



2017 ACTIV- ITY RE- PORT



SOLETANCHE FREYSSINET

2017 ACTIVITY REPORT



SOLETANCHE FREYSSINET

Soletanche Freyssinet is the world leader in soils, structures and nuclear engineering.

The Group brings together an unparalleled array of construction and engineering expertise.



SOLETANCHE BACHY



MENARD



TERRE ARMEE



FREYSSINET



NUVIA



SIXENSE



SOLETANCHE FREYSSINET

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World map: population density

PROJ- ECTS



**Around
the world,
our teams rose
to the complex
technical
challenges
of our clients'
projects.**

NORTH AMERICA





No. **1** PLACE **New York City, United States**

GPS
40.727544,
-73.928738

COMPANY


PROJECT
K Bridge: Freyssinet reintroduces stay cables to the New York City skyline

The new Kosciuszko Bridge and the Goethals Bridge bring stay cables to the New York landscape, which more typically features large suspension and steel bridges. Freyssinet played a key role in the transformation by designing and supplying the stay cables and providing technical assistance during their installation on the new Kosciuszko Bridge. Each stay is equipped with fire and explosion protection systems to ensure safety in an emergency. Freyssinet also took part in the work on the new cable-stayed Goethals Bridge linking Staten Island and New Jersey.

No. **2** PLACE **Richmond, British Columbia, Canada**

GPS
49.189924,
-123.133804

COMPANY


PROJECT
ViewStar property project: an effective seismic protection solution

Menard participated in the development of a new property project, ViewStar, which comprises six residential towers as well as commercial buildings. Throughout 2017, Menard successfully installed stone columns to a depth of 17 metres to reinforce the ground. The main purpose of this work was to provide a long-term ground improvement solution to prevent liquefaction of the upper sand layer in the event of an earthquake.



No. **3** PLACE **Regina, Saskatchewan, Canada**

GPS
50.462663,
-104.633356



PROJECT

A challenging motorway

In Canada, Terre Armée subsidiary RECo Canada is taking an active part in the Regina Bypass project, which notably includes the construction of a new 61 km motorway. For this large-scale project, Terre Armée designed and built 21 bridges and 44 Reinforced Earth® walls with a total surface area of 23,000 sq. metres and 11,800 TerraClass® panels. The project involved many design, production and construction challenges for Terre Armée, mainly due to the climate and the extreme environmental conditions. The city of Regina is known for its very soft "Regina" clays, which generally have a high rate of settlement. Among its many properties, the TerraClass® solution used on the project can withstand the expected settlement without significant impact on overall structure stability and aesthetics. The Terre Armée teams managed to overcome the project's many difficulties and stick to the tight schedule. The Regina Bypass project, initiated in 2015, is set for completion in 2019.

NOTE

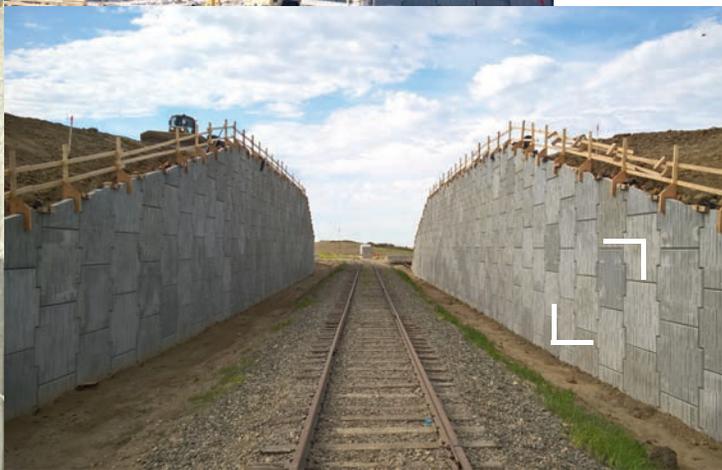


Taj Gould,
MSE Superintendent,
Graham Infrastructure Ltd

"The main challenge was to coordinate personnel, equipment and workspace availability. We chose Terre Armée subsidiary RECo Canada based on their rock-solid technical bid. RECo Canada has a substantial track record and brought its full added value to the project. Every time we encountered an obstacle, they worked with us to find a solution. RECo Canada's strength is its highly skilled, responsive and professional people. They are always available to provide advice and support and to go above and beyond their contractual obligations to help drive the project forward."



**23,000
SQ. METRES
OF WALLS**



No. **4** PLACE **Toronto, Ontario, Canada**

GPS
43.653226,
-79.383184

COMPANY

SOLETANCHE BACHY

PROJECT

Eglinton Crosstown LRT: Toronto's largest transit project

The Eglinton Crosstown LRT is Toronto's largest-ever transit project, with 19 kilometres of track. The Government of Ontario awarded the contract to Soletanche Bachy's Canadian subsidiary Bermingham to design and carry out the excavation and shoring works for the stations, connecting tunnels and bridges. By the end of 2017, Bermingham had built 5,500 sq. metres of shoring and 85 load bearing elements in a geotechnically challenging environment.



No. **5** PLACE **Stampede Reservoir, California, United States**

GPS
38.265848,
-119.549058

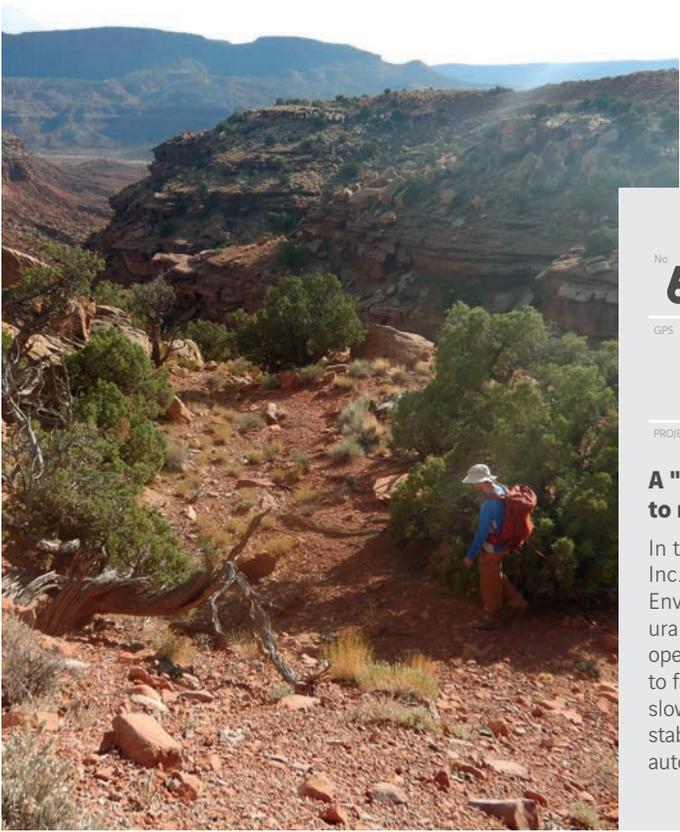
COMPANY

TERRE ARMÉE

PROJECT

Customised protection solutions for the Stampede Dam

In the United States, Terre Armée subsidiary RECo USA is working on the Stampede Dam in the Sierra Nevada range. To prevent flooding in extreme weather conditions and protect neighbouring towns, the company is building 10,000 sq. metres of Reinforced Earth® walls with rectangular TerraPlus® facing panels to raise the height of the dam. This new structure is designed to withstand the earthquakes that occur in the region and to support traffic on the road above the dam. The project is scheduled for completion in October 2018.



No.	PLACE	Colorado and Utah, United States	
GPS	38.893481, -77.036370	COMPANY	
PROJECT			

A "backpack" spectrometer to monitor abandoned uranium mines

In the United States, Navarro Research and Engineering Inc. used four portable Nuvia Dynamics (formerly PICO Envirotec) gamma ray spectrometers to assess former uranium mining sites in Colorado and Utah prior to their opening to the public. The system is carried in a backpack to facilitate spectrometric monitoring and can be used in slow motion if necessary. The device is self-calibrating and stabilises on natural gamma ray peaks; the data collected is automatically synchronised in real time by GPS.

No.	PLACE	Washington, D.C., United States	
GPS	38.893481, -77.036370	COMPANY	
PROJECT			

Purple Line: an automated worksite monitoring solution

The Purple Line (a 26 km light rail line with 21 stations) will improve transport in the area around Washington, D.C. Sixense won the contract to monitor a tunnel and a deep shaft as well as noise and vibrations along the entire length of the line. While most specifications were based on manual monitoring, Sixense opted to propose an entirely automated system, which is safer since the teams do not have to be physically present in dangerous areas, and which delivers better results thanks to real-time monitoring and a more responsive alarm system.



L A T I N A M E R I C A



No.
1PLACE
**Candelaria,
Chile**

GPS

-27.5096,
-70.2874

COMPANY



PROJECT

An additional 15 years of operation at the Candelaria mine

At the Candelaria mine, preparations are under way for a further 15 years of operation. They include construction of a 690 hectare impoundment that will store up to 600 million tonnes of tailings from the copper extraction process. The project also includes special works to intercept and drain seepage under the retention embankments to ensure compliance with the applicable environmental regulations. Local Soletanche Bachy subsidiary Soletanche Bachy Chile won the contract, which called for work in three different areas. Downstream from the central embankment, it built a plastic concrete cut-off wall and a drainage wall to a depth of up to 25 metres (the deepest drainage wall ever built by Soletanche Bachy). At the foot of the south embankment, it installed a slab on the mountainside to build a grout curtain by means of more than 40 km of drilling and grouting. Lastly, in partnership with specialist Soletanche Bachy subsidiary Bessac, it bored a 358 metre long microtunnel underneath the central embankment to drain filtration water from the impoundment for re-use in the copper concentration and tailings transport processes. Carried out for the Canadian Lundin Mining Company, the project called for substantial resources and the use of state-of-the-art techniques.

44 MILLION METRES OF DRAINS



No. **2** PLACE **Mexico City, Mexico**

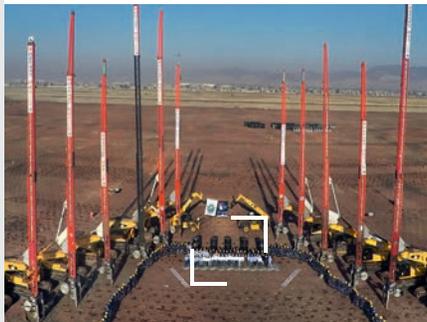
GPS 19.432418, -99.133016



PROJECT

The new international airport in Mexico City: 44 million metres of drains installed in eight months

The new international airport in Mexico City is the country's largest infrastructure construction project. The airport is being built on the site of a dried-up saltwater lakebed where the ground is made up of clay with water content between 250% and 400%. As part of this project, Menard won the contract to supply and install prefabricated vertical drains under what will become Runway No. 2. The company installed 44 million metres of drains within an eight-month period. This is an all-time productivity record for Menard Mexico. Thanks to the support of various Group entities, the company rapidly assembled 15 operating rigs, some of which can reach depths of 27 metres. To carry out this large-scale project, 150 local employees were trained. The project was handed over in the summer of 2017.



PERFORMANCE

2017, a record year for vertical drains

With the new international airport in Mexico City and the Free Trade Zone in the East Port Said Industrial Area in Egypt, Menard increased its annual production of drains by a factor of 10.

NOTE

Hector S. Ovalle Mendivil, CEO, Coconal

"We selected Menard based on its technical expertise but above all on its human approach, which is all-important to us. Menard became a partner; engaging and working closely with our employees. Based on this good relationship with its local teams, we built an outstanding dialogue and were able to work together to devise the best solutions. The Menard teams were very precise, which makes all the difference. We are very satisfied with this experience and are already looking for a further project that we can undertake with Menard."



No.	PLACE	Xalapa, Mexico
GPS		COMPANY
19.543775, -96.910181		
PROJECT		
Cathodic protection for PEMEX gas pipelines		
<p>In Mexico, Freyssinet took part in developing the new Liquefied Petroleum Gas (LPG) underground storage site in Xalapa, 300 km east of Mexico City in the state of Veracruz. At this strategic site, Freyssinet Mexico teams designed, supplied and installed cathodic protection systems for the gas pipelines and the various underground metal structures. The project will now enable PEMEX (Petróleos Mexicanos) to store 1.8 million barrels of LPG in a salt cavern at a depth of more than 1,500 metres and transfer more than 120,000 barrels per day.</p>		



No.	PLACE	Guadalajara, Mexico
GPS		COMPANY
20.659699, -103.349609		
PROJECT		
New metro: real-time monitoring to conserve historic landmarks		
<p>Sixense carried out the instrumentation works in the Guadalajara metro tunnel, its five stations and all surface buildings along the line. The Mexican Ministry of Transport and Telecommunications initiated the real-time mission in order to monitor and better conserve landmark buildings. The Sixense teams brought their added value to the design by suggesting a detailed analysis plan. The dynamic and responsive teams succeeded in installing the comprehensive automated instrumentation in the buildings while the tunnel boring machine was operating at full capacity.</p>		

No. **5**

PLACE **Antamina,
Peru**

GPS

-9.565371,
-77.036014

COMPANY



PROJECT

An innovative TechSpan® arch for the Antamina mine

In Peru, Tierra Armada Perú designed and supplied TechSpan® arches to cover the Antamina mine's pumping station. With a maximum span of 21.5 metres and a thickness of 50 to 60 cm, the structure comprises 95 precast elements. Its technical design and the production of its precast elements were complex. The Tierra Armada Perú team was recognised for the iconic project with an innovation award.

INNOVATION

To cope with the many technical challenges of the project, Terre Armée developed several innovative solutions, including:

- design of vertical shuttering with special lower and upper stops that adapt to the four sections and 27 different shapes of the precast elements making up the TechSpan® arch;
- use of high density steel with special lengths in each arch element, for which strategic partners able to produce them had to be found;
- use of a high-strength (100 MPa) concrete produced industrially for the first time in Peru. Since the existing regulations do not spell out specific procedures for validating the conditions in which the concrete is used, Terre Armée created a special test protocol adapted to the concrete.



A F R I C A



No. **1** PLACE **Durban,
South Africa**

GPS

-29.858680,
31.021840

COMPANY



PROJECT

12,500 sq. metres of walls for the Cornubia Industrial and Business Estate

The Cornubia Industrial and Business Estate north of Durban will be home to the largest shopping centre in KwaZulu-Natal. Terre Armée subsidiary RESA took part in this ambitious development programme, for which it built the hard surface. To adapt to the configuration of the site, located in a region with irregular terrain, the teams carried out earthworks and built a retaining solution using Reinforced Earth® walls with a maximum height of 18 metres. The total surface area of the project's four walls is more than 12,500 sq. metres.

No.
2PLACE
**Reunion Island,
France**

GPS

-20.907963,
55.360218

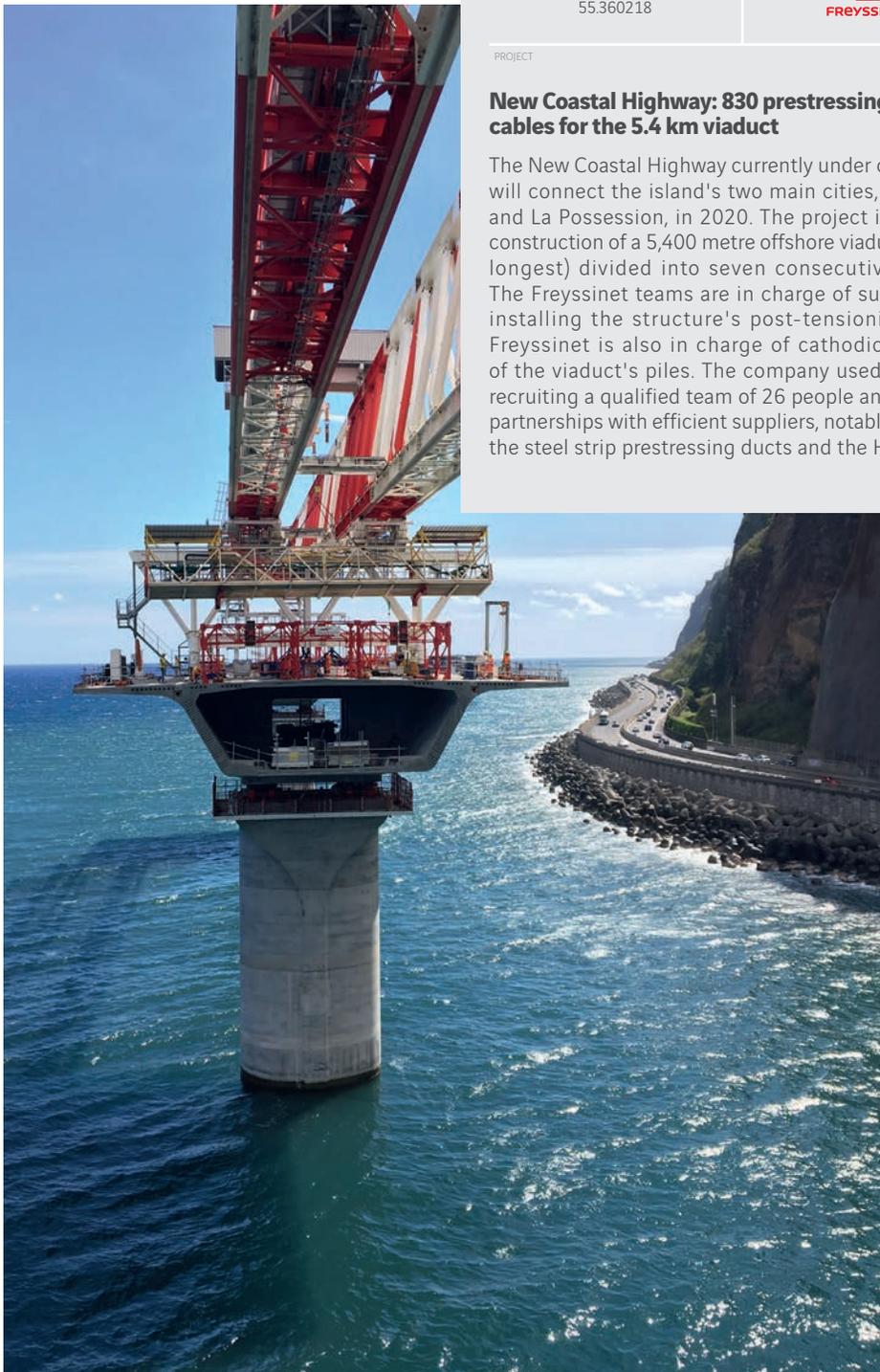
COMPANY



PROJECT

**New Coastal Highway: 830 prestressing
cables for the 5.4 km viaduct**

The New Coastal Highway currently under construction will connect the island's two main cities, Saint Denis and La Possession, in 2020. The project includes the construction of a 5,400 metre offshore viaduct (France's longest) divided into seven consecutive sections. The Freyssinet teams are in charge of supplying and installing the structure's post-tensioning system. Freyssinet is also in charge of cathodic protection of the viaduct's piles. The company used local skills, recruiting a qualified team of 26 people and setting up partnerships with efficient suppliers, notably to produce the steel strip prestressing ducts and the HDPE tubes.



MIDDLE EAST / CENTRAL ASIA

No. **1**

PLACE **Dubai, United Arab Emirates**

GPS

25.104076,
55.148475

COMPANY



PROJECT

Dubai Creek Tower: 473 barrettes for the foundations of an outsized tower

The future Dubai Creek Harbor destination developed by the Emaar Properties company will epitomise the future habitat with its dozens of high-end residential towers and an extensive shopping area. Designed by Spanish architect-engineer Santiago Calatrava, the Dubai Creek Tower will stand at the heart of the future development. Structurally, the observation tower is a vertical hollow reinforced concrete cylinder and is too tall to be self-supporting at all times. For this reason, the first two-thirds of its height will be supported by stay cables anchored to the ground. The tower foundations are commensurate with its size. They consist of 473 barrettes set under the tower itself and the two cable stay anchor blocks. Soletanche Bachy, which has operated in the United Arab Emirates for 35 years, won the contract to build the tower foundations and retaining structures in June 2016. Thanks to its painstaking preparations, flawless logistics and highly experienced personnel, it delivered the project on time in July 2017, just 12 months after the start of works. This is a flagship project for the Group and for Soletanche Bachy Middle East, Soletanche Bachy International and Zetaş, which marshalled 600 people and four Hydrofraise® machines on the worksite and set a world record by performing tests with a combined load of 36,300 tonnes.

NOTE



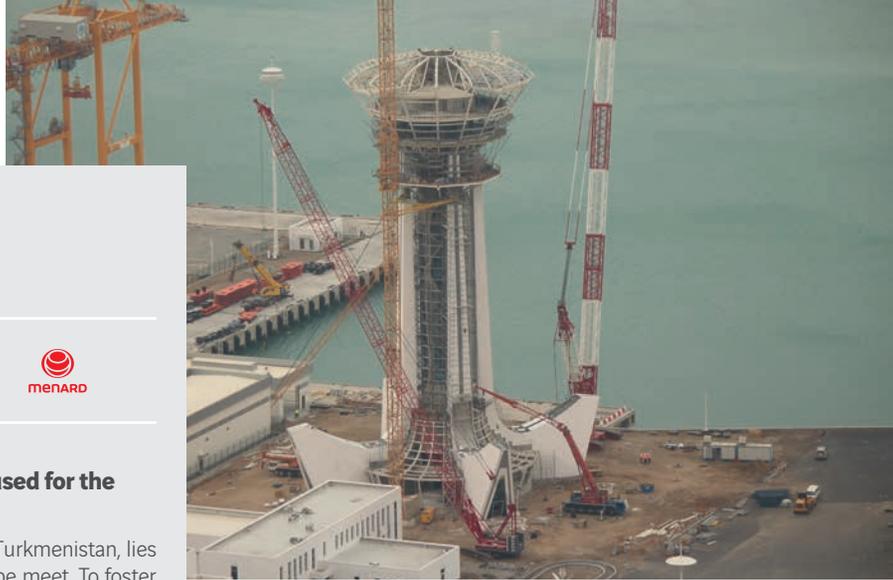
Colum O'Donovan,
FIDIC engineer

"There is an African proverb that says: 'If you want to go fast, go alone. But if you want to go far, let us go together.' Given the scale and unique design of the Dubai Creek

Tower, the real challenge was to harness the expertise of all the professionals involved and to build team spirit. It was essential for all the parties – designers, engineers and builders – to work collaboratively and openly with each other. The Soletanche Bachy team worked closely with us on the foundations for the Dubai Creek Tower. The team was proactive in proposing alternative solutions and in overcoming the day-to-day challenges of a complex construction project carried out within a tight schedule."

36,300 TONNES, A RECORD TEST LOADING





No. **2** PLACE **Turkmenbashi,
Turkmenistan**

GPS
40.031290,
52.973540

COMPANY
 **SOLETANCHE BACHY**  **MENARD**

PROJECT

Ground improvement techniques used for the first time in Turkmenistan

Turkmenbashi, one of the main cities in Turkmenistan, lies on the Caspian Sea where Asia and Europe meet. To foster development of maritime transport, the city is acquiring a large-capacity, top-level port complex over an area of one square kilometre. Lead company GAP İnşaat called on the combined expertise of local Soletanche Bachy subsidiary Zetaş as well as Menard to handle the ground improvement works by installing vertical drains and carrying out rapid impact compaction, Deep Soil Mixing and piling over the entire site. The use of vertical drains, rapid impact compaction and Deep Soil Mixing - the first time they were used in combination in Turkmenistan - reduced construction time and made it possible to hand over the works on time in July 2017.

NOTE

**Savaş Atahan,
Soil works manager, GAP İnşaat - Turkmenistan branch**

"Zetaş built on its wide variety of expertise to deliver a customised solution. It notably made a persuasive case - to us and to the local authorities - for the use of Deep Soil Mixing to improve the ground under the future passenger terminal, the largest of the port complex buildings. The solution saved time and reduced costs. Working with Zetaş also means working safely. At the height of activity the company took time to train the teams in health and safety and raise their awareness of health and safety issues."

No. **3** PLACE **Dubai,
United Arab Emirates**

GPS
25.204849,
55.270782

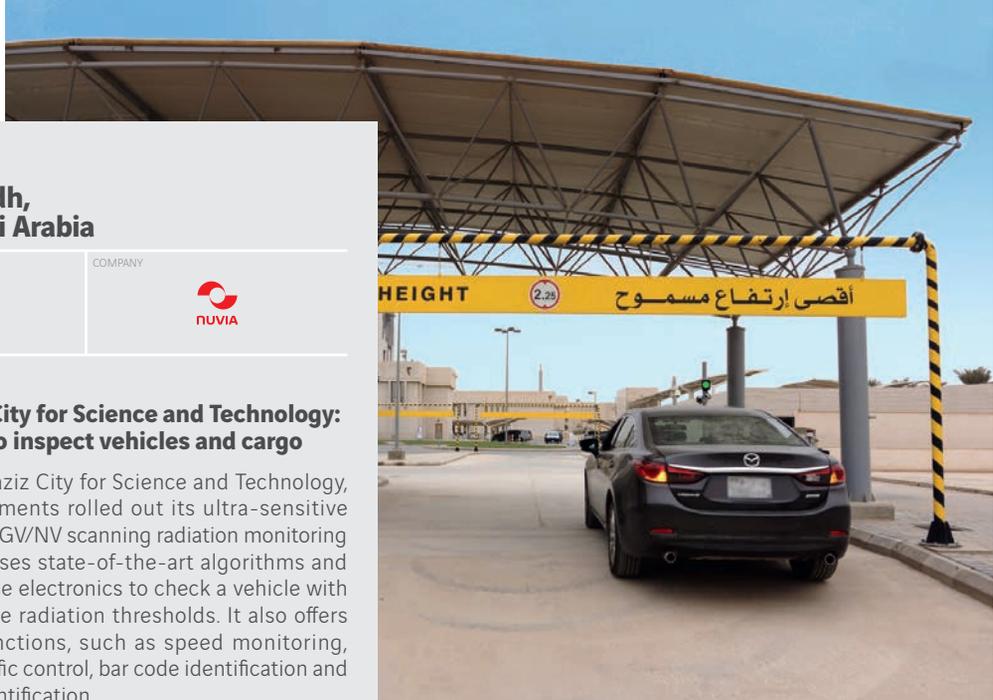
COMPANY
 **FREYSSINET**

PROJECT

Innovating to secure and repair a building following a fire

In Dubai, the Viceroy luxury hotel residence project was severely damaged by fire. Only 23 of the 63 storeys of the tower had been built. Freyssinet carried out work to stabilise the building, which had been weakened in the fire. The teams innovated by creating special equipment to support the loads and reduce stress on the building prior to repair. Subsequently, the company carried out repair works. Thanks to Freyssinet's support, the building was completed and will be opened in 2018.





No.	PLACE	4	Riyadh, Saudi Arabia
GPS	24.716945, 46.643350		COMPANY 
PROJECT			

King Abdulaziz City for Science and Technology: an x-ray portal to inspect vehicles and cargo

At the King Abdulaziz City for Science and Technology, NUVIA Tech Instruments rolled out its ultra-sensitive NuHLS PORTAL V 2GV/NV scanning radiation monitoring tool. The system uses state-of-the-art algorithms and advanced low-noise electronics to check a vehicle with the lowest possible radiation thresholds. It also offers other optional functions, such as speed monitoring, CCTV cameras, traffic control, bar code identification and employee pass identification.



No.	PLACE	5	Saudi Arabia
GPS	23.885942, 45.079162		COMPANY 
PROJECT			

Sixense becomes a go-to expert in concrete pathology

In the Middle East, a large number of prestressed concrete buildings and structures need special attention due to issues such as heat, humidity, erosion and faulty construction. Sixense continues, especially in Saudi Arabia and the United Arab Emirates, to consolidate its positioning with administrations and the construction industry as a concrete pathology expert delivering turnkey solutions. The local Sixense subsidiary has carried out several investigations, including life span assessment of a set of buildings in Mecca for the developer, a diagnosis of five bridges between Riyadh and Dammam for the Kingdom of Saudi Arabia Ministry of Transport, and an inspection of the world's largest reservoirs in Jeddah for the National Water Company.

WESTERN / NORTH-EASTERN EUROPE





No. **1** PLACE **Joncet, France**

GPS
42.561747,
2.311370

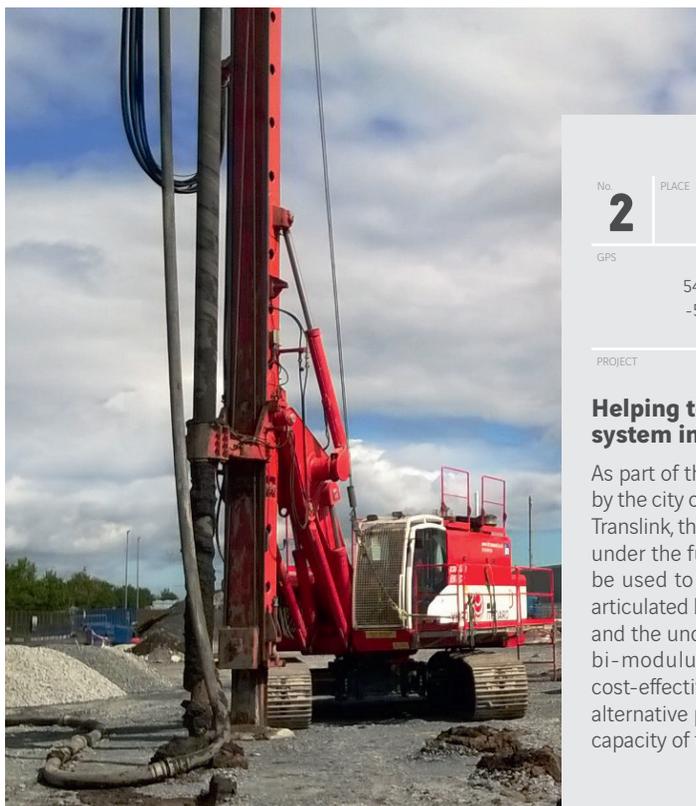
COMPANY

TERRE ARMÉE

PROJECT

Mineral TerraTrel® for the Joncet bypass

Terre Armée is taking part in the construction of the RN 116 bypass around the village of Joncet in France's Pyrénées Orientales department, where it is designing and supplying 6,200 sq. metres of mineral TerraTrel® panels. The project began in 2013 and is being carried out in two phases. The second phase, still under way, comprises the construction of three reinforced backfill walls with 4,600 sq. metres of TerraTrel®. The project is set for completion in 2018 with the construction of one last wall, but Terre Armée can already take pride in having helped to build these 17 metre high structures.



No. **2** PLACE **Belfast, Ireland**

GPS
54.597285,
-5.930120

COMPANY

MENARD

PROJECT

Helping to expand the public transport system in Belfast

As part of the public transport upgrade project conducted by the city of Belfast, Menard won the contract awarded by Translink, the city transport company, to improve the ground under the future bus depot. The completed structure will be used to service and maintain the city's new fleet of articulated buses. To reinforce the surface layer of soft clay and the underlying layer of loose sand, the team installed bi-modulus columns. This technique, which is more cost-effective and can be deployed more rapidly than the alternative pile solution, was used to improve the bearing capacity of the ground and limit the amount of spoil.

No. **3**

PLACE **Creys-Malville,
France**

GPS

45.759453,
5.473520

COMPANY



PROJECT

Decommissioning of EDF's Creys-Malville power plant: a 100% innovative workshop and robot

As part of the decommissioning of the Superphénix fast breeder reactor that got underway in 2006, Nuvia teams dismantled the components of the BCC (Core Cover Plug) and PBT (Small Rotating Plug).

The project consists in removing these components from the reactor vessel and then using a robot to dismantle them in a modular workshop. Nuvia designed the complete workshop including metal structures, civil engineering, handling equipment, special ventilation networks specifically dimensioned for contamination risks during cutting, fire detection systems, electric cabling, monitoring and control systems, and tele-operated processes. The complex, outsized project stands out in two ways: firstly, in the scope of its components (the BCC weighs 188 tonnes and the PBT 235; the reactor vessel is 24 metres in diameter); and secondly, in the painstaking attention paid to risk control and the combination of skills required, including preliminary studies, design, project management and decommissioning.

NOTE

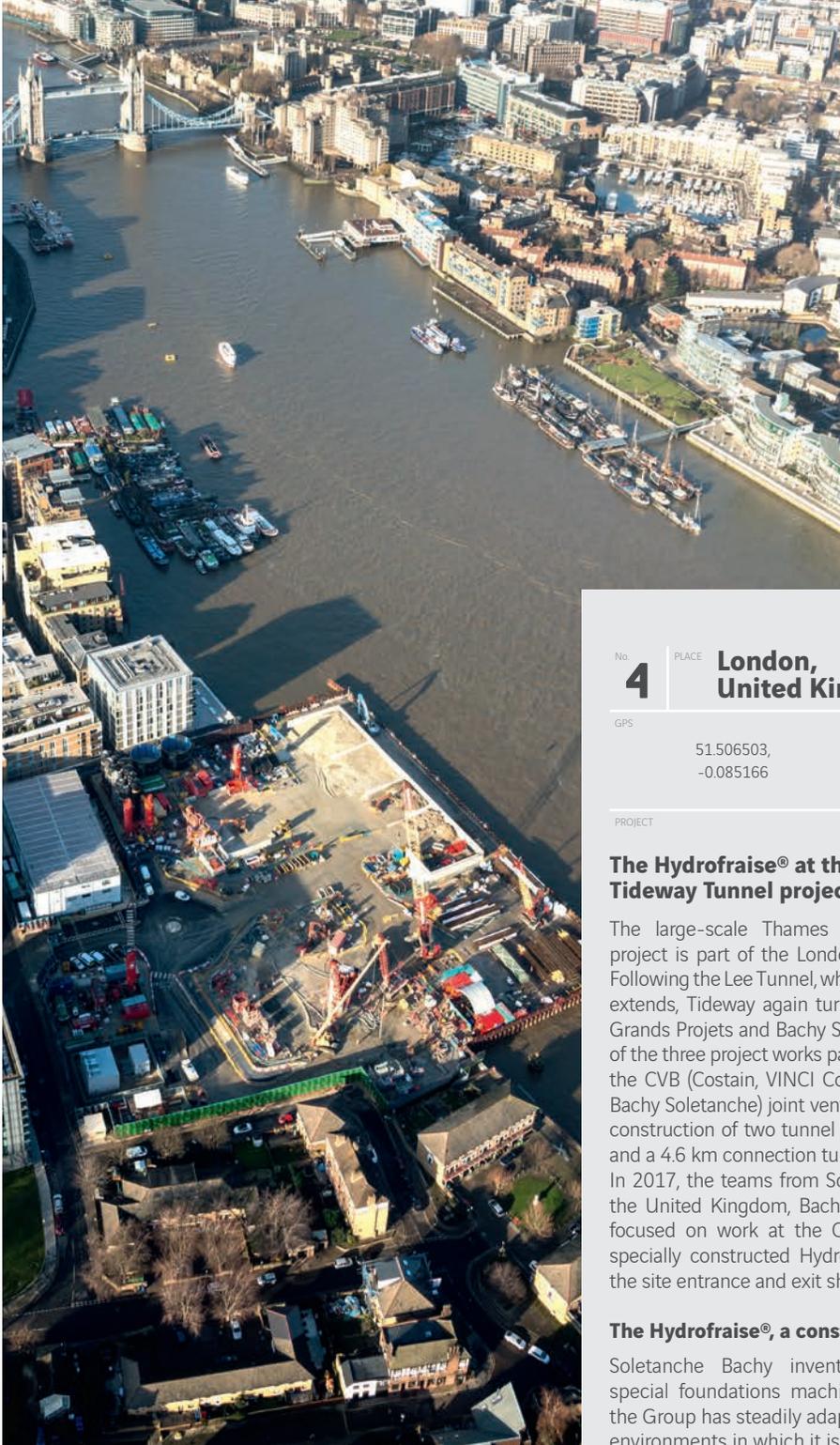


**Damien Bilbault,
Director, EDF site
at Creys-Malville**

"For us, safety of personnel is a priority. We therefore opted for this solution, which used a robot and remotely controlled cutting operations. It proved

a very good choice. The teams adapted an existing robot to the nuclear environment (it is now a prototype innovation) but designed it with a maximum number of generic parts so that we do not have to worry about breakdown or spares. It is reliable and sturdy, and that is an important, critical point for us."





No. **4** PLACE **London,
United Kingdom**

GPS
51.506503,
-0.085166

COMPANY

SOLETANCHE BACHY

PROJECT

The Hydrofraise® at the heart of the Thames Tideway Tunnel project

The large-scale Thames Tideway Tunnel construction project is part of the London sewer upgrade programme. Following the Lee Tunnel, which the Thames Tideway Tunnel extends, Tideway again turned to the VINCI Construction Grands Projets and Bachy Soletanche teams, awarding one of the three project works packages – the East contract – to the CVB (Costain, VINCI Construction Grands Projets and Bachy Soletanche) joint venture. The works package covers construction of two tunnel sections, a 5.5 km main tunnel and a 4.6 km connection tunnel, as well as five large shafts. In 2017, the teams from Soletanche Bachy's subsidiary in the United Kingdom, Bachy Soletanche, were particularly focused on work at the Chambers Wharf site, where a specially constructed Hydrofraise® was used to excavate the site entrance and exit shaft walls.

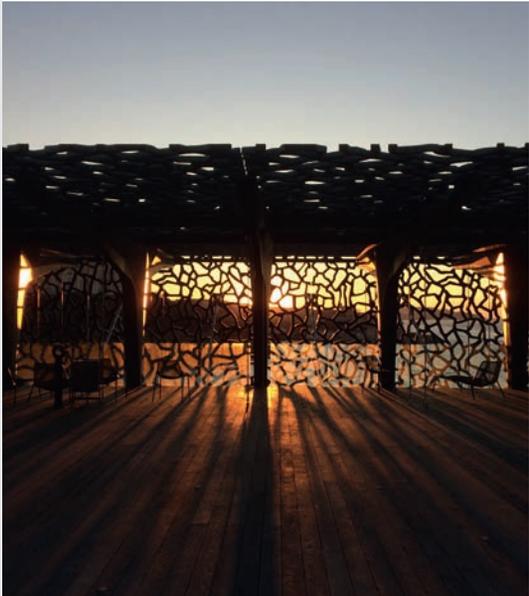
The Hydrofraise®, a constantly evolving machine

Soletanche Bachy invented the iconic Hydrofraise® special foundations machine in the 1970s. Since then, the Group has steadily adapted it to the constraints of the environments in which it is used. For the Thames Tideway Tunnel project, the Group developed a Hydrofraise® with an electric power pack that reduces the project's carbon footprint and minimises disruption for local residents.

No.	PLACE	Marseille, France
5		
GPS	43.297018, 5.361161	
	COMPANY	
PROJECT		

The MuCEM opts for Sixense until 2023

The architecturally daring MuCEM is already one of the world's 50 most-visited museums. The structure of the mineral cube is surrounded by fine concrete latticework and branching posts that must be preserved. The Sixense teams worked in synergy to win the six-year Ultra-High Performance Fibre-Reinforced Concrete (UHPFRC) structure inspection and monitoring contract. Visual inspections, backed by drone, are performed in addition to topometric surveys, instrumentation and dynamic damper measurements. To inspect the access walkways, a dedicated mobile inspection platform was designed.



No.	PLACE	Bridgwater, United Kingdom
6		
GPS	51.207112, -3.136597	
	COMPANY	
PROJECT		

Hinkley Point C: three projects at the heart of a major nuclear site

Nuvia is participating in the construction of two EPR (European Pressurised Reactor) type nuclear reactors at Hinkley Point C. The local subsidiary is working with Rolls-Royce to supply the turnkey subassemblies for the power plant's liquid coolant treatment systems: the Primary Circuit Boron Recycling (TEP) and Secondary Effluent Treatment (TEU) systems. The teams were also selected to carry out a third EPC (Engineering, Procurement and Construction) project involving the design and construction of the Nuclear Sampling System (NSS). This crucial facility in the heart of the nuclear complex will validate compliance of water with the most exacting specifications and standards.



51 METRES HIGH



No. **7** PLACE **Brest, France**

GPS
48.391548,
-4.484818



PROJECT

Brest: tackling the silos

In order to continue to use the silos for another 20 to 30 years, the Brest Chamber of Commerce and Industry selected Sixsense to perform an inspection and recommend ways to ensure their integrity and durability. The eight silos built in 1982 are exceptional structures with a height of 51 metres and an interior diameter of 13 metres. Sixsense carried out special visual inspection operations. On the outside of the silos, the teams worked on foot, on work platforms and via drone. Inside the silos, rope access technicians explored the structures. Sixsense analysed the reinforced concrete and studied the prestressing. To draw up a 3D model, the local subsidiary conducted a robot-based geometrical and mechanical silo monitoring operation during a filling and emptying operation. Lastly, it used a 3D scanner to georeference the silos and check their vertical alignment.





**MORE THAN
12,000 SQ.
METRES OF
DIAPHRAGM
WALLS**

No. **8**PLACE **Greater Paris area,
France**

GPS

48.856451,
2.352342

COMPANY



PROJECT

Soletanche Bachy and Sixense work on the Grand Paris Express

The Grand Paris Express, Europe's largest urban project, will provide 200 km of additional public transport lines for the region's citizens, as much as the current Paris metro system.

Diaphragm walls to support a 7,000 tonne slab

The vast Fort d'Issy - Vanves - Clamart (T3B) works package awarded to the Horizon (Bouygues Travaux Publics and Soletanche Bachy) joint venture is the first in the series of 68 new stations to be built as part of the Grand Paris Express programme. The work got underway in June 2016 and reached a milestone when the station cover slab was slid into place on schedule in mid-August 2017. The carefully calibrated schedule of partial deliveries included construction of the diaphragm walls making up the reinforced concrete envelope of the future station. Soletanche Bachy carried out the work in a restricted environment within a record eight weeks.

In 2017, the Horizon joint venture won two further works packages on the same Line 15: T2A (Villejuif - Louis Aragon, excluding the station - Créteil l'Échat) and T3A (Pont de Sèvres - Fort d'Issy - Vanves - Clamart), which includes construction of six stations and nearly 12 km of tunnels.

SAFETY

Closely watched structures

On works package T2A, Sixense was selected to perform a detailed analysis of the stations, ancillary structures, tunnel and about 1,000 buildings adjacent to the worksite, which involved measuring settlement, deformation, noise and vibration.

NOTE

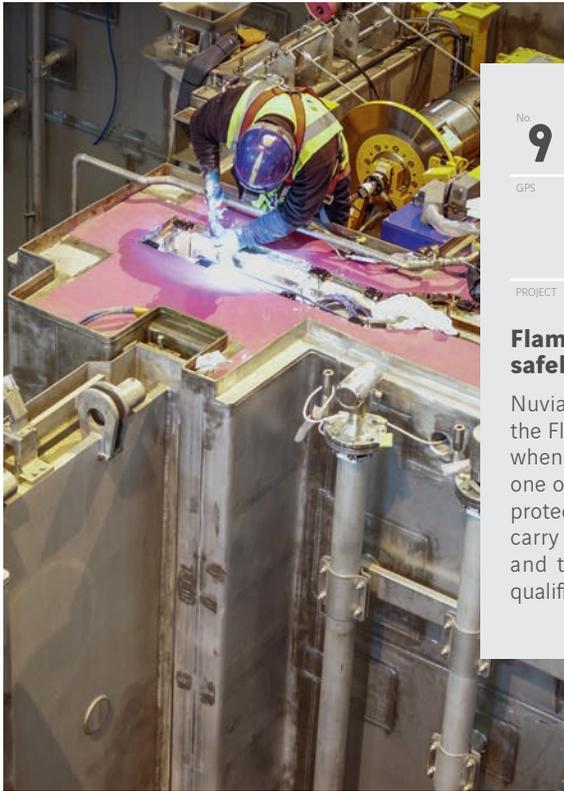


Nicolas Labrousse,
Civil engineer and T3B project
manager, setec tpi

"Soletanche Bachy was able to adapt to new constraints and reorganise its worksite while sticking to the schedule. The teams were always able to come up with

solutions - both human and technical - to resolve the issues that arose. The people we dealt with were not just experts with a pragmatic approach to suggesting solutions; they were also very pleasant people to work with day-to-day. Another plus was the youth of the supervisors and skilled workers from a wide variety of backgrounds. We formed a young, capable, responsive and enthusiastic team that worked exceptionally well together."





No.	PLACE	Flamanville, France	
GPS	49.539702, -1.881645	COMPANY	
PROJECT			

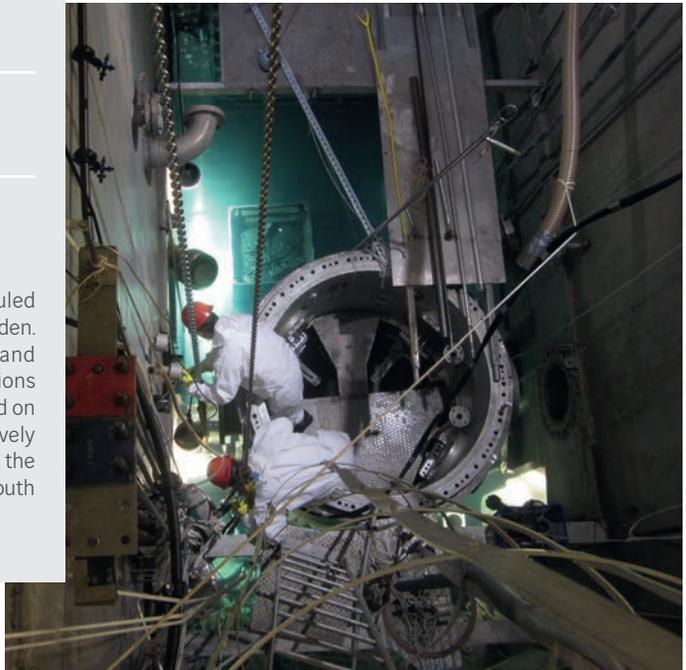
Flamanville EPR: 3,000 wall penetrations safely sealed

Nuvia is sealing more than 3,000 wall penetrations at the Flamanville EPR. The project is challenging, notably when sealing the penetrations of the reactor building, one of the most sensitive parts of the EPR passive fire protection system. The main focus of the project is to carry out the work safely within a very tight schedule and to ensure compliance with specifications and qualifications.

No.	PLACE	Sweden	
GPS	59.2883, 18.0684	COMPANY	
PROJECT			

Decommissioning of nuclear power plants: Nuvia has become a long-term partner

In 2017, Nuvia carried out a large number of scheduled maintenance operations at nuclear power plants in Sweden. The work included radiation protection, opening and closing of reactor vessels, fuel changes, valve operations and a wide variety of maintenance works. Nuvia worked on Studsvik, the first Swedish reactor to be comprehensively dismantled. The Swedish Nuvia teams also worked on the decommissioning of the Ringhals power plant 60 km south of Gothenburg.



No. **11**

PLACE

United Kingdom

GPS

52.392587,
-1.166598

COMPANY



PROJECT

ElevArch®: a revolution in structural modification

The railways are undergoing massive electrification in the United Kingdom. To make room for overhead power lines under the masonry arch bridges that cross the tracks, Freyssinet and its partner Bill Harvey Associates opted to raise the existing structures. Freyssinet devised ElevArch®, which won the 2017 VINCI Innovation Award in the "Processes and Techniques" category. ElevArch® has proven more cost effective than the alternatives: 20% less costly than replacing the bridge and 135% less costly than lowering the tracks. The innovative structural modification can be applied to about 40 bridges in the United Kingdom. It also has strong potential for use in other countries.

NOTE

**Julien Erdogan,
Technical Director, Freyssinet**

"ElevArch® is something we are proud of, it is emblematic of the innovative projects our subsidiaries are increasingly carrying out. We filed 15 patents in 2017, twice as many as the average number in previous years, which goes to show that ideas are being put into practice!"

INNOVATION

ElevArch® close-up

The portion of the bridge containing the arch is first cut with a diamond saw. Vertical hydraulic jacks are then placed under the arch and it is raised to its final position, generally 50 cm above the initial position. Throughout the operation, vertical bearings are inserted in the wing walls to ensure stability.



CENTRAL EUROPE / EASTERN EUROPE



No.

1

PLACE

Budapest,
Hungary

GPS

47.497912,
19.040235

COMPANY



PROJECT

Diving board for International Swimming Federation FINA: a high-flying worksite for HBM

In preparation for the 17th FINA World High Diving Championships, set to take place in Budapest in July 2017, HBM, a Soletanche Bachy subsidiary in Hungary, pulled out all the stops to enable the divers to perform. To build the foundations for the diving platform opposite the Parliament building on the Danube, it deployed 480 tonnes of equipment and materials and set up a customised installation system on three barges. The main barge – 80 metres long and 10 metres wide – held the drilling rigs used to install the piles. The barges proved an efficient response to the worksite challenges, the main one being the lack of space, since shipping on the river and traffic along the embankment continued uninterrupted throughout the project. Another challenge was the exceptionally high water level in the river during construction. With its teams working around the clock, seven days a week, HBM managed to comply with the very tight timeframe, and even completed the project seven days ahead of schedule.

An effective partnership with Sixense

To avoid risks due to the narrow width of the main barge, which was highly sensitive to machinery movements, a comprehensive workplan was carefully drawn up and parallel activity was restricted. To control the stability of the main barge, HBM called on Sixense teams, who deployed a system to monitor tilting in real time within a narrow range of plus or minus four degrees.



No.	PLACE	Sosnowiec, Poland
GPS		50.286264, 19.104079
COMPANY		
PROJECT		

A large ground reinforcement project

Menard teams carried out ground reinforcement works under 10 warehouses and a service station in the Sosnowiec business park. The ground was made up of mine tailings – black shale – stored for more than three decades. The largest and most representative work phase was for the future Amazon building, where Menard reinforced more than 132,000 sq. metres of ground by means of dynamic compaction and installed 1,635 dynamic replacement pillars. The project was successfully completed despite difficult winter weather conditions and a tight schedule that required the work to be carried out in parallel with the design studies.



No.	PLACE	Lublin, Poland
GPS		51.246454, 22.568446
COMPANY		
PROJECT		

4,600 sq. metres of Reinforced Earth® walls for a road intersection

Terre Armée teams worked on an elevated intersection project in the Lublin, Poland region. For this project, designed to improve user safety and accommodate traffic growth, Terre Armée designed and supplied 4,600 sq. metres of Reinforced Earth® walls. A GeoMega® solution using TerraClass® panels in conjunction with HA GeoStrap® reinforcing strips was applied for the walls. The project was completed in July 2017.



No. **4** PLACE **Győr, Hungary**

GPS
47.6302,
17.6344

COMPANY


PROJECT

Freyssinet locked cables on the banks of the Danube

A new bridge over the Mosoni-Danube now enables motorists to bypass the much-visited city of Győr via a 395 metre arch bridge designed to carry 9,000 vehicles per day. The main bridge contractor Hódút selected Freyssinet to install the locked cables on the structure. The Freyssinet teams met the challenging schedule, completing the project between August and September 2017.

No. **5** PLACE **Czech Republic**

GPS
49.817492,
15.472962

COMPANY


PROJECT

European Spallation Source: Nuvia expertise to support the nuclear technologies of the future

The European Spallation Source (ESS) holds out new prospects for researchers in all scientific disciplines. Every year, two to three thousand guest scientists will conduct experiments there.

The ESS is a future European centre in Sweden dedicated to scientific research using neutron scattering techniques. The Czech Republic is an ESS partner. The Nuclear Physics Institute of the Czech Academy of Sciences decided to call on Nuvia, which is already conducting many large projects in the Czech Republic, to bring its expertise and experience to the design, fabrication and installation of primary and intermediate cooling water systems and a ventilation system for the target station. The Nuvia teams are in charge of coordinating the many engineering and fabrication firms involved and ensuring compliance with legislation and the very stringent technical requirements applying to experimental nuclear facilities.



ASIA





No. **1** PLACE **Hong Kong**

GPS
22.312855,
114.174990

COMPANY

SOLETANCHE BACHY

PROJECT

Hong Kong International Airport: an outsized major project

Following several months of a very careful preparation, local Soletanche Bachy subsidiary Bachy Soletanche Group Limited, Soletanche Bachy International and their Korean partner Sambo E&C began work in Hong Kong on the largest-ever Geomix® ground reinforcement project in April 2017. Special equipment was developed for the project, part of the construction of the Three-Runway System at Hong Kong International Airport, to meet safety-related height restriction constraints in the vicinity of aircraft take-off and landing zones. A total of 16 compact CSM machines were designed and manufactured in record time to carry out the project, which is set for completion in 2019.



No. **2** PLACE **Coimbatore, India**

GPS
11.016845,
76.955832

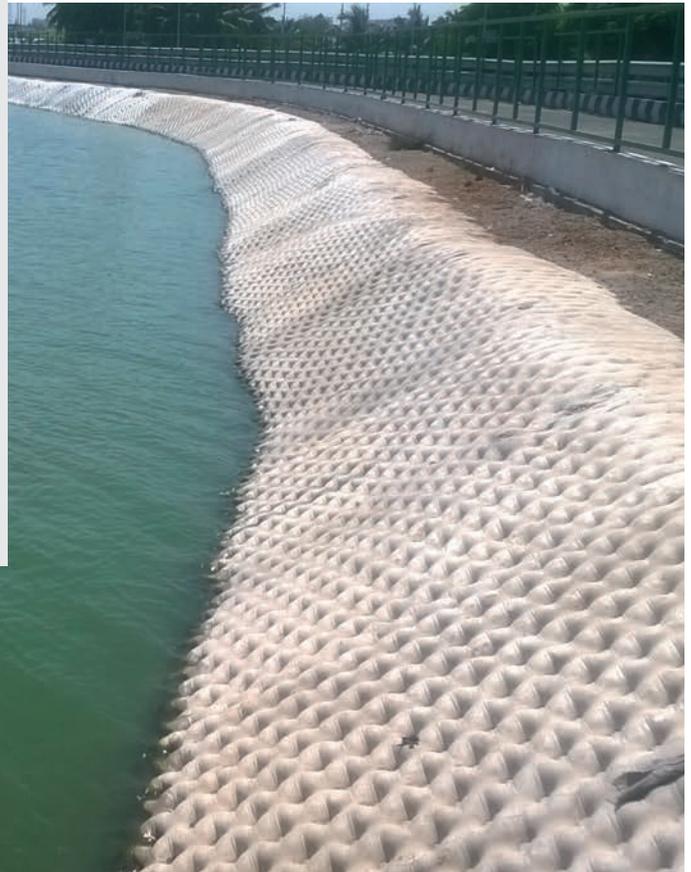
COMPANY

TERRE ARMEE

PROJECT

An innovation prize for TechRevetment®

The TechRevetment® solution, winner of the Soletanche Freyssinet 2017 Innovation Prize, provides efficient long-term embankment erosion protection. It uses a geosynthetic mat filled with mortar and a non-woven geotextile filter. It was installed in record time to protect 1.2 km of embankments at the Coimbatore municipal reservoir in India. Since it was introduced, the TechRevetment® solution has been used several times and a large number of projects are now on the drawing board in other countries around the world.





**1,750
TONNES
OF PRE-
STRESSING
CABLES**



No. **3**

PLACE

Hong Kong

GPS

22.312855,
114.174990

COMPANY



PROJECT

Lian Tang 3 Bridge: mission accomplished following four years of work

In Hong Kong, the Freyssinet teams installed the 1,322nd and last arch segment on the major Lian Tang 3 (LT3) bridge project exactly 1,070 days after installing the first one in 2014. They built a major part of the complex motorway junction designed to connect an existing motorway with the new border post to Mainland China. Freyssinet was responsible for two missions on the project, which was built above a motorway and a railway line that both remained open during construction: installing the 1,322 precast concrete arch segments and tensioning more than 1,750 tonnes of prestressing cables. At peak activity, 350 mobile and versatile workers were working simultaneously on several installation sites.

NOTE



Bobby Hung, Senior Resident Engineer

"Our relationship with Freyssinet's team can be summed up in three adjectives: cooperative, flexible and effective. From the start, Freyssinet was willing to work closely with the project team

to resolve the design and site difficulties. For example, Freyssinet revised the design of the temporary structures so that the latter could perform more efficiently and safely, and revised the segment erection sequence when necessary to expedite the erection works and minimize delay. The work was carried out in a safe, efficient and competent manner. Another important point was that Freyssinet was always willing to share with the project team their experience from other projects."

No. **4** PLACE **Cilegon, Indonesia**

GPS
-6.12,
106.150278

COMPANY


PROJECT

Harbour Stockyard project: reinforcement of four ore storage sites

Menard was awarded the contract to reinforce the ground for four ore storage sites where steelmaking equipment is now to be stored. The task was complex due to the non-uniform nature of the ground and the weakness of a number of areas located on former coastal reclaimed land. The solution was to install Controlled Modulus Columns reinforced with steel cages on peripheral columns sunk to a depth of 8 to 18 metres.



No. **5** PLACE **Singapore**

GPS
1.355379,
103.867744

COMPANY

SOLETANCHE BACHY

PROJECT

Thomson-East Coast Line: Soletanche Bachy works on two stations

As part of the Thomson-East Coast Line construction project in Singapore, the joint venture made up of Penta Ocean Construction and Bachy Soletanche Singapore, the local subsidiary of Soletanche Bachy, in association with two other subsidiaries, Soletanche Bachy International and tunnel specialist Bessac, continued work on the Orchard station in 2017. This station will become a major transit hub and the operations, carried out on the surface and underground in a densely populated urban area and under a busy road artery, required advanced geotechnical expertise. The project's many features included underpinning the existing station; boring an 840 metre long, 6.6 metre diameter dual-tube tunnel between the Orchard and Orchard Boulevard stations; and, in a world first, building a connecting corridor between the Thomson-East Coast Line and the existing North-South Line at a depth of 27 metres under the six-lane Orchard Boulevard, by using a retractable micro-tunnel boring machine to install an 18 tube, 41 metre pipe arch.



No.	PLACE	Jakarta, Indonesia
6		
GPS	-6.175110, 106.865040	
	COMPANY	
PROJECT		
Light Rail Transit: a revolutionary earthquake protection system		
<p>At the heart of the Grand Jakarta project, the first phase of the future Light Rail Transit (LRT) system in Jakarta comprises three elevated lines covering 43 km and 18 stations. The challenge in the seismically highly active area was to enable the line to continue operating following an earthquake. The client opted for Freyssinet's ISOSISM® protection system. Freyssinet designed and supplied the ISOSISM® LRB (Lead Rubber Bearing) dampers, the lead core elastomer bearings that limit bridge displacement and dissipate energy during an earthquake.</p>		



No.	PLACE	China
7		
GPS	35.861660, 104.195397	
	COMPANY	
PROJECT		
An on-board system to detect metals at a distance of up to 300 metres		
<p>Working for China AGRS (Aero Geophysical Survey & Remote Sensing Center for Land and Resources), Nuvia Dynamics built a turnkey geophysical unit comprising a data acquisition and navigation system, a magnetometer and a gamma ray spectrometer. Designed to be carried by an Airbus AS350 helicopter, the system can detect metals in the ground to a depth of up to 300 metres for potential mining.</p>		

OCEANIA



No. **1**

PLACE **Spencer Gulf,
Australia**

GPS

-32.975742,
137.744155

COMPANY



PROJECT

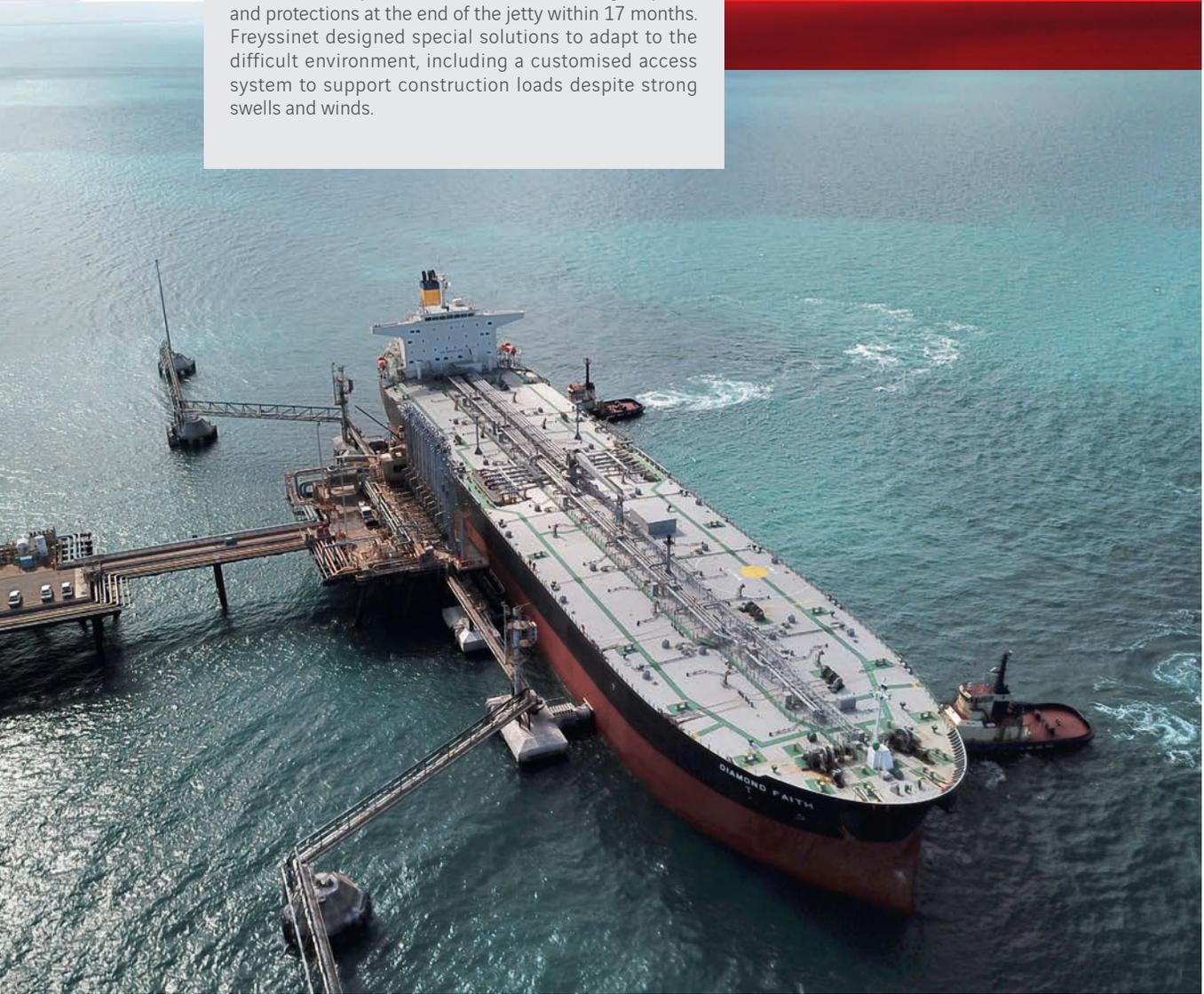
Port Bonython, an exemplary repair project

Port Bonython is a deepwater port in the Spencer Gulf, 250 km northwest of the city of Adelaide. It has a 2.5 km jetty built in the early 1980s to export hydrocarbons from a nearby refinery. Given its age, the jetty needed major refurbishment. Freyssinet managed, by dint of teamwork and meticulous project management, to carry out the main repairs on two concrete mooring dolphins and protections at the end of the jetty within 17 months. Freyssinet designed special solutions to adapt to the difficult environment, including a customised access system to support construction loads despite strong swells and winds.

SAFETY

A project with a strong safety focus

The work was carried out under difficult environmental and logistical conditions on a high-risk facility located adjacent to a world famous marine reserve. The project safety record was excellent, with 500 accident-free days.



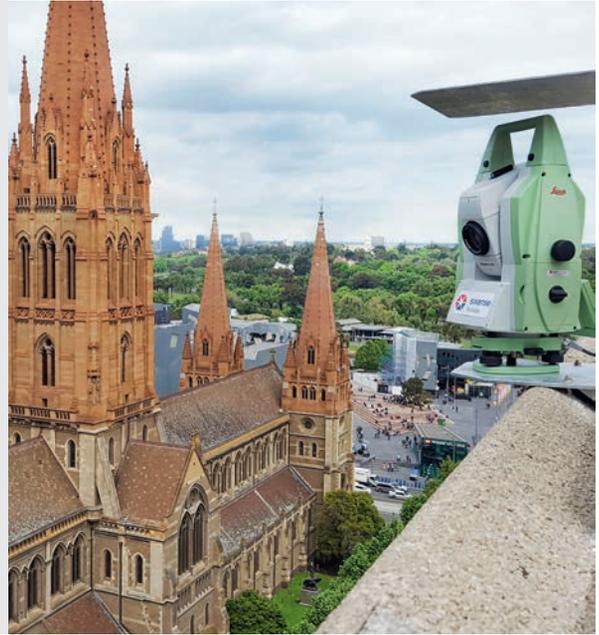
No. **2** PLACE **Melbourne, Victoria, Australia**

GPS
-37.815068,
144.966925



Melbourne metro: an integrated geotechnical and environmental instrumentation and monitoring system

Sixense won the instrumentation and monitoring contract for the preparatory work on the major Melbourne metro project. The work primarily involves excavating two 40 metre deep shafts in the city centre adjacent to several high-profile landmarks. To meet this challenge, a fully automated solution was selected and Sixense deployed a network of wireless sensors covering the full set of geotechnical, topological and environmental measurements. The Geoscope platform consolidates the data and generates reports.



No. **3** PLACE **Perth, Western Australia, Australia**

GPS
-31.889837,
115.908551



Northlink WA: Terre Armée at the heart of a large road construction project

Northlink WA, the future link between Morley and Muchea on the outskirts of Perth, will benefit the region's economy and industry as well as its residents. RECo Australia, the local Terre Armée subsidiary, was selected to deliver more than 30,000 sq. metres of TerraTilt® panels for three different bridge structures as well as noise-reducing retaining walls and two temporary walls. The Terre Armée solutions saved materials and reduced costs, once again demonstrating their efficiency and sustainability.



No. **4** PLACE **Sydney, New South Wales, Australia**

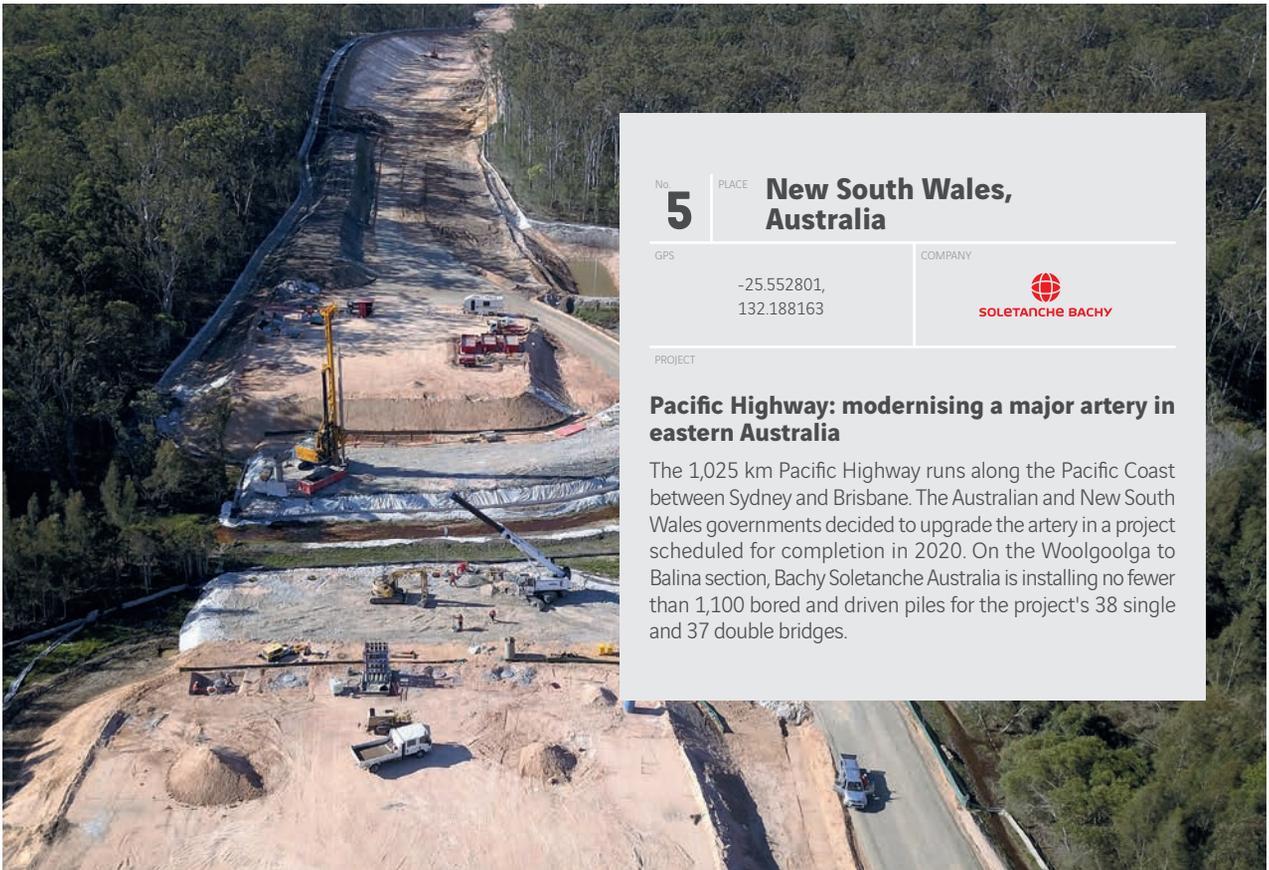
GPS
-33.868820,
151.209296

COMPANY


PROJECT

M5 WestConnex motorway: relieving traffic congestion in Sydney

The major WestConnex infrastructure project in New South Wales is designed to smooth traffic flow in the outskirts of Sydney. The M5 motorway, which is currently congested because it serves both the city and the airport, will be given two additional lanes in each direction to double its capacity. As part of this project, Menard carried out a variety of ground consolidation works, installing a 15,000 sq. metre cut-off wall to a depth of 20 metres, carrying out jet grouting, treating 20,000 sq. metres of ground by dynamic compaction (Rapid Impact Compaction method) and installing 1,500 metres of 750 mm CFA piles and Controlled Modulus Columns over 21,500 linear metres. The M5 is scheduled to re-open in early 2020.



No. **5** PLACE **New South Wales, Australia**

GPS
-25.552801,
132.188163

COMPANY


PROJECT

Pacific Highway: modernising a major artery in eastern Australia

The 1,025 km Pacific Highway runs along the Pacific Coast between Sydney and Brisbane. The Australian and New South Wales governments decided to upgrade the artery in a project scheduled for completion in 2020. On the Woolgoolga to Balina section, Bachy Soletanche Australia is installing no fewer than 1,100 bored and driven piles for the project's 38 single and 37 double bridges.



From: **Manuel Peltier,**
Chairman and Chief Executive

To: **All**

Subject: **A year of growth
and expanding expertise**



In 2017, Soletanche Freyssinet generated €3.18 billion* in revenue, representing 5% organic **growth**, riding the wave of a strong global construction market.

This market growth is due to a combination of factors. Substantial investments are being made in urban and transport infrastructure in both emerging countries, which are catching up, and mature economies. Large urban areas are being renewed within their existing footprint to cope with the shortage of space, and transport networks, such as the Grand Paris Express in France, are being densified and expanded. This race for space also calls for higher density construction, with an increasing number of high rises in urban areas. Lastly, the energy transition and growth in world energy demand are prompting investment in energy infrastructure around the world. These megatrends boosted all our activities. Order intake was strong, especially in our soil activities, since construction can only take place on solid ground.

We also strengthened our market position by **acquiring new expertise**. We expanded our technology portfolio by integrating Carpi, world leader in waterproofing, and ConeTec, the Canadian geotechnical site investigation specialist. We also invested heavily in **equipment** with the dual objective of upgrading our fleet and acquiring state-of-the-art, high-capacity machines to tackle the complex challenges of such projects as the Hong Kong airport extension. Lastly, the Group continues its **digital** transformation to meet its own needs and deliver new services for construction clients under the Sixense brand. The Digital Site application heralds the paperless worksite and improves site productivity by eliminating low-value-added tasks.

Our in-depth work to boost the **safety** of our employees continued in 2017 with a wide variety of initiatives across all entities around the world. We paid special attention to hand injuries with the annual "Safety Is in Your Hands" campaign, which generated innovative solutions and highlighted the initiatives taken by our teams facing this day-to-day risk on our sites.

To support our growth we invested – and will continue to invest – in **developing our human resources**. To meet our growing needs, we must do more, around the world, to recruit and train people by promoting our culture based on autonomy, empowerment and initiative.

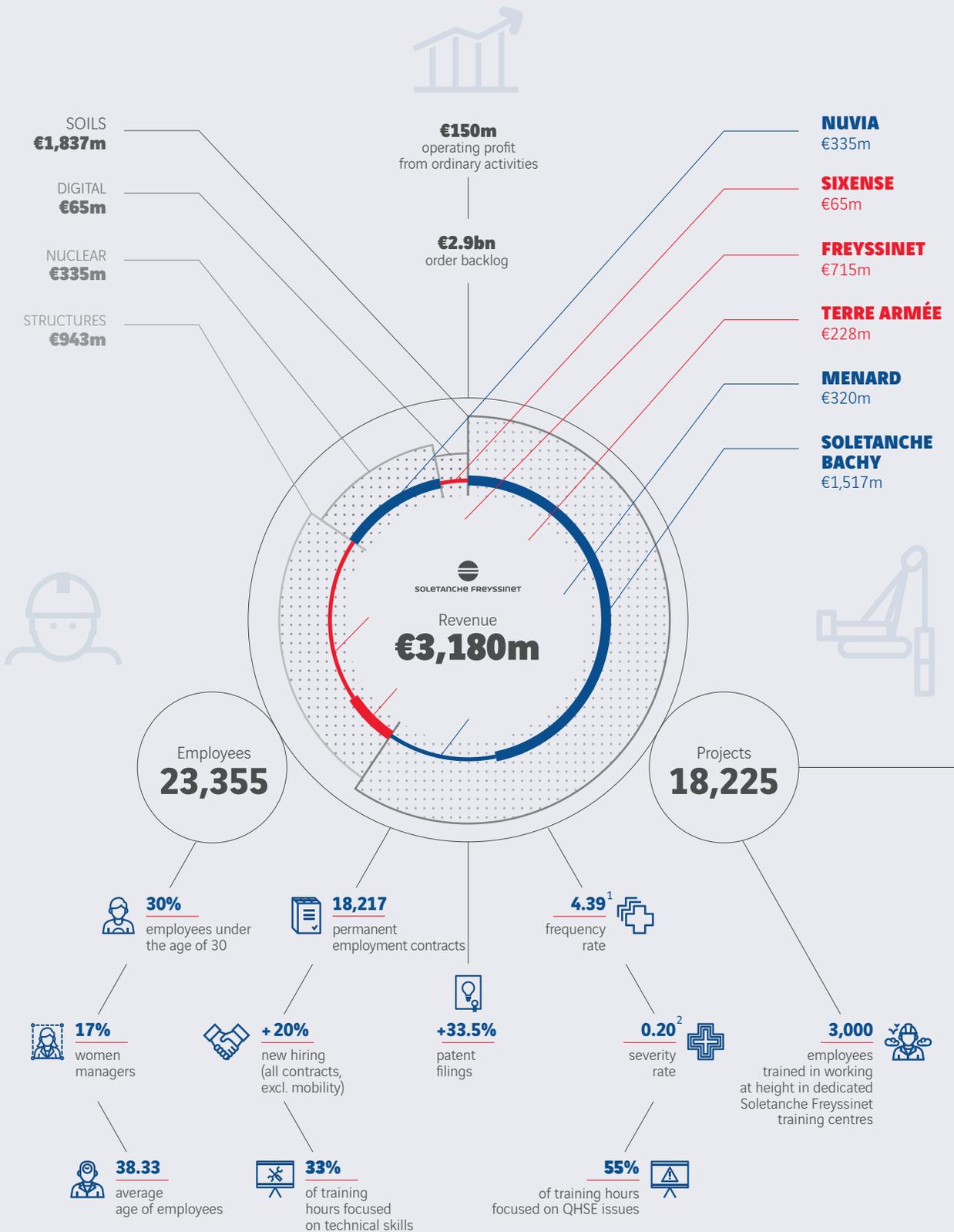
On the strength of our **wide-ranging complementary expertise**, our extensive network of locations around the world and **the unwavering engagement of our teams in serving their clients**, we move into the future with confidence.

*IFRS standards

2 > GROUP



KEY FIGURES





locations in **80 countries** operating in **120 countries** **100** nationalities **over 10** languages

- Algeria
- Argentina
- Australia
- Azerbaijan
- Belgium
- Botswana
- Brazil
- Brunei
- Bulgaria
- Cameroon
- Canada
- Chile
- China
- Colombia
- Costa Rica
- Czech Republic
- Egypt
- El Salvador
- France
- Georgia

- Germany
- Greece
- Guatemala
- Honduras
- Hong Kong
- Hungary
- India
- Indonesia
- Ireland
- Italy
- Japan
- Jordan
- Kazakhstan
- Kenya
- Kuwait
- Lebanon
- Luxembourg
- Macao
- Macedonia
- Malaysia

- Mexico
- Monaco
- Morocco
- Mozambique
- Namibia
- Netherlands
- New Zealand
- Nicaragua
- Oman
- Pakistan
- Panama
- Peru
- Philippines
- Poland
- Portugal
- Qatar
- Romania
- Russia
- Saudi Arabia
- Serbia

- Singapore
- Slovakia
- Slovenia
- South Africa
- South Korea
- Spain
- Swaziland
- Sweden
- Switzerland
- Thailand
- Trinidad and Tobago
- Turkey
- Ukraine
- United Arab Emirates
- United Kingdom
- United States
- Uruguay
- Venezuela
- Vietnam

- Arabic & Middle Eastern languages**
2,240 employees
- Asian languages**
2,880 employees
- English**
5,382 employees
- French**
5,177 employees
- Slavic languages & German**
1,545 employees
- Spanish, Portuguese & Latin languages**
6,131 employees

1 - Number of lost time workplace accidents x 1,000,000 hours worked. / 2 - Number of days lost due to workplace accidents x 1,000/number of hours worked.



M.P



MANUEL PELTIER
Chairman and Chief Executive
Soletanche Freyssinet

C.D



CHRISTOPHE DAUCHY
Chief Executive Officer
Soletanche Bachy

P.N



PATRICK NAGLE
Chief Executive Officer
Freyssinet

B.L



BRUNO LANCIA
Chief Executive Officer, Nuvia
Chief Executive Officer, Sixense

X.P



XAVIER PLANCHON
Human Resources Director
Soletanche Freyssinet

S.A



STÉPHANE ABRY
Managing Director
Soletanche Bachy

M.L



MARC LACAZEDIEU
Chief Executive Officer
Menard

V.O



VINCENT OUDIN
Chief Executive Officer
Terre Armée

M.d'A



MARINE d'ANTERROCHES
Communications Director
Soletanche Freyssinet

M.D



MARK DEARY
Chief Administrative and
Financial Officer
Soletanche Freyssinet

L.A



LORENZO ALESSI
Quality, Safety, Environment
Director
Soletanche Freyssinet

The Group's quest for excellence is also reflected in our concrete commitments to fostering project innovation, employee development, worksite safety and environmental protection. We took a number of noteworthy initiatives in 2017.

Innovation

COMMITMENT



Further progress in our flagship technologies

Each project is a challenge in which our teams constantly strive to push the technological envelope to achieve ever greater safety and performance. They devise and implement innovative solutions - with respect to methods, processes, machines, materials, measurement technologies and more - that are tailored to the constraints of the project. We build innovation momentum by attentively listening to our clients and our teams in the field, and by encouraging collaboration between subsidiaries and with partners, start-ups and research laboratories around the world.

CONSTANTLY PUSHING THE TECHNOLOGICAL ENVELOPE

Boosting performance and safety

- ★ Freyssinet designed a new stay cable protection system that enables cables to withstand a 1,000°C fire for three hours, a performance unrivalled in the market.
- ★ Terre Armée forged a partnership with IFSTTAR to develop embankments that protect infrastructure from rockfall in mountainous areas. The innovation is part of Terre Armée's core business, which makes extensive use of soil-structure interaction.
- ★ Freyssinet developed a prestressing system using a shape memory alloy to achieve simpler and more efficient PT force that can be implemented more rapidly and cost-effectively.
- ★ To boost safety, facilitate worksite operations and reduce the amount of concrete and steel required, Freyssinet and Soletanche Bachy joined forces to devise a new diaphragm wall prestressing system based on less bulky cables and smaller UHPFRC anchorages.

- ★ Nuvia worked in partnership with the French Alternative Energies and Atomic Energy Commission (CEA) to design a new generation of gamma imaging technology: NuVISION. The one-of-a-kind portable spectrometric gamma camera performs real-time imaging and is used by radiation protection and rapid response teams to observe mobile sources in sensitive sites.

Digitalisation and big data

All entities are highly invested in the strategic issue of digital transformation of worksites, more especially Sixense, with digital transformation as its core expertise. A major goal is to utilise and capitalise on the data derived from our operations, particularly geotechnical works, where techniques, processes, machines and equipment generate an enormous volume of raw data. For example, on the Hong Kong airport extension project (see page 39), which employs 16 machines, Soletanche Bachy set up an innovative data system based on rigorous real-time monitoring of drilling operations. The system directly benefits the client and helps the teams coordinate and analyse production. Menard has designed special instrumentation to acquire data in a number of techniques such as dynamic compaction and has modernised its monitoring systems. These necessary technological improvements also optimise the engineering, design and production processes, boost reporting reliability, support predictive equipment maintenance and ensure traceability of operations. All this significantly improves the quality and safety of our worksites for the benefit of our clients.

2017 Soletanche Freyssinet Innovation Awards

- The 34 winners of the 2017 Awards notably included:
- ★ Terre Armée, India: TechRevetment®, an innovative embankment erosion protection system.
 - ★ Soletanche Bachy, United Kingdom: "Interactive House", a 3D demonstration of Roger Bullivant's packaged foundation systems.
 - ★ Sixense, France: "Visite de Gestion Mobile", the mobile version of ScanPrint®, used to monitor and maintain SNCF Gares & Connexions (French railways) assets.

Environment

COMMITMENT



New solutions and services to anticipate risk

Reducing the environmental footprint of our worksites is an integral part of our approach to our specialist activities. Our mission on each project, starting at the design stage, includes saving resources by optimising design, methods and works. "Building differently" is part of our DNA and the watchword of our integrated design offices, which devise the efficient and innovative solutions that best meet the goals and challenges of each project.

Pollution reduction, infrastructure protection, soil investigation: our expanding solutions

We build on our ground and complex operation expertise to develop new risk reduction solutions. Terre Armée teams optimise existing solutions and innovate to protect infrastructure from the impact of climate change, including erosion, landslides and flooding. Menard consolidated its

soil investigation expertise with the acquisition of the Canadian ConeTec company and boosted its positioning in remediation works by creating the Remea brand. In 2017 Menard further expanded this activity on projects including a textile dye factory in Huningue (France), infrastructure in Poland and the Grand Paris transport programme.

"BUILDING DIFFERENTLY" IS PART OF OUR DNA

EOLESENSE®: an efficient technology to predict the noise impact of wind turbines

Meanwhile, Sixense developed a new patented technology that is revolutionising wind farm noise impact studies. The EOLESSENSE® technology makes it possible, from the start of the baseline study, to measure acoustic activity in the target area in real time and simulate the impact of wind turbines at the site to help reduce the obstacles to developing this type of facility.

Safety

COMMITMENT



Targeted training and managerial engagement

Our priority is to ensure the highest level of safety for our employees, partners and subcontractors while carrying out our operations. From the design stage onwards, health and safety and the safety culture are an integral part of our working methods on our worksites and in our workshops, factories and agencies. We strive to boost individual and collective responsibility and to make safety second nature in our day-to-day operations.

SAFETY: OUR DAY-TO-DAY PRIORITY

Raising employee awareness of the risk of hand injuries

We regularly raise awareness of major risks. In 2017, we rolled out a Group-wide "Safety Is In Your Hands" campaign to draw attention to accidents involving the hands. It was supported by a film, meetings and

activities on the worksite, some of which involved the families, and an innovation competition designed to share best practices.

Training to prevent traffic accidents

Special attention is paid to traffic accidents. Drivers are given comprehensive training that combines e-learning and practice. Continuing the commitment we made in 2016 to reduce the number of falls from height, we have already set up 10 in-house training centres on three continents focused on working at height. Nearly 3,000 employees have been trained.

Boosting safety management in a collaborative approach

The individual entities are also very active: Soletanche Bachy revised its induction programme to further emphasise safety. Freyssinet developed a Safety Contract under which the local subsidiaries engage in a collaborative, customised programme designed to enhance safety management. PreStart Meetings have been systematically introduced on worksites with enhanced training materials including a film and an educational booklet.

Solidarity

COMMITMENT



Engagement in the field

Everywhere we operate, we do our utmost to find new ways for our employees to develop their skills and to ensure that our projects are a source of opportunity for everyone. Our managers are committed to putting our values of solidarity and employee development into practice, in keeping with the principles of the Group's Code of Ethics and Conduct.

"Going To School Together", to efficiently combat illiteracy

In Colombia, 17% of our employees have only a primary school education and 12% suffer from total or partial illiteracy. Soletanche Bachy set up the accelerated "Going To School Together" programme, which consists of 80 hours of courses

taught by specialist instructors and cultural activities. In 2017, 31 of its workers enrolled in the programme and were assigned a mentor within the company. The demonstrable results are improved skills, fewer accidents and smoother induction.

Fostering integration in partnership with a charity

As part of the Thames Tideway Tunnel project in the United Kingdom, Soletanche Bachy is involved in the pre-hiring programme conducted by Thames Reach, a charity that helps the homeless and other vulnerable people to find employment. A total of 15 internships were provided and 12 people were employed by Tideway companies, including five on the Tideway East contract.

STRONG FOCUS ON EMPLOYEE DEVELOPMENT

Human resources

COMMITMENT



Accelerated training, diversified career paths

In 2017, the Group continued to invest in its human resources, in keeping with the major thrust of its strategy: accentuating recruitment and induction programmes, fostering the career development of its employees and encouraging mobility under the best possible conditions. The goal is to offer employees stimulating career prospects and diversified assignments.

Group's standards of excellence in preparing and executing projects. The programme also applies to each subsidiary, which adapts its processes prior to training its employees in the basic shared practices. In 2017, the Orchestra rollout was expanded on all continents to new profiles and new solutions and services. Soletanche Bachy added 12 further countries to the programme; Freyssinet extended it to foremen, after training the full range of project supervisors. Terre Armée customised it to its own product lines. By boosting employee skills, Orchestra provides added value for clients. The Orchestra "trademark" brings increasing efficiency and performance to the management of our projects.

Boosting mobility and training throughout the Group

Opportunities for exchanges between business activities, subsidiaries and continents broaden the horizons of our employees and our companies, as Nuvia demonstrated when it carried out some 40 mobility transfers. The training effort kept pace with the growth in the Group's business activity, with operations and management training stepped up within the Freyssisschool, the Nuvia Academy and Sixense Formation.

Orchestra: across-the-board rollout during the year

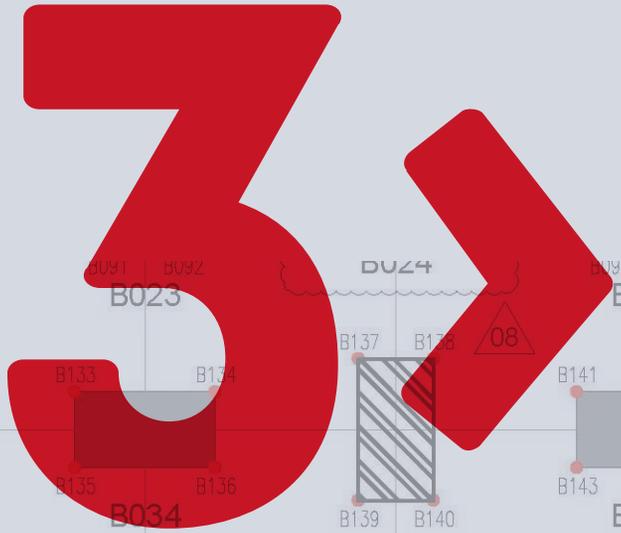
This integrated project training course is used by all entities. The purpose of Orchestra training is to boost the ability of project managers to meet the

Innovative training in technical skills

The introduction of specific training designed in-house goes hand-in-hand with innovative tools that provide new potential for learning our skills and mastering our expertise.

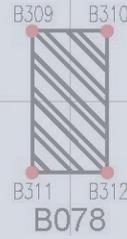
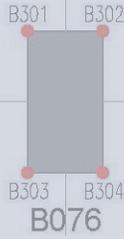
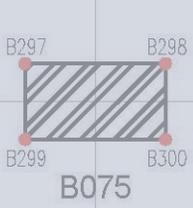
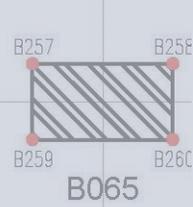
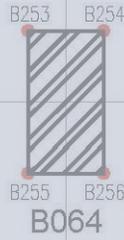
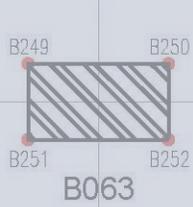
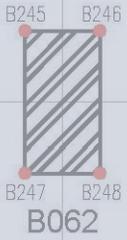
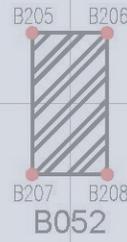
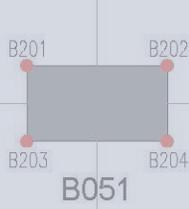
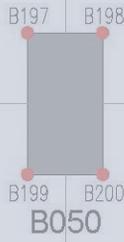
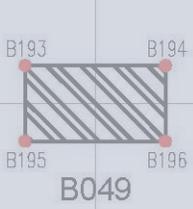
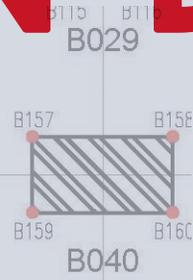
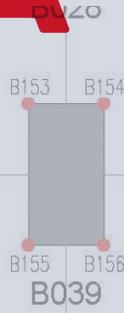
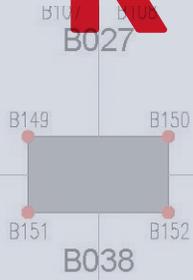
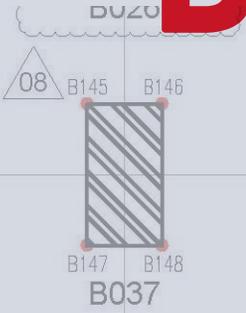
Bessac developed the first virtual reality arch segment installation simulator (ViSAS), focused on the key operation in TBM tunnel construction. Soletanche Bachy created the first Hydrofraise® simulator. These exciting full scale virtual environments provide safer, faster and more comprehensive training and make our jobs more attractive to young people.

Designed as initial training for new operators or refresher courses for more experienced people, these programmes are set to come into broader use, notably as they are applied to further types of equipment and operations.



**The teams
composing our
international
network bring
state-of-the-art
technologies and
operational excellence
to the construction and
engineering sector.**

BRANDS





ACTIVITY

World benchmark in foundations and soil technologies

Soletanche Bachy delivers comprehensive main contracting capabilities for large infrastructure projects as well as the complete range of specialist capabilities in geotechnical processes, special foundations, underground works, marine facilities and ground improvement.

SPECIALITY

FOUNDATIONS

REVENUE

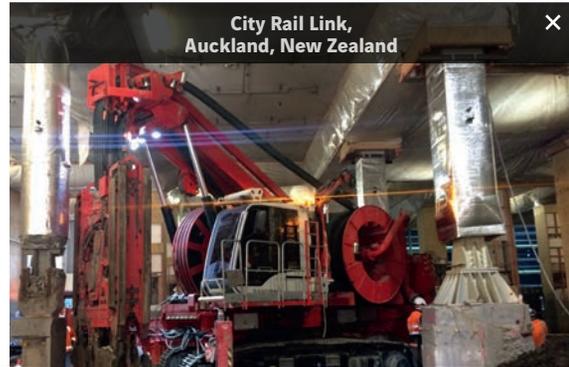
€1,517m

EMPLOYEES

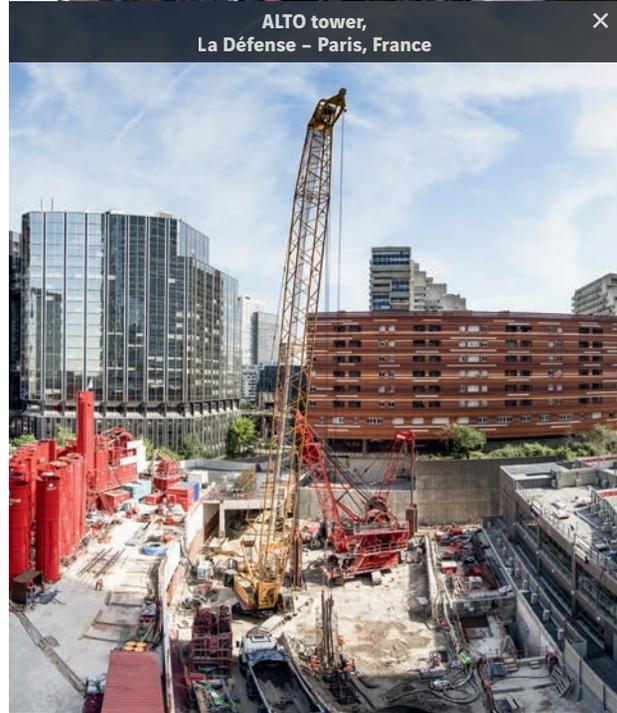
10,215

ORDER INTAKE

- Portage Lakes Dam, Ohio, United States
- Highway A019, Córdoba, Argentina bypass
- Light rail section between the Pont de Sèvres and Fort d'Issy – Vanves – Clamart stations, France
- Trans Adriatic Pipeline, Albania
- High-speed train and metro station for the new airport in Istanbul, Turkey
- Parramatta Square urban renewal project, Australia



City Rail Link,
Auckland, New Zealand



ALTO tower,
La Défense – Paris, France



Port of Brighton, Trinidad and Tobago

From: **Christophe Dauchy, Chief Executive Officer**
Subject: **Three questions for...**

What were your markets like in 2017?

More or less everywhere, economic growth and expanding urbanisation supported demand for residential buildings and industrial and commercial infrastructure. Furthermore, for several years now large metropolitan areas have been focusing on mobility, which has prompted the development of new metro and light rail lines. Against this backdrop, the Soletanche Bachy teams focused in 2017 on proposing innovative and suitable solutions to meet the expectations of their clients. The Group's revenue increase reflects their success. Activity was particularly strong in large infrastructure projects such as the iconic Grand Paris programme and the Hong Kong airport extension project, to mention only two.

Does the combination of major projects and local contracts constitute one of the keys to the Group's strength?

We try to make sure our order book is balanced and reflects our strategic model, which is based on a local/global approach. It is supported by the two pillars of our organisation. On the one hand we have our local subsidiaries, which often handle "small" projects; they are firmly rooted in their markets and operate close to their clients. On the other, we have Soletanche Bachy International, which carries out major projects around the world and focuses on expanding into new activities such as marine works and into certain market segments such as dams and nuclear engineering. These two pillars complement each other and give our model its strength.

What is THE priority for 2018 and thereafter?

One of our priorities is to strengthen and improve our relationships with our clients. We must see to it that we get to know them better and understand them better in order to better meet their expectations. Digital tools can help us do that, but client relations are above all a matter of client experience, which we must all work to cultivate and improve. It is central to our focus.



Rivière des Galets Bridge,
Reunion Island, France



Whitechapel Station, London,
United Kingdom

**OUR
CENTRAL
FOCUS:
THE CLIENT
EXPERIENCE**



ACTIVITY

Key soil investigation, improvement and remediation provider

Menard develops foundation solutions based on ground improvement and reinforcement technologies. Its treatments eliminate the need for the deep foundations traditionally used to support surface structures. The Group also operates throughout the infrastructure life cycle, offering expertise in soil investigation and remediation through its ConeTec and Remea brands.

SPECIALITY

GROUND IMPROVEMENT

REVENUE

€320m

EMPLOYEES

1,200

ORDER INTAKE

- I-295 Direct Connection project, Camden County, New Jersey, United States
- Avenida del Rio project, Baranquilla, Colombia
- Port of Brest expansion, France
- South Spine project, Abu Dhabi, United Arab Emirates
- Sydney metro, Australia
- Soil remediation in Huningue, France

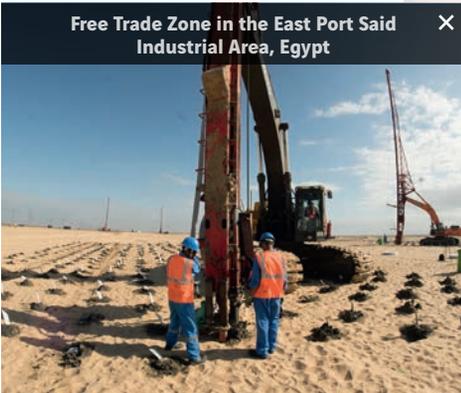
Highway TH169 – Nine Mile Creek project, Minnesota, United States



Latam storage area, Bogota, Colombia



Free Trade Zone in the East Port Said Industrial Area, Egypt





**OUR
STRONG
POINT: OUR
ABILITY TO
SIMPLIFY
COMPLEX
ISSUES**

New Palmas Altas shopping centre, Seville, Spain



From: **Marc Lacazedieu, Chief Executive Officer**
Subject: **Three questions for...**

Was 2017 a growth year for Menard?

I would say it was a very good organic growth year in Europe, the Middle East and Latin America and to a lesser extent in Asia and Australia. We marked time in North America after several years of outstanding results. In all these markets, our momentum was driven by several major projects and above all by the in-depth work we have done there. Our subsidiaries, which have strong local roots, ensure an ongoing volume of recurring projects.

How did your scope of activities change?

We made one major acquisition when we bought the Canadian ConeTec company, which specialises in geotechnical site investigation. We also boosted our positioning in remediation by setting up our Remea brand. Menard now has three complementary business lines. ConeTec carries out the geotechnical site investigations needed to design projects such as settling ponds for mine tailings. The company operates primarily in Canada, the United States and South America, but there is a potential market on all continents. Menard's longstanding business activity, ground

improvement, is provided by about 30 subsidiaries around the world. Lastly, the Remea remediation activity is set to expand in countries that have pollution remediation standards and regulations; outside France, we provide this service in Australia and Poland. We are pushing these three business lines beyond their current boundaries, via the Menard network.

What is the common added value of these business activities?

Our ability to simplify complexity. Ground characteristics can never be perfectly identified and qualified. We know how to manage this complexity and come up with simple solutions to enable our clients to cope with it. This is based on heavy investment in R&D. The Menard "hives", the collaborative innovation programme introduced in 2016, enabled us to identify several key topics last year that we are now working on, the goal being to round out our range of efficient, competitively priced techniques.



ACTIVITY

World leader in retaining structures

The Terre Armée Group, which introduced the Reinforced Earth® technique, has unrivalled experience in reinforced backfill and soil-structure interaction. Its techniques are applied in projects ranging from roads and motorways to railways, industry, the environment and water engineering.

SPECIALITIES

RETAIN, CROSS, PROTECT

REVENUE

€228m

EMPLOYEES

890

ORDER INTAKE

- Christchurch Northern Corridor, New Zealand
- Slope stabilisation and road reconstruction, Tindharia, India
- Reinforced Earth® access ramps, Kearsarge Extension Project, Canada
- Stone Oak Parkway project, Texas, United States
- İkitelli Integrated Health Campus, Istanbul, Turkey
- TER access ramps and retaining structures, Dakar, Senegal

HEAVY INVESTMENT IN OUR INDUSTRIAL ACTIVITY



Reinforced Earth® walls along the Paris-Bordeaux high-speed rail line, France



Danang – Quang Ngai expressway,
Vietnam



Customised facing panels for Reinforced Earth® walls along
the Horseshoe motorway, Dallas, Texas, United States



Interchange, Macleod Trail and 162nd Avenue,
Calgary, Canada



From: **Vincent Oudin, Chief Executive Officer**
Subject: **Three questions for...**

How did business develop at Terre Armée in 2017?

Business volume grew in all the world regions where we operate, with the exception of Europe. This goes for all three business activities. The Retain solutions that account for more than 80% of our overall volume and the Cross solutions that account for more than 10% were driven by the buoyant global infrastructure construction market. Protect – i.e. protection from environmental risks such as rockfall, avalanches, coastal and river erosion, etc. – is an area where the need for investment is growing rapidly and where Terre Armée has a strong position. On all three markets, we have set our sights high in terms of diversification and geographical locations.

Within that strategic framework, what were your priorities?

Above all, to make the most of our global leadership, our presence in some 40 countries and our collective expertise in order to better meet the expectations of our clients across all countries. We are working to organise a global innovation network, to optimise our engineering and purchasing tools and methods and make them uniform and to set up more interactive communication with our clients and partners. All these "projects" are closely related to the digital transformation of our company. A fourth focus is the industrial dimension of our activity. We are increasingly fabricating the materials we use on our sites and are planning to invest heavily in extending our existing factories and opening new ones starting in 2018.

How does Terre Armée's range of solutions and services stand out from the competition?

We create value by proposing and implementing solutions that are as comprehensive as possible. Clients do not come to us to buy off-the-shelf products but rather to seek solutions that include products, services and engineering. Value engineering is a big part of our business. To address a problem, we optimise the solution for the benefit of the client. That is probably where the Terre Armée teams really come into their own.



ACTIVITY

**World benchmark
in construction and structural
repair**

Post-tensioning, construction methods, cable-stayed structures, structural accessories, structural reinforcement, concrete repair, reinforcing steel protection, earthquake protection and specialised maintenance - Freyssinet makes its specialist services available in two major fields: construction and structural repair.

SPECIALITY

CONSTRUCTION & REPAIR

REVENUE

€715m

EMPLOYEES

8,200

ORDER INTAKE

- Reinforcement of the P2 bridge at Orly Airport, France
- Refurbishment of the Kpémé wharf, Togo
- Ihsaniye and Kalyon viaducts, Turkey
- Rogun Dam, Tajikistan
- Phuoc Khanh and Binh Khanh cable-stayed bridges, Vietnam
- San Martin Viaduct, Argentina

**INNOVATION,
CLIENT
FOCUS,
PROACTIVE
APPROACH**

Repair of the Mesches Dam, France



Repair of the Aconcagua and David Garcia bridges over the Aconcagua River, Chile



From: **Patrick Nagle, Chief Executive Officer**
Subject: **Three questions for...**

What were the main changes in your markets in 2017?

The overall revenue of the Group remained stable, but a number of geographic areas were particularly buoyant – especially the United States and above all Asian markets such as Hong Kong, Indonesia, and Malaysia, where we generated record revenue in 2017. In Europe, we did well in France, where repairs account for 90% of our business volume. Strong regional locations, detailed market analysis and robust marketing were the key thrust of the strategy that generated strong growth. In Latin America, new markets are opening up in Peru, Argentina and Chile.

What proportion of Freyssinet's business volume does the repair activity account for?

A bit more than 40% worldwide. Our activity is concentrated on new construction and structural repair. In terms of overall growth, the repair activity is expected to increase substantially. Freyssinet also stresses client service and our proactive sales and marketing work provides real added value. Freyssinet is also expanding in areas related to major global issues such as wind energy and earthquake protection, where we have innovative solutions to offer.

What are your priorities in 2018 and afterwards?

One of Freyssinet's strengths is its teams' ability to go outside their technical comfort zone and to take controlled risks. We need to continue to do that because there are enormous challenges in the construction sector that need to be addressed. Prestressing, cable stay protection, new materials and digital analysis are some of the areas in which our R&D teams are coming up with innovative solutions. We also want to work more closely with our clients, listen to them, better understand their needs and build suitable solutions together with them.





ACTIVITY

A specialist in nuclear and other highly regulated environments

Nuvia is a nuclear industry partner offering innovative engineering, service and product solutions for industrial facilities and sensitive environments. It provides services ranging from construction to waste management, life span extension and equipment operation while ensuring excellence and meeting safety and security requirements.

SPECIALITY

NUCLEAR ENGINEERING

REVENUE

€335m

EMPLOYEES

2,380

ORDER INTAKE

- Nuclear Sampling System, Hinkley Point C, United Kingdom
- Plastic scintillator plates for the CERN ICARUS sensor, France
- Radiation protection for Bruce Power, Canada
- Design of hot cells for nuclear laboratories, Canada
- Encapsulation and cementation plant, Sellafield Ltd, United Kingdom
- Construction of a supporting wall for the ITER Cryostat, France
- Operational maintenance of remote control arms, ORANO La Hague, France

STRONG EXPANSION IN THE MEDICAL SECTOR

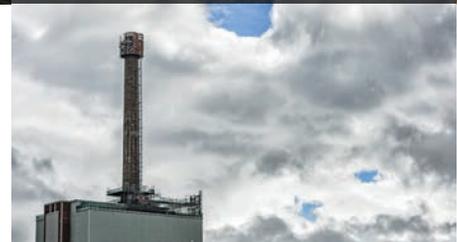


Scaffolding for asbestos removal from the EDF thermal power plant in Martigues, France



Storage and handling of nuclear fuel, Ignalina nuclear power plant, Lithuania

Decommissioning of a stack, Sellafield site, United Kingdom



Radiation monitoring, nuclear power plant in Darlington,
Ontario, Canada



Elimination of water leaks,
Kakrapar Atomic Power Station, India



From: **Bruno Lancia, Chief Executive Officer**

Subject: **Three questions for...**

What were the major trends on your markets last year?

2017 was a stable year for the Group against a global backdrop of declining investment in nuclear power generation. China, India and Russia, where the nuclear industry is dynamic, are difficult markets. We have few operations there. Elsewhere, Nuvia is positioned in a broad range of activities: new build construction, especially for the Hinkley Point project in the United Kingdom; construction of facilities for the nuclear research sector, for example the EPURE project at Valduc and the ITER programme in Cadarache, in France; decommissioning operations across the entire nuclear cycle, in which we do a substantial amount of work in Europe; and services, such as those we provide in Canada, where our engineering, radiation protection and waste treatment activities are undergoing strong growth.

Have there been new developments in your diversification strategy?

Nuvia has long worked in the defence markets in France and the United Kingdom on nuclear deterrence. We are now extending our operations to further countries, such as the Czech Republic, Canada and the United States, with a comprehensive range of services, engineering and products. The medical sector is another area in which we are building on a specific range of services to branch out into applications that are independent of nuclear energy policy choices. Our new products and services in fire, flood and earthquake protection and scaffoldings are also getting off to a good start in the nuclear sector as well as in other sensitive environments.

What are your goals in coming years?

To provide our clients with a broad range of services and technologies focused on excellence. In the near term, our goal is the worldwide rollout of the full complement of nuclear measuring solutions already being sold under the NUVIA Tech brand. And lastly, we are going to boost our operations in countries where we are only marginally present for the time being.



ACTIVITY

Expertise at the heart of digital services and solutions

Combining our expertise in infrastructure and digital technology to offer infrastructure designers, builders and operators optimisation and durability solutions throughout the entire life cycle.

SPECIALITY

DATA SOLUTIONS

REVENUE

€65m

EMPLOYEES

570

ORDER INTAKE

- Eole instrumentation - La Défense station and adjacent tunnel, France
- Track instrumentation, Line A of the Toulouse metro, France
- Redevelopment of the former Central Police Station in Hong Kong
- Venice Beach pumping station, Los Angeles, Ca., United States
- Structural behaviour testing, ENSAM Paris Tech, Aix-en-Provence, France
- Corrosion diagnostics for the Tancarville Bridge, France

Instrumentation of prestressing bars, Adolphe Bridge, Luxembourg



Detailed analysis of console prestressing, Olympic Stadium, Montreal, Canada



Inspection of the metal frame of the Kpémé wharf east of Lomé, Togo



WE COVER THE INFRA-STRUCTURE DATA CYCLE

From: **Bruno Lancia, Chief Executive Officer**
Subject: **Three questions for...**

What is your view of Sixense's first full year of activity?

Sixense offers traditional services: engineering, technologies and services designed to optimise structures, soils and their environment, to which we add digital capabilities. The development of the new brand has exceeded all our expectations, demonstrating that our range of services meets strong demand in the building and civil engineering sector and more broadly the entire infrastructure sector. We are continuing to recruit people and roll out the services in France and in other countries.

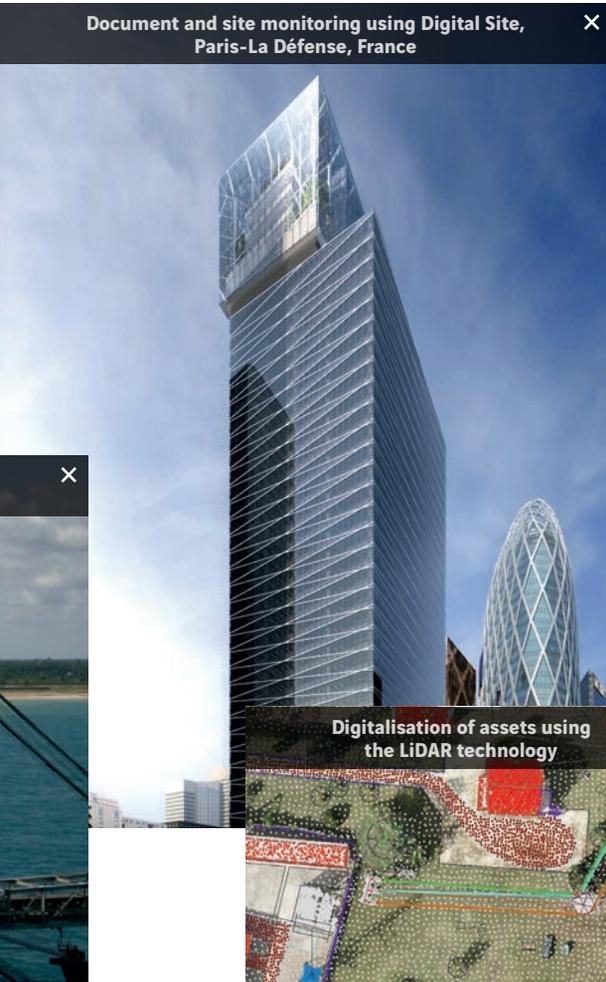
What form does the digital dimension of your range of services take?

Sixense Digital has developed and marketed a range of digital solutions and packaged services that can be accessed from a PC, tablet or smartphone and that cover the entire infrastructure life cycle. Digital Site is used to manage a construction project from start to finish, optimising the full range of processes. The Archade European hadrontherapy centre in Caen was one of the first projects to have the benefit of the tool. Since then, several hundred projects have used it in France and it is spreading to the rest of Europe and beyond. ScanPrint, focused on infrastructure management and maintenance, has been used in many applications in France, Europe and North America. The Geoscope tool, which provides monitoring data in real time to control structure risks, has also been a great success. Sixense operates across the entire infrastructure data cycle, from collection to analysis.

Do you expect your markets to expand?

Urban density will increase with population growth. More infrastructure will have to be built, but in increasingly difficult conditions due to lack of space and tighter environmental requirements. Add to that a legitimate effort to control investment and operating costs and it will clearly be necessary to monitor, inspect and measure more and more behaviours of structures and infrastructure throughout their life cycle. Sixense provides not only the requisite instrumentation but also the modelling, diagnostic and analytical capabilities and services required. The combination of our range of services against a backdrop of infrastructure development holds out many opportunities for growth.

Document and site monitoring using Digital Site, Paris-La Défense, France



Digitalisation of assets using the LiDAR technology



SOLETANCHE FREYSSINET

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TERRE ARMEE



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