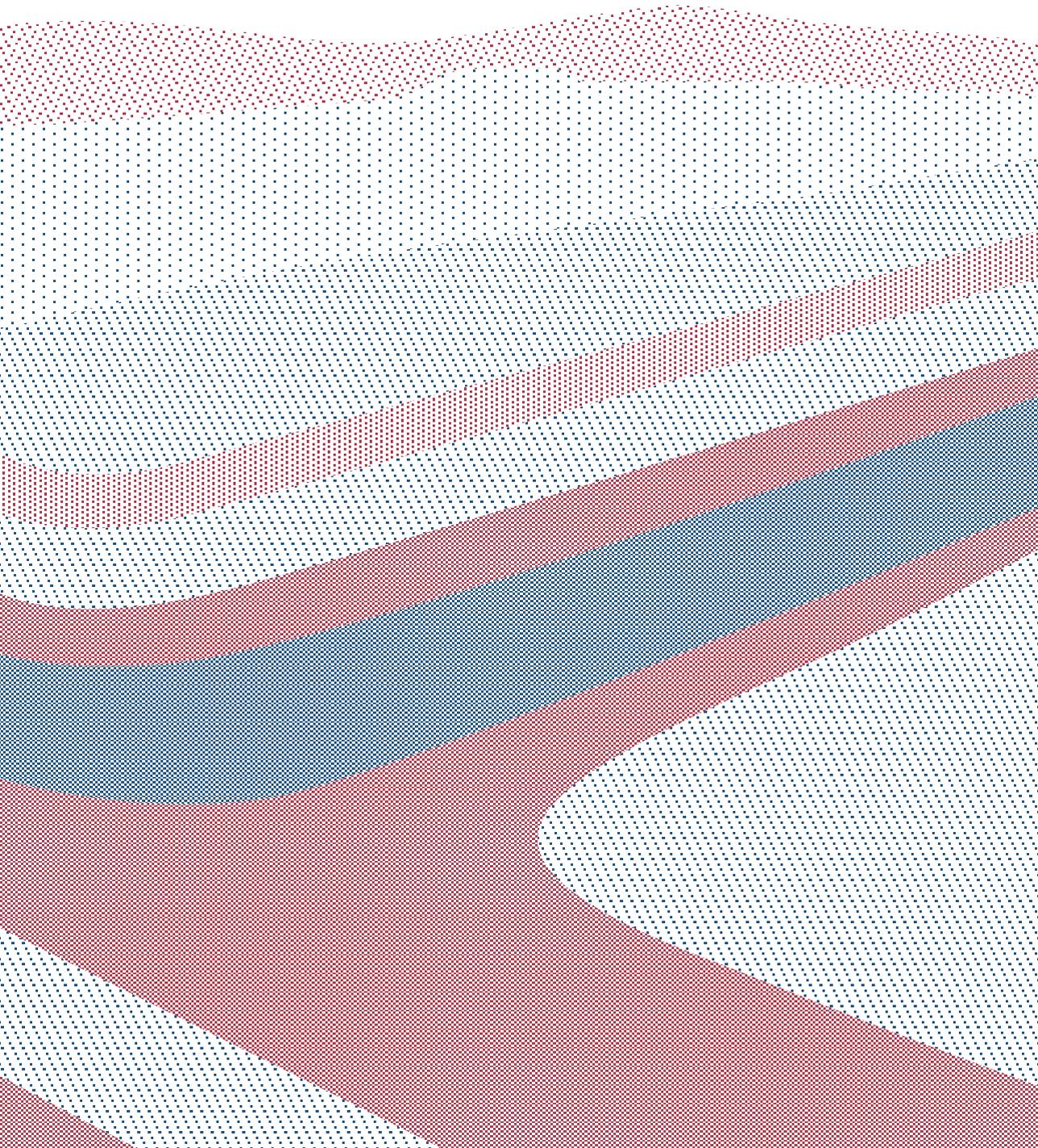
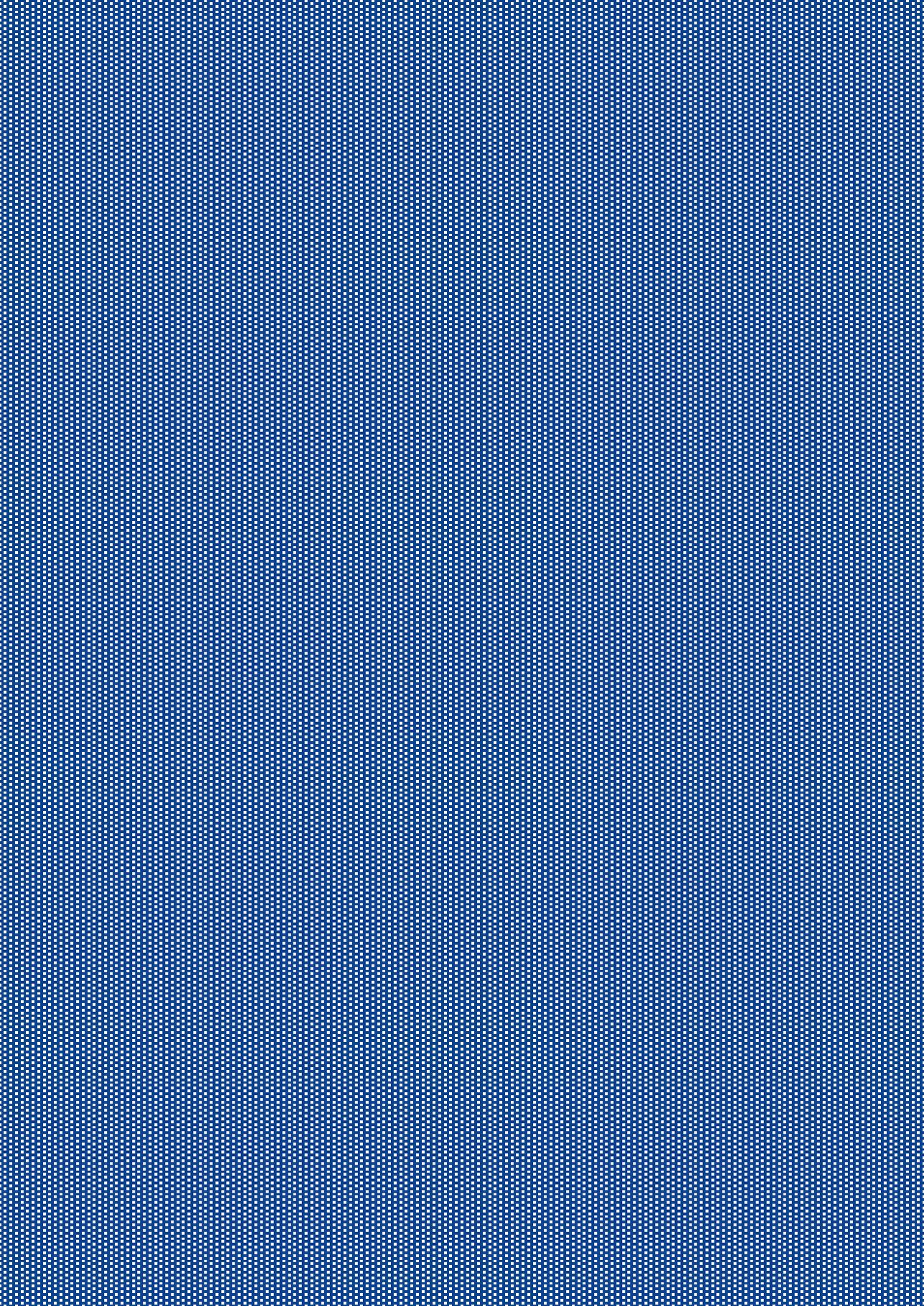


# Soletanche Freyssinet

2018  
Activity report





# 2018 Activity report



SOLETANCHE FREYSSINET

## **04.**

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from the Chairman

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Commitments

The 2018 Soletanche Freyssinet activity report is structured in seven volumes: the brochure covering the Group and six brochures setting out the activity of each of our brands.

Soletanche Freyssinet is world leader in soil, structural and nuclear engineering.

The Group offers an unparalleled array of construction and engineering expertise and brands. Soletanche Bachy, Menard, Terre Armée, Freyssinet, Nuvia and Sixense deliver technical excellence to ensure the performance and sustainability of structures.

The Group supports the expansion of its brands by providing them with resources to extend their networks throughout the world and to broaden their technology portfolios.

## Message from the Chairman

“Very good performance in 2018, and an increase in the order book”

**T**he Soletanche Freyssinet Group’s 2018 revenue\* rose 4.8% on 2017 to €3.271 billion.

This growth was driven by strong business volume in Asia, Australia, France and North America, and by the acquisition of ConeTec in Canada, Rob Carr in Australia and Concreet in the Netherlands in 2017 and 2018.

Our order book increased for the fifth consecutive year to a record €3.2 billion, which consolidates the Group’s future. The new projects are divided between short-term, recurring activity and major projects scheduled over several years. Beyond the many projects currently under way or finalised, we won a number of exceptional contracts in 2018, including the second phase of the Port Said industrial zone in Egypt, for Menard; the I-66 interstate highway in the United States, for Terre Armée; logistics services at the Dampierre nuclear power plant in France, for Nuvia; the roof of the Las Vegas Stadium, for Freyssinet; the underground road corridor in Singapore, for Soletanche Bachy; and monitoring of the Grand Paris transport infrastructure project, for Sixense.

All this demonstrates the momentum in the international speciality works sector, in which our Group plays a major role thanks to our comprehensive expertise and our strong business presence worldwide, close to our customers. We are doing our utmost to continue this growth in 2019 and thereafter. As part of this effort, Soletanche Freyssinet earmarks a significant proportion of its annual budget to innovation, to help us meet the current and future needs of our customers. Our design offices are fully committed to innovation, following in the footsteps of Pierre Bachy, Louis Ménard, Henri Vidal and Eugène Freyssinet, the pioneering founders of our companies.

“The work we have done over many years to improve safety is bearing fruit. Our teams are fully invested in safety and are putting forward a wide range of ideas for making progress in our safety practices.”



**Manuel Peltier,**  
Chairman,  
Soletanche Freyssinet

These technical innovations support the major vectors of growth in our markets, which will sustain our business over the long term. Structural maintenance, for example, is generating substantial investment. Freyssinet and Sixense offer unrivalled expertise in this area.

I could also mention the environment, which is a major and growing concern for the public at large and for our customers. We have solutions to offer, including those put forward by Remea, Menard's subsidiary specialising in remediation, and the Soil Mixing technique used by Soletanche Bachy to improve the ground for the Hong Kong airport while conserving marine ecosystems. The launch of ActivSkeen in active facades and the acquisition of Ertex Solar in photovoltaics applied to buildings are also part of this endeavour. Lastly, our customers are increasingly focusing on resistance to climate events and seeking to build stronger new structures and retrofit existing ones. This is a particularly acute issue in the nuclear sector, for which Nuvia

“We are entrepreneurs. We build projects in the public interest that are needed to address our evolving urban fabric, transport network and energy needs.”

has developed specific solutions to protect structures from earthquakes and flooding. Meanwhile, Terre Armée has developed solutions for preventing embankment erosion and raising dams.

To support this growth, we will continue to invest in recruitment, reaching out in particular to young people and women, and to support our teams around the world.

Since its inception a decade ago, the Soletanche Freyssinet group's revenue, areas of expertise and geographical reach have all undergone considerable expansion. Brought together by our common values of innovation, safety culture and passion for our business activities, the men and women at Soletanche Bachy, Menard, Terre Armée, Freyssinet, Nuvia and Sixense are continuing to write the history of our Group, doing everything in their power to support our customers and working with them to shape the world of the future, its cities and its transport and energy systems. Building on these assets, we can go forward with confidence.

\* Managed revenue

# Key figures

Revenue<sup>1</sup>

€3,271m

Projects

20,623

Operating profit from ordinary activities

€150.5m

Employees

23,131

Order backlog

€3.2bn



**29%**  
employees  
under  
the age of 30



**18,596**  
permanent  
employment  
contracts



**4.02**  
frequency rate<sup>2</sup>



**2,234**  
patent filings



**18%**  
women managers



**32%**  
of training  
hours focused  
on technical skills



**0.23**  
severity rate<sup>3</sup>



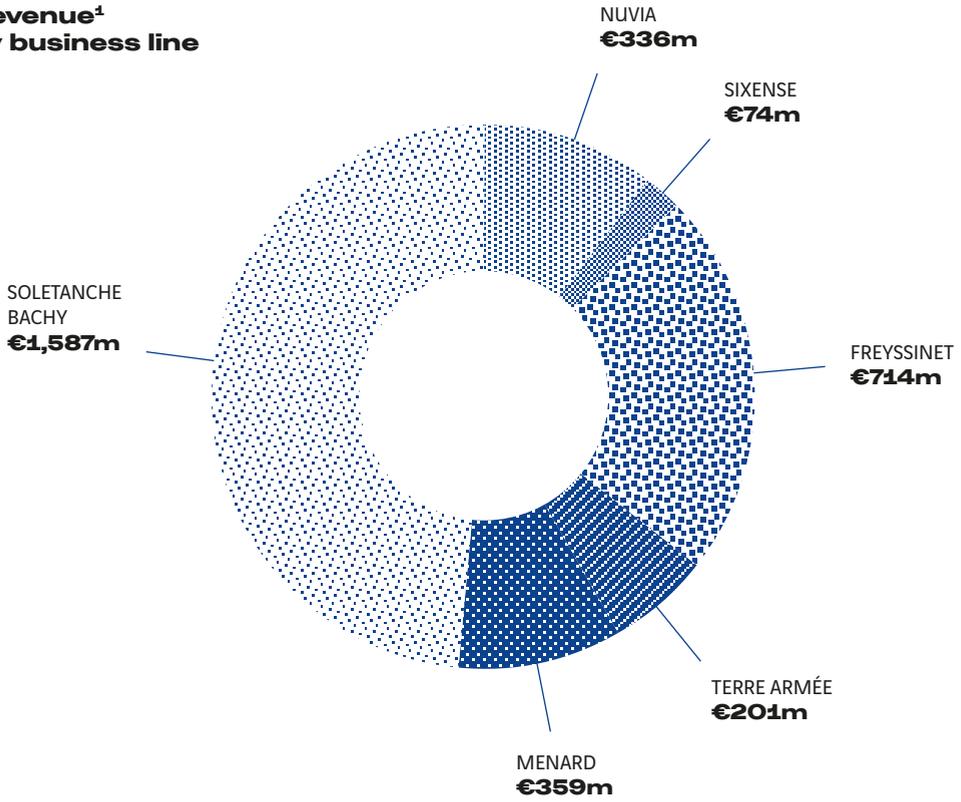
**39**  
average age  
of employees



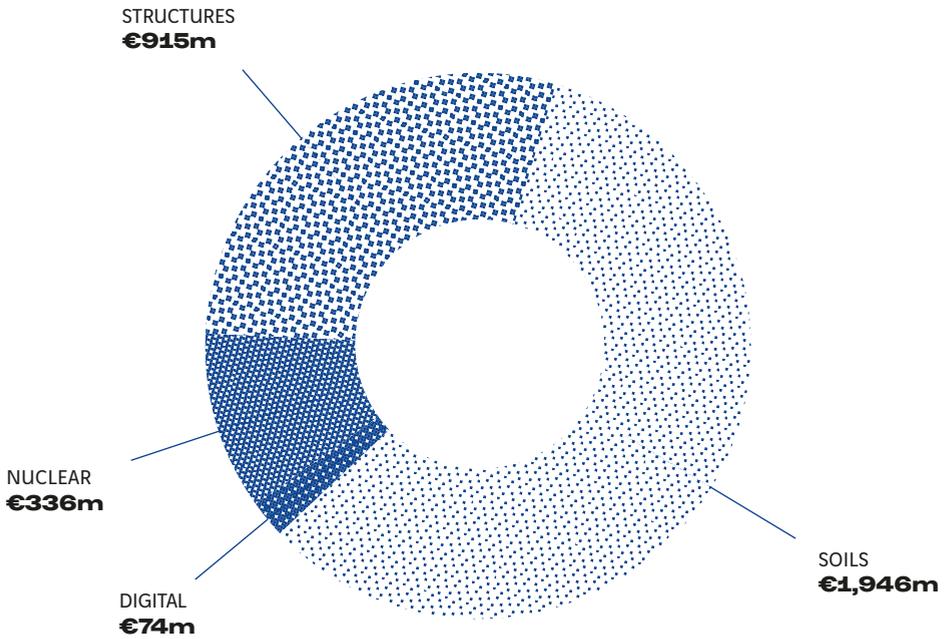
**51%**  
of training hours  
focused on QHSE  
issues

<sup>1</sup> - managed revenue / <sup>2</sup> - number of lost-time workplace accidents x 1,000,000 / number of hours worked  
<sup>3</sup> - number of days lost due to workplace accident x 1,000 / number of hours worked

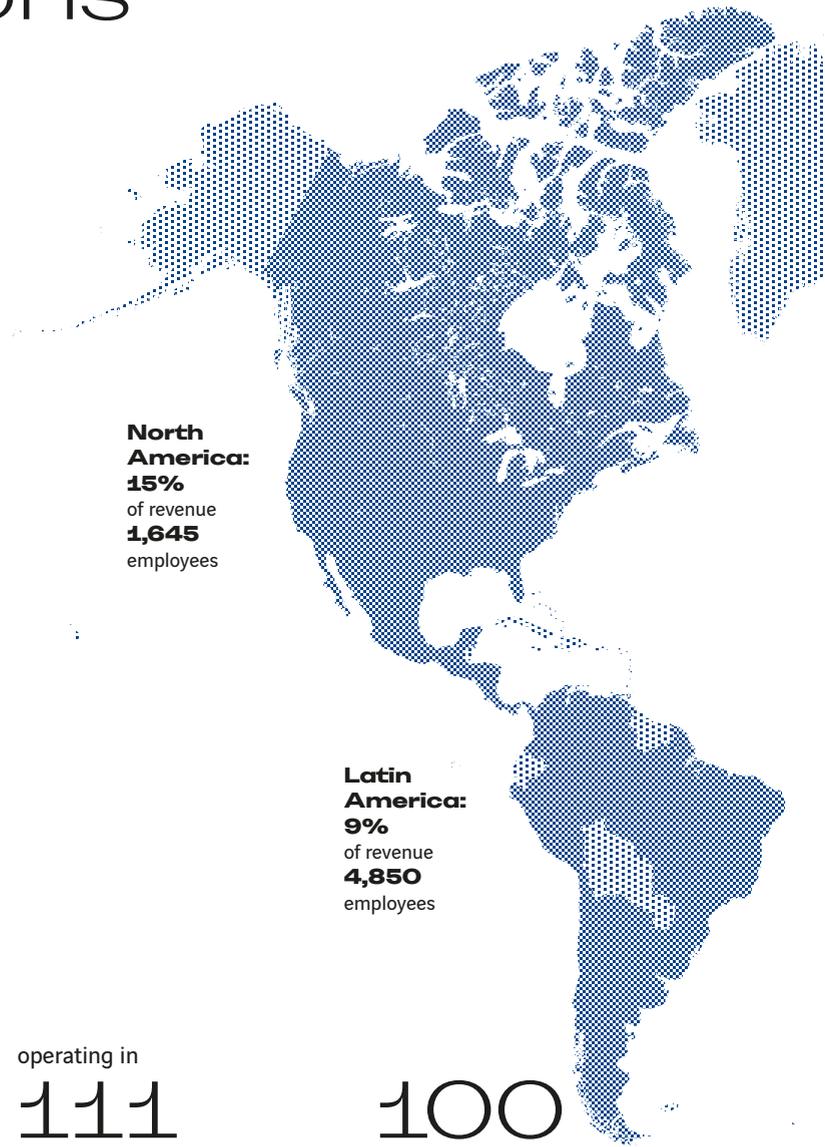
**Revenue<sup>1</sup>  
by business line**



**Revenue<sup>1</sup>  
by business activity**



# Locations



**North America:**  
**15%**  
of revenue  
**1,645**  
employees

**Latin America:**  
**9%**  
of revenue  
**4,850**  
employees

locations in

**86**

countries

operating in

**111**

countries

**100**

nationalities

Albania  
Algeria  
Argentina  
Australia  
Azerbaijan  
Belgium  
Botswana  
Brazil  
Brunei  
Bulgaria  
Cameroon  
Canada  
Chile  
China  
Colombia

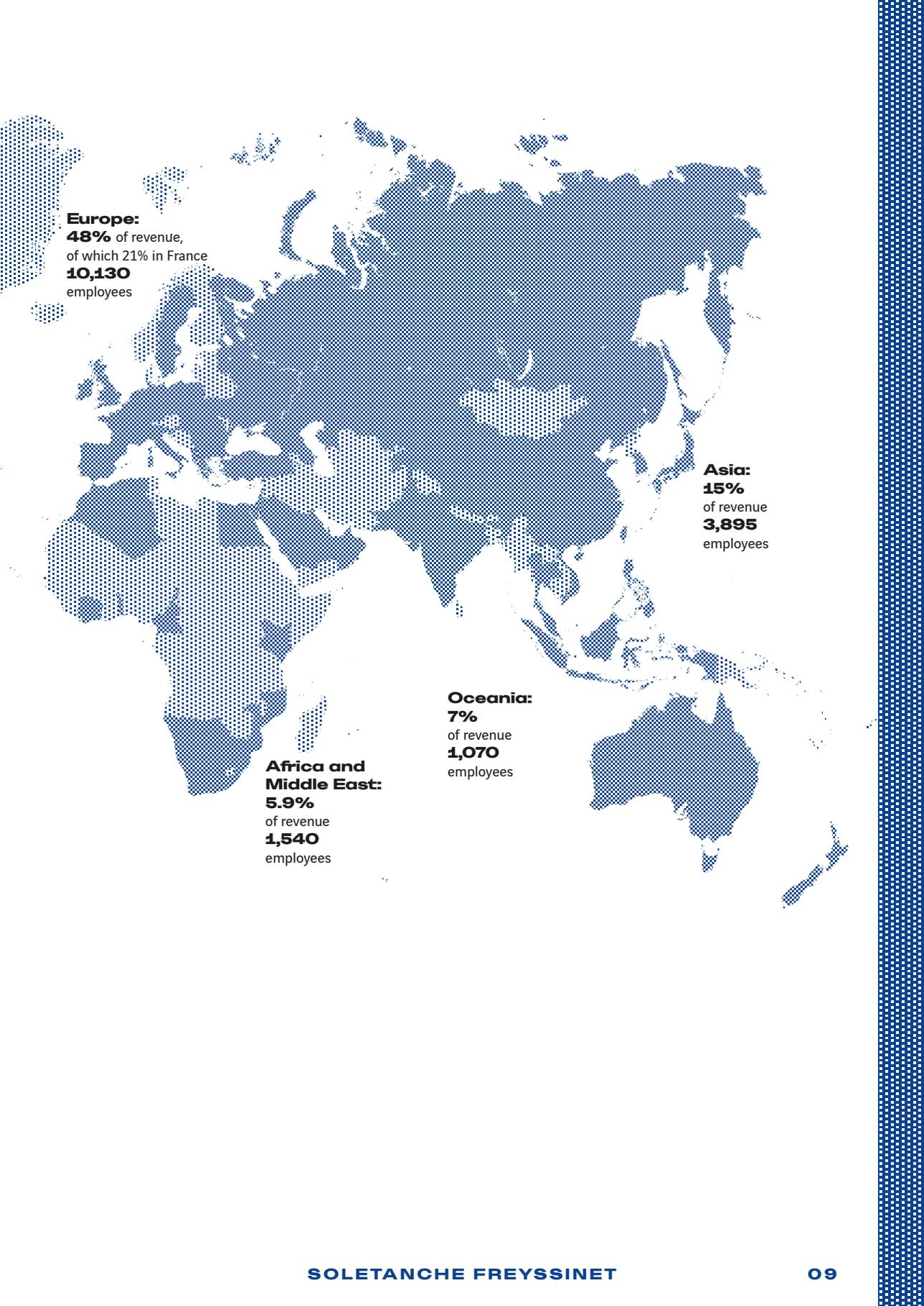
Costa Rica  
Czech Republic  
Egypt  
El Salvador  
France  
French Guiana  
Georgia  
Germany  
Greece  
Guadeloupe  
Guatemala  
Honduras  
Hong Kong  
Hungary  
India

Indonesia  
Ireland  
Israel  
Italy  
Côte d'Ivoire  
Japan  
Jordan  
Kazakhstan  
Kenya  
Kuwait  
Lebanon  
Luxembourg  
Macao  
Macedonia  
Malaysia

Martinique  
Mexico  
Monaco  
Morocco  
Mozambique  
Namibia  
Netherlands  
New Zealand  
Nicaragua  
Oman  
Pakistan  
Panama  
Peru  
Philippines  
Poland

Portugal  
Qatar  
Réunion  
Romania  
Russia  
Saudi Arabia  
Serbia  
Singapore  
Slovakia  
Slovenia  
South Africa  
South Korea  
Spain  
Sweden  
Switzerland

Thailand  
Togo  
Trinidad and  
Tobago  
Turkey  
Ukraine  
United Arab  
Emirates  
United Kingdom  
United States  
Uruguay  
Venezuela  
Vietnam



**Europe:**  
**48%** of revenue,  
of which 21% in France  
**10,130**  
employees

**Asia:**  
**15%**  
of revenue  
**3,895**  
employees

**Africa and  
Middle East:**  
**5.9%**  
of revenue  
**1,540**  
employees

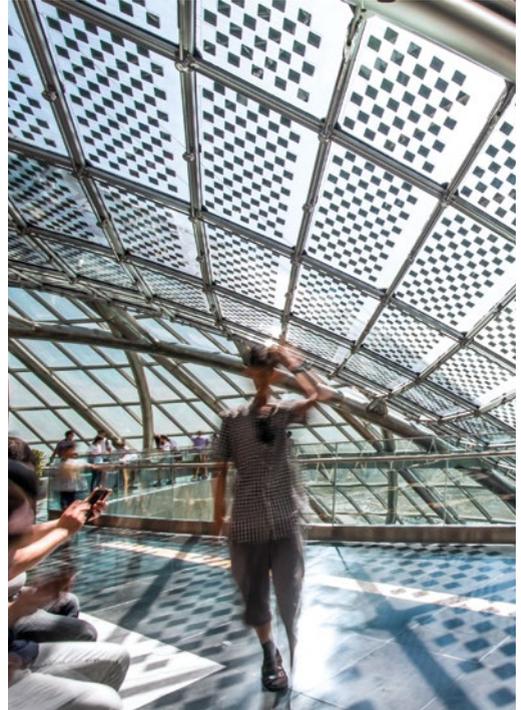
**Oceania:**  
**7%**  
of revenue  
**1,070**  
employees

# Highlights



## 24/7 Safety Campaign

The 24/7 Safety Campaign launched in 2018 illustrates the work done by Soletanche Freyssinet to increase the safety of its employees and ensure that safety becomes not just a concern but second nature. Extended to families, the new campaign gave the children of Group employees an opportunity to express their views on safety through drawings.



## CONCREATIVE

### 3D concrete printing with CONCREATIVE

Freyssinet supports CONCREATIVE, a startup focused on 3D printing that uses an innovative technology developed by Xtree. After several months of incubation, the startup began marketing its services in Dubai in 2018. CONCREATIVE's goal is to supply a fully integrated, large-scale 3D concrete printing service in partnership with two longstanding local Dubai companies, e-construct, an engineering firm, and Drawling Architect, an interior design firm.

## Smart facades with ActivSkeen

With the launch of the ActivSkeen brand, Soletanche Freyssinet explores new horizons in active building facades. Supporting the launch is the acquisition of the Ertex Solar company, a leader in building-integrated photovoltaics. The Group is thus now able to deliver engineering, materials development and installation services to architects, developers and builders around the world.



## Freyssinet celebrates its 75<sup>th</sup> anniversary

At Freyssinet's anniversary celebrations, held at the Orsay Museum in Paris on 19 June, there were 450 guests, three speakers, hundreds of smiles and thousands of discussions. The company organised the congenial gathering with its customers to celebrate the 75-year history of innovation and passion that was set in motion by Eugene Freyssinet in 1943.



## The Group's top management meets in Chicago

360 managers from the Group's six brands met in Chicago in April 2018 at the Soletanche Freyssinet Convention, the fourth such event since the Group was founded 10 years ago. The gathering provided an opportunity to review the three-year period since the last Convention, held in Hong Kong in 2015, and to work on Soletanche Freyssinet's strategy and development in coming years.



## United Nations Global Compact

Soletanche Bachy Cimas has joined the United Nations Global Compact. With this move, our Colombian subsidiary demonstrates its commitment to corporate social responsibility and includes measures in its CSR strategy designed to boost the country's development through education and infrastructure.

# Governance

Vincent  
Oudin

Chief Executive Officer  
Terre Armée

Lorenzo  
Alessi

Quality, Safety,  
Environment Director  
Soletanche Freyssinet

Stéphane  
Abry

Executive Vice President  
Soletanche Bachy



Marc  
Lacazedieu

Chief Executive Officer  
Menard

Xavier  
Planchon

Human Resources Director  
Soletanche Freyssinet

Mark  
Deary

Chief Administrative  
and Financial Officer  
Soletanche Freyssinet

Guillaume  
Billaroch

Communications Director  
Soletanche Freyssinet

Bruno  
Lancia

Chief Executive Officer  
Nuvia

Pascal  
Berger

Chief Executive Officer  
Sixense



Manuel  
Peltier

Chairman  
Soletanche Freyssinet

Christophe  
Dauchy

Chief Executive Officer  
Soletanche Bachy

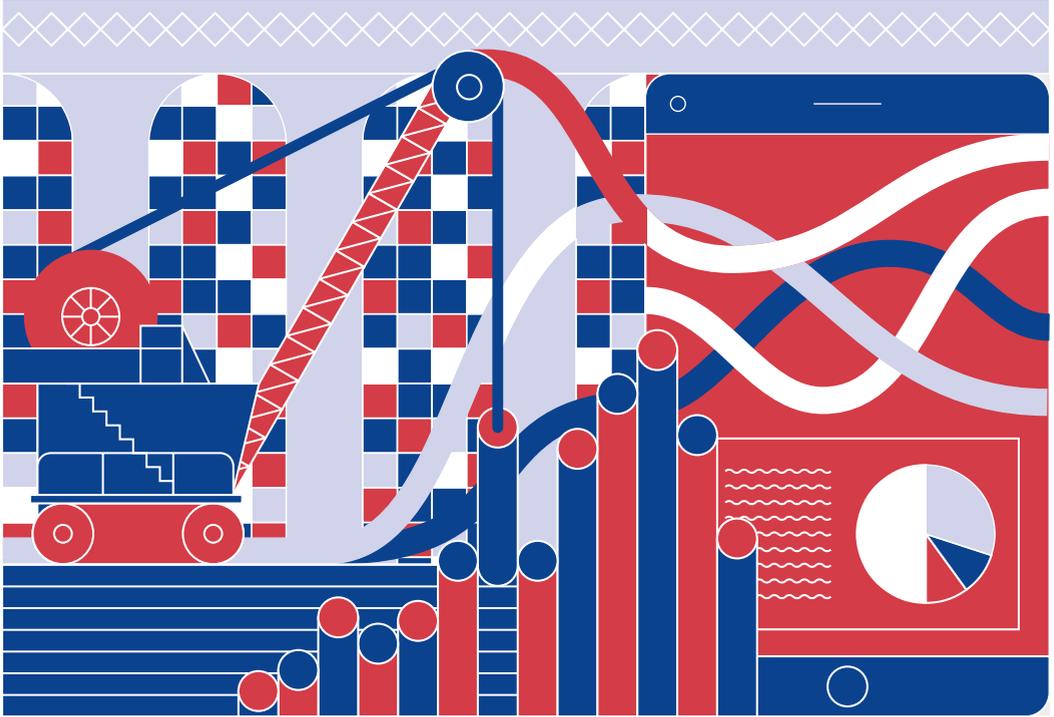
Patrick  
Nagle

Chief Executive Officer  
Freyssinet

# Commitments

Soletanche Freyssinet's quest for excellence is reflected in five practical commitments: to innovate on our projects, to improve safety, to reduce our environmental footprint, to reach out to the communities where we work, and to foster the development of our employees.

# INNOVATION



At Soletanche Freyssinet, each project is seen as a challenge that pushes the technical envelope. Our teams create innovative solutions to meet the needs of our customers and work on the innovations of the future to develop new markets.

## A “BEYOND” platform for infrastructure

Sixense has developed an infrastructure life cycle digitalisation platform that meets the need to acquire, process, display, monitor and analyse data.

## Successful incubation of 3D concrete printing

The startup 3D concrete printing project supported by Freyssinet succeeded with the launch of CONCREATIVE, a company which offers design, production and support services in the field of large-scale 3D concrete printing.

## A new 3D design tool for better customer service

Terre Armée has developed an integrated BIM-compatible 3D design tool that enables design teams to save time and devote themselves fully to creating new customer solutions.

## Artificial intelligence boosting productivity

Soletanche Bachy has developed Z-Lyze, a digital platform that collects data (on machines, weather, ground investigation, etc.) and converts it to indicators that operators can use to improve worksite productivity.

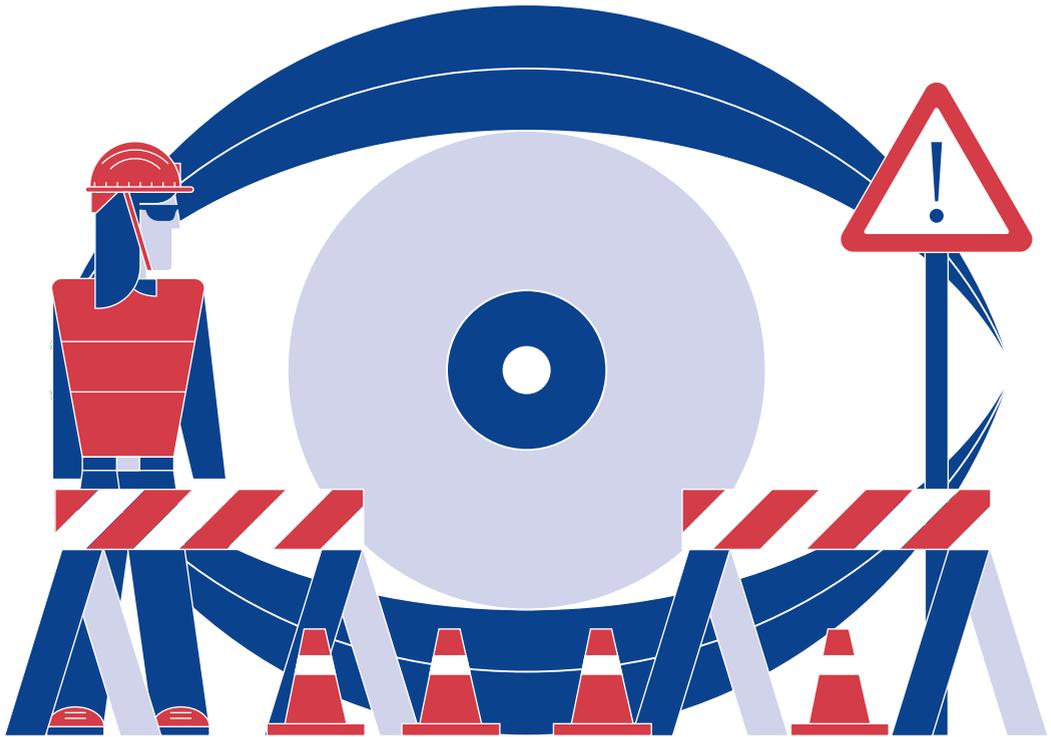
## The worksite goes digital

Menard has created the digital Omnibox system, a universal machine and process data acquisition device that is connected to an online space to prepare the worksite, track production and monitor quality.

## A new-generation Gamma camera

Nuvia worked with CEA Leti to develop NuVISION. Designed as a comprehensive portable system, the Gamma camera detects and measures dose rates, locates the source, identifies the radioisotope and carries out real-time imaging.

# SAFETY



Our primary goal is to ensure the safety of our employees, partners and subcontractors under the best possible conditions, from project design through handover. Safety is an integral part of our organisation, equipment, processes and techniques across all of our worksites, workshops, production plants and agencies around the world.

## **New “24/7 Safety” campaign**

Because safety is not limited to the worksite but continues in private life, Soletanche Freyssinet has launched an in-house campaign designed to raise 24/7 risk awareness at the workplace and in the home.

## **Virtual reality serving safety**

Soletanche Bachy has introduced safety training based on a virtual reality module, which provides worksite immersion to let trainees experience risk and learn to prevent accidents.

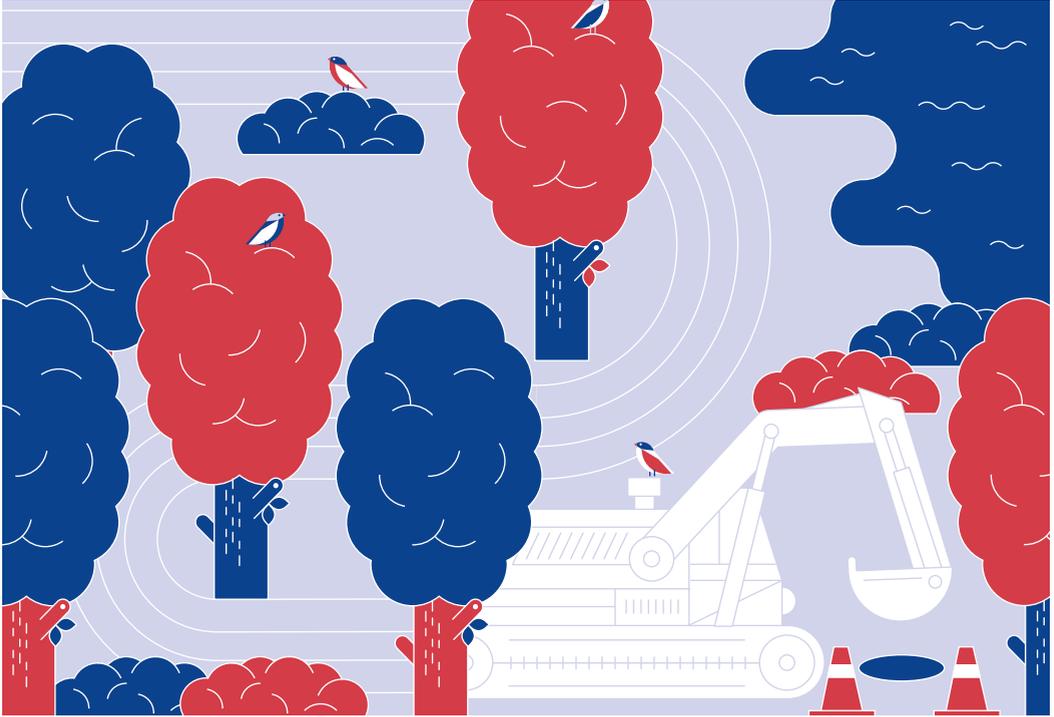
## **Greater safety in hyperbaric atmospheres**

Soletanche Bachy subsidiary Bessac, which specialises in tunnels, has developed Hyperb'Assist, a process that optimises safety in hyperbaric atmospheres, where strict compliance with procedures is vital. The tool notably reinforces decompression monitoring.

## **Support for employees suffering from stress**

In the United Kingdom, Nuvia introduced a programme to support employees suffering from stress and mental health issues. As part of the programme, about 100 managers were trained in stress management and other employees were trained in first aid procedures.

# ENVIRONMENT



Reducing the environmental footprint of our worksites is part of Soletanche Freyssinet's DNA. Our mission, starting with the design of each project, is to build differently and optimise design, methods and working practices to save resources.

## Managing water to protect the natural environment

Remea, Menard's remediation subsidiary, helps those in the building sector to manage water in order to conserve it. To protect the environment and comply with regulatory thresholds, Remea treats worksite water efficiently before discharging it.

## An electric Hydrofraise®

On one of the London tunnel projects in the United Kingdom, Soletanche Bachy used a Hydrofraise® powered by electricity rather than diesel fuel. The result is lower consumption of fossil fuels and reduced noise emissions.

## Vehicle fleet renewal

Nuvia in the United Kingdom has reduced its commercial vehicle fleet and replaced part of it with new vehicles that consume less fuel. This has cut vehicle emissions despite a slight increase in overall kilometres covered.

# SOLIDARITY



Everywhere we operate, Soletanche Freyssinet makes a point of carrying out projects that provide a source of opportunity for everyone. Our managers are committed to putting our solidarity values into practice, in keeping with the Group's code of ethics.

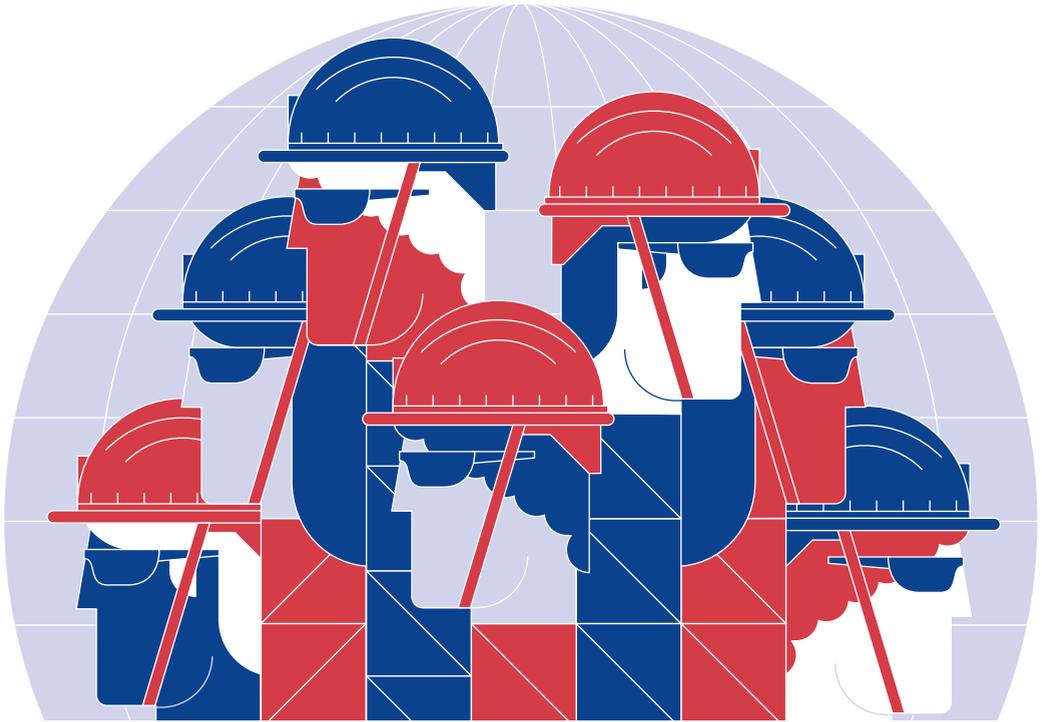
## Freyssinet volunteers help build a suspension bridge

In February 2018, five Freyssinet employees went to Rwanda as volunteers to help build a suspension bridge with NGO Bridges to Prosperity and five employees of the Danish company COWI. The bridge improves daily life for the inhabitants of Kucyaruseke, who had previously used a bridge made of rough logs to cross the river to reach the market, healthcare centres and schools. The log bridge was dangerous in normal times and especially hazardous when it rained and many people had been injured using it. The Kucyaruseke bridge now provides a safe crossing throughout the year.

## A Reinforced Earth® wall to raise awareness of education for women

A Reinforced Earth® wall on a road bridge in the town of Barnala, India was chosen as a backdrop for a campaign designed to raise awareness of women's education. Created as part of a large government programme, the fresco illustrates the basic nature of women's education by showing coloured portraits of six women. They include Malala Yousafzai, the Pakistani campaigner who received the Nobel Prize in 2014 at the age of 17 for her work to promote education for girls.

# HUMAN RESOURCES



Soletanche Freyssinet's goal is to offer prospects for stimulating careers and to diversify assignments. To do this, the Group emphasises recruitment, develops induction courses, fosters the professional development of its employees and encourages mobility.

## Meetings with top managers

Freyssinet is celebrating the third anniversary of the STEP programme. This initiative enables young managers (between 30 and 35 years of age) to meet informally with the Freyssinet CEO and Human Resources Director to discuss the development of the company. The programme was also introduced across the Soletanche Freyssinet group in 2018 for newly hired employees under the age of 30, who meet in a similar setting with the Chairman and Human Resources Director.

## Training for good project management

To develop and improve their skills, future Freyssinet and Terre Armée project managers took part in the new PM+ sessions held in 2018. PM+ training presents the practical stages of a project from contract signature to closeout; it stresses the key aspects of project management such as preparation, scheduling and organisation, and it also focuses on the importance of human relations and negotiations. To date, more than 350 Freyssinet and Terre Armée employees have received the training.

## Enabling workers to complete their schooling

In partnership with the Construyendo y Creciendo non-profit, Soletanche Bachy's Mexican subsidiary Cimesa is helping raise the educational level of its employees. The company makes classrooms available and helps fund the organisation to train its workers, partly during working hours. Since mid-2017, about 50 people have been able to complete their schooling.

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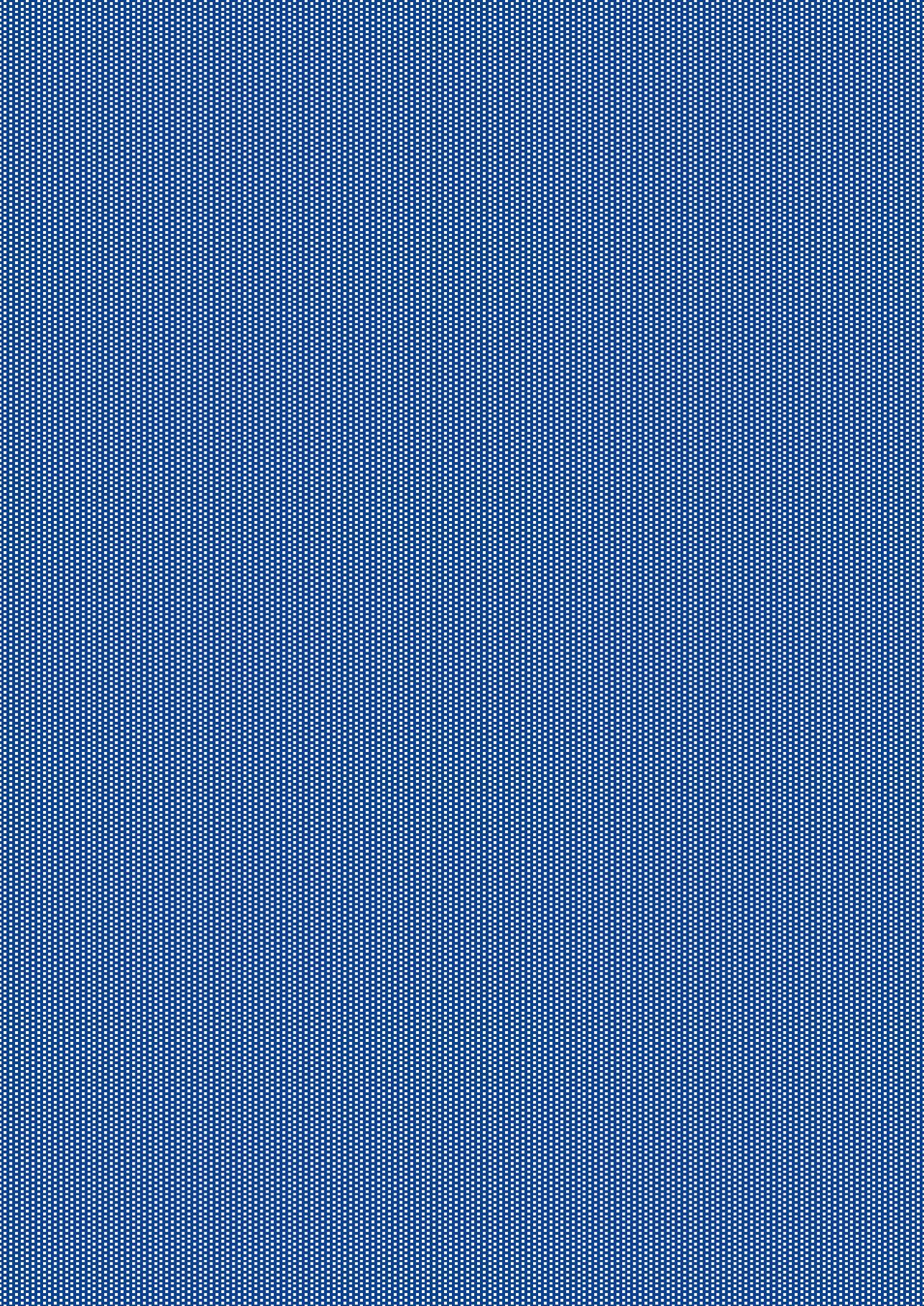
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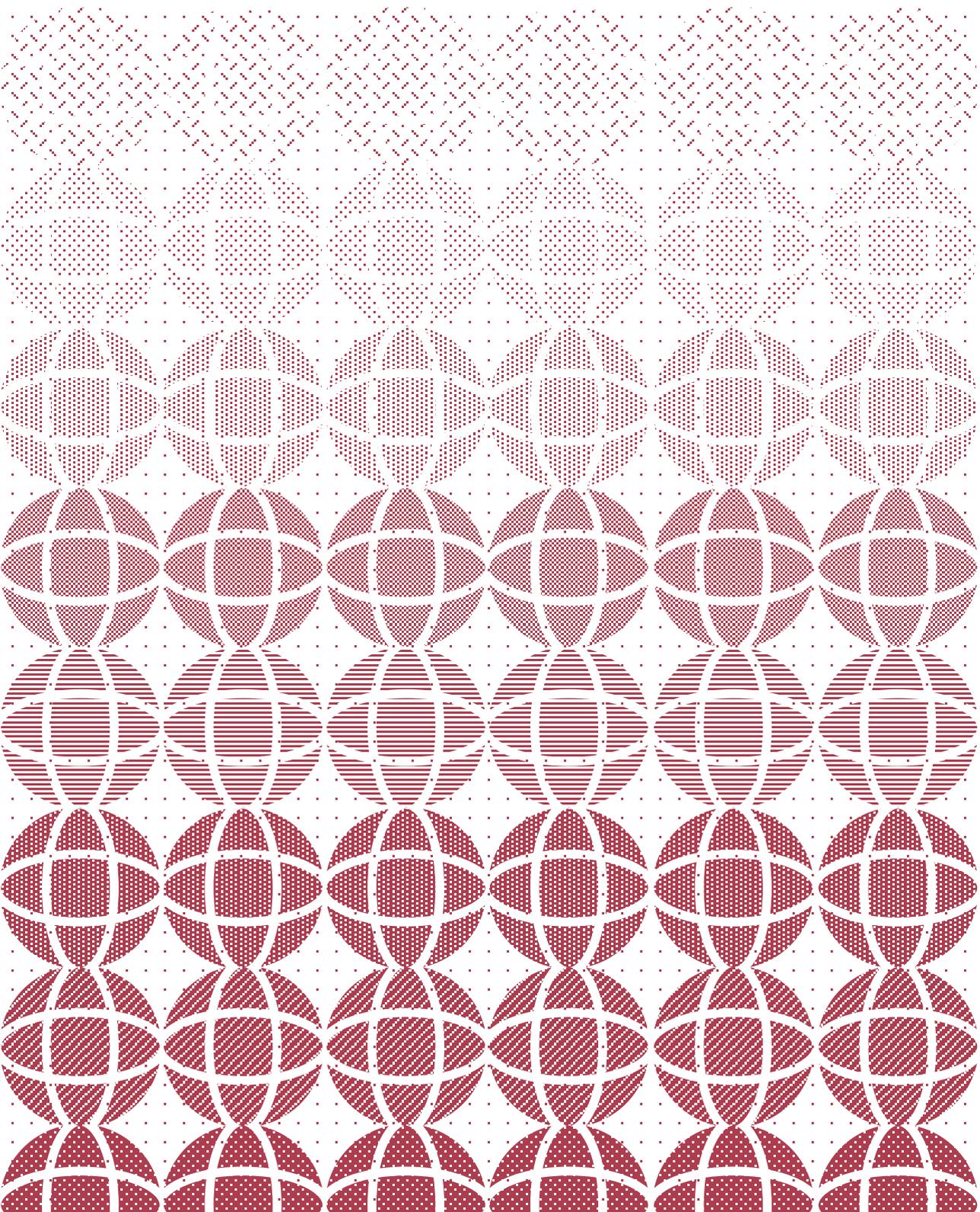
[www.soletanchefreyssinet.com](http://www.soletanchefreyssinet.com)





Soletanche  
Bachy

2018





## SOLETANCHE BACHY

### World leader in foundations and soil technologies

Soletanche Bachy develops innovative and effective geotechnical solutions for deep foundations, retaining structures, reinforcing, waterproofing, and ground improvement. The Group operates as both a general contractor and a specialist subcontractor to design, build, rehabilitate and commission all types of structure: ports, dams, car parks, metros, tunnels, energy facilities, buildings, etc.

### Revenue<sup>1</sup>

€1,587m

### Employees

9,700

### Order intake

- N105 Contract, North-South Corridor, Singapore
- Maison Blanche Station, Line 14 South, Paris, France
- Silicon Valley Clean Water, Phase 2B, California, United States
- Boone Dam, Tennessee, United States
- Prairie du Sac Dam, Wisconsin, United States
- Prince Edward Station, Singapore

Thames Tideway Tunnel, United Kingdom



1 - Managed revenue

**Christophe Dauchy, CEO, Soletanche Bachy**

# “Further consolidating our local roots”

## **What were the major events for your company in 2018?**

First, we recorded an improvement in employee safety. For the sixth consecutive year, the number of lost-time accidents per million hours worked has fallen, as has the severity rate. This is a great source of satisfaction and the results reinforce our determination to build a strong, shared safety culture throughout the company. Economically, our revenue increased and our order book reached its highest-ever level, with a good balance between major projects, which give us long-term visibility, and smaller local projects, which give us resilience and bring in repeat business activity.

## **What were the major projects in 2018?**

We carried out 4,000 projects in 2018. Some were very large. One example is Grand Paris Express Line 15, for which we were in charge of works packages T2A and T3A involving a high level of special works. I could also mention the Subansiri Dam in India and the Ituango Dam in Colombia, where we built a cut-off wall under difficult conditions. Lastly, we were happy to win a major works package on the underground North South Corridor motorway in Singapore, which boosts our presence in Asia but will also be a major technical challenge.

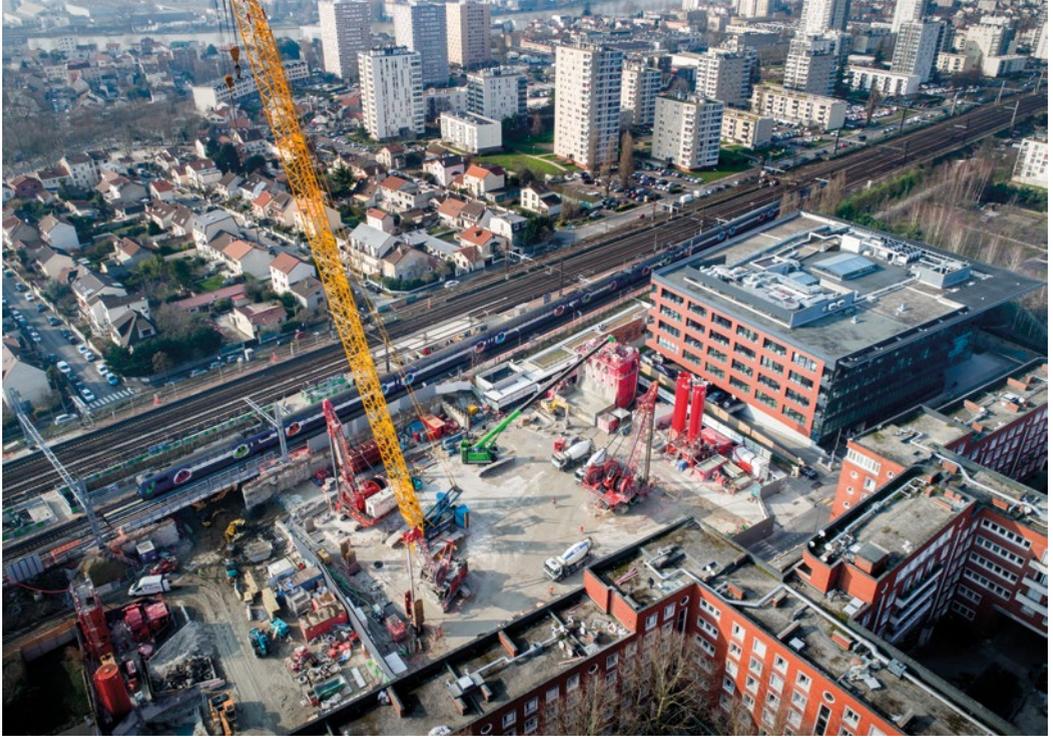


## **And what is your strategy?**

In 2019, we hope to both consolidate our local roots and strengthen cooperation between our local subsidiaries and our major projects subsidiary, to be able to better meet the requests of our customers. We also have several Research & Development projects coming to fruition. One example is the hydrofraise with grippers, and another is digitalisation of worksite processes. These innovations set us apart and we plan to accelerate their rollout and move them to the industrial stage within coming months.

France

# Grand Paris Express Line 15 South



Soletanche Bachy is participating in the construction of seven stations, more than 10 km of tunnels, and numerous shafts on cramped worksites in crowded urban areas as part of three Line 15 South works packages.

The teams are notably installing deep diaphragm walls with waterstop joints brought down to a depth of 74 metres. They are using innovative machines such as the Hydrofraise® with grippers and the compact Hydrofraise® designed for confined spaces, as well as reinforcing techniques such as jet grouting, ground freezing and compensation grouting.

More than

# 10km

of tunnels

© [Watch the video:](#)

**United States**

# Prairie du Sac Dam, Wisconsin

Due to deterioration of its existing wooden piles, the hydroelectric dam required renovation. Our American subsidiary Nicholson Construction worked alongside the client from the design stage and installed nearly 1,000 micropiles and 250 anchors.

**1,000**  
micropiles

**250**  
anchors



© [Watch the video:](#)



## Guatemala United States Embassy

Rodio Swissboring Guatemala executed the infrastructure works for the 40,000 sq. metre project, which includes an office building and ancillary buildings and will house the new U.S. Embassy in Guatemala City.



## **Hungary** **Komárom bridge on the Danube**

HBM built the bridge foundations and carried out extreme load tests on the piles.

## **Mexico** **Gran Terraza Coapa**

For the shopping centre foundations, Cimesa installed 1,150 linear metres of diaphragm walls and 900 Starsol® piles, excavated around 405,000 cu. metres of materials and cast a 57,000 sq. metre slab on top of very soft clay.



## **Colombia** **Ituango Dam**

Two Colombian Soletanche Bachy subsidiaries, Soletanche Bachy Cimas and Geofundaciones, built a slurry cut-off wall with a length of more than 500 linear metres and a depth of 38 metres.



Construction of two  
**800**  
metre tunnels

## Singapore **Thomson- East Coast MRT line**

As part of a flagship Thomson Line works package in central Singapore, Bachy Soletanche Singapore served as the main contractor in partnership with a Japanese company to build two 800 metre tunnels and a station located partly underneath the existing Orchard Road station, Singapore's busiest.

© [Watch the video](#)

India

# Subansiri Dam

For the country's biggest hydroelectric project, Soletanche Bachy International - Major Projects installed an 18,000 sq. metre cut-off wall to a depth of up to 50 metres, without affecting the construction of the dam. The Group carried out most of the work from tunnels with limited space. To meet this challenge, the teams used a Hydrofraise® HC05 specially designed for confined spaces. Thanks to its compact size, this machine fits in a shipping container, which allowed it to be brought by road from Kolkata, more than 1,000 km away.

# 18,000

sq. metre cut-off wall





## Albania Trans Adriatic Pipeline

Bessac, Soletanche Bachy's subsidiary specialising in tunnels, dug four microtunnels in the mountainous region near Çorovoda for a gas pipeline linking Greece and Italy.

## New Zealand Auckland City Rail Link C1

In partnership with Soletanche Bachy International - Major Projects and a local company, March Construction worked as a general contractor to build a dual railway tunnel under a historic building, which was underpinned.



[▶ Watch the video](#)



## Benin Womey Bridge

SFAO and its partners installed the bridge foundations and defined the pile driving procedure and construction system.

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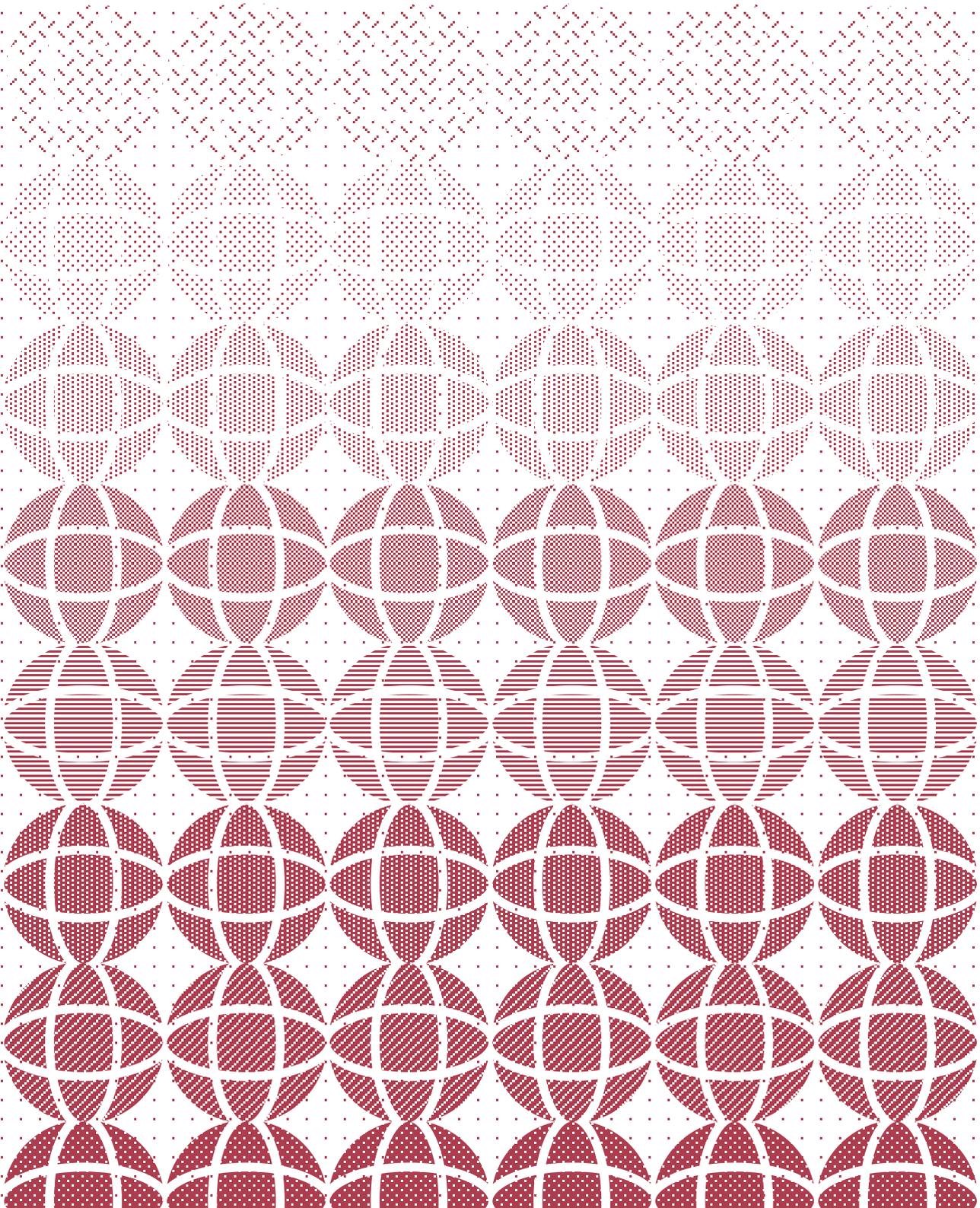
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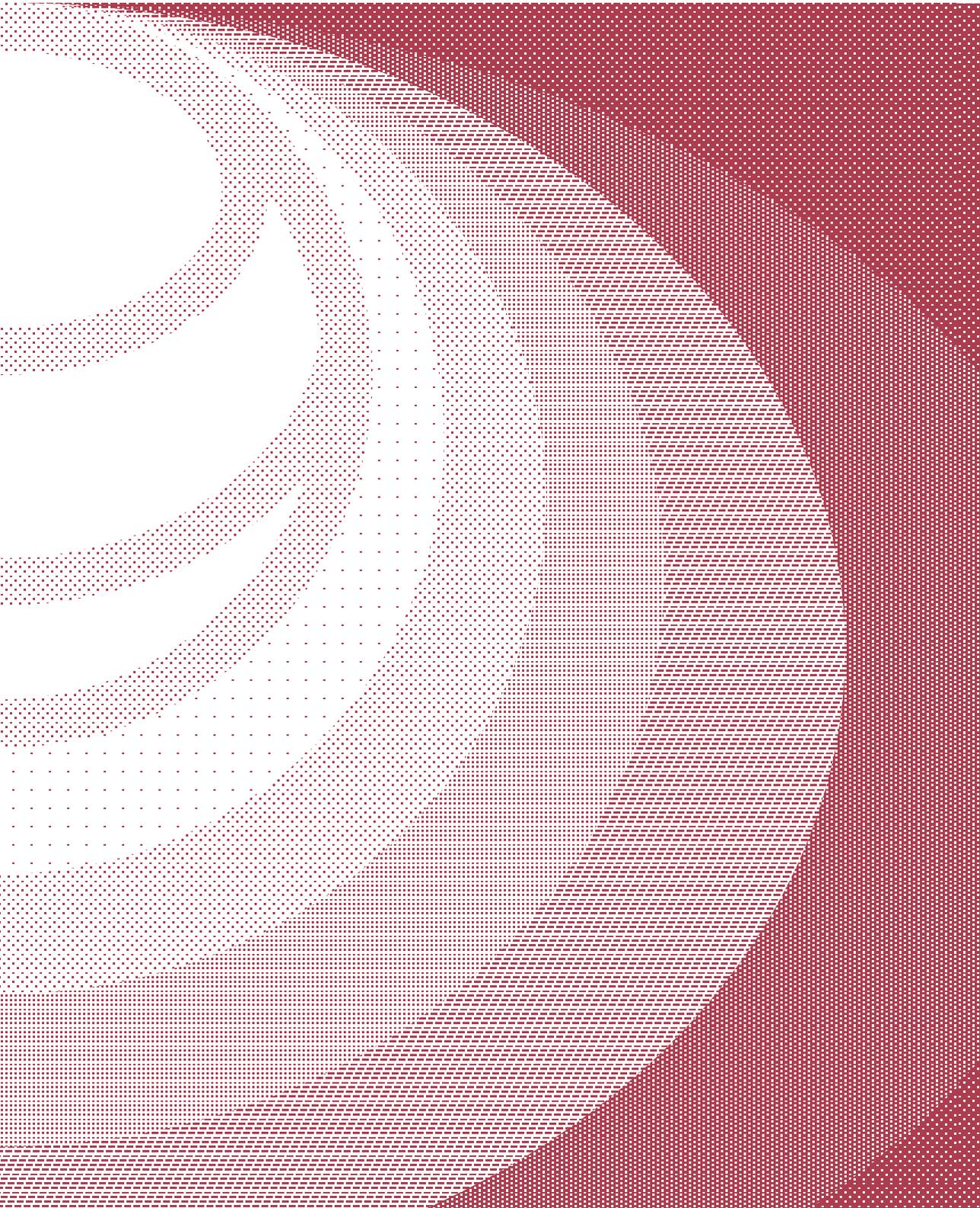
**Design and layout:**

**Abmo**

Soletanche Freyssinet is world leader in soil, structural and nuclear engineering. The Group brings together an unparalleled array of construction and engineering expertise and brands. Soletanche Bachy, Menard, Terre Armée, Freyssinet, Nuvia and Sixense provide technical excellence to ensure structure performance and sustainability. The Group supports the expansion of its brands by providing the resources to extend their worldwide networks and broaden their technology portfolios.

**[www.soletanchefreyssinet.com](http://www.soletanchefreyssinet.com)**







**menARD**

**Key soil investigation,  
improvement and remediation  
provider**

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

**Revenue<sup>1</sup>**

**€359m**

**Employees**

**1,470**

**Order Intake**

- East Port Said Extension, Egypt
- Smelting Plant in Toledo, Ohio United States
- Aicherpark Shopping Centre, Germany
- Central Avenue Highway, New Jersey, United States
- Prabuty-Szymankowo Railway Line, Poland

"Seasons" complex, Canada



ST. CATHARINES, ON

1 - Managed revenue

**Marc Lacazedieu, CEO, Menard**

# “Digitalisation is a central focus of our approach”

## **What is your take on your business activity in 2018?**

Our 2018 activity is good, overall. In Australia, for example, we returned to moderate profitability. We expanded in Asia and Latin America, did well in Europe and maintained good profitability in the Middle East. We had difficulties in North America – the United States and Canada – in 2018, but we are restructuring there and the results of our efforts will be fully felt in 2019. Meanwhile, we continued the integration of ConeTec, acquired in 2017, which operates in Canada, the United States and Latin America. ConeTec outperformed its objectives and in 2019 we will be expanding its activities to other geographical areas.

## **What is the main focus of your expansion strategy?**

Our priority is to continue to build on our local roots to expand our market share in areas where we are already operating. We are therefore reviewing our markets, our services and the geographical areas in which we work. In North America, for example, we are putting together a less centralised organisational structure made up of entities that work autonomously and can therefore handle projects of reasonable size simply and efficiently.



## **What are your operational priorities in 2019?**

Digitalisation is a central focus of our approach. We have major programmes involving the introduction of tools that enable us to dialogue with our worksites, send execution plans directly to machines and collect production data. This boosts our responsiveness and the quality of our work. In 2019 we also plan to better capitalise on the technical solutions used on our various projects. We have therefore set up support teams to help us better share techniques and expertise and make them a permanent feature of our worksites.

Chile

# Geotechnical investigation at a mine tailings dam



The teams at ConeTec carried out a geotechnical site investigation of a large mine tailings dam in Chile. They carried out seismic piezocone penetration testing (SCPTu) and installed push-in VW piezometers to depths of up to 100 metres. The primary purpose of the investigation is to monitor the stability of the dam. The goal was to safely provide high quality geotechnical information to support engineering decisions.

Penetration testing to depths of up to

100

metres

Monaco

# Portier Cove reclamation project

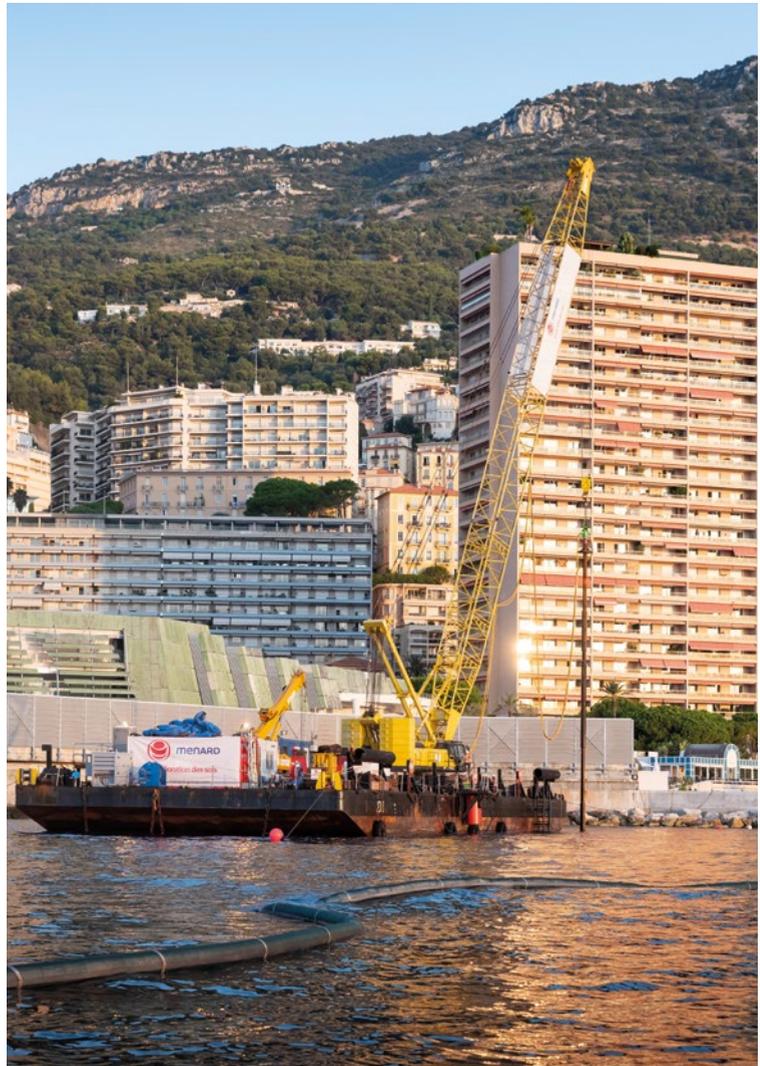
The outsized Portier Cove urban extension project will reclaim six hectares of land from the sea to accommodate 60,000 sq. metres of residential space as well as public facilities. To meet the technical and environmental challenges of this colossal undertaking, Menard employed three ground improvement techniques: vibrocompaction; "bottom feed" stone columns; and "top feed" stone columns (more than 5,000 linear metres installed).

6 ha

of land from the sea

60,000

sq. metres of  
residential space



[Find out more](#)



## United States Glasshouse real estate development

In Pittsburgh, Menard carried out ground improvement at a former glass factory to support a multi-use real estate development comprising more than 300 homes, offices, shops, an underground car park and a swimming pool. To improve the historic fills, the Group installed stone columns. This economical and quick-to-install solution strengthened the soil's load-bearing capacity and ensures minimal settlement.

[Find out more](#)



## Indonesia New Yogyakarta International Airport

Menard took part in the consolidation of the future runways at the new Yogyakarta international airport, densifying some 400,000 sq. metres of soil by means of dynamic compaction.

## Colombia Extension of the Yati-Bodega Interchange

Menard's teams participated in the construction of the Roncador Bridge, the longest in Colombia, deploying a ground improvement solution using vertical drains (330,000 linear metres).



[▶ Watch the video](#)



## Australia Sydney Metro

Menard carried out major geotechnical work on the future Waterloo and Barangaroo stations. The work included jet grouting, rock injection, and installation of around 1,000 anchors and anchor bolts. The project was a major factor in the award of the Melbourne metro contract.

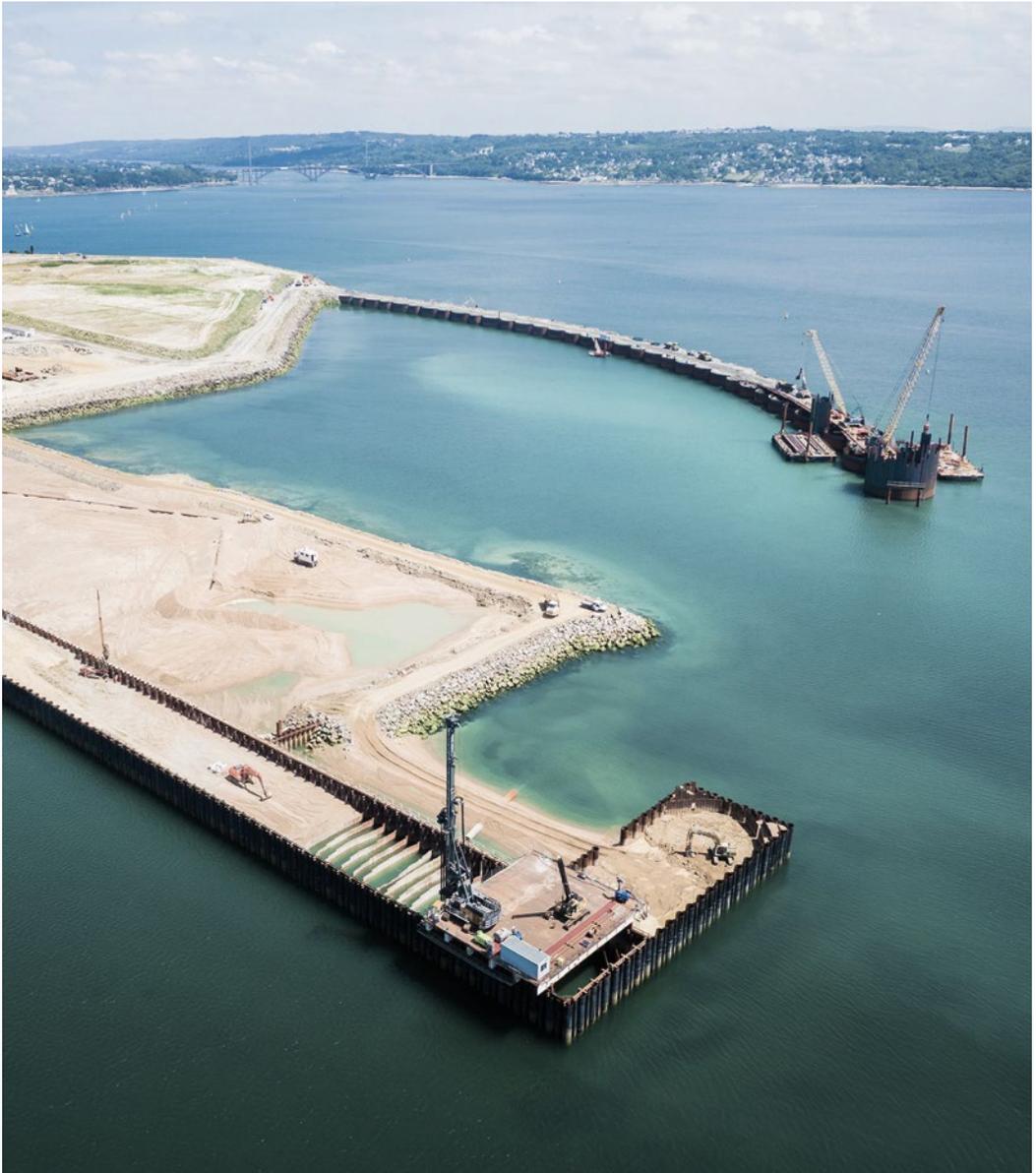
[🌐 Find out more](#)

France

# Port of Brest Extension

[Find out more](#)

Menard worked on the extension of the commercial port in Brest as part of the construction of a 400 metre quay and a storage area for heavy loads. Three techniques – soil mixing, jet grouting, and vertical drains – were employed to reinforce and consolidate the existing silt and avoid the need for dredging. The solution is technically effective and also protects the environment.



France

# Rehabilitation of a former pesticide factory

Remea, the Menard brand specialising in soil remediation, carried out rehabilitation work on a brownfield site in the Gard department to remove pollutants from the soil and water. Remea excavated some 70,000 cu. metres of soil and treated it at the bottom of the excavation. Following on-site analysis, more than 26,000 cu. metres of polluted soil were removed and disposed of. The remaining soil was backfilled in strict compliance with compaction and load-bearing capacity requirements.

70,000

cu. metres of soil excavated





**Poland**  
**Warsaw-Lublin**  
**railway line**

To improve the ground for the future railway lines, Menard's teams installed more than 20,000 controlled modulus columns (CMC), over more than 140,000 linear metres.

**Scotland**  
**Lidl supermarket**  
**logistics centre**

Vibro Menard carried out ground improvement beneath a Lidl logistics centre built over a backfilled quarry by installing controlled modulus columns to a depth of up to 15 metres.



**Egypt**  
**East Port Said**  
**Industrial Zone,**  
**Port Said**

Following successful completion of the first phase carried out in 2016, Menard won the contract for a second phase of ground improvement works at the industrial terminal site involving installation of 64 million linear metres of prefabricated vertical drains.

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**Design and layout:**

**Abmo**

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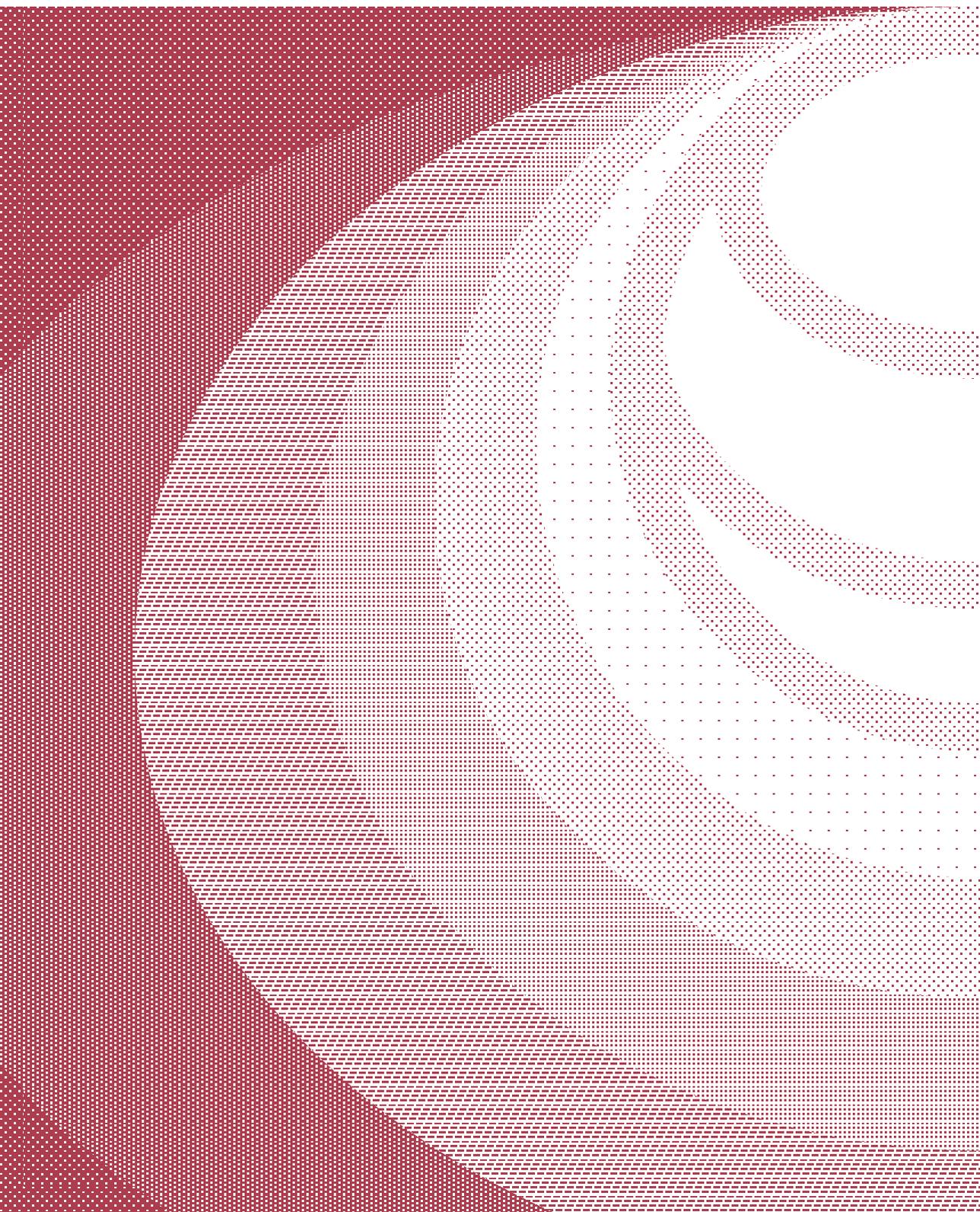
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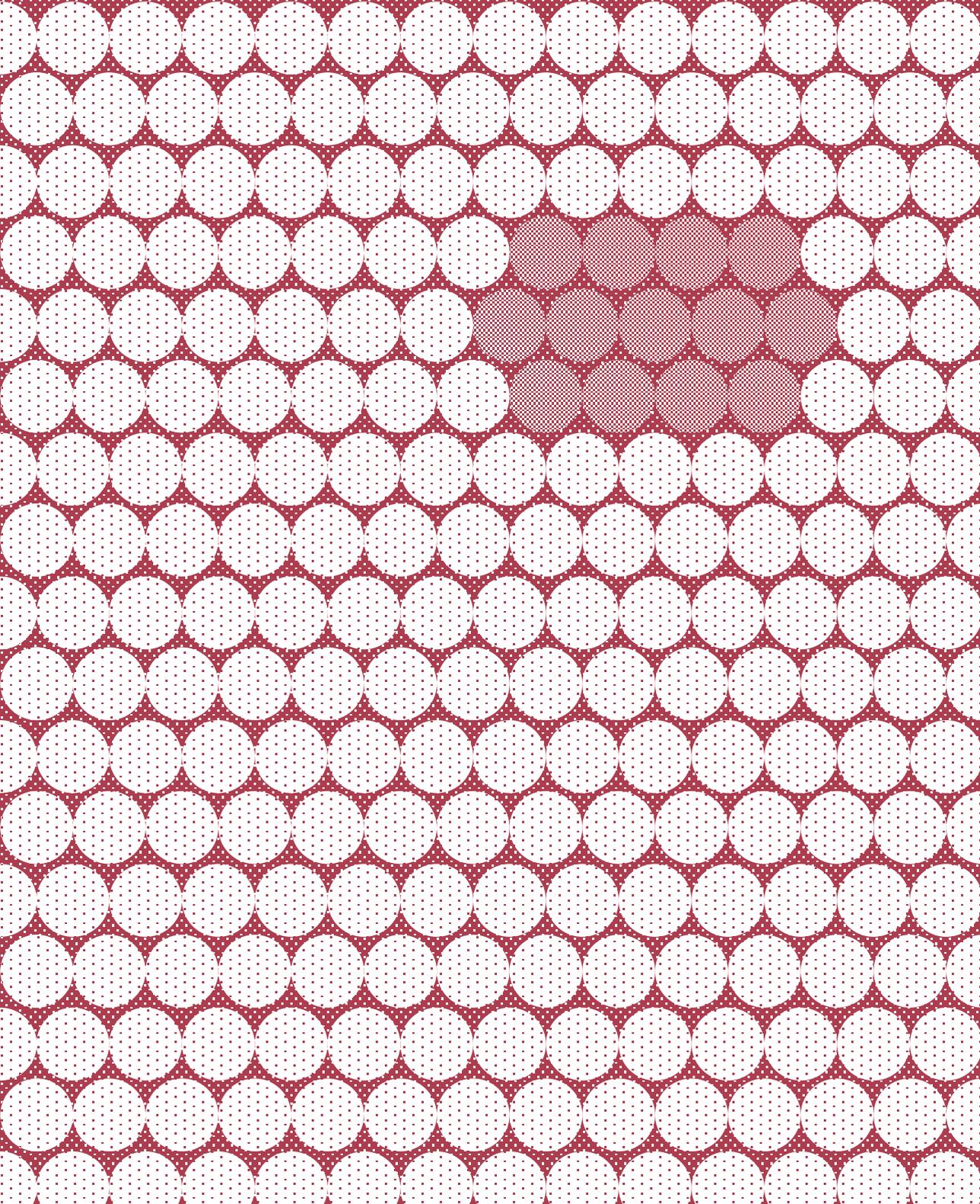
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# Terre Armée

2018





## TERRE ARMÉE

### Devising and developing retaining, access, and protection solutions

The Terre Armée Group, which pioneered ground reinforcement techniques, has unrivalled experience in the field of reinforced backfill and soil-structure interaction. Its techniques are used in a wide variety of applications, including highways, railways, industry, and environmental and water engineering projects.

### Revenue<sup>1</sup>

€201m

### Employees

885

### Order intake

- I-66 Interstate Highway, United States
- Embankment protection on the Jia Bharali River, India
- Port of Valparaiso, Chile
- Ajaokuta-Warri Railway, Overbridges – Nigeria
- Auckland Northern Corridor, New Zealand
- NorthLink WA Highway, Australia

Stampede Dam, United States



1 - Managed revenue

# “Diversifying our activity”

## **Was your business activity satisfactory in 2018?**

In 2018, we booked a record number of orders. We now have an order book amounting to 15 months of work, which is substantial. It includes our largest-ever order, for Interstate 66 in the U.S. state of Virginia.

## **What is the outlook for your markets?**

The world infrastructure market is very promising. We therefore need to branch out from our traditional retaining wall activities. We also need to diversify geographically, since much of our business volume is currently concentrated in the United States. We have therefore structured our organisation in five geographical areas: North America, South America, Oceania, Asia, Europe/Francophone Africa. We also undertook a portfolio review and are building on it to reconsider our presence in a number of countries and invest in new regions.

## **What are your current priorities?**

One of our main strategic priorities is vertical integration. Our goal is to deliver not only engineering, which is our core expertise, but also the materials our customers need to build their structures. To that end we opened four new factories in 2018, three in the United States and one in India. We will continue to increase our production capacity, notably in geosynthetics. This will enable us to boost our operations in our core markets and to tackle new geographies.



## United States

# Los Angeles Stadium



In the United States, Terre Armée is taking part in the construction of the Los Angeles Stadium, one of the world's biggest sports venues. The company is supplying and installing more than 35,000 sq. metres of Reinforced Earth® walls, which will act as an internal circular structure for the building and provide earthquake resistance. With its sleek design and transparent roof, this futuristic stadium is the flagship structure of the Hollywood Park project, which will also include a shopping centre, a park, residential units, and a concert hall.

**35,000**  
sq. metres of  
Reinforced Earth® walls

# India Tindharia

Following an earthquake, a landslide swept away the Siliguri – Darjeeling highway and left a railway line in danger of collapse. Terre Armée won the contract to stabilise the slope and rebuild the road. The solution is based on a TerraLink™ structure and uses the TerraNail® and FreyssilAnchors® techniques, with GeoTrel™ facing panels and GeoStrap®5 steel reinforcements. Rising to a height of 100 metres, it will be one of the world's tallest Reinforced Earth® structures.



[Find out more](#)

**Peru**

# Uchumayo Highway

In Arequipa, one of Peru's largest cities, Terre Armée worked on the Uchumayo motorway, for which it designed and supplied 33,800 sq. metres of precast TechWall® retaining walls and provided technical support during their construction. The technique optimises construction costs and times. TechWall® is a precast retaining wall system combining a full-height facing panel and counterfort into one unit.



# 33,800

sq. metres of precast TechWall®

[Find out more](#)



## France Gourette Highway

In the Pyrenees, Terre Armée rebuilt a collapsed road, using Terre Armée® backfill to a height of 7 metres. The work was completed in record time to accommodate the Tour de France bicycle race.

📺 [Watch the video](#)

## Philippines Mactan Cebu Airport

Terre Armée's teams participated in the construction of the country's most modern airport, building the Philippines' first Reinforced Earth® load-bearing abutment and seven reinforced backfill walls.

🌐 [Find out more](#)



## Senegal Dakar Regional Express Train

Terre Armée designed and supplied formwork for 12 Reinforced Earth® access ramps comprising 18,000 sq. metres of TerraPlus® panels and GeoStrap®5 reinforcing strips.

**Burkina Faso**

# Northern interchange in Ouagadougou

[Find out more](#)

Terre Armée took part in the construction of the Northern interchange in Ouagadougou, installing 12,000 sq. metres of Reinforced Earth® access ramps for four engineering structures. Terre Armée's teams also carried out the engineering calculations and produced the drawings for the project, supplied the formwork, precast inserts, and GeoStrap® synthetic reinforcing strips, and provided technical assistance. Located in the middle of the city, the interchange is designed to ease traffic flow at one of the city's most congested junctions.



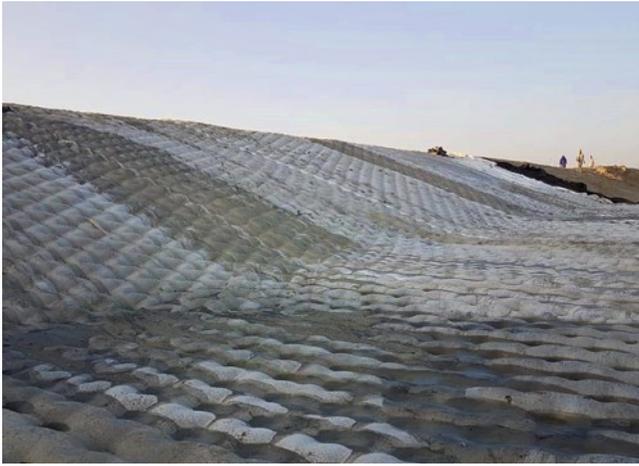
## Australia

# West Gate Tunnel

In Melbourne, Terre Armée supplied reinforced earth walls for the city's major road tunnel. The company produced and supplied more than 11,000 sq. metres of TerraPlus® panels with HAR steel strips to widen the existing motorway. Once completed in 2022, the West Gate Tunnel will serve as an alternative to the West Gate Bridge, providing quicker and safer access to the city centre and the western suburbs.



**11,000**  
sq. metres of  
TerraPlus® panels



**India**  
**Banks of the Jia Bharali River**

Terre Armée employed TechRevetment™ technology to protect the banks and the channel and to contain the course of the river during flooding.

**Uganda**  
**Kampala Northern Bypass Extension**

Terre Armée supplied more than 10,000 sq. metres of TerraClass® walls for the construction of six bridges and their access ramps as part of a network of interchanges currently under construction.



[Find out more](#)



**Venezuela**  
**Cinta Costera seafront**

Terre Armée built 14 walls composed of TerraClass® panels and HA reinforcements as part of the seafront development project.

[Find out more](#)

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**Design and layout:**

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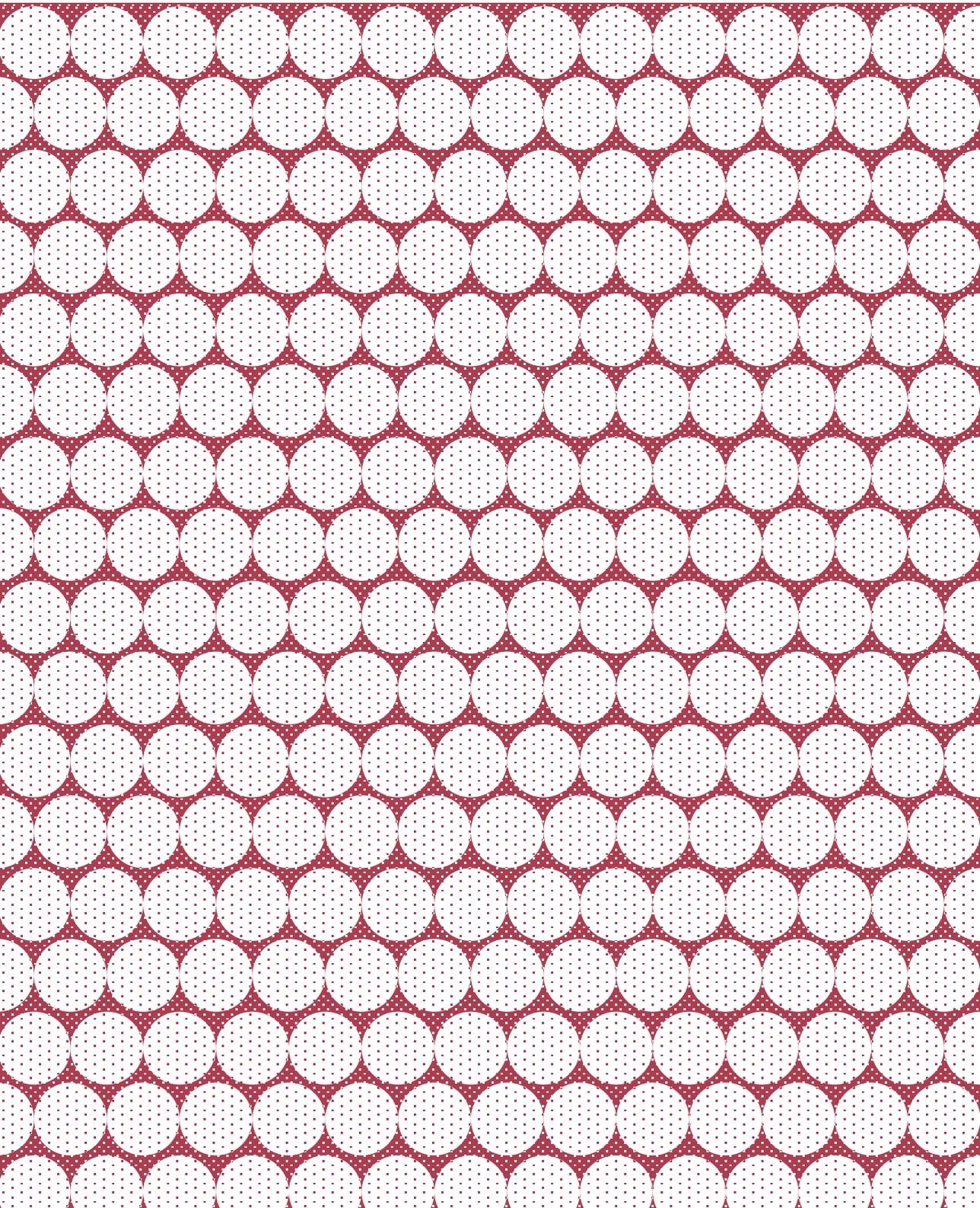
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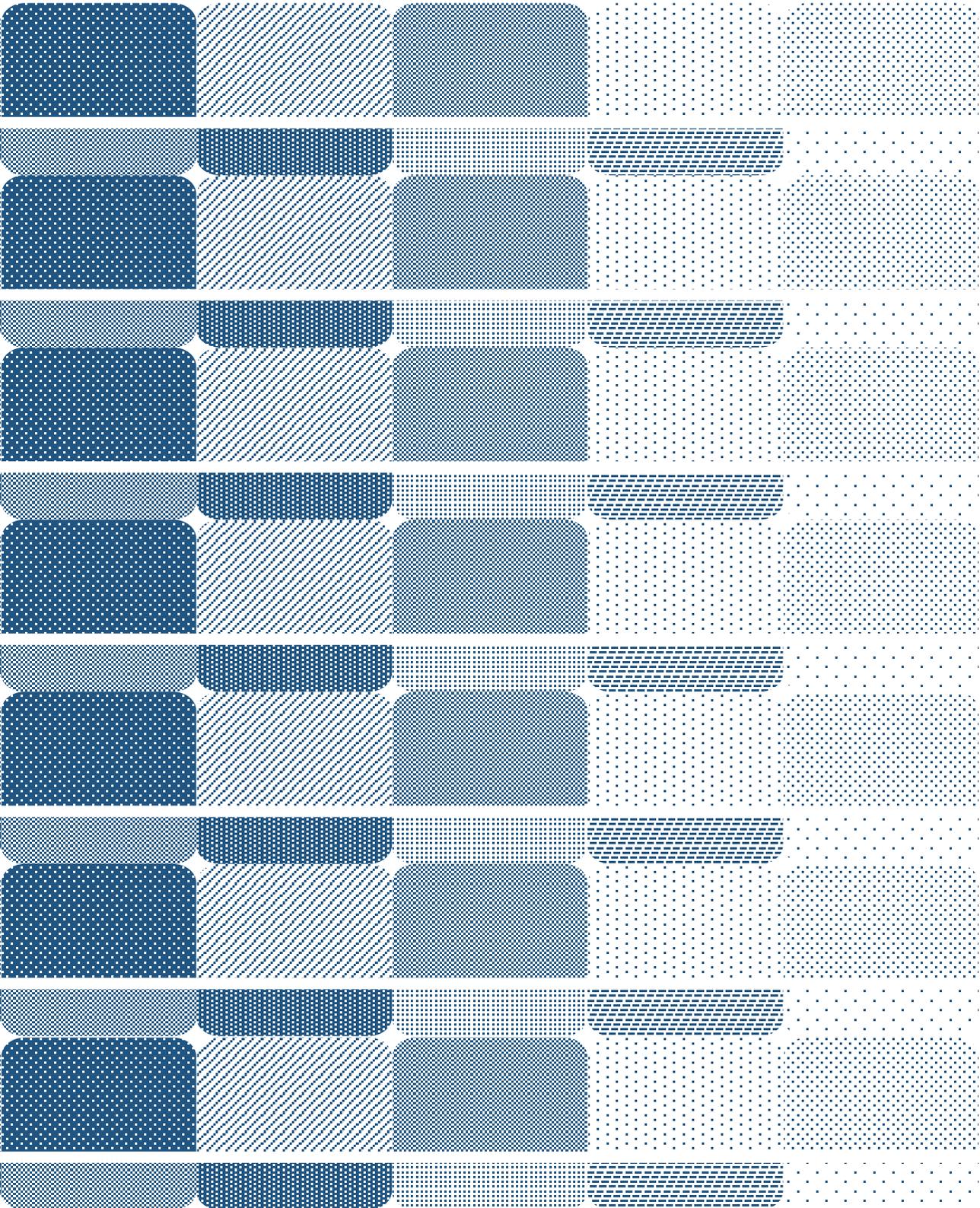


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## FREYSSINET

### The world benchmark in construction and repair of structures

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

### Revenue<sup>1</sup>

€714m

### Employees

7,900

### Order intake

- Larona Canal waterproofing, Indonesia
- Cebu Cordoba cable-stayed bridge, Philippines
- Rooppur nuclear power plant, Bangladesh
- Çanakkale Viaducts, Turkey
- Kosciuszko Bridge, Phase 2, United States
- Bletchley Viaduct, United Kingdom

Kalikuto Bridge, Indonesia



**Patrick Nagle, CEO, Freyssinet**

# “Consolidating our leadership”

## **What is your take on 2018?**

It was a fairly good year. We performed well, especially in France, in Asia, and within our subsidiary Carpi, which specialises in water infrastructure sealing. We added work with a value of €840 million to our order book. In 2018, we paid special attention to risk management and margin improvement. Our safety performance was also commendable. Safety is an absolute priority on all our worksites. Lastly, to mark the 75<sup>th</sup> anniversary of Freyssinet’s founding, we celebrated our heritage and highlighted our strengths – technical excellence, entrepreneurship and innovation.

## **What were your standout projects?**

We increased our work under ECI (Early Contractor Involvement) contracts, more particularly in Australia and the United Kingdom. ECI is a collaborative approach that enables us to build a good partnership with our customers very early in the project. This gives our customers access to the full range of our technical expertise and innovations. We also signed major contracts, including the Las Vegas Stadium roof in the United States, viaduct construction and repair in the United Kingdom and Turkey and prestressing at the Rooppur nuclear power plant in Bangladesh.



## **What are your upcoming challenges?**

We have done a lot of work on the sales and marketing aspects of our business. They are central to our strategic plan. We are going to build on our decentralised business model to take advantage of new opportunities and consolidate our leadership in both the construction and the maintenance and repair of infrastructure. We will also continue to innovate, as we did by supporting a project involving 3D printing of high-performance concrete to create architectural and structural shapes, which spawned a dedicated startup. Lastly, young people are the future. We are going to do our best to motivate, train and support them and help them achieve professional fulfilment.

## Panama

# Atlantic Bridge



The Atlantic Bridge, located 3 km north of the Gatún locks near the city of Colón, is a cable-stayed bridge with the world's longest concrete central span (530 metres). Once completed, it will allow vehicles to cross the Panama Canal independently of the locks' operation. For this large-scale project, Freyssinet installed cable stays on the main structure and prestressing on the approach ramps and the main structure. The company also supplied the materials and supervised all installation operations.

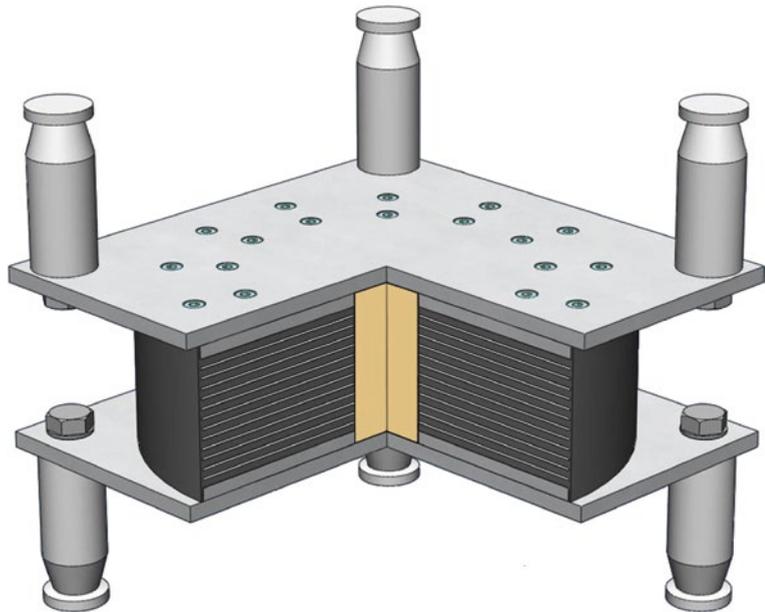
# 530

metre central span

Chile

# Curicó Hospital

To replace the former hospital, which was badly damaged by an earthquake in 2010, the city of Curicó embarked on the construction of a new hospital complex. With 400 rooms, 12 surgical units and 27 medical units, it will be the region's largest healthcare centre. For this new facility, Freyssinet designed, supplied and installed a seismic isolation protection system made up of 150 ISOSISM® isolators, which dissipates energy and controls displacement in the event of a tremor.



# 150

ISOSISM® isolators

## Togo

# Kpémé Wharf

Due to the saline environment and a lack of maintenance, the Kpémé wharf was suffering from significant deterioration that jeopardised its operation. Freyssinet's teams carried out remediation work on the wharf, which is used to transport phosphate, one of the country's key industries. The work included analysis of damage to the steel structure, repair of various elements (motors, electrical circuits, conveyors, etc.), cathodic protection of the piles, and anti-corrosion painting.





## Vietnam Phuoc Khanh and Binh Khanh bridges

For these two bridges, Freyssinet designed, supplied and installed the stay cables and the saddle system. For the Binh Khanh Bridge, the company also supplied the prestressing system and mobile formwork.

## China Fuqing Nuclear Power Plant

Freyssinet supplied a post-tensioning anchorage system and the equipment for its installation, including newly designed stressing jacks, as well as expertise throughout the project.



## Morocco Sidi Maârouf Bridge

Freyssinet supplied and installed the 27 stay cables that support the bridge deck, as well as the pre-stressing, bearings and joints.

[Find out more](#)

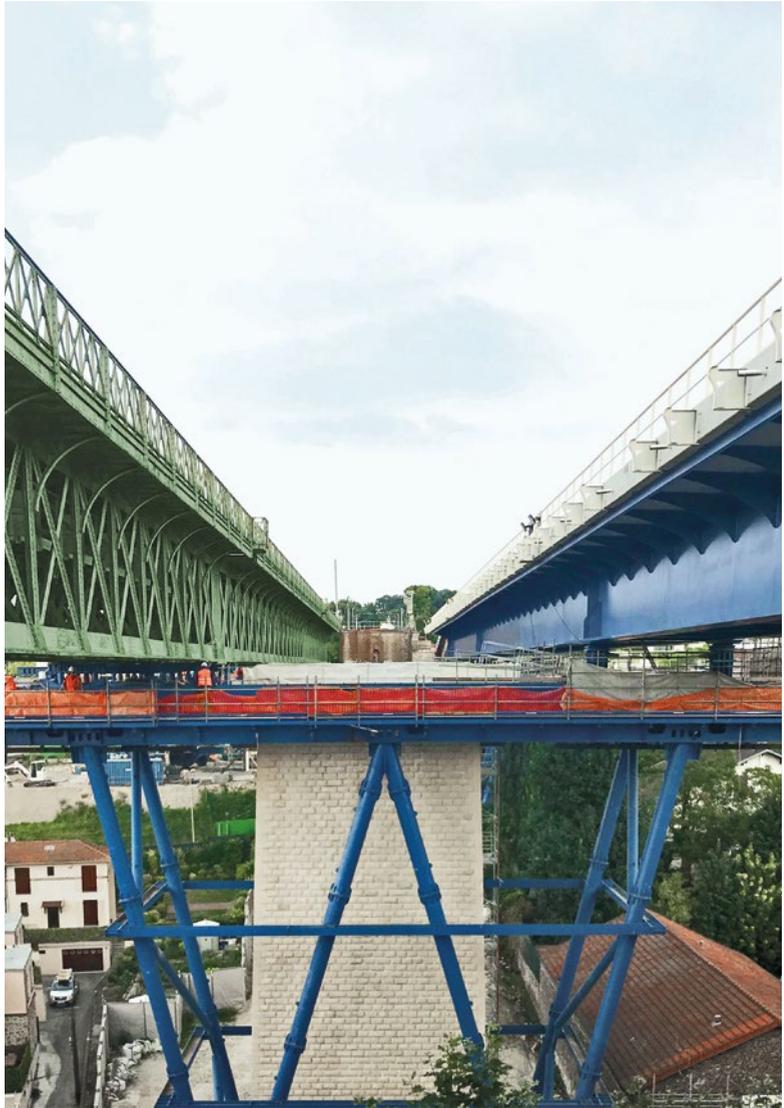
## United States

# Las Vegas Stadium

The future Las Vegas Stadium is a huge project. It will have a seating capacity of 62,000 and 110 luxury suites on 10 levels. Freyssinet is in charge of supplying and installing the structural part of the cable-stayed roof. This notably includes production of cables and metal elements, raising/jacking using the "Big Lift" method, coordination of temporary structures and protection of stands. The teams also provided design assistance services.



Seating capacity of  
**62,000**



## France Marly-le-Roi Viaduct

Freyssinet played an active role in the remediation of the Marly-le-Roi rail viaduct west of Paris, built in 1883. The teams replaced the existing 250-metre steel deck by sliding the existing structure out, sliding the new one into place and, lastly, unlaunching and dismantling the old deck. This delicate manoeuvre required meticulous scheduling to comply with the seven-week period during which train services were interrupted.

# 7

week  
comprehensive  
remediation

© [Watch the video](#)



**France**  
**Mesches Dam**

Freyssinet carried out repairs, notably repointing the stonework to seal the upper part and applying a 1,800 sq. metre shotcrete facing on the lower part of the dam.

[Find out more](#)

**Spain**  
**Rande Bridge**

Freyssinet worked on the widening of this heavily trafficked bridge, supplying 80 stay cables to support the addition of two decks connected to the existing structure.



[Find out more](#)



**Peru**  
**Perené bridge**

For this two-lane road suspension bridge, Freyssinet was chosen to design and supply two carrier tendons, two carrier tendons made up of 18 hangers each, and to provide technical support for their installation

[Find out more](#)

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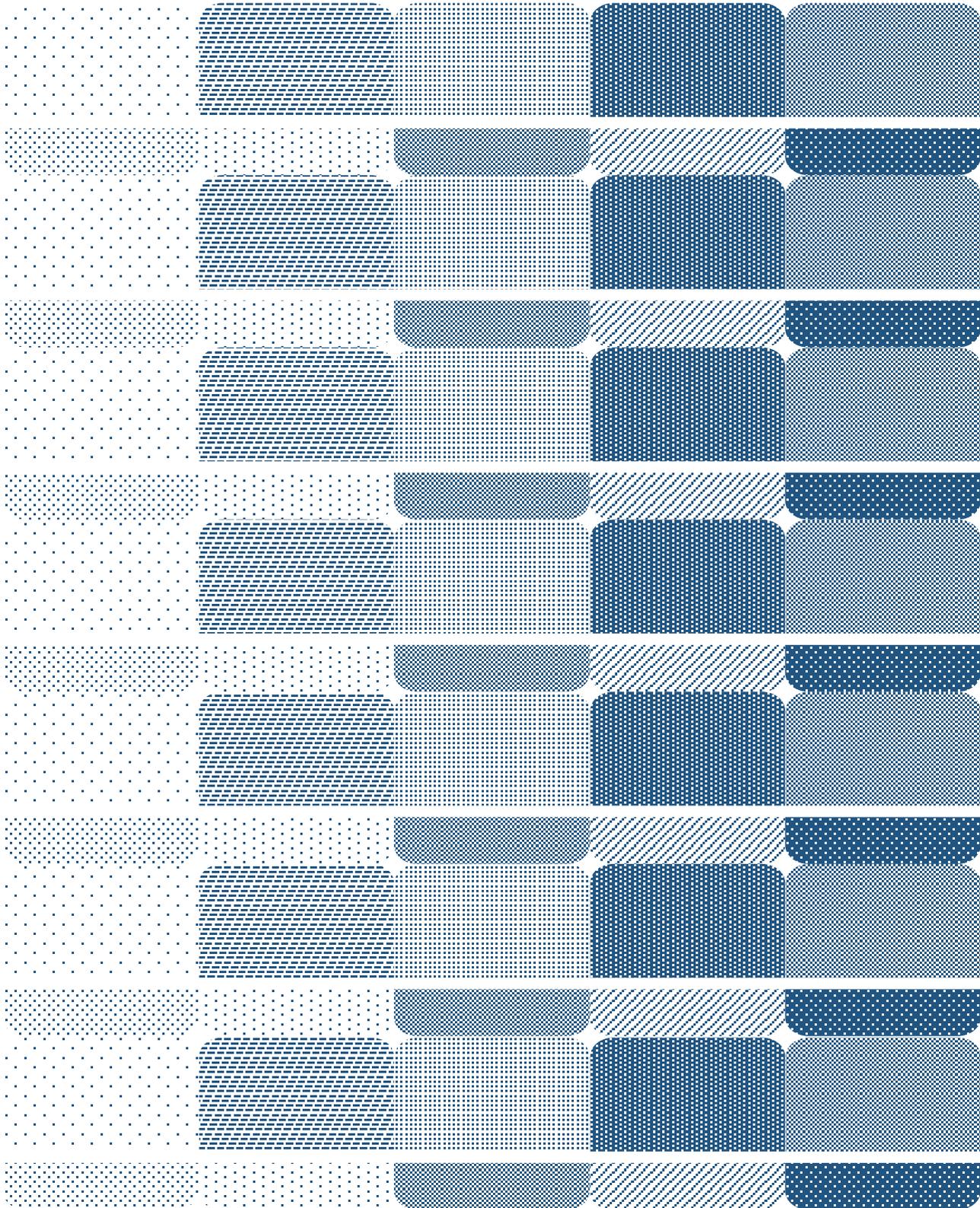
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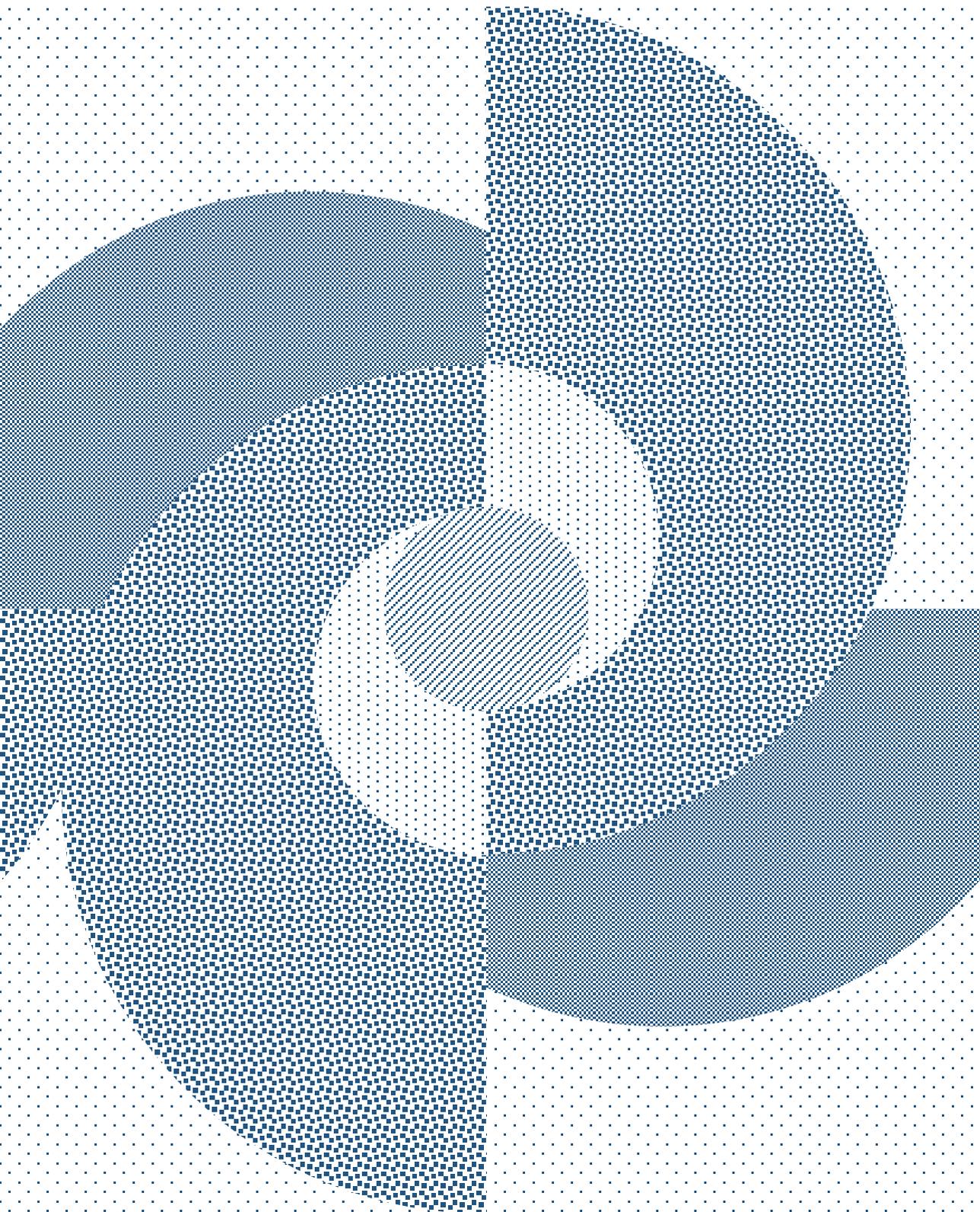
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Nuvia

2018





**NUVIA**

**A specialist in the nuclear sector  
and regulated environments**

Nuvia is a key partner for the nuclear industry, delivering innovative engineering, services and product solutions for industrial facilities and sensitive environments. Its services range from construction, waste management, and life span extension to equipment operation, while guaranteeing a level of excellence and compliance with safety and security requirements.

**Revenue<sup>1</sup>**

€336m

**Employees**

2,400

**Order intake**

- Protection of EPR ventilation ducts, France
- Modernisation of the SUNPP nuclear plant, Ukraine
- Protection and safety contract, United Kingdom
- Logistics services for the Dampierre plant, France

Dampierre en Burly



1 - Managed revenue

**Bruno Lancia, CEO, Nuvia**

# “Continuing our geographical diversification”

## **What have the main highlights been in your activity in 2018?**

Our revenue has remained steady despite a decline in investments in France and the United Kingdom in 2018. We continued our geographic expansion by setting up a new subsidiary in Belgium. Our Czech subsidiary also won a very large contract in Ukraine. This is a major success and here, too, it enables us to diversify geographically. And of course, we integrated the company NucAdvisor, which signed a very substantial contract with the Bolivian government, and the company Compart, which enables us to expand our passive fire protection offer for sensitive industrial environments. Innovation remains a major focus and in 2018 we launched a camera developed in partnership with the CEA, “NuVISION”, which enables radioactive source visualisation. Lastly, our safety results further improved, which is a major priority for us.



## **What is your current strategy?**

We are going to continue to focus on innovation, a major asset for Nuvia. Meanwhile, we will continue to extend our network of locations around the world and increase our presence across new territories, such as Asia, North America, South America and, why not, Africa, where demand is emerging.

## **What is the outlook for the market?**

The business situation is quite sensitive, since the nuclear industry is closely tied in with political issues. In France, we are waiting for long-term decisions on the energy transition. In the United Kingdom, there is an upturn with investment programmes for new construction. In addition, many countries that have so far been absent from the market are now turning to nuclear energy as a way to address climate change. There are therefore good prospects for expansion in the medium and long term.

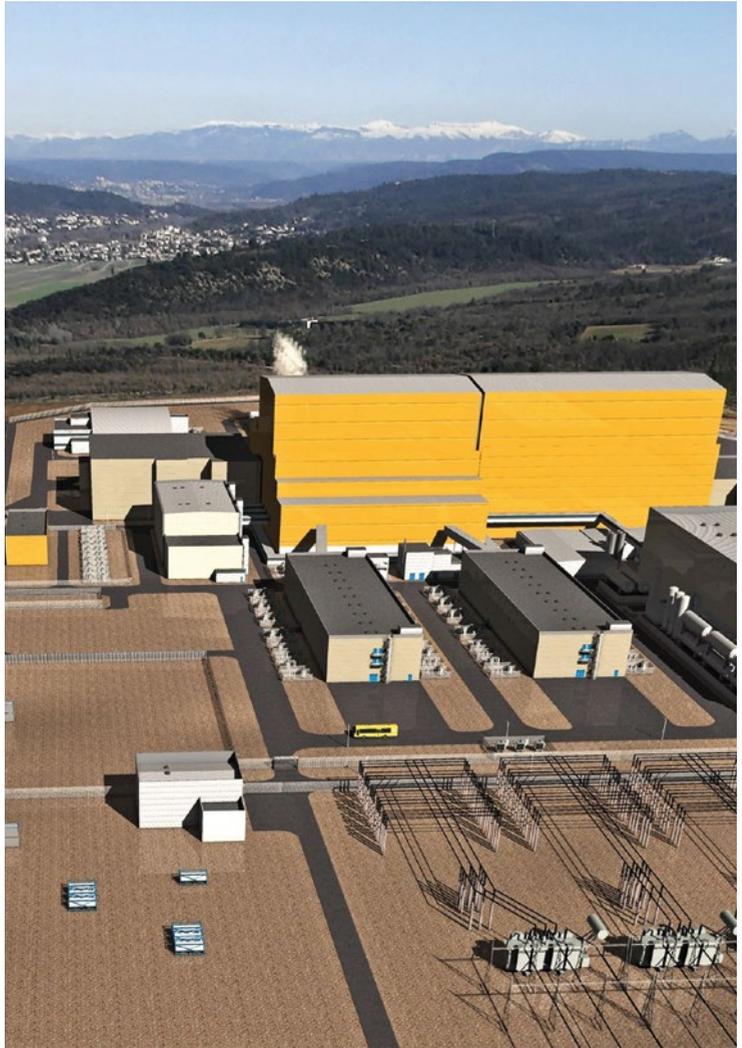
United Kingdom  
**Sellafield**  
nuclear site



The first-generation chimney of the reprocessing plant needed to be dismantled due to its non-compliance with current seismic standards and the risk to important sensitive buildings in its vicinity. To speed up the process while ensuring safety on site, Nuvia built and put in service a self-climbing platform that allowed manual dismantling work to proceed without interrupting the operation of the power plant. The company also deployed an innovative wet coring demolition method, which is twice as fast as conventional techniques.

2x

as fast – the wet coring  
demolition method



## United Kingdom ITER

Nuvia UK carried out an overhaul and audit of the Tokamak Complex and Hot Cell detritiation systems for the ITER site in France. The aim was to reduce the estimated costs of the detritiation system by 80% and to ensure its compliance with regulations. ITER is a nuclear fusion research reactor project near Cadarache, southern France. The research project involves 35 countries and aims to industrialise nuclear fusion as a source of electricity.

# 80%

reduction in the  
estimated cost  
of the detritiation  
system

## United Kingdom

# Magnox, Harwell\*

The dismantling of the liquid effluent treatment plant (LETP) in Harwell involves major ground remediation works. Large volumes of earth were excavated and treated according to their radiological content. To optimise and automate the analysis and treatment of excavated earth, Nuvia deployed four high-resolution gamma spectrometry systems and developed a database and associated software. These technologies enabled the treatment of more than 500 semi-bulk bags with a unit capacity of 1 cu. metre every week.

\*Former Atomic Energy Research Establishment



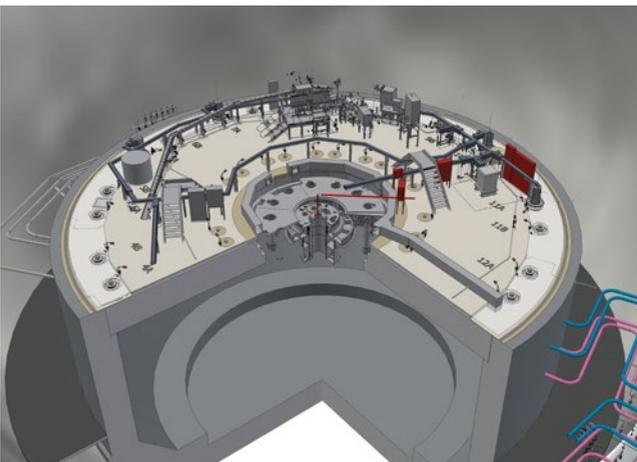


## Czech Republic Dukovany nuclear power plant

Nuvia is currently carrying out operational measurements under a long-term contract that includes radiochemical analyses of the primary and secondary circuits and radioactive waste measurement. Nuvia is the only company in the Czech Republic that performs measurements for the release of radioactive waste material.

## France Flamanville EPR

Nuvia mobilised more than 100 people to carry out sealing operations on cable penetrations, to wrap cable raceways and to protect ventilation ducts at the Flamanville EPR. The work used Nuvia Tech Protection products designed and manufactured by Nuvia.



## United Kingdom Dounreay nuclear research site

Nuvia is working with Dounreay Site Restoration Limited to design, install and commission equipment in order to remove and process NaK residues (a sodium-potassium alloy) from the pipe system of the Fast Reactor facility. As part of the reactor's decommissioning scheme, the residual NaK is being removed using an existing Water Vapour in Nitrogen (WVN) process.

## Ukraine Safety upgrade

As part of a consolidated safety upgrade programme of Ukrainian nuclear power plants, Nuvia CZ's teams were active on many sites around the country. They supplied equipment to measure radioactivity in the radioactive waste processing complex and a whole-body scanner module.





## United Kingdom

# Dungeness nuclear power plant

Nuvia UK's teams are working to design, supply, integrate and commission equipment for the nuclear waste transfer area (WTA). The WTA will retrieve, process and package intermediate-level waste to prepare it for transport. The important facility, which must be carefully configured within the plant's safety perimeter, drew on the full range of Nuvia's expertise



## France Penly nuclear power plant

Nuvia carried out the paint renovation of the reactor building gantries at the power plant's reactor building. To prepare the project, Nuvia designed and implemented all access and containment systems.

## France Dampierre en Burly nuclear power plant

EDF renewed Nuvia's Global Site Assistance Services contract covering the power plant. Under the seven-year contract, more than 120 people will coordinate and manage nuclear logistics and radiation protection to support operation and maintenance of site installations.



## France Orano maintenance contract

Orano contracted Nuvia to carry out maintenance on more than 600 remote-controlled arms at its La Hague site in northern France. Specialist maintenance activities ensure security and safety of installations, availability of the remote-controlled arms and significant long-term reduction in the cost of spare parts for Orano, and they optimise the waste and recycling chains.

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**Design and layout:**

**Abmo**

Soletanche Freyssinet is world leader in soil, structural and nuclear engineering. The Group brings together an unparalleled array of construction and engineering expertise and brands. Soletanche Bachy, Menard, Terre Armée, Freyssinet, Nuvia and Sixense provide technical excellence to ensure structure performance and sustainability. The Group supports the expansion of its brands by providing the resources to extend their worldwide networks and broaden their technology portfolios.

**[www.soletanchefreyssinet.com](http://www.soletanchefreyssinet.com)**



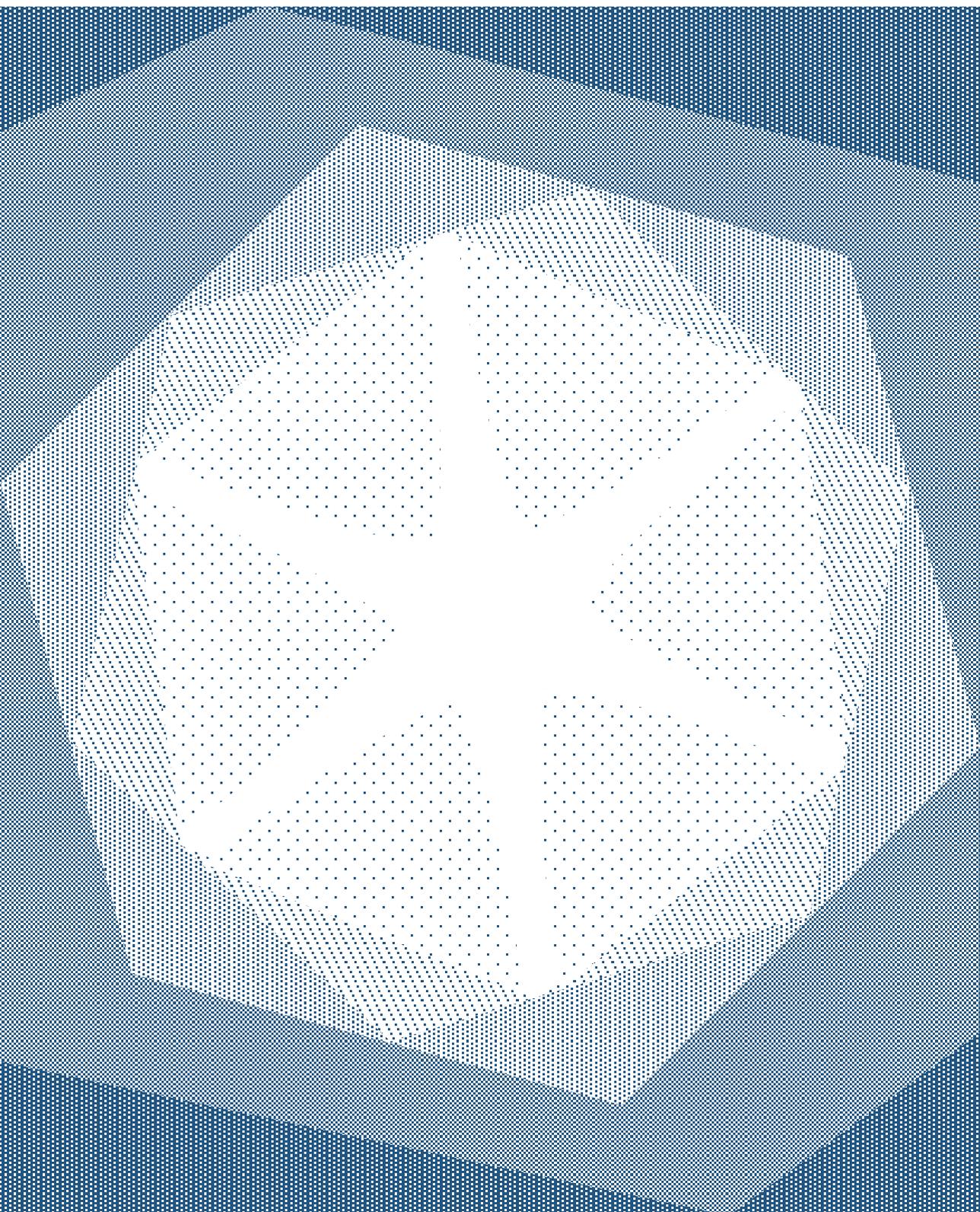
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Sixense

2018





**Sixense**

### Digital services and solutions

Sixense is an international company with expertise in the fields of technical, digital and scientific solutions for the construction and industrial sectors. Sixense offers digital solutions based on its knowledge of geotechnics, the environment, and infrastructure. It's goal is to monitor, diagnose, and model sites and assets to enable clients to better analyse, understand and manage them within their surrounding environment.

Saint-Gobain tower, La Défense



### Revenue<sup>1</sup>

€74m

### Employees

640

### Order intake

- Mapping of rail lines, France
- Topographic maps for a new high-speed rail line, UK
- Instrumentation of the Bavigne Dam, Luxembourg
- Inspection and structural audit, Saint-Joseph jetty in Ajaccio, France
- Monitoring of descaling operations, Tricastin nuclear power plant, France
- Earthquake protection reinforcement study, Tazi Palace Hotel, Morocco

1 - Managed revenue

**Pascal Berger, CEO, Sixense**

# “Becoming the benchmark in innovative solutions for assets”

## **What were the main highlights in 2018?**

Sixense was founded quite recently, in 2016, and 2018 was a year of consolidation. We specialise in innovative solutions for asset design, construction and operation. We work in five business areas that span the entire asset life cycle: construction services, asset operation, risk management, data management and consulting. We have also organised the company in four business lines: Engineering, Monitoring, Asset Digitalisation and Platform Hosted Software Solutions. In 2018 we acquired the Perazio company to reinforce our asset digitalisation business line and we won iconic projects that will enable us to create benchmark solutions and introduce them across all our markets.

## **What is the outlook for the current year?**

The goal will be to put our new approach into practice and to win new key contracts for the company. We will also be strengthening synergies between our various activities by creating links between our areas of expertise and hosting all our solutions within a single digital platform. This will enable us to develop and deliver new solutions and services for our customers.



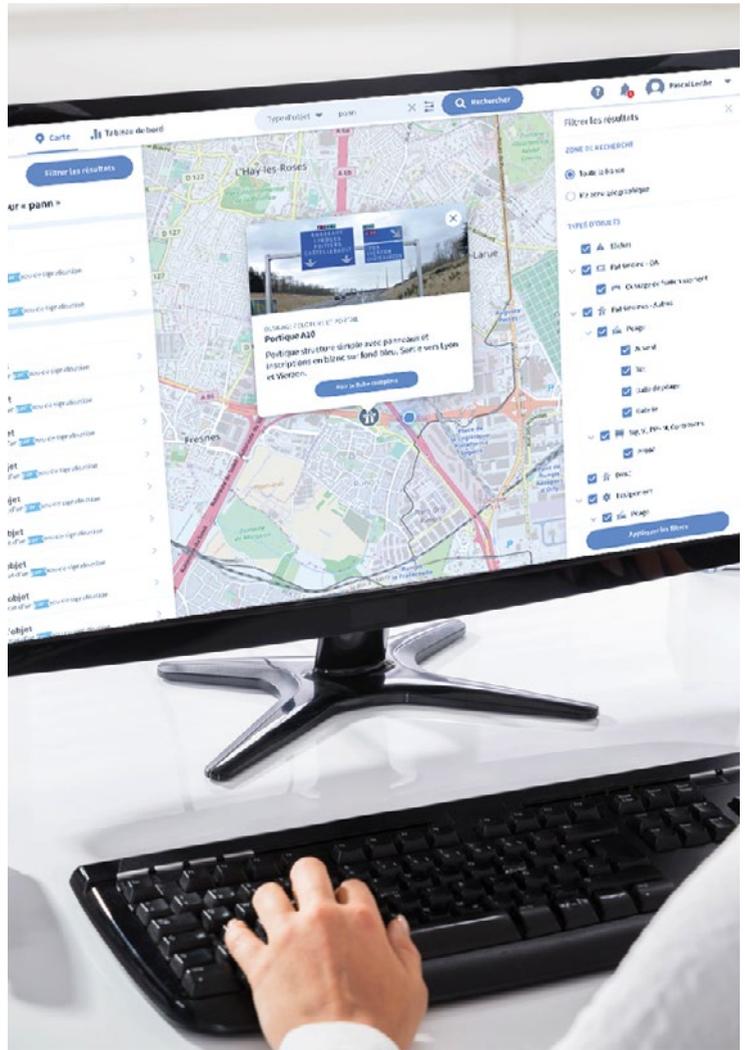
## **How do you plan to set yourself apart in digital solutions?**

We are going to build on our strengths – our leadership in our traditional business lines and the in-depth knowledge of customers’ asset life cycles and operational processes acquired within the VINCI Group. There are many start-ups moving into building and civil engineering, but very few have our combination of asset knowledge and digital solutions.

# Australia West Gate Tunnel



The West Gate Tunnel, set for completion in 2022, will provide an alternative route to the West Gate Bridge and faster, safer access to the centre of Melbourne and the western suburbs. The project also includes the addition of four new lanes to an existing highway and construction of a bridge to connect the tunnel to the road network and improve access to the port. Sixsense teams are responsible for geotechnical analysis on the part of the project located in the tunnel and for environmental monitoring of the entire project.



## France Full BIM Project

Full BIM is aimed at boosting VINCI Autoroutes' ability to manage its assets via a single optimised and collaborative interface. The purpose of the project is to ensure uninterrupted information on the infrastructure life cycle, from construction to operation, and to facilitate dialogue between project participants and improve asset management coordination.

Full BIM ensures uniformity of methods, introduces common tools that communicate with each other (3D modelling, infrastructure management, maintenance and geographic information system) and sets up a central data aggregation and hypervision platform (database and hypervisor).

1

single interface  
to coordinate road  
asset management

## France

# Wind farm

Sixense won the contract to perform an acoustic survey to ensure that a large wind farm in the Doubs department complies with noise regulations. To achieve this, the company developed an innovative method combining measurements and calculations in several stages to ensure a sufficient level of control during handover procedures. The client particularly appreciated the approach, which combined state-of-the-art technical capabilities and innovation. The project boosts the partnership with the client, who plans to increase work with Sixense.





**Cameroon**  
**Song Loulou Dam**

Sixense carried out diagnosis of corroded concrete and carried out laboratory testing and analysis to prepare refurbishment of the intake structure at the Song Loulou hydroelectric power plant, the country's largest.

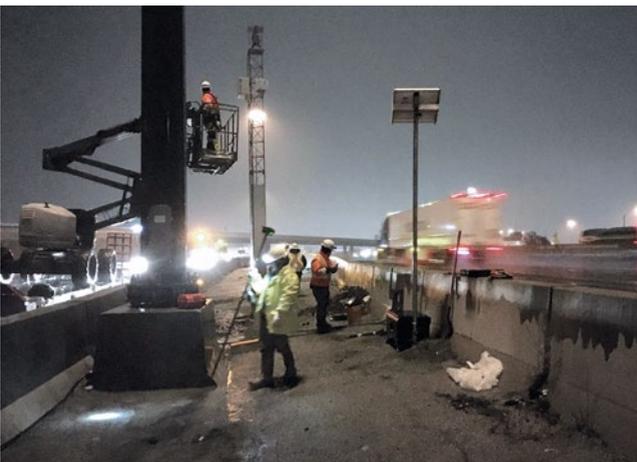
**France**  
**Grand Paris**

Sixense Soldata is involved in 14 Grand Paris Express and Eole works packages, for which it is installing and maintaining instrumentation and monitoring systems on adjacent structures.



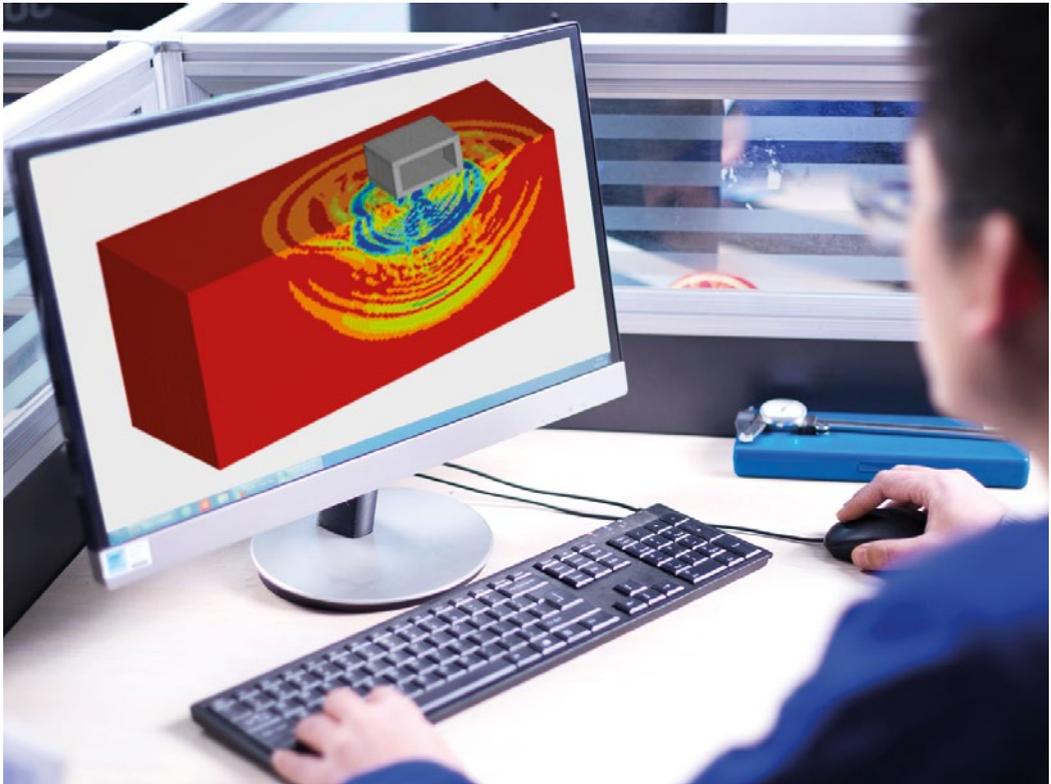
**Canada**  
**Kitchener**  
**rail corridor**

Sixense is supplying, installing, operating and maintaining a monitoring programme covering the existing rail tunnel, a surface motorway and retaining structures.



## Belgium Test bunker

Sixense provided technical support for the design of a test bunker for hydrogen facilities. The bunker must withstand the effects of overpressure and projectiles in the event of an accidental equipment explosion while limiting the impact on the surroundings. To do this the Sixense teams digitally modelled the effects of an internal explosion and performed a study of the ground and foundations to verify limited transmission of vibrations to nearby structures and ensure maintenance of production lines in the event of an incident.





## Côte d'Ivoire

# Houphouët Boigny Bridge

Sixense took part in the refurbishment of the first bridge in the country's economic capital, which has spanned the lagoon for more than 60 years. The project will ensure ongoing safety for car, truck and train traffic across the bridge. The company carried out a detailed digital inspection of the structure, with a special focus on non-destructive testing to identify construction features and measure tension in the pre-stressing cables.



**Greece**  
**Satellite monitoring of a motorway**

Sixense used satellite imagery to carry out historic analysis and continuous monitoring of geological movements on a 200 km section of the Athens-Patras motorway.

**France**  
**Tancarville Bridge**

Sixense teams performed a corrosion protection investigation of the bridge to assess its condition and recommend compliance upgrades, together with works schedules and cost estimates.



**France**  
**Flamanville nuclear plant**

Sixense monitored the sealing work on the exterior surface of the inner containment of the plant's reactor buildings (Units 1 and 2).

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