-free accelerators and super-plasticizers to control water/cement ratios and maintain workability. And how could we forget the importance of rock support given by the most appropriate rock-bolt injection technology (both cementitious-based and chemical-based).

And who amongst those who work in the underground construction industry has never had to face the problem of water ingress in a tunnel at some point or other?

Mapei has the answer for this problematic issue:

- 1. Polyurethane resins**
- 2. Organic mineral resins**
- 3. Acrylic gel**
- 4. Engineering solutions and on-site technical support for each specific intervention**

Spray-applied waterproofing membranes and PVC –P waterproofing membranes, together with a high standard of engineering expertise and technical support to help design the most appropriate system in compliance with the most recent, severe standards.

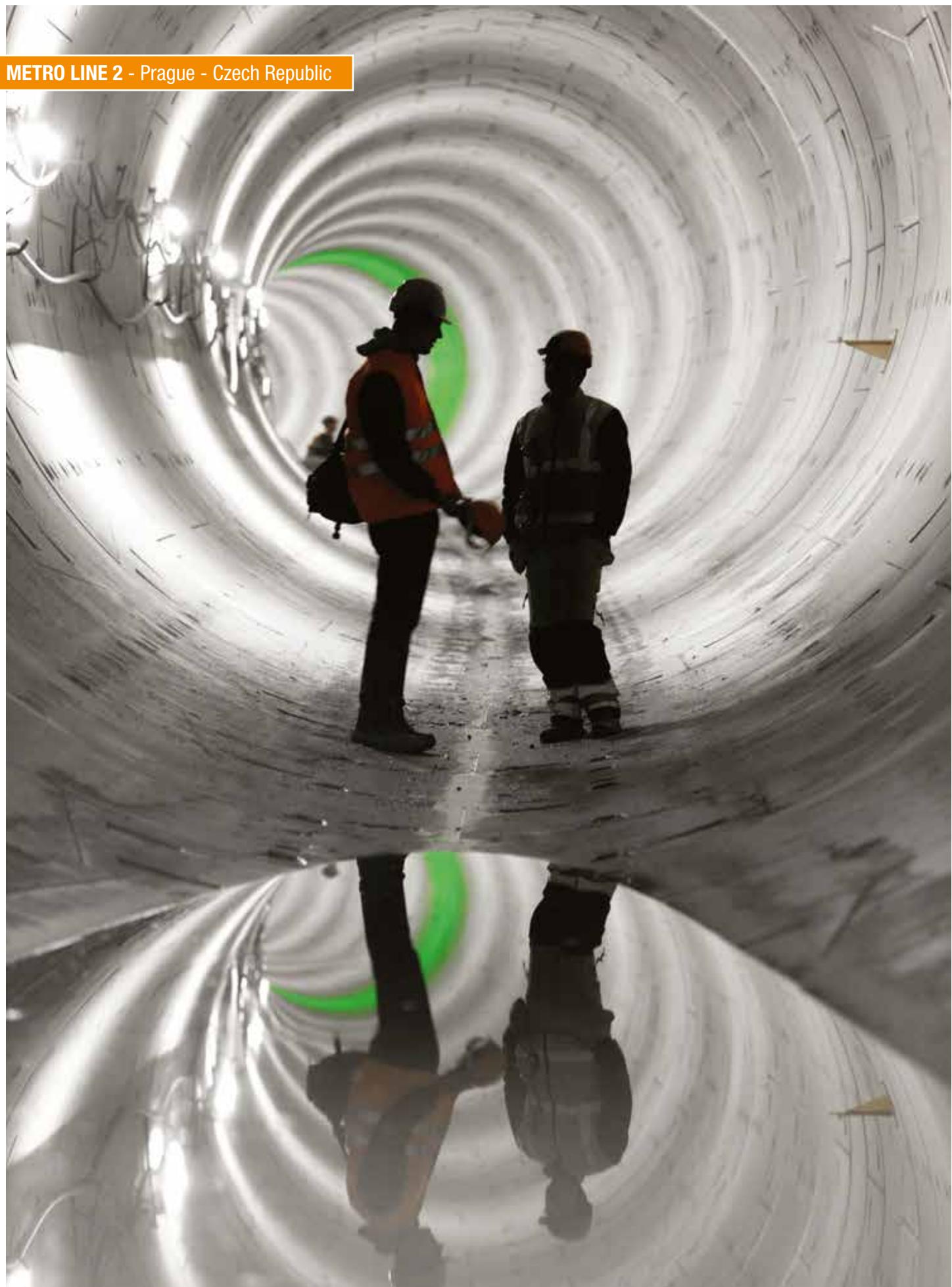
The “added value” that we supply to concrete technology, through the use of our wide range of concrete admixtures to obtain high performance concrete for cast in-situ linings and precast segmented linings. Creating a bright surface in a road tunnel to help improve the level of safety and reduce costs is just one of the results that can be achieved by applying Mapei systems for finishing and coating tunnel surfaces. All of these systems are approved and certified, with results that can be measured to ensure durable, non-toxic environments.

The impact of our technology on the environment must be low and friendly, and our mission is to contribute in providing safe and economically sustainable technology.

All our systems are certified according to the most severe international standards and the cooperation we have on a day-to-day basis with the most important Universities from around the world gives us the guarantee that we are promoting and offering our clients the best option available for every challenge they face.

This brief product guide is dedicated to our clients, our most important “asset”. So I would like to thank all of you for the trust you show in us and for giving us the opportunity to make a contribution to the success of your work and helping it become part of your great success.

METRO LINE 2 - Prague - Czech Republic



UNDERGROUND
TECHNOLOGY
BY MAPEI

PRODUCTS FOR TUNNELLING, MINING AND UNDERGROUND CONSTRUCTION

The goal we have in mind for the products and technologies manufactured by Mapei and developed by the UTT-Team is to completely satisfy all the technical requirements of our clients, from those who apply them right down to the end user.

The products have been divided into 6 categories:

1. Concrete technologies

More than 70 products are offered, ranging from super-plasticizers to accelerators and retarding agents to “accessory” products, dedicated to 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
- Stabilisers
- Air-entraining agents
- Concrete anti-washing
- Form release agents / curing agents
- Pumping aids
- Accelerators/anti-freeze agents
- Fibers

2. Injection systems, 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 or concrete structures to improve the properties of the ground, stop water leaks, improve internal cohesion, anchoring, 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, equipment for ready-to-use shotcrete and injected products.

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

5. Coating technologies

A range of products and on-site technical assistance services to support clients throughout complete tunnelling projects, from start to finish.

- Coating

6. Mechanised tunnelling

A range of products and on-site technical assistance services to support clients throughout complete tunnelling projects, from start to finish.

- Mechanised TBM tunnelling



SERVICES FOR TUNNELLING, MINING 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 specialised 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 characterised by extremes that set them apart from most other civil works. And which 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

World-wide 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 optimisation 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.

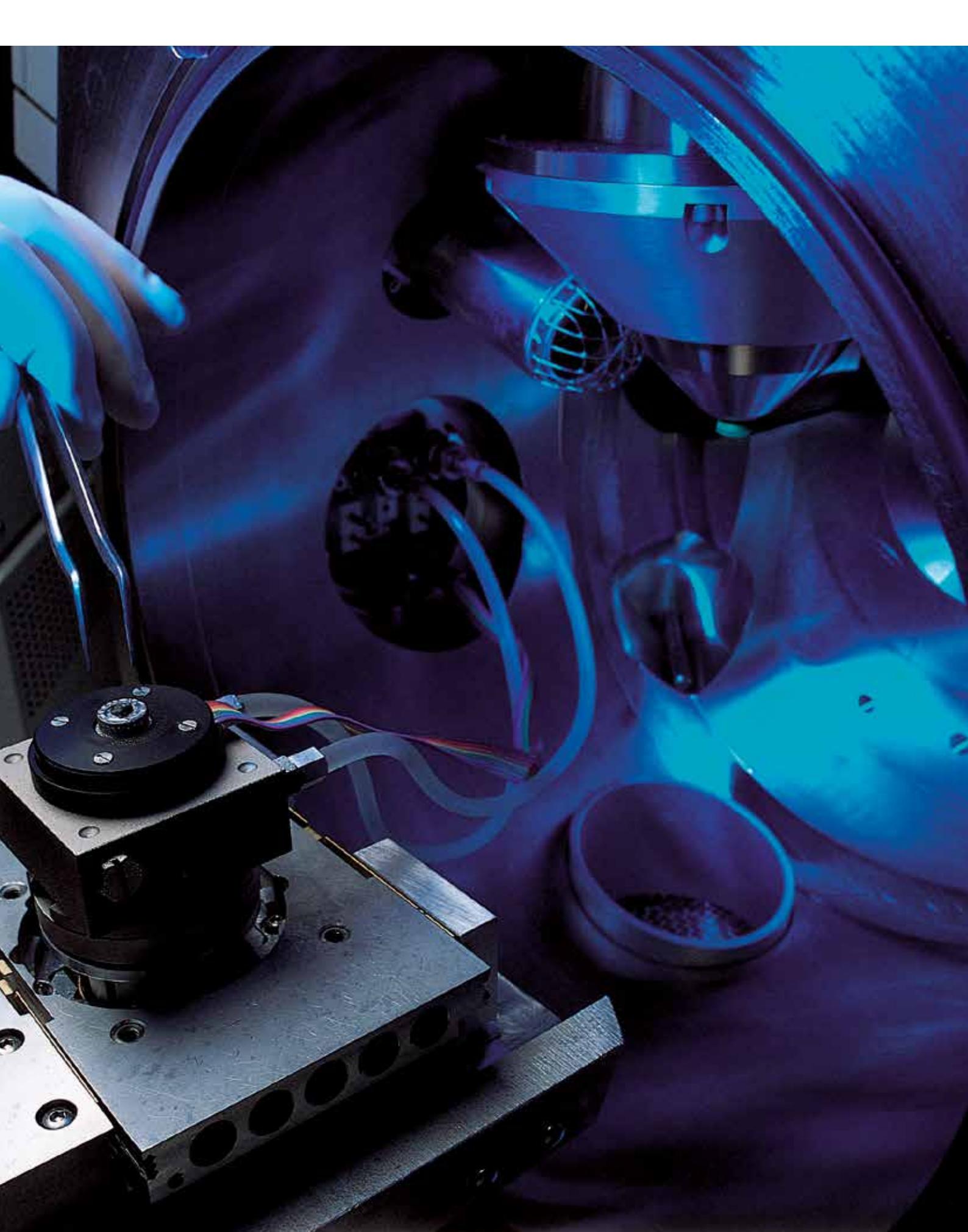
Client training

Personalised practical and theoretical client training programmes to suit your needs and requirements.

RESEARCH AND PRODUCT INNOVATION FOR A HIGH SPEED MARKET.

A CONSIDERABLE PORTION OF MAPEI'S ANNUAL TURNOVER IS CHANNELLED INTO **IMPORTANT R&D INVESTMENTS**. MAPEI'S PROACTIVE APPROACH IS A CONCEPT IN CONSTANT DEVELOPMENT, IN WHICH INNOVATION BECOMES THEIR DAILY ROUTINE.





UNDERGROUND
TECHNOLOGY
BY MAPEI

MAPEI SHOTCRETE TEST CENTRE (STC)

As one of only a handful companies, Mapei has stood at the forefront of efforts to develop alkali-free shotcrete accelerators. Thanks to breakthroughs made by Mapei, this technology has evolved from its early beginnings in the laboratory to full-scale testing and production.

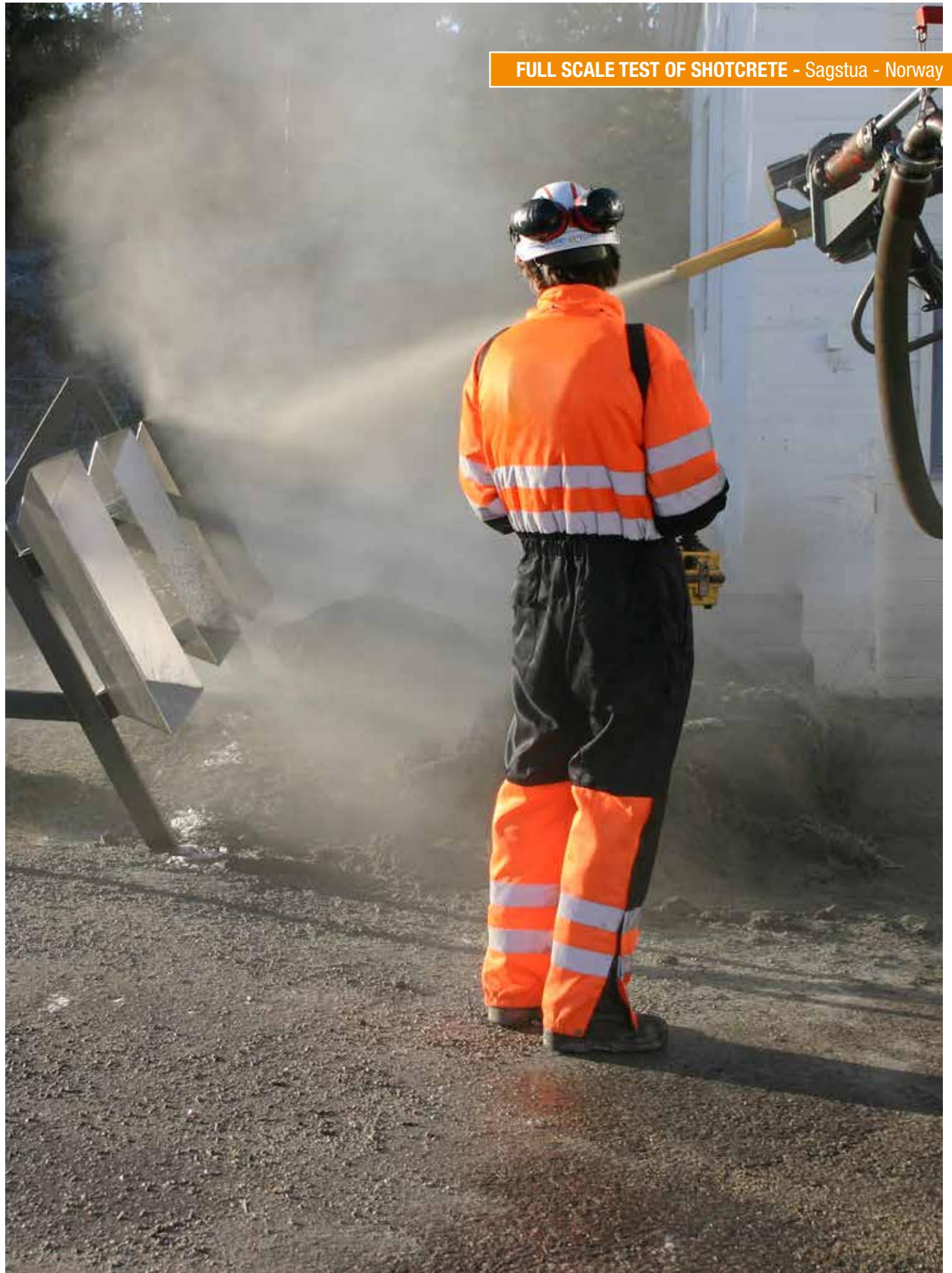
In June of 2011, Mapei officially opened our shotcrete centre. The centre is a one-of-a-kind facility and was built at an old sawmill not far from our factory in Sagstua (Nord-Odal, Norway).

At Mapei's shotcrete test centre, not only can we produce our own shotcrete, but we also have access to the same equipment that is mounted on modern shotcrete rigs. The centre is used mainly for full-scale testing of shotcrete and in-house development of new products, in addition to being a venue for intercompany cooperation. The doors of our test centre are always open to our customers and partners so that we can find the best possible solutions for every project.



MAPEI SHOTCRETE TEST CENTRE - Sagstua - Norway

FULL SCALE TEST OF SHOTCRETE - Sagstua - Norway



UNDERGROUND
TECHNOLOGY
BY MAPEI

1. CONCRETE TECHNOLOGIES

FLASH SETTING ACCELERATOR FOR SHOTCRETE

PRODUCT / DESCRIPTION

Mapequick AF 2000

Alkali-free accelerator for shotcrete.

Mapequick AF 118

Alkali-free accelerator for shotcrete.

Mapequick AF 300 Dry

Powder alkali-free setting accelerator for shotcrete.

Mapequick AF 118N

Alkali-free accelerator for mortar and shotcrete.

Mapequick AF 70

Alkali-free accelerator for shotcrete.

Mapequick AF 2000 NL

Alkali-free accelerator for shotcrete.

Mapequick AF 3000

Alkali-free accelerator for shotcrete.

Mapequick 34

Accelerator for shotcrete.

ADMIXTURE FOR SHOTCRETE (MIX BASE) AND CONCRETE

PRODUCT / DESCRIPTION

SHOTCRETE

CONCRETE

Dynamon XTEND

Acrylic super-plasticizer for concrete.



Dynamon SX-N

Modified acrylic super-plasticizer for concrete with very high efficiency.



Dynamon SX-A

Modified acrylic super-plasticiser for concrete, characterised by its low water/cement ratio, very high mechanical strength and long workability times.



Dynamon NRG 1010NK

Super-plasticizer, hardening accelerating admixture for quick stripping precast concrete.



LYSEBOTN - Norway



STABILIZERS

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
Mapetard D Retardant admix for concrete and mortar.	★	★
Mapetard SD2000 Set-retardant for concrete and mortar.	★	★

AIR ENTRAINING AGENTS

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
Mapeair 25 Admixture which promotes the formation of small air bubbles and is used to improve the frost resistance of concrete and mortar.		★

CONCRETE ANTI-WASHING

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
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Rescon T
Anti-washout admixture for underwater concrete.



FORM RELEASE AGENTS / CURING AGENTS

PRODUCT / DESCRIPTION	EQUIPMENT	CONCRETE
Mapeform ECO 91 Form release agent based on vegetable oils in water emulsion with chemical action.	★	★
Mapeform Protector Mold release agent based on highly refined mineral oils and vegetable oils. Used as a mold-release oil on construction sites, precast elements and release agent for concrete equipment.		★
Mapeform MB 700 Form release agent based on highly refined mineral oils. Used as mould release agent on construction sites and in the precast industry.		★
Mapecure SRA-N Curing admixture for cementitious mortar and concrete to reduce hydraulic shrinkage and the formation of micro-cracks.		★
Mapecure 1 Film-forming curing compound in water emulsion for concrete.		★
Mapecure WF 75 Anti-evaporation agent in water emulsion for protecting the surface of concrete against quickly drying out when exposed to sunlight and winds.	★	★
Mapecure AF Solvent film-forming curing compound for mortar and concrete.		★
Mapecure CCI 2000 N Liquid self-aging admixture for shotcrete.	★	

PUMPING AID

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
Mapestart 1 Pumping aid admixture for concretes.	★	★

ACCELERATORS / ANTIFREEZERS

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
Antifreeze N Chloride free admixture that depresses the freezing point of water in concrete and mortar.		★

FIBERS

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
PP-fiber M6 Monofilament polypropylene fibre with optimal mechanical, physical and chemical properties for use in concrete and mortar.	★	★
Steel Fibre DE 35/0,55 N High quality steel fibres for reinforcement of concrete.	★	★

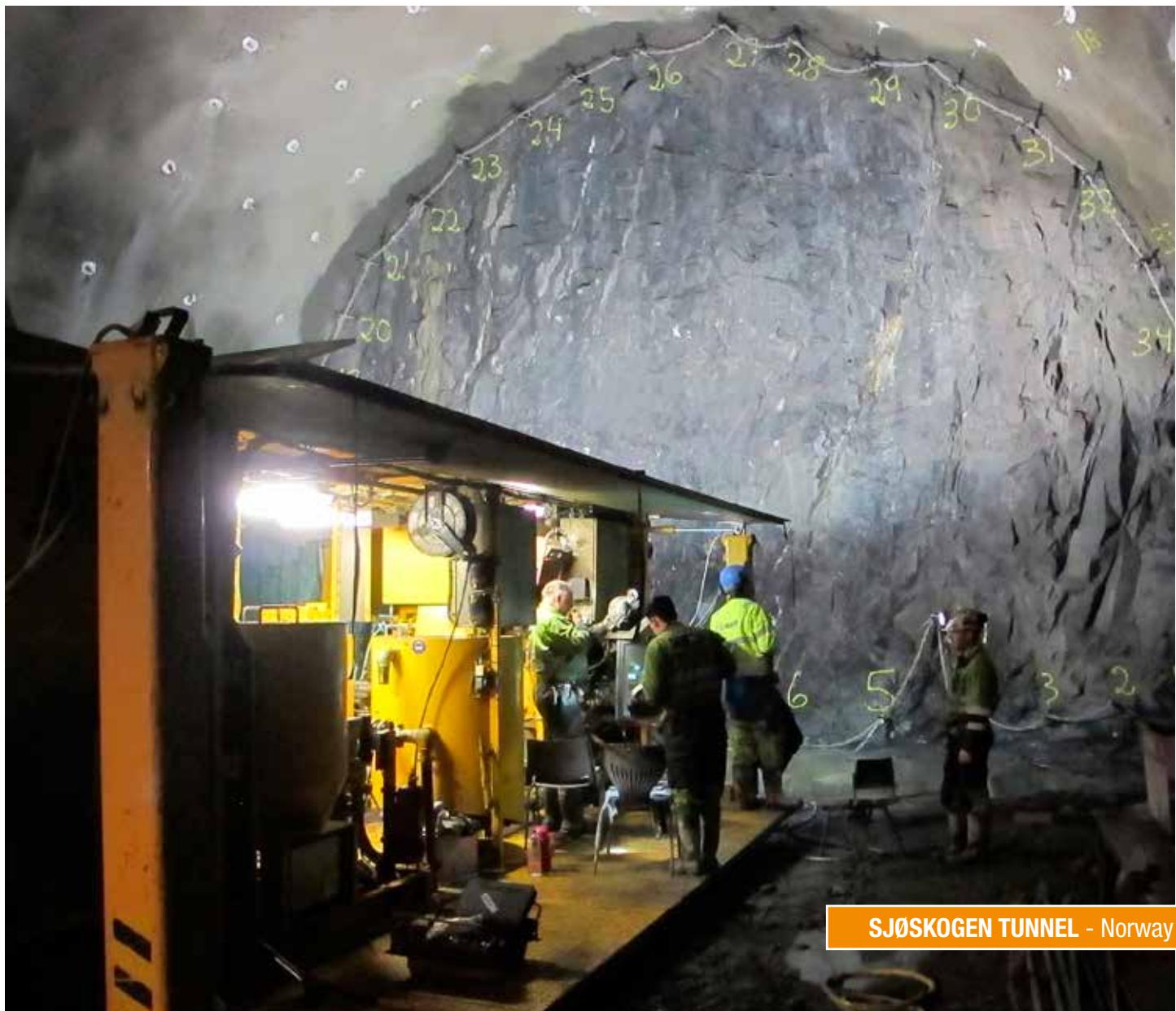
2. INJECTION SYSTEMS, CONSOLIDATION AND ANCHORING

INJECTIONS / CONSOLIDATION

PRODUCT / DESCRIPTION	INJECTION GROUT	INJECTION CEMENT	INJECTION RESIN	INJECTION ADMIXTURE
Microfin 20 Ultra rapid setting two-component polyurethane resin with fluid consistency, to be injected for consolidating and waterproofing of structures subject to weak water ingress.			★	
Microcem 650 High viscosity ultra rapid setting two-component polyurethane resin, to be injected for consolidating and waterproofing of structures subject to strong water ingress.			★	
Purgel Polyurethane one-component expansive resin for injection.				★
Rapp Ultra rapid curing, cement-based mortar for fixing water leaks.				
Silicajet EXP Series Two-component organo-mineral fast reacting and high foaming resin for void filling.				★
Resfoam 1KM and Resfoam 1KM AKS Ultra fluid, one component polyurethane injection resin with adjustable reaction times, for waterproofing structures, ground and rocks subjected to intense water seepage.				★
Resfoam S Fluid, two-component polyurethane injection resin for waterproofing concrete and rocks structures subjected to water seepage.				★
Mapegel UTT System Three-component hydrophilic gel for consolidating grounds and for creating barriers through injection in the concrete.				★
Foamjet F and Foamjet AKS Ultra rapid setting two-component polyurethane resin.				★
Mauring Cement based grout for sealing larger cracks and water leaks.	★			
Grout Set 2000 Setting accelerator for cement grouting.				★
Grout Tech 5000 Stabilizer for cement grouting.				★
Grout Tech System N Liquid superplasticizer admixture for cement grout.				★

ANCHORING

PRODUCT / DESCRIPTION	ANCHORING MORTAR	INJECTION RESIN
Mapefix PE SF Styrene-free, polyester resin chemical fastener for heavy loads.		★
Mapefix VE SF Styrene-free, hybrid vinyl resin-based chemical anchor for structural loads.		★
Mapefix EP 385 Pure epoxy, resin-based chemical anchor for structural loads. Certified for threaded bar, construction bars, core-drilled holes and C1 seismic loads.		★
Montocryl Two-component acrylic based anchoring mortar.		★
Nonset Series Cement-based mortar for anchoring, foundation and injection.	★	
Zinkbolt Cementitious mortar for anchoring galvanized rock bolts.	★	



SJØSKOGEN TUNNEL - Norway

UNDERGROUND
TECHNOLOGY
BY MAPEI

3. WATERPROOFING SYSTEMS

GEOSYNTHETIC AND SPRAYABLE WATERPROOFING MEMBRANE

PRODUCT / DESCRIPTION	MEMBRANE	ACCESSORIES
Mapeplan TU Series Synthetic waterproofing membrane for tunnels and underground works.	★	
Mapeplan Protection Black PVC protection membrane.	★	
Mapelastic TU System One-component membrane for spray application for waterproofing every type of concrete supports, included sprayed concrete.	★	
Polydren PP HT Non-woven geotextile to be used as compensation, levelling, protection and filter layer.	★	
Mapeplan Disk PVC-P fixing element.	★	
Mapeplan Anchoring Anchoring bar embedded in heavy duty plastic case for the fixings in tunnels.	★	
Mapeplan Waterstop PVC-P PVC-P profiles for every type of joints and waterproofing compartments.	★	
Idrostop Multi 11 / 19 PVC-P re-injectable hoses for waterproofing systems.	★	

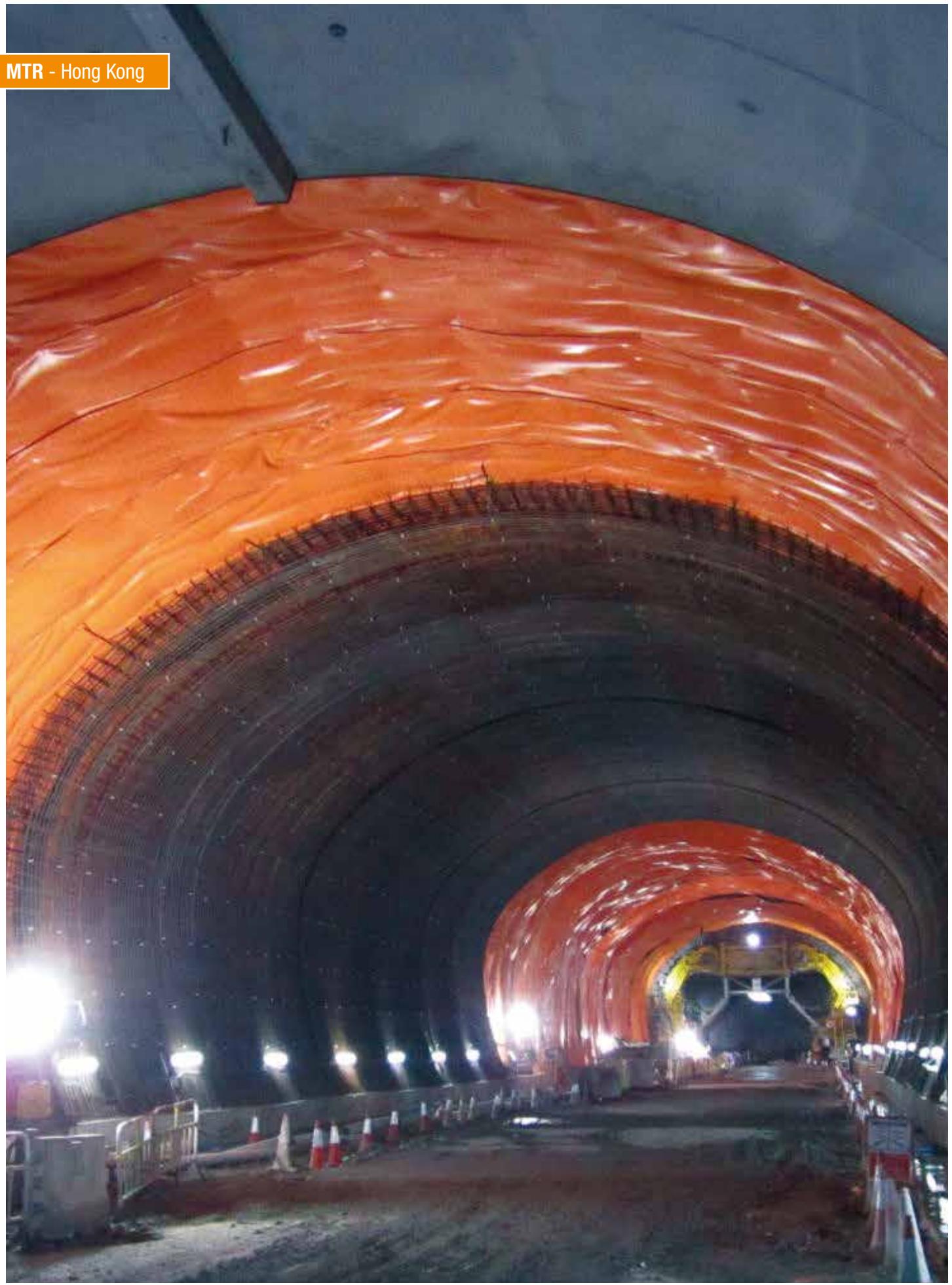
WATERPROOFING ANCILLARY PRODUCTS

PRODUCT / DESCRIPTION
Lamposilex Ultra quick-setting and hardening hydraulic binder for blocking seeping water.
Adesilex PG1 - PG2 Two-component, thixotropic epoxy adhesive with modified rheology for structural bonds.
Idrostop Hydrophilic, expanding rubber profiles for waterproof working joints.
Idrostop Mastic One-component thixotropic adhesive for bonding IDROSTOP water-resistant rubber profile.

LÖTSCHBERG TUNNEL - Switzerland



UNDERGROUND
TECHNOLOGY
BY MAPEI





4. RENOVATION, MAINTENANCE AND REPAIR TECHNOLOGIES

CONCRETE REPAIRING PRODUCTS

PRODUCT / DESCRIPTION	WET APPLICATION	DRY SHOTCRETE
Mapegrout Gunite One-component pre-packed multi-purpose non-accelerated cementitious mortar applied using either the dry or damp spraying technique.		★
DS Cement based mortar for dryshot application.		★
DS-SR Cement-based mortar with sulphate-resistant cement for dryshot application.		★
DS m/PP-fiber Cement based mortar for dryshot application with PP-fibers.		★
DS-RSF Shrinkage compensated repair mortar for dry shot application.		★
Mapegrout T 40 / T 60 Fibre-reinforced, sulphate-resistant thixotropic mortar for repairing concrete.	★	
Mapegrout Thixotropic Fibre-reinforced, compensated-shrinkage mortar for repairing concrete.	★	
Mapegrout Compact Pre-mixed injecting grout characterized by great resistance to wash-out and controlled rheology and fluidity.	★	
Mapefer Two-component, anti-corrosion cementitious mortar for steel reinforcement rods.	★	
Nonset 400 Expanding mortar for foundations and concrete repairs.	★	

FIRE PROOF MORTAR

PRODUCT / DESCRIPTION
Ignisiliex Malta 4 Cementitious based passive fire protection barrier for underground constructions.

OTHER PRODUCTS FOR REPAIR WORK

PRODUCT / DESCRIPTION

Mapegrout I

Fast-setting and hardening compensated-shrinkage, easy-flow mortar for repairing concrete and for fixing inspection shafts, manholes and highway coating materials.

Mapefer

Two-component, anti-corrosion cementitious mortar for steel reinforcement rods.

Mapefer 1K

One-component corrosion-inhibiting cement mortar for the protection of reinforcing rods.

Mapefill N

High strength, shrink compensated, cementbased mortar for bedding and repair.

Mapefill N-LH

High strength expanding mortar for screeds and grouting.

Mapepoxy BI

Two-component epoxy resin for injection.

Mapepoxy BI 1,8

Two-component epoxy resin for injection of larger cracks.

Mapepoxy BI-R

Two-component epoxy for injection, long open and curing time.

Mapepoxy L

Epoxy adhesive.

Mapepoxy LR

Epoxy adhesive with long opentime.

Mapepoxy UV-S

Epoxy based putty for use under water.

Lampocem

Ready-to-use shrinkage-free rapid setting and hardening hydraulic binder.

Rapp

Ultra rapid curing, cement-based mortar for fixing water leaks.

Redirep 25 RSF

Fibre reinforced shrinkage compensated thixotropic mortar for concrete repair.

Cem-Elastic

Two component cementitious flexible coating.

Primer E-10

Primer for elastic paints and renderings.

Cl-brems

Silanbased, hydrophobic impregnation against chloride ingress.

Silimp 100

Low viscosity silane impregnation for concrete, brick and masonry outdoors.

Conbit

Fast curing, waterproof and frost resistant mortar for laying and grouting of slate, concrete blocks, natural stone and curb stone against asphalt or concrete.

OTHER PRODUCTS FOR REPAIR WORK

PRODUCT / DESCRIPTION

Color Pigments

Colour Pigments for mortar and concrete.

Confix

Mortar for repairs and casting.

Confix m/PP-fiber

Fibre reinforced mortar for repairs and casting.

Mapefoam

Closed cell polyethylene foam cord as a support to elastomeric sealants, for correct sizing of joints.

Mapeflex MS45

One-component flexible, thixotropic, quickhardening sililated polymer-based hybrid sealant and adhesive with a high modulus of elasticity. Also suitable for damp substrates.

Elementfog Tix

Thixotropic mortar for filling element joints.

WallGard Graffiti Barrier

Reversible graffiti-resistant protective barrier for all surfaces.

WallGard Graffiti Remover Gel

Gel-detergent for cleaning graffiti-damaged surfaces.

Mapegrout SV

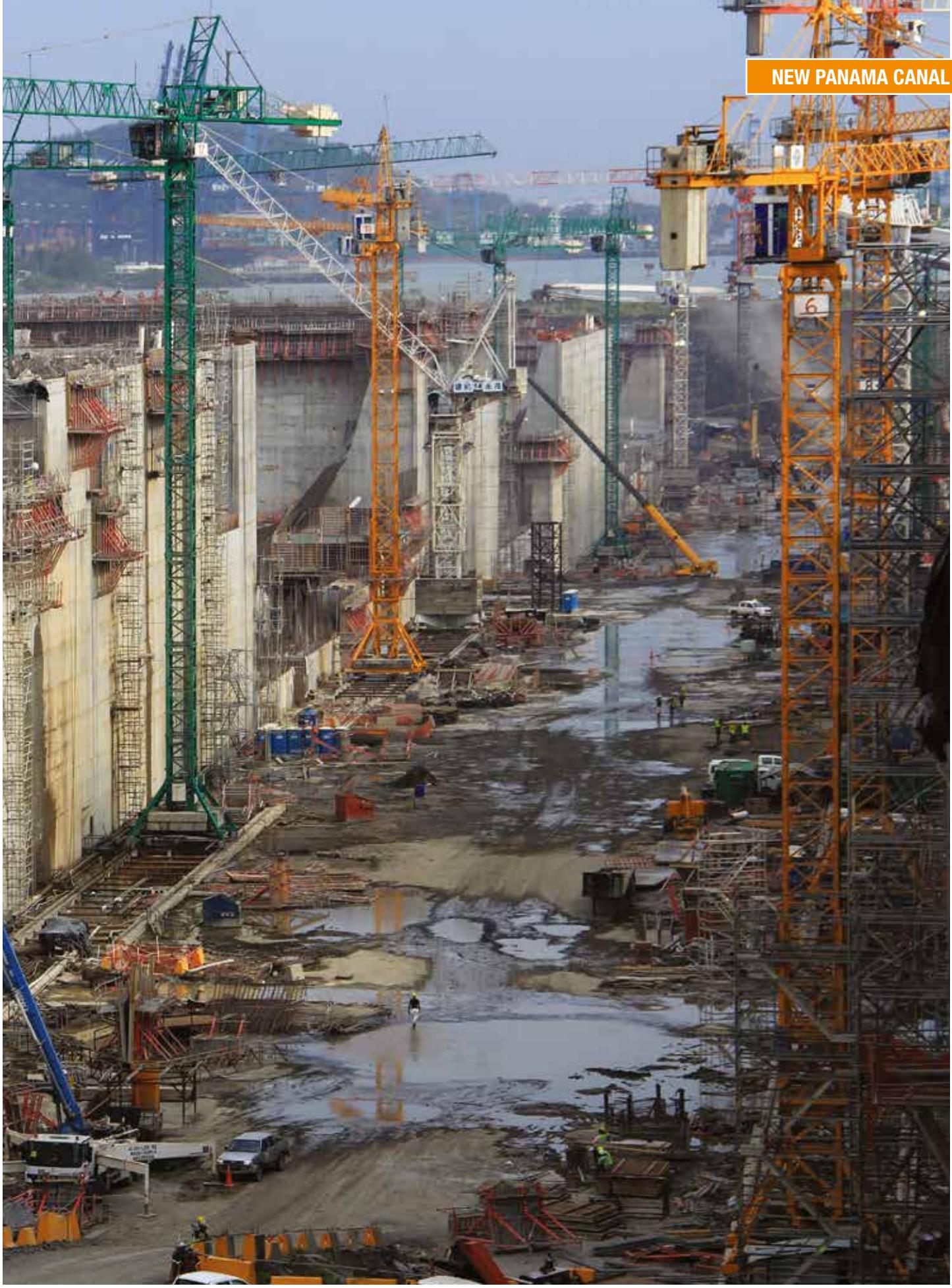
Fast-setting and hardening compensated-shrinkage, easy-flow mortar for repairing concrete and for fixing inspection shafts, manholes and highway coating materials.

Lamposilex

Ultra-fast setting and curing hydraulic for stopping water leaks.

Murtett

Waterproof and permeable surface treatment for all brick and concrete structures.



NEW PANAMA CANAL

UNDERGROUND
TECHNOLOGY
BY MAPEI

5. COATING TECHNOLOGIES

COATING

PRODUCT / DESCRIPTION

Murtett

Waterproof and permeable surface treatment for all brick and concrete structures.



CUCCHERO TUNNEL - Parma - Italy

6. MECHANIZED TUNNELLING

MECHANIZED TBM TUNNELLING

PRODUCT / DESCRIPTION

Mapequick CBS System 1 EVO

Liquid retarding admixture with plasticizing and stabilizing effect for cementitious-based injection systems, able to improve the grout stability.

Mapequick CBS System 3 HEM SS

Liquid activator admixture used in extremely fluid cement-based grouts systems.

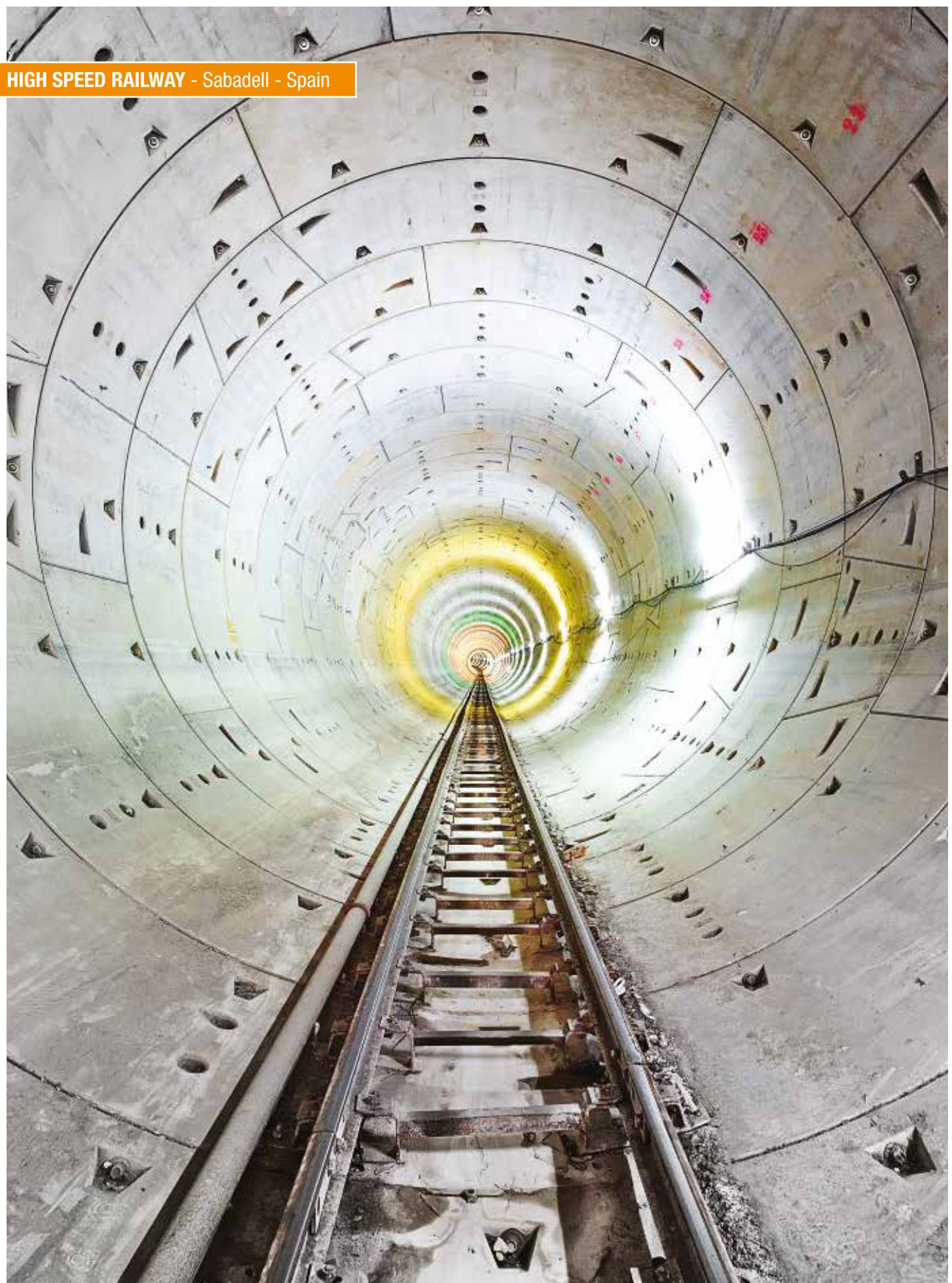
Mapequick CBS System 1 L

Liquid retarding admixture for cementitious-based injection systems.

Mapequick CBS System 1

Liquid retarding admixture with plasticizing effect for cementitious-based injection systems.





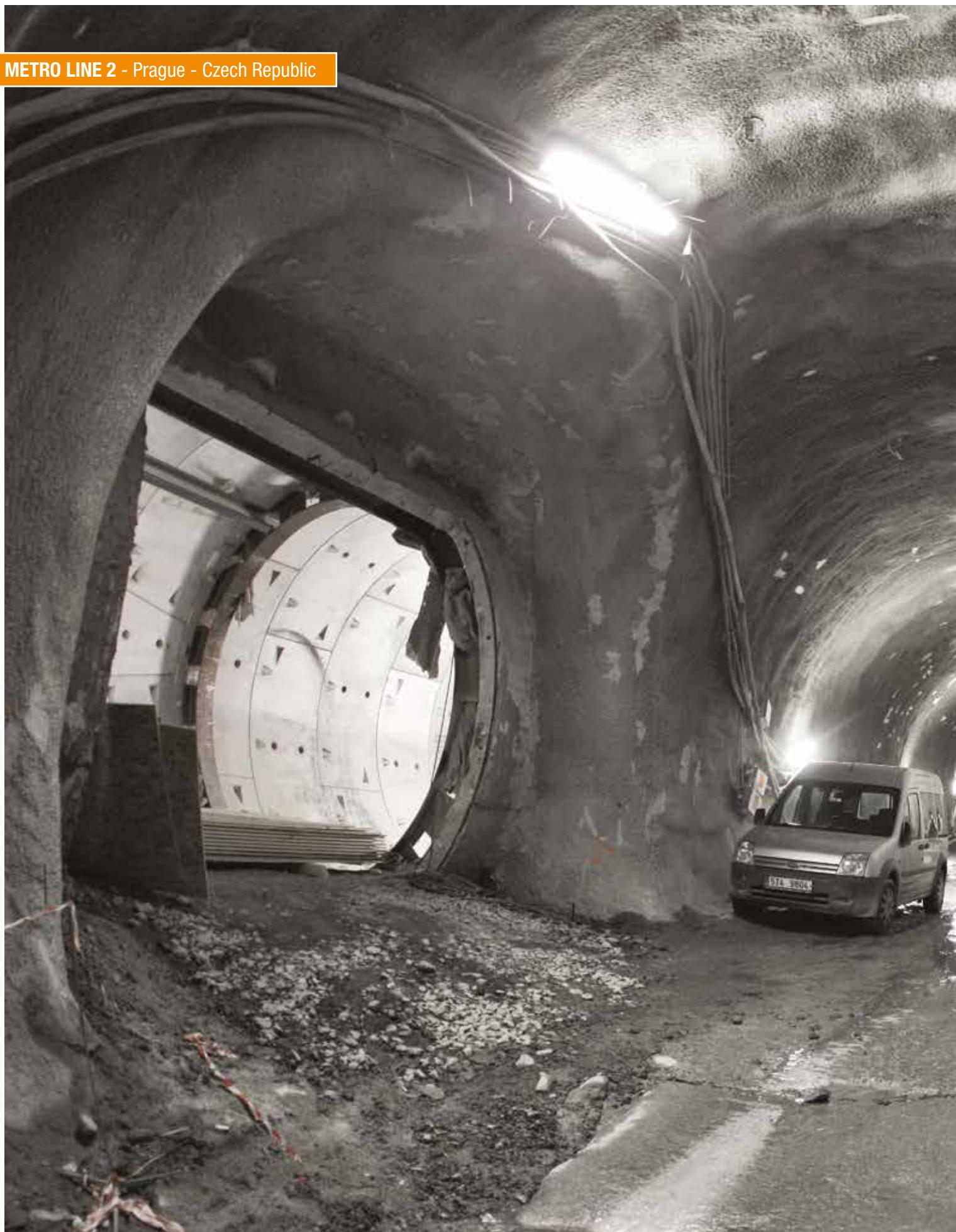
HIGH SPEED RAILWAY - Sabadell - Spain

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