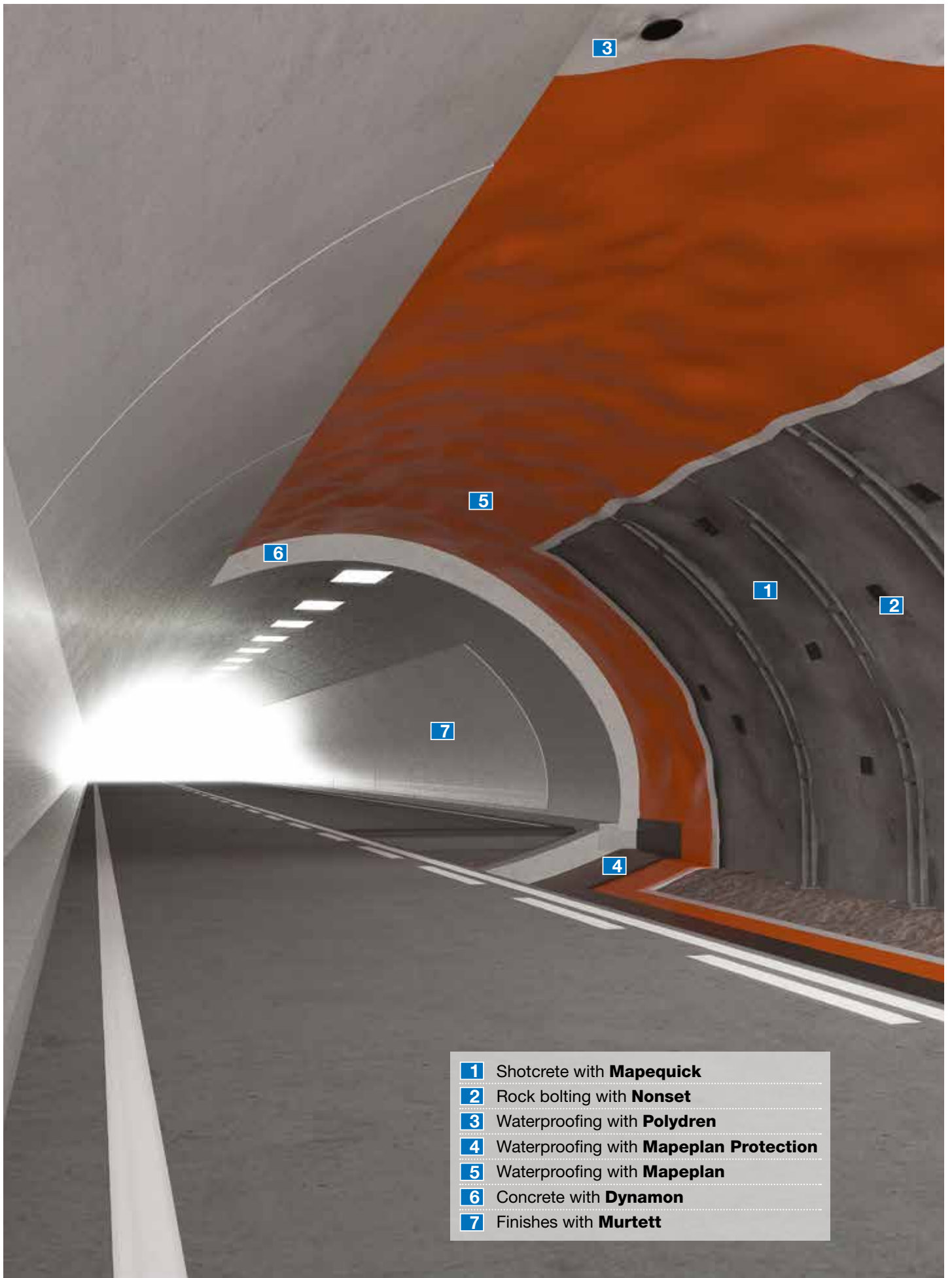


# PRODUCTS FOR TUNNELLING, MINING AND UNDERGROUND CONSTRUCTION





- 1** Shotcrete with **Mapequick**
- 2** Rock bolting with **Nonset**
- 3** Waterproofing with **Polydren**
- 4** Waterproofing with **Mapeplan Protection**
- 5** Waterproofing with **Mapeplan**
- 6** Concrete with **Dynamon**
- 7** Finishes with **Murtett**

# “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**

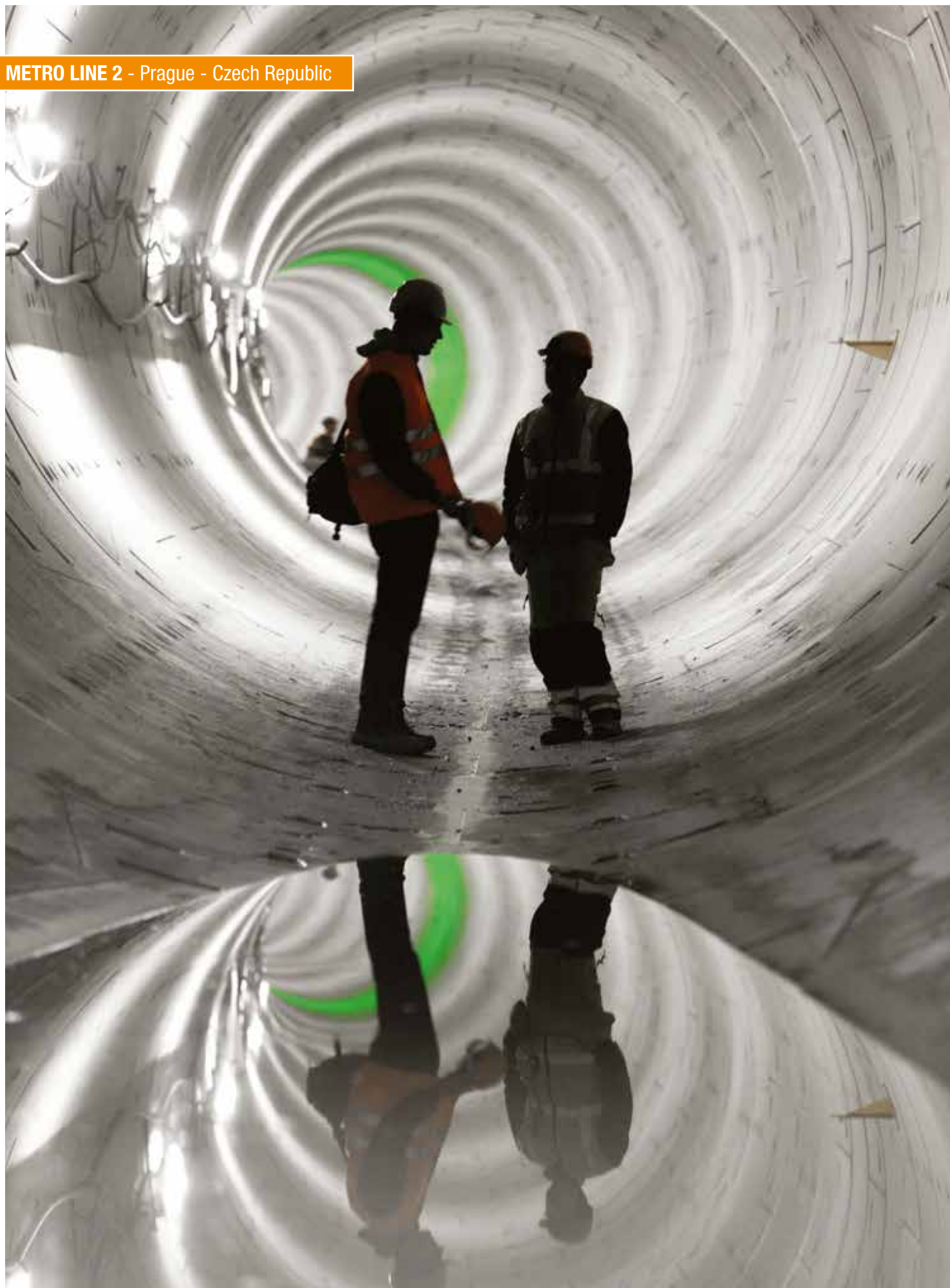
Spray-applied waterproofing membranes and PVC –P waterproofing membranes, together with a high standard of engineering expertise and technical support to help design the most appropriate system in compliance with the most recent, severe standards.

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.



# 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**

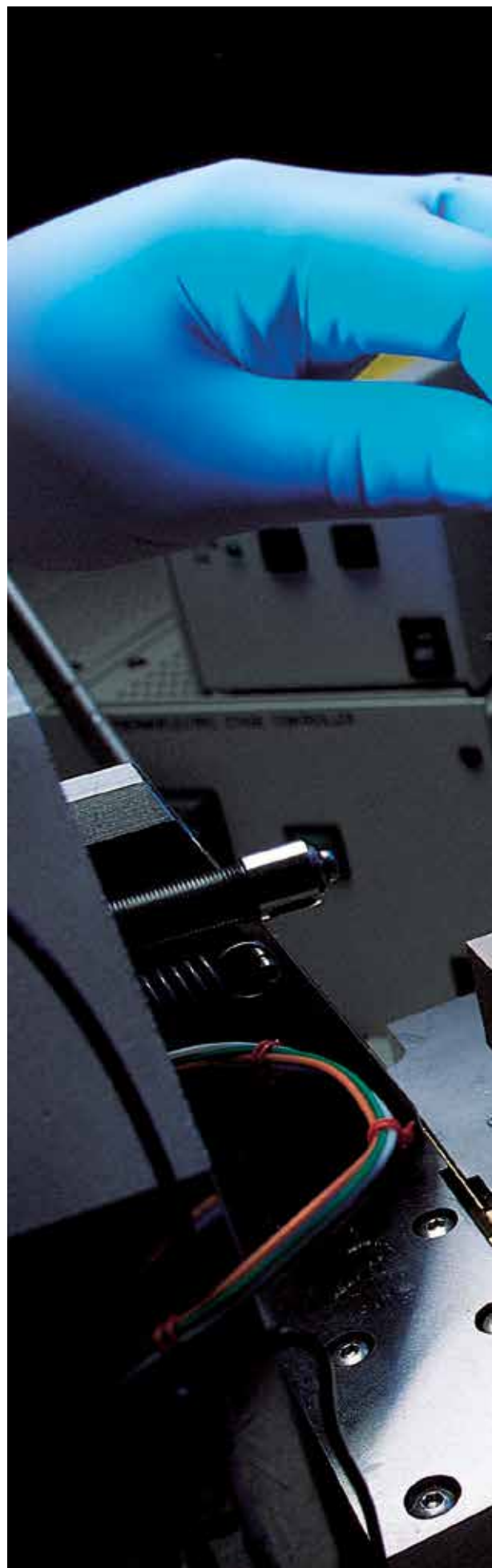
Collaboration with external laboratories for product classification and testing in compliance with the most severe standards on the market.

## **Client training**

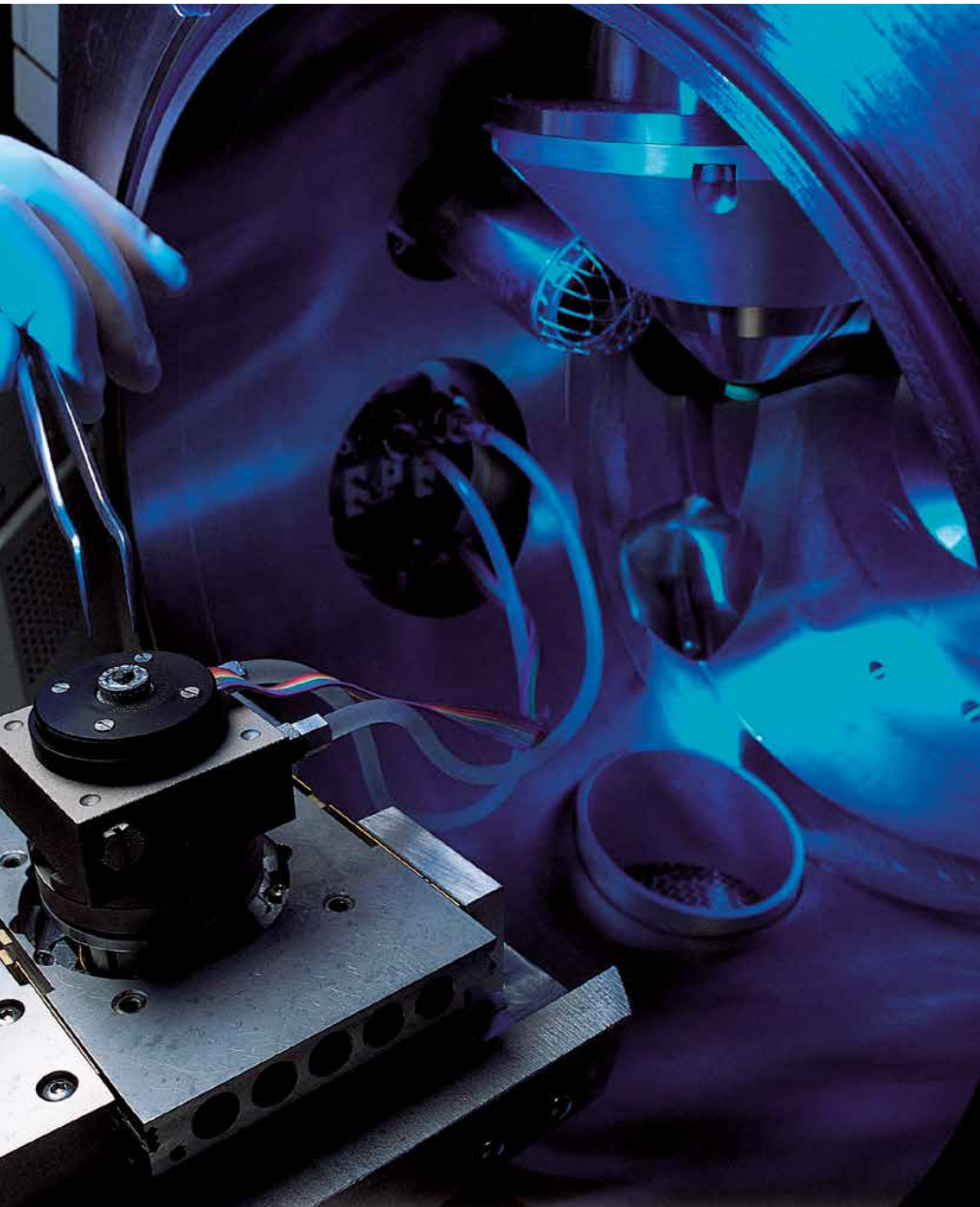
Personalised practical and theoretical client training programmes to suit your needs and requirements.

## 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.







# MAPEI SHOTCRETE TEST CENTRE (STC)

As one of only a handful of 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



# 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-plasticizer 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

UNDERGROUND  
TECHNOLOGY



# 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

**Rescon T**

Anti-washout admixture for underwater concrete.



UNDERGROUND  
TECHNOLOGY

# FORM RELEASE AGENTS / CURING AGENTS

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

# PUMPING AID

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

# ACCELERATORS / ANTIFREEZERS

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

# FIBERS

PRODUCT / DESCRIPTION	SHOTCRETE	CONCRETE
<b>PP-fiber M6</b> Monofilament polypropylene fibre with optimal mechanical, physical and chemical properties for use in concrete and mortar.	★	★
<b>Steel Fibre DE 35/0,55 N</b> 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
<b>Microfin 20</b> Ultra rapid setting two-component polyurethane resin with fluid consistency, to be injected for consolidating and waterproofing of structures subject to weal water ingress.		★		
<b>Microcem 650</b> High viscosity ultra rapid setting two-component polyurethane resin, to be injected for consolidating and waterproofing of structures subject to strong water ingress.		★		
<b>Purgel</b> Polyurethane one-component expansive resin for injection.			★	
<b>Rapp</b> Ultra rapid curing, cement-based mortar for fixing water leaks.				
<b>Silicajet EXP Series</b> Two-component organo-mineral fast reacting and high foaming resin for void filling.			★	
<b>Resfoam 1KM and Resfoam 1KM AKS</b> Ultra fluid, one component polyurethane injection resin with adjustable reaction times, for waterproofing structures, ground and rocks subjected to intense water seepage.			★	
<b>Resfoam S</b> Fluid, two-component polyurethane injection resin for waterproofing concrete and rocks structures subjected to water seepage.			★	
<b>Mapegel UTT System</b> Three-component hydrophile gel for consolidating grounds and for creating barriers through injection in the concrete.			★	
<b>Foamjet F and Foamjet AKS</b> Ultra rapid setting two-component polyurethane resin.			★	
<b>Mauring</b> Cement based grout for sealing larger cracks and water leaks.	★			
<b>Grout Set 2000</b> Setting accelerator for cement grouting.			★	
<b>Grout Tech 5000</b> Stabilizer for cement grouting.				★
<b>Grout Tech System N</b> Liquid superplasticizer admixture for cement grout.				★



# ANCHORING

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



SJØSKOGEN TUNNEL - Norway

## 3. WATERPROOFING SYSTEMS

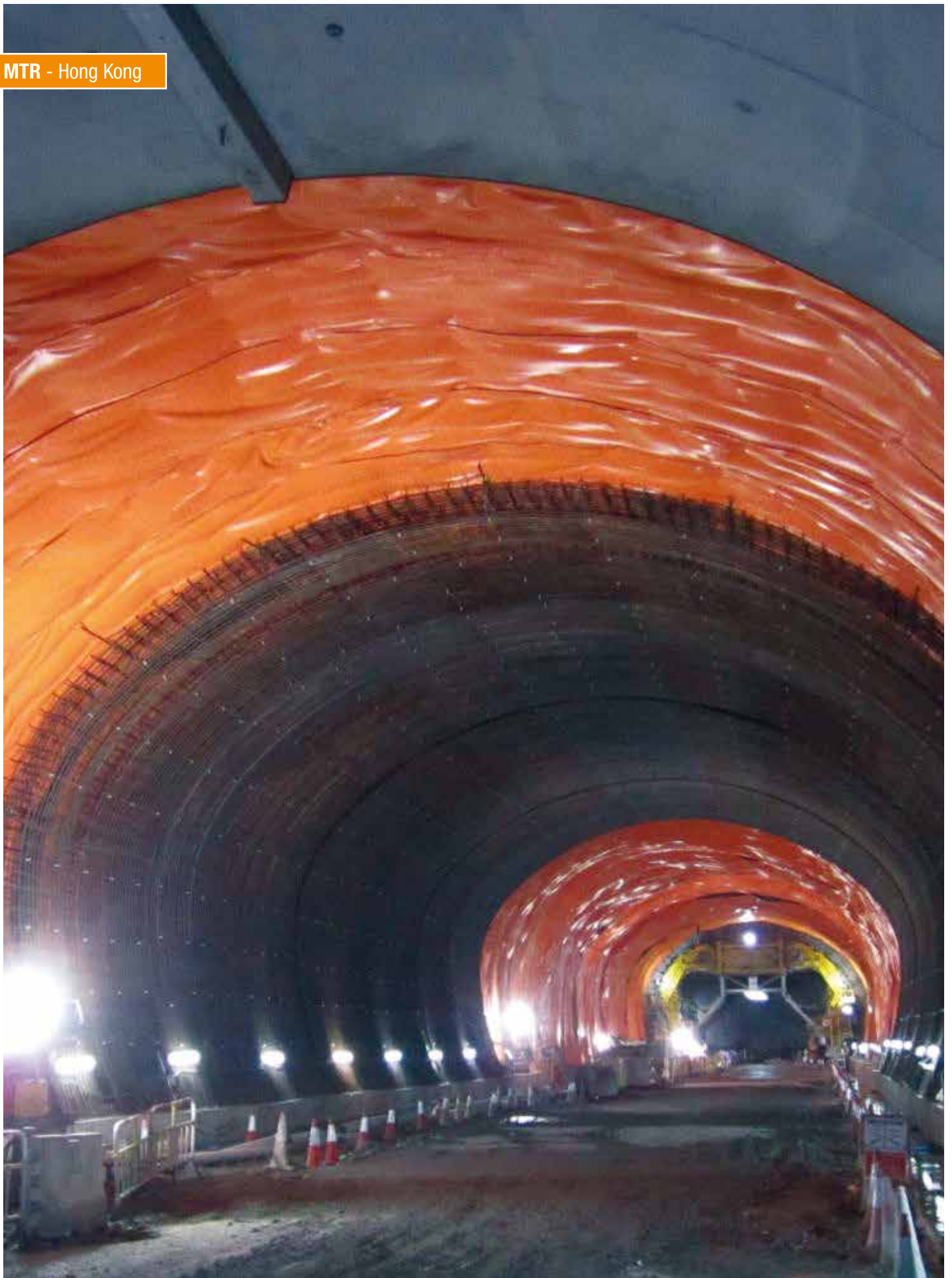
### GEOSYNTHETIC AND SPRAYABLE WATERPROOFING MEMBRANE

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

### WATERPROOFING ANCILLARY PRODUCTS

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







## 4. RENOVATION, MAINTENANCE AND REPAIR TECHNOLOGIES

### CONCRETE REPAIRING PRODUCTS

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

### **CI-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 silitated 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.

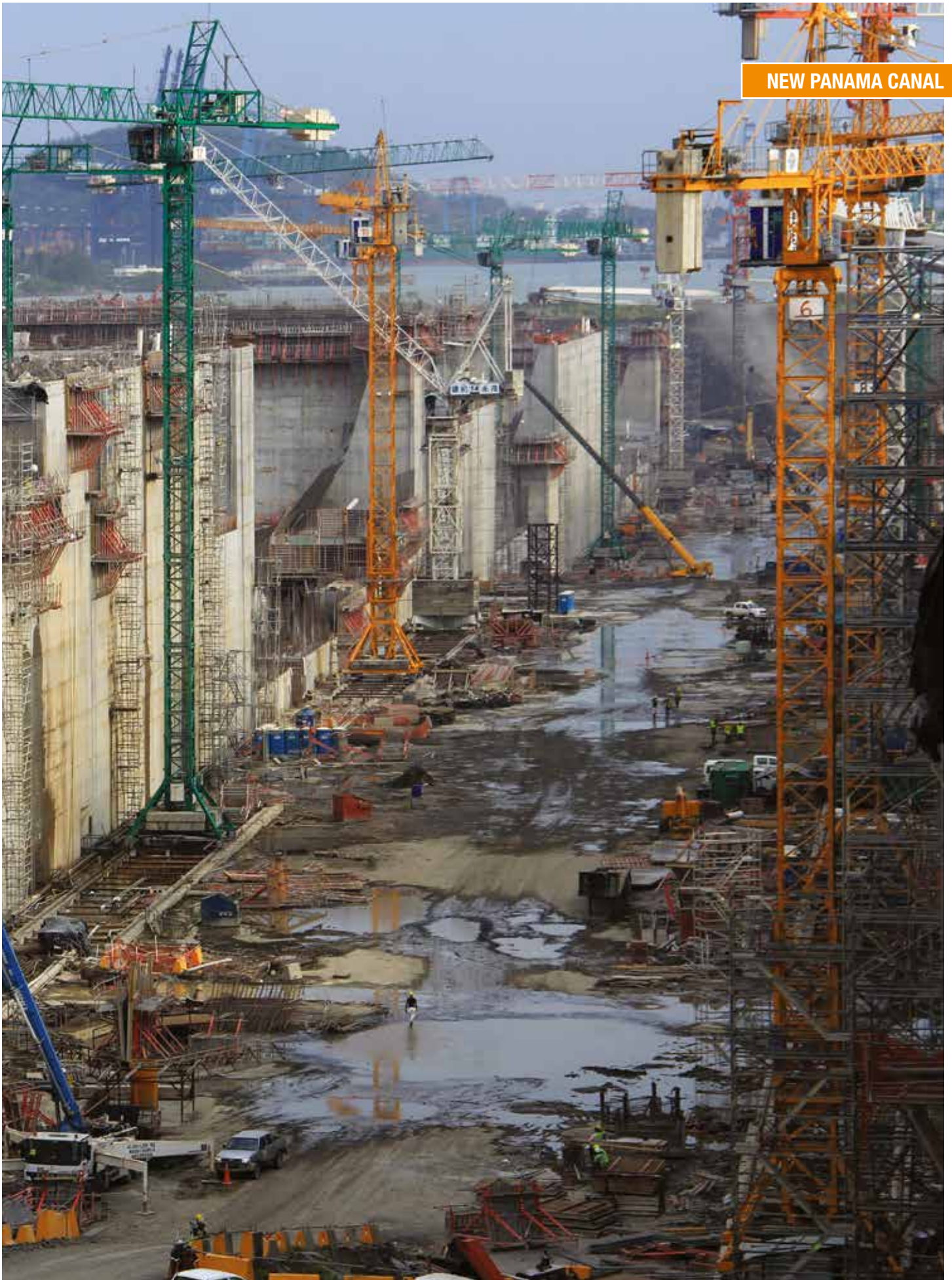
### **Lamposilex**

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

### **Murtett**

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





## 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**

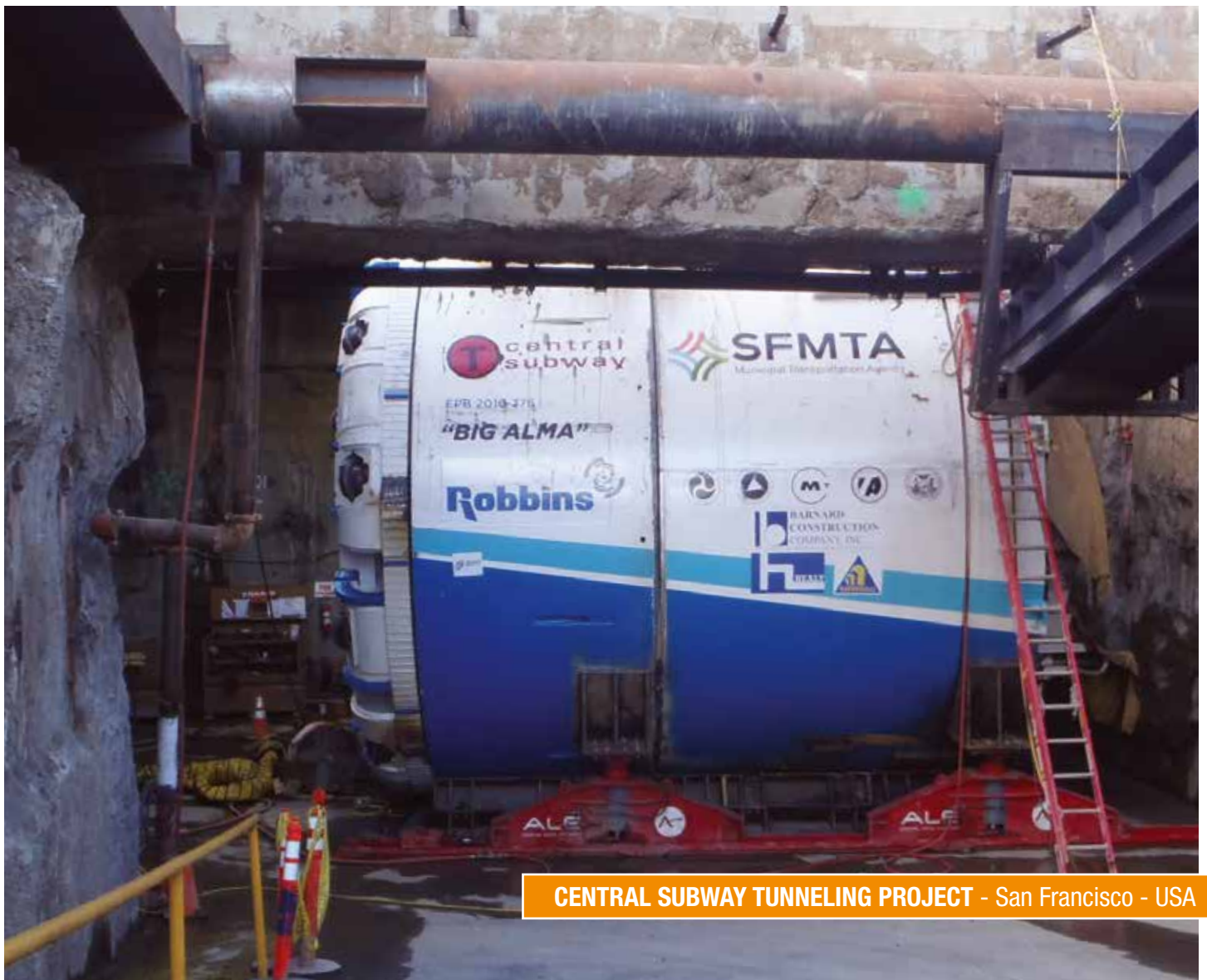
Liquid activator admixture used in extremely fluid cement-based grouts systems.

#### **Mapequick CBS System 1 L**

Liquid retarding admixture for cementitious-based injection systems.

#### **Mapequick CBS System 1**

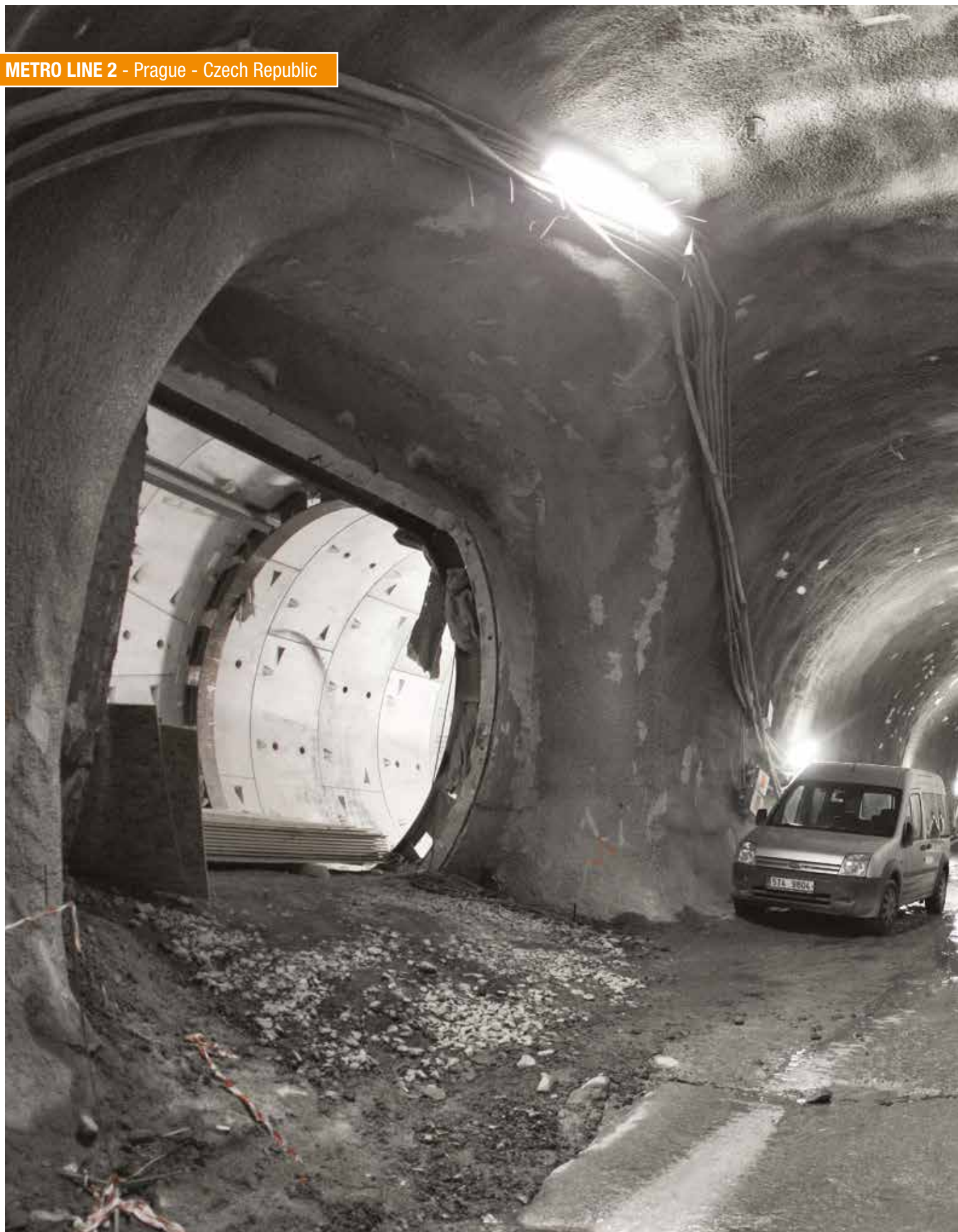
Liquid retarding admixture with plasticizing effect for cementitious-based injection systems.



CENTRAL SUBWAY TUNNELING PROJECT - San Francisco - USA











C.P. MK09730 (GB) 01/17

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