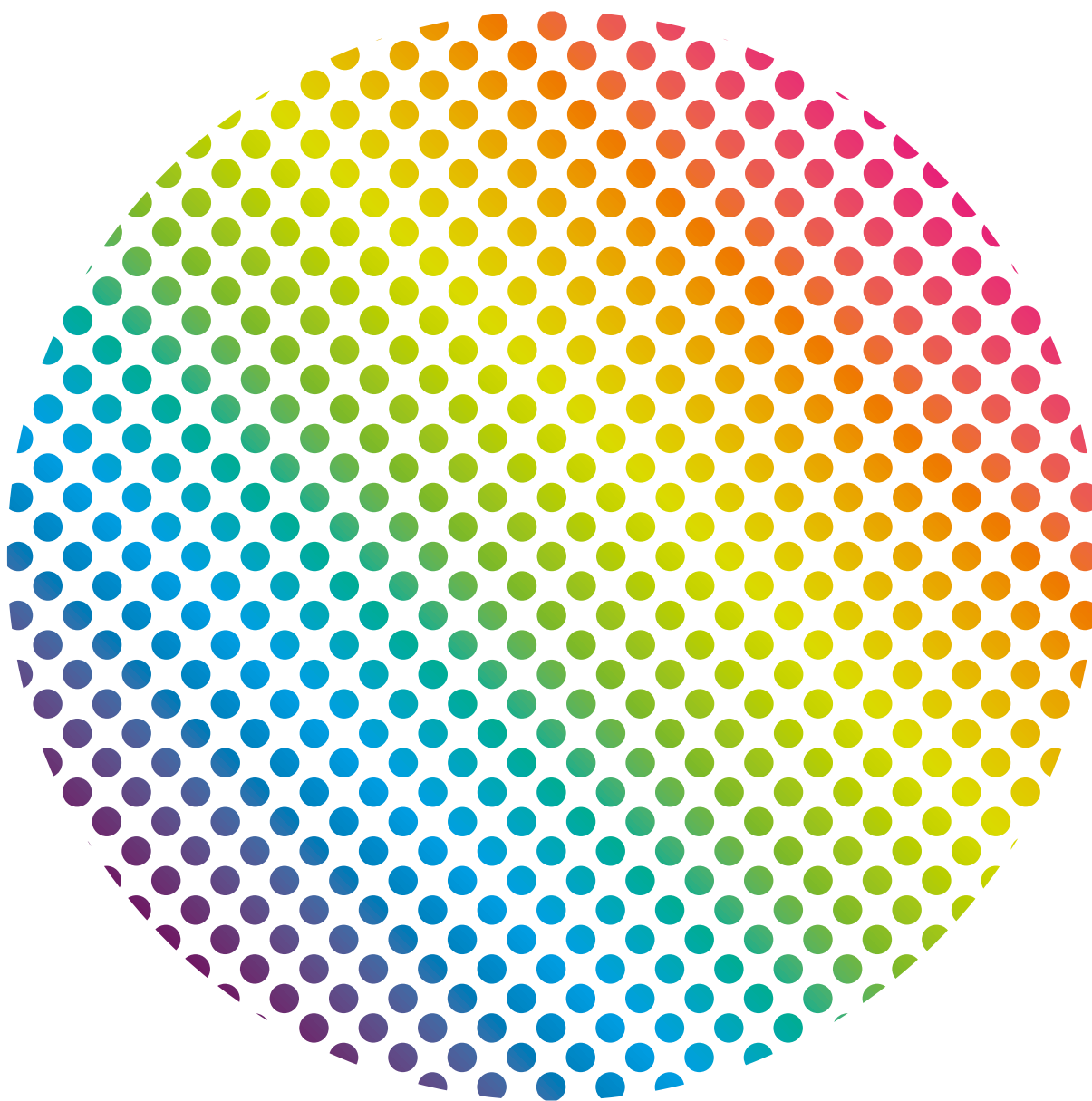


# GLOBAL REPORT

8



DENYS  GLOBAL



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## Multi love

### Energized by the tip of the iceberg

Working for an atypical company like Denys regularly yields extraordinary experiences. One I remember very well is my visit to the Royal Museum for Central Africa construction and renovation site about two years ago. Our teams had just completed excavating the underground museum entrance, leaving the historic building resting on a grid of temporary grout columns. It looked almost like a colossus stilt-walking, quite a scary sight for someone unaccustomed to this kind of work. I enjoyed it, though, just as I might looking at a curious Dali painting.

I must say I love such projects, which I like to refer to as tip-of-the-iceberg assignments. They throw up a multitude of challenges, many of which are 'below the surface', both literally and metaphorically. Another telling example is the Antwerp Handelsbeurs renovation project, a highly multidisciplinary venture involving extremely tricky foundation reinforcement work. As a matter of fact, multi-disciplinary expertise can only gain in importance faced with the inner-city densification programmes now being rolled out all over Europe and beyond. Coming across extreme subsoil risks? Call Denys, it's our specialty. Looking to extend precious architectural heritage in a densely built-up area? We know how it's done. Projects that push the boundaries? That's exactly what energizes us most.

*Johan Van Wassenhove / CEO Denys Group*

**INTRODUCTION**  
**ENERGIZED BY THE TIP  
OF THE ICEBERG**

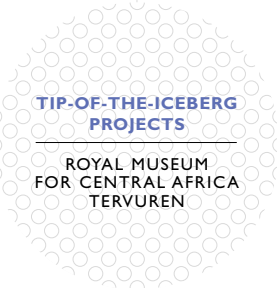


Beyond the ordinary



© Régine Mahaux

Five years after the Royal Museum for Central Africa in Tervuren, Belgium, closed its doors, we're proud to have completed the ambitious renovation and extension project. It was very much a multidisciplinary effort, involving the restoration and renovation of the old museum building and the construction of an entirely new entrance pavilion as well as a 100-metre underground space connecting the two. Nearly everything we did here was beyond the ordinary.







© Régine Mahaux

TIP-OF-THE-ICEBERG  
PROJECTS  
ROYAL MUSEUM  
FOR CENTRAL AFRICA  
TERVUREN



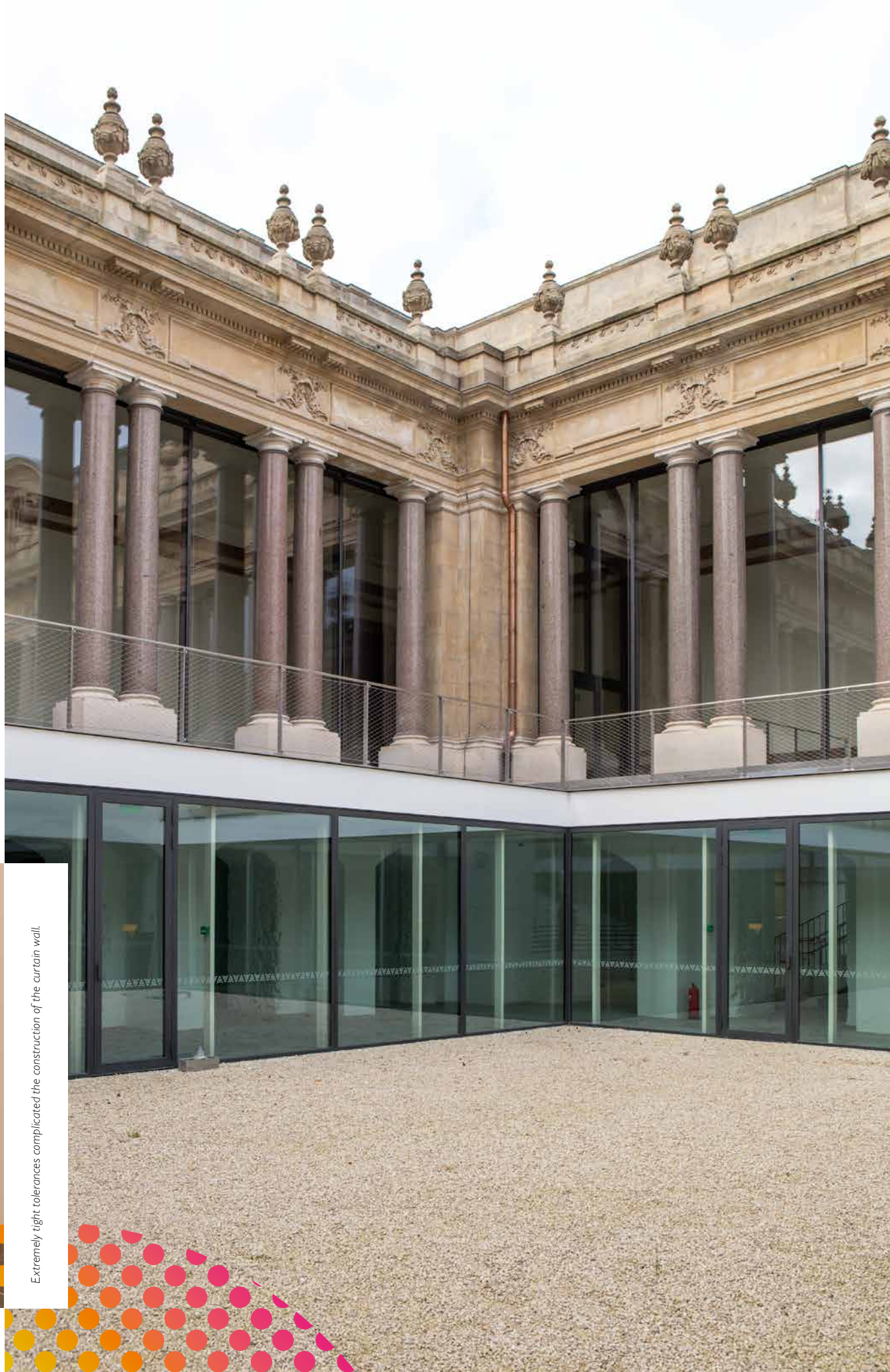


### A museum on stilts

The underground connection between the entrance pavilion and the museum was also a challenging feat. While the space itself could be created using classic secant pile wall construction, the passageway to the old museum building required some special techniques. The connection had to be made below existing foundation level, requiring the construction of a 2.5-metre high reinforcement beam to divert the considerable forces involved. However, the presence of a number of precious, non-removable historic maps of the Belgian Congo in the space above required us to keep subsidence within tight limits. Our soil mechanics expert therefore developed a detailed step-by-step procedure which involved the use of grout piles and lattice work to reinforce the foundations and jack screws to monitor and compensate for any movement. At one time it was almost as if the museum was resting entirely on stilts.

### Simulating actual use

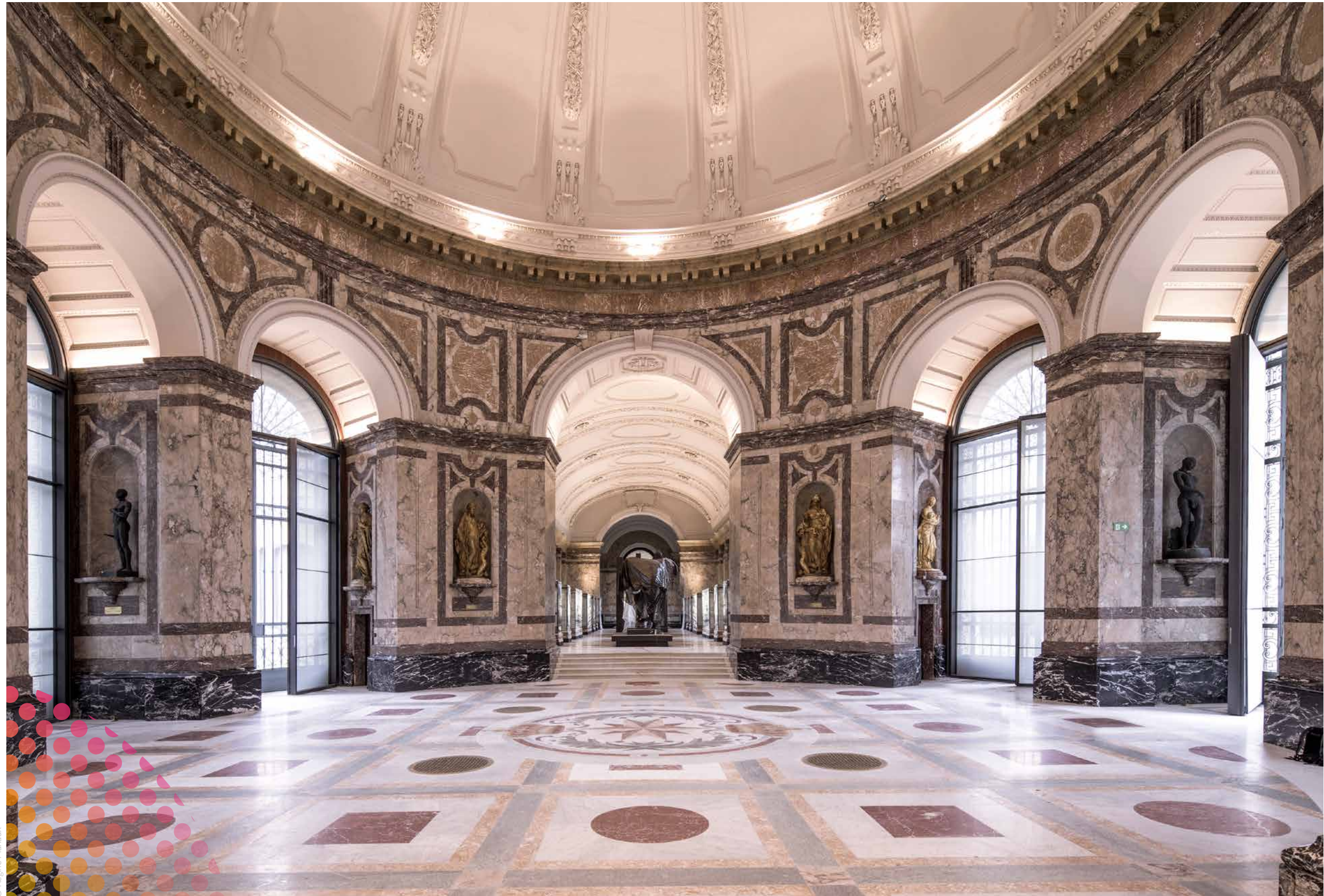
Take the entrance pavilion, a transparent volume of steel, glass and black fair faced concrete that will house secondary functions including the new museum shop, a restaurant and an auditorium. Extremely tight tolerances complicated preparation and construction work, especially on the curtain wall. We even had to put in dummy weights during construction to simulate eventual use conditions and proactively induce the vertical deflection and subsidence that will occur.



Extremely tight tolerances complicated the construction of the curtain wall.

TIP-OF-THE-ICEBERG  
PROJECTS  
ROYAL MUSEUM  
FOR CENTRAL AFRICA  
TERVUREN

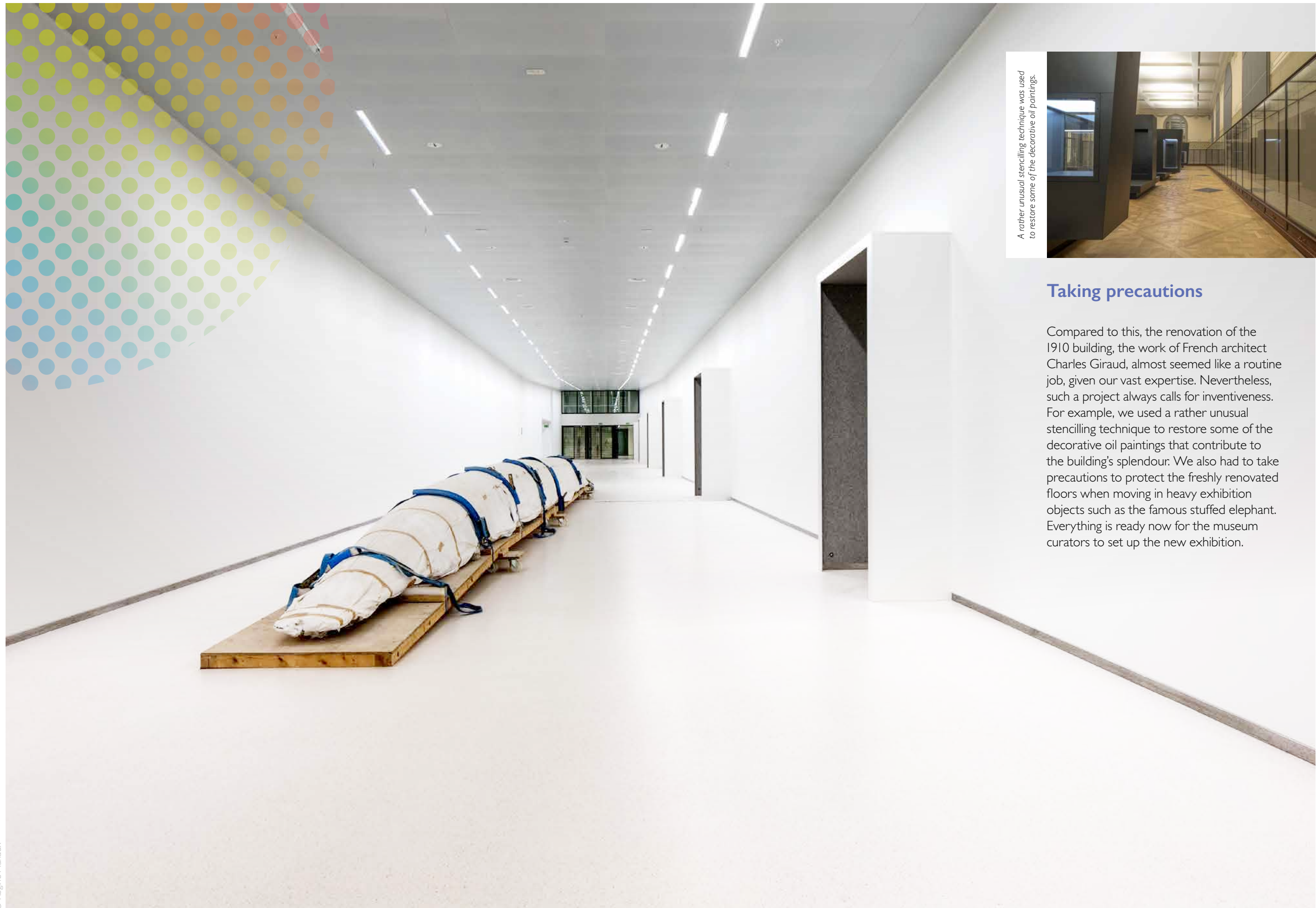




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TIP-OF-THE-ICEBERG  
PROJECTS  
ROYAL MUSEUM  
FOR CENTRAL AFRICA  
TERVUREN





A rather unusual stencilling technique was used to restore some of the decorative oil paintings.

### Taking precautions

Compared to this, the renovation of the 1910 building, almost seemed like a routine job, given our vast expertise. Nevertheless, such a project always calls for inventiveness. For example, we used a rather unusual stencilling technique to restore some of the decorative oil paintings that contribute to the building's splendour. We also had to take precautions to protect the freshly renovated floors when moving in heavy exhibition objects such as the famous stuffed elephant. Everything is ready now for the museum curators to set up the new exhibition.

TIP-OF-THE-ICEBERG  
PROJECTS

ROYAL MUSEUM  
FOR CENTRAL AFRICA  
TERVUREN





© Régine Mahaux

Constructing the underground entrance to the museum building called for some engineering ingenuity.

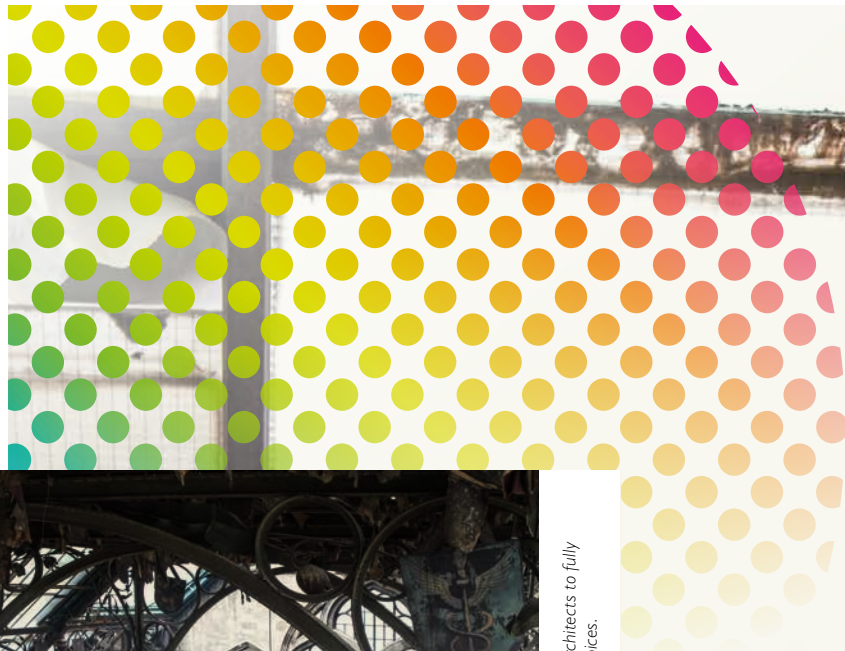
Everything is ready now for the museum curators to set up the new exhibition. Success.

TIP-OF-THE-ICEBERG  
PROJECTS

ROYAL MUSEUM  
FOR CENTRAL AFRICA  
TERVUREN



A multidisciplinary feast



Denys conferred a lot with architects to fully understand the aesthetic choices.



© Régine Mahaux

The rehabilitation of the Antwerp Handelsbeurs site is a real multidisciplinary feast. The first and most complicated stage involved the careful restoration and renovation of the former 19th century stock exchange building, a fusion of neo-gothic architecture with revolutionary metal construction techniques. This also required the use of special foundation techniques to be able to construct three parking levels beneath the historic building. In addition, we constantly needed to multitask in unprecedented ways to ensure planning stability and meet the deadline scheduled first half 2019. And by the end of next year, we're due to complete the conversion of the adjacent buildings into a luxury hotel.







Advanced multitasking was required to ensure planning stability.



## Doing things in parallel

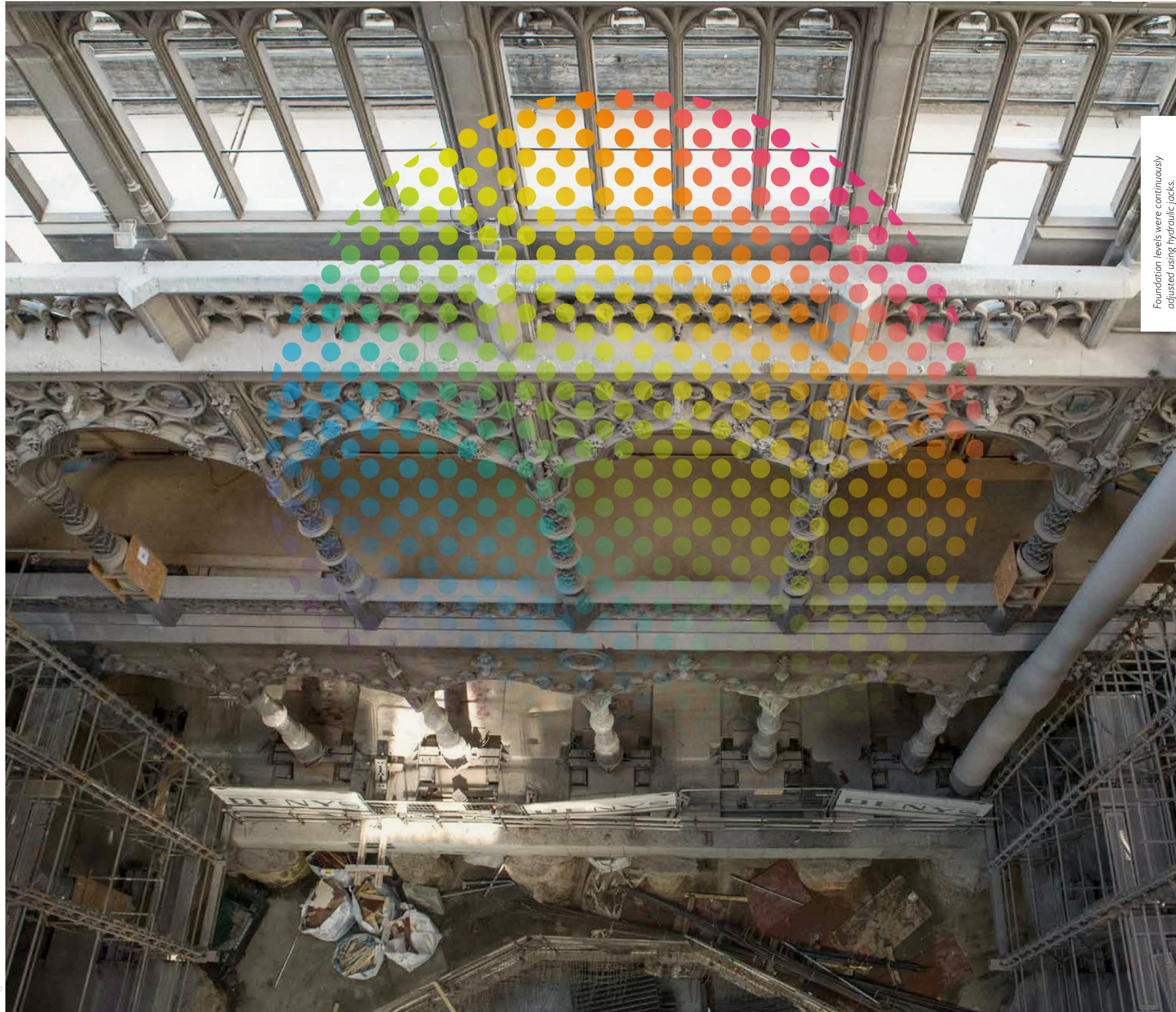
The renovation of the stock exchange building was especially challenging due to the planning impact of a number of interior design decisions. We needed to confer a lot with the architects to gain a full understanding of their aesthetic choices and develop appropriate techniques to achieve them without jeopardizing the initial planning. An essential aspect of this was our rigorous approach, as seen in our ability and willingness to do many things in parallel, often to people's surprise. For example, we carried out some of the painting before completing structural work to ensure delivery was on time. While we made sure this didn't negatively impact the quality of what we delivered, it did help keep costs down.

TIP-OF-THE-ICEBERG  
PROJECTS

HANDELSBEURS  
ANTWERP







Foundation levels were continuously adjusted using hydraulic jacks.



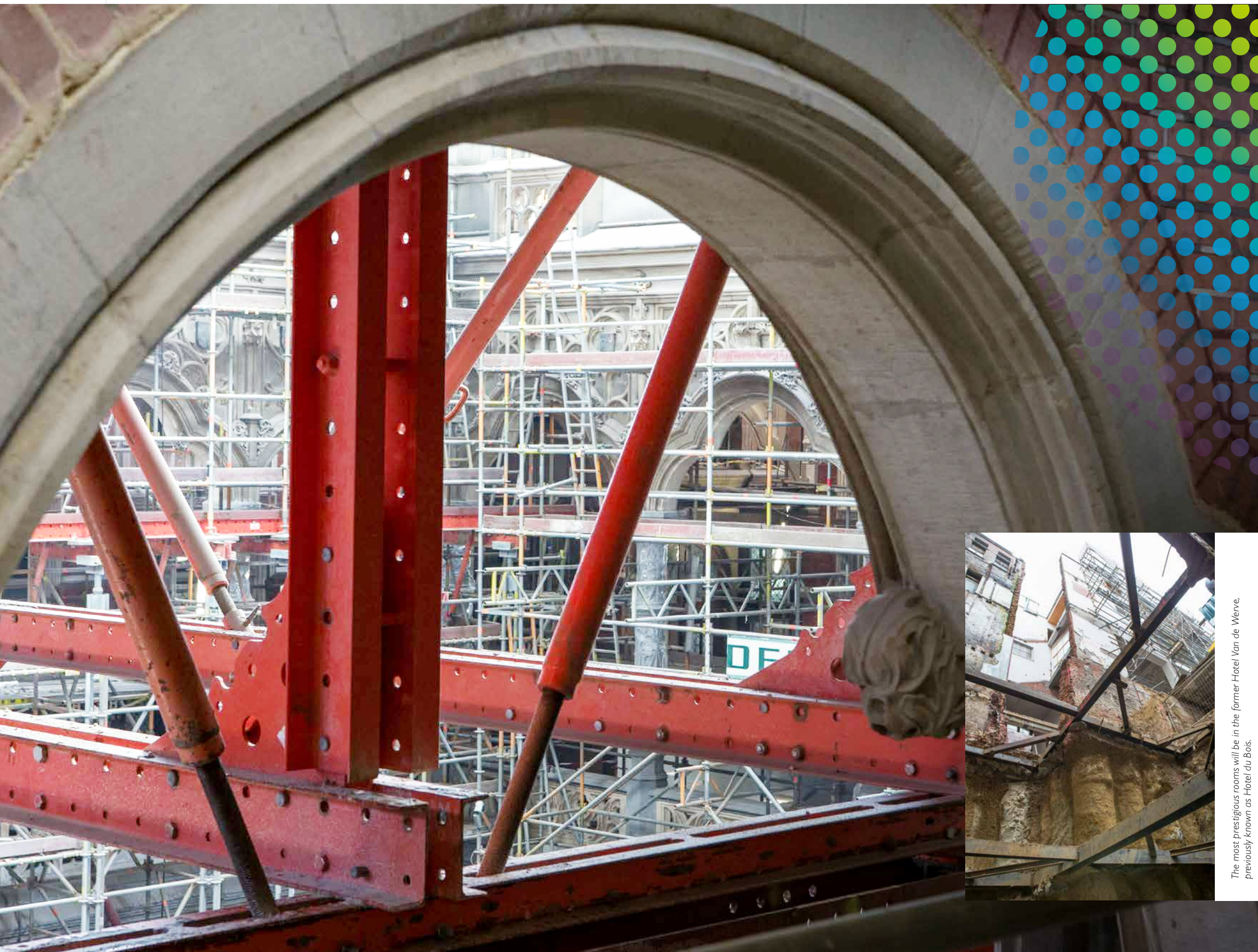
## Gradual swelling

Any construction engineer will confirm that soil mechanics is one of the more perplexing fields of engineering knowledge. Risks might be involved, but the subject is a Denys specialty. And so, our multidisciplinary expertise was fully engaged to build the underground parking space which we carried out according to a well-crafted scenario. First, the floor was taken out, laying bare archaeological remains, which were investigated and secured. Then we injected a series of grout piles three levels deep and constructed a grid of concrete beams to support the Handelsbeurs. Subsequently, the parking space was excavated and constructed, level by level. Meanwhile, we had to take into account the behaviour of the clay subsoil, which when laid bare tends to swell gradually. Consequently, we needed to continuously monitor the building's behaviour, and make adjustments to the stone column bases using hydraulic jacks.



TIP-OF-THE-ICEBERG  
PROJECTS  
HANDELSBEURS  
ANTWERP





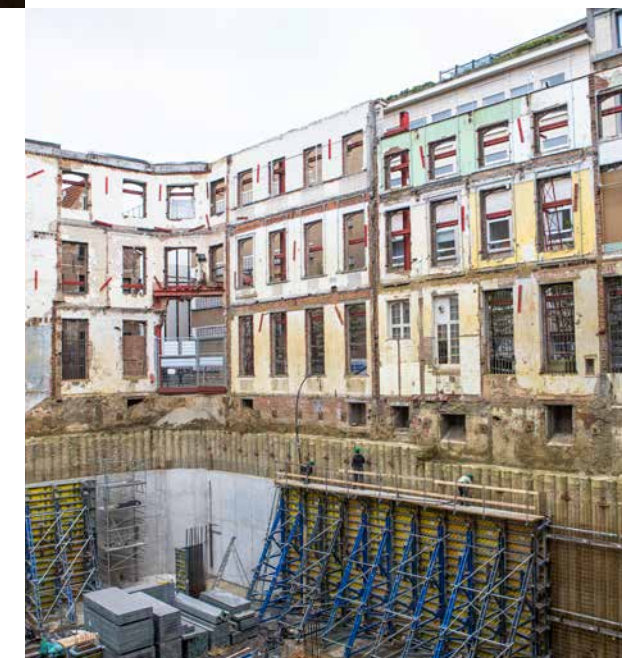
## An exquisite hotel

To the east of the Handelsbeurs building, we're constructing a 139-room hotel. Part of it is due to be built on the site of the former city residents' administrative centre, locally known as the Burgerlijke Stand. The most prestigious hotel rooms, however, will be sited in the adjacent historic Hotel Van de Werve, previously known as Hotel du Bois, an 18th century building with a 16th century basement and attic.

We're particularly proud of our work here, preserving the best of a historic building and sensitively fusing it with the modern elements. In future years our guess is that this development will come to be known for exactly what it is, an exquisite, thoughtfully designed building, and a hotel beyond the commonplace.



The most prestigious rooms will be in the former Hotel Van de Werve, previously known as Hotel du Bois.

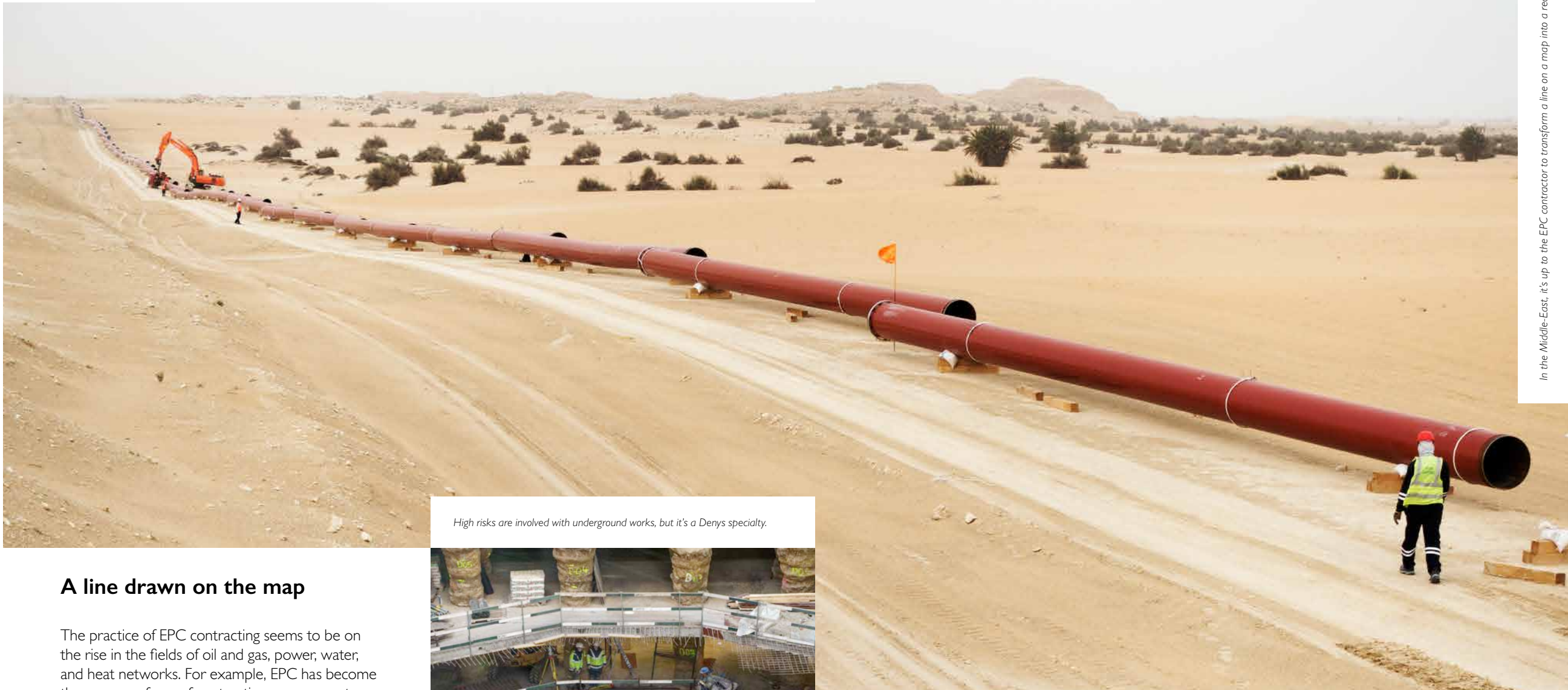


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TIP-OF-THE-ICEBERG  
PROJECTS

HANDELSBEURS  
ANTWERP



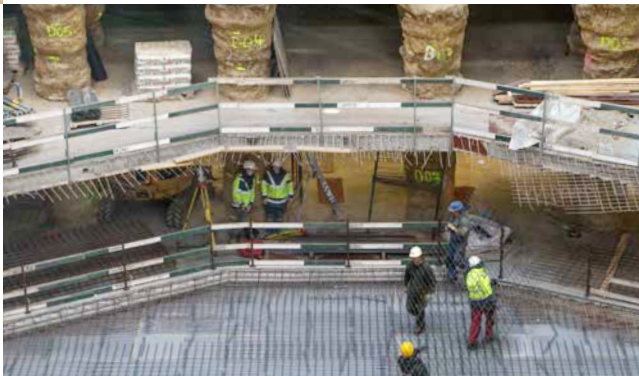


In the Middle-East, it's up to the EPC contractor to transform a line on a map into a real-life project.

High risks are involved with underground works, but it's a Denys specialty.

A line drawn on the map

The practice of EPC contracting seems to be on the rise in the fields of oil and gas, power, water, and heat networks. For example, EPC has become the common form of contracting arrangement in Africa and the Middle East. A contract for the construction of a gas pipeline in Saudi-Arabia is based on a Front-End Engineering Design (FEED), which sometimes is limited to a simple line drawn on a map. Then it's up to the contractor to do the rest of the thinking and negotiating, including the detailed engineering, the specification and procurement of materials and equipment, and the administrative hassle, for example to obtain permits for trenchless crossings. In the fields of power and water, customers will typically define performance requirements, leaving the contractor to propose adequate technical solutions from scratch. In Europe, EPC contracting is still less common, although it is gradually being used in innovative projects such as the development of heat networks. The reason is that EPC contracting is seen as the best way to combine both the customer's and the contractor's expertise and experience, which is essential to bring such projects to fruition.



© Régine Mahaux

Increasing upfront commitment

In Europe, project developers make more elaborate upfront preparations and most of them tend to keep a careful eye on their procurement process. However, there is an increasing tendency to outsource parts of the engineering and/or procurement scope, in addition to the construction work. This opens up opportunities for companies such as Denys to optimize or finetune basic designs to improve feasibility or to bring in valuable field expertise. For example, an experienced constructor may critically evaluate a proposed high-voltage line, gas pipeline or heat network trajectory preliminary design and put

forward alternatives. Projects within the framework of the energy transition also need greater upfront commitment from contractors. Of course, the contractor assuming engineering responsibility will see their liabilities increase.

Comprehensive expertise

The EPC contracting model also finds its way into the building industry, where it's often called turnkey contracting. The model is particularly useful in complex projects, where the contractor's comprehensive expertise provides a clear added value for the customer. Look at the Antwerp Handelsbeurs project where we engineered the specific and very challenging foundations and supporting structures, using our know-how in complex underground civil engineering.

Communicate, communicate, communicate

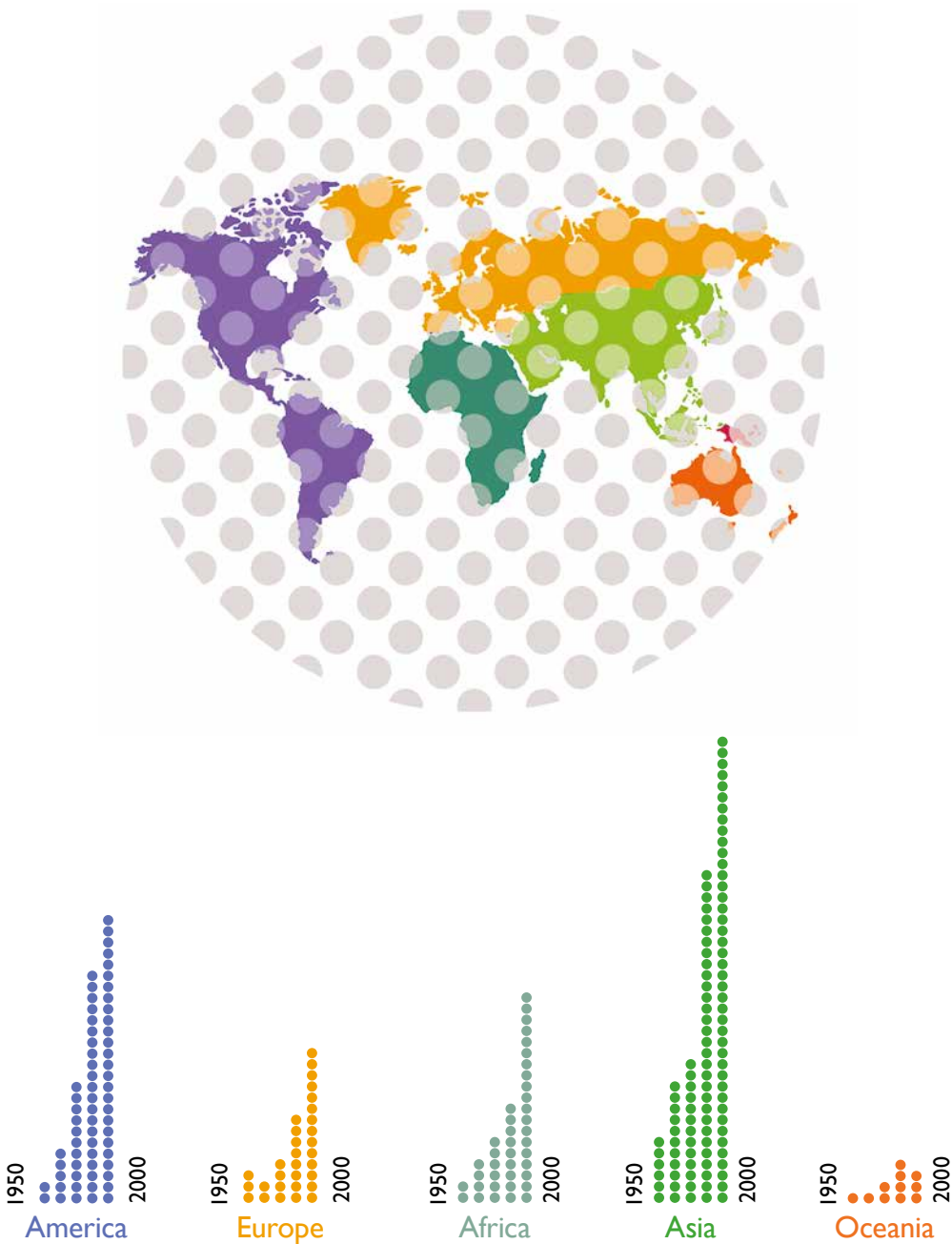
There's another reason why turnkey contracting is on the rise in the building industry: competitive pressure leads architectural firms to leave much of the detailed study work to the contractor, who needs to further reinforce technical prowess. That's what we have been doing for a number of years now. In addition, the changed relationship between architect and contractor requires them to develop a more solid mutual understanding. Ideally, this is done through a DBFM arrangement, but since that's not always possible it's best to plan carefully, follow up systematically and communicate, communicate, communicate.





# Flood control in urban areas

Flooding has become one of the toughest challenges faced by society today. The World Bank report ‘Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century,’ argues that floods are the most frequently occurring events among natural disasters, and that the number of reported floods has steadily increased over recent decades. In addition, an increasing number of floods occur in urban areas, where the economic consequences are more severe and mitigation is more difficult.



The number of floods occurring worldwide has steadily increased over recent decades.

## Urban stormwater detention

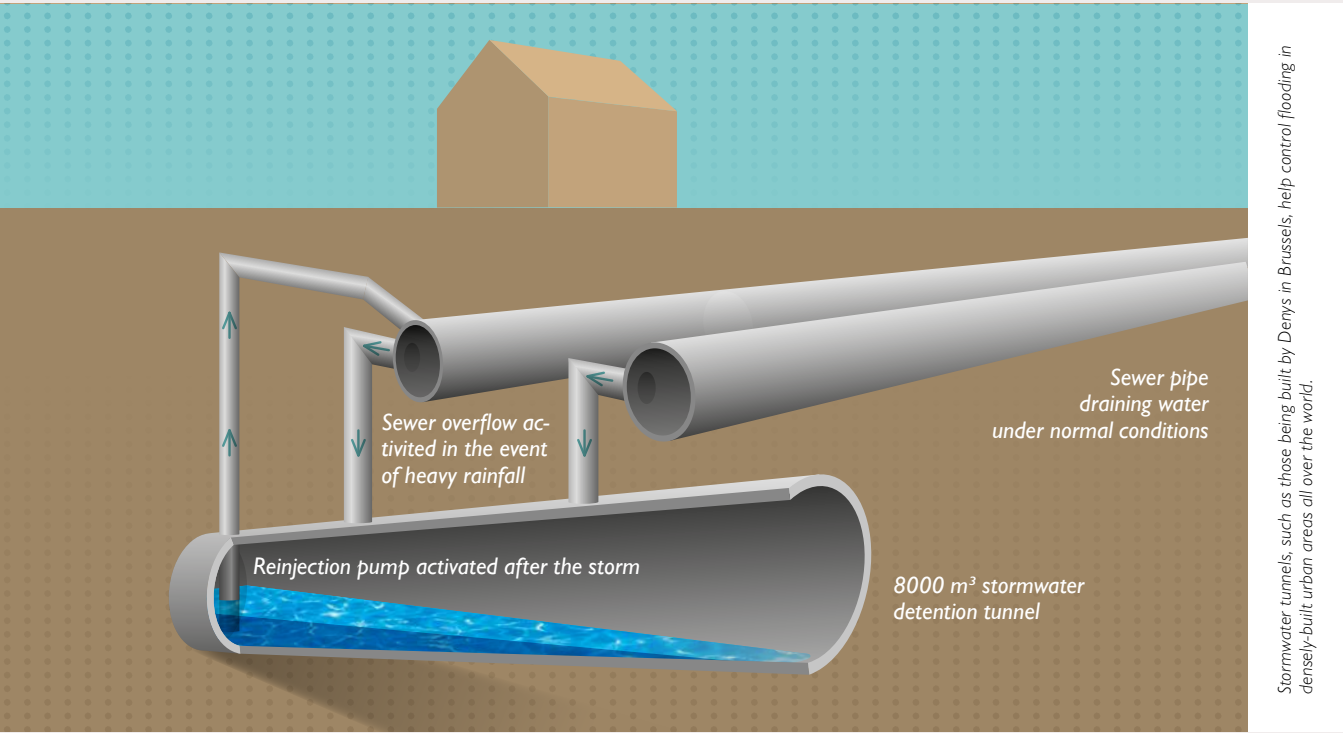
A prime cause of increased urban flooding is the growing incidence of heavy rainfall worldwide due to climate change. This makes stormwater management a top priority. Yet large-scale stormwater detention is a challenge in densely-built urban areas lacking the necessary space for detention ponds. That's where a stormwater detention tunnel comes in as a useful alternative.

The idea is simple: construct a large-diameter tunnel, some 5 to 20 metres below ground level, and connect it to a sewer overflow installation equipped with a reinjection pump. The main advantage is that this creates extensive detention capacity with low aboveground impact. When the tunnel is constructed without a retrieval shaft, surface disruption is limited to just the launch shaft, which in the end will even serve as an overflow installation.

## A turnkey operation

Denys is currently constructing such a stormwater tunnel in Sint-Pieters Woluwe, a community of the Brussels urban area. It's a 400-metre tunnel with an external diameter of 5700 mm, good for a nominal detention capacity of 8000 m<sup>3</sup>. An important design detail is the built-in 1% incline, which drains any lingering sludge from the tunnel, making it effectively self-cleaning.

As usual, we're delivering the project as a turnkey operation, including all the required electro-mechanical equipment.



Stormwater tunnels, such as those being built by Denys in Brussels, help control flooding in densely-built urban areas all over the world.

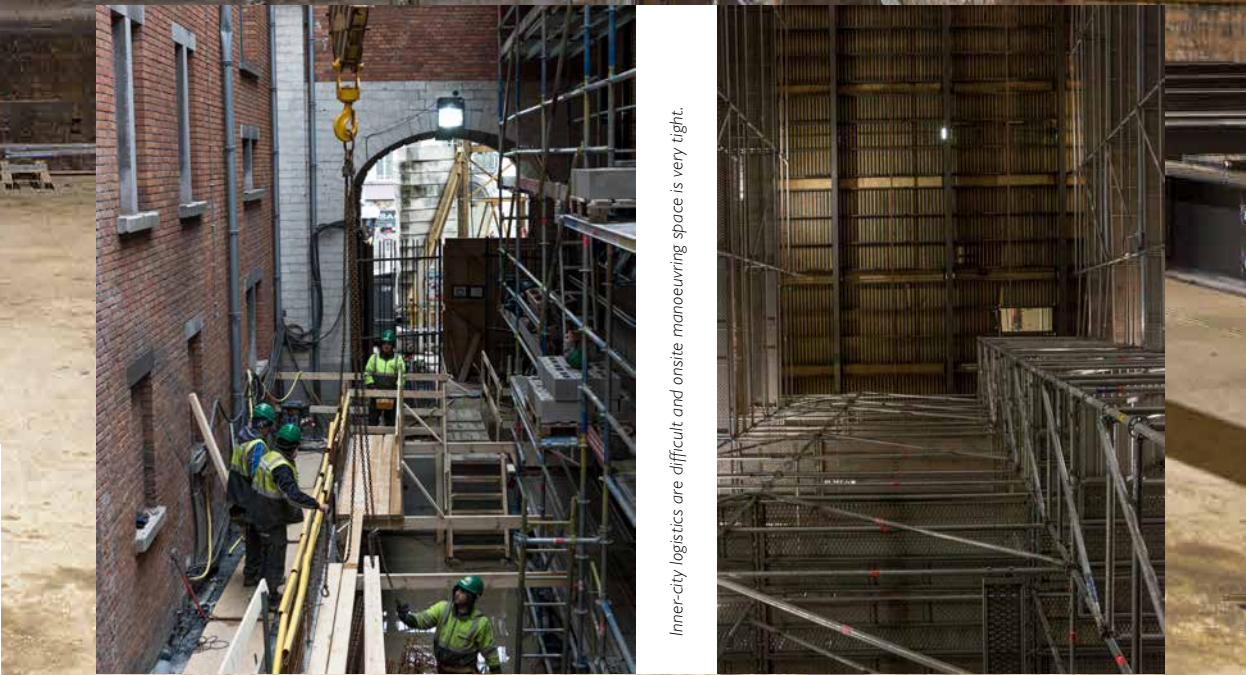




Flexible and pragmatic



Another multidisciplinary project being carried out right now is the renovation of the NTGent city theatre in Ghent. Time is extremely short, inner-city logistics are frustrating, onsite manoeuvring space is very limited, technical issues are multiple, and the project scope needed quite some finetuning. But we're completely familiar with this kind of challenge, and we've been flexible, proactive and pragmatic as always. For example, we've reengineered the design for the new automated stage winches, allowing us to avoid the huge cost of constructing an additional support structure.



Inner-city logistics are difficult and onsite manoeuvring space is very tight.

© Régine Mahaux





# The Spanish bridge is back



A main traffic axis in the centre of Antwerp known as De Leien is currently being refurbished. De Leien, in fact, follows the line of the 16th century Spanish battlements demolished in 1864, and the current activities have unsurfaced some interesting remnants which will be preserved and displayed to the public, including parts of the nine bastions and five bridges.



Prior to dismantling, the bridge vault was reinforced using glass fibre reinforcement and masonry injection.

One of these remaining structures is the old Kipdorp bridge, which in its time was a major connection to the city's hinterland. Denys is currently reinforcing, underpinning and partially dismantling the bridge to make way for the construction of a new road tunnel beneath it. Our unique technique, in which grout piles are used, allows the tunnel to be built without needing to completely remove the bridge, making it much easier to carefully restore it once the tunnel is finished.

TIP-OF-THE-ICEBERG  
PROJECTS  
KIPDORP BRIDGE  
ANTWERP



Justice is served



The renovation of the Brussels Palace of Justice has been a long-standing issue in this capital of Europe. Built in the 19th century by architect Joseph Poelaert (1817-1879), the landmark building has been enrobed in scaffolding for decades, in dire need of a refurbishment which has always failed to materialize. Awaiting the more comprehensive effort promised to start anytime soon, Denys recently carried out a project to restore, reorganize and extend the building's main access area, particularly to improve access control.

While it was a fairly modest project, it did involve defining quite a number of options for the larger restoration project. Aspects under scrutiny included the application of Marmorino plastering techniques on interior columns and the careful integration of new safety equipment within the architecture of the building.



New access areas were created both for staff and the general public.

TIP-OF-THE-ICEBERG  
PROJECTS  
PALACE OF JUSTICE  
BRUSSELS

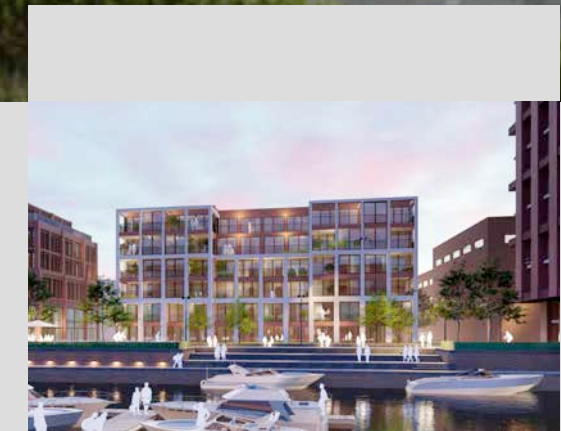
© Régine Mahaux



## A quality injection



The yacht basin will provide space for about 50 small yachts and will be ringed by energy efficient buildings.



Denys is planning the construction of Rivesquare, a 35,000-m<sup>2</sup> project surrounding a new yacht basin plugged into the Brussels canal in Anderlecht. The project will convert urban wasteland into a lively residential and commercial cluster that includes 240 apartments, a three-star 120-room hotel, a child care centre, sports clubs, and a commercial area including a fitness space, restaurants, bars, a car and e-bike sharing service, and a cycle repair shop. With its fine architecture and functional richness, Rivesquare will form a real injection of quality into this part of Brussels.



The new bio-accelerator will add to the existing cluster of biotech and life-science companies in Zwijnaarde Technology Park.



#### BUILDING WORKS

BIO-ACCELERATOR 3  
GHENT

## A third bio-accelerator for Ghent

Biotechnology continues to boom in the university city of Ghent. As a result, we're all set to develop a third bio-accelerator building in Zwijnaarde Technology Park, next to the biotechnology research centre we're already constructing. The two five-storey buildings will be connected via a semi-underground parking space and include office space, meeting rooms and laboratories surmounted by a greenhouse. The bio-accelerator will be equipped with all the necessary technical infrastructure, but internal organization is highly adaptable to meet occupant's needs. Negotiations with interested parties are ongoing.

## Exemplary educational ambitions

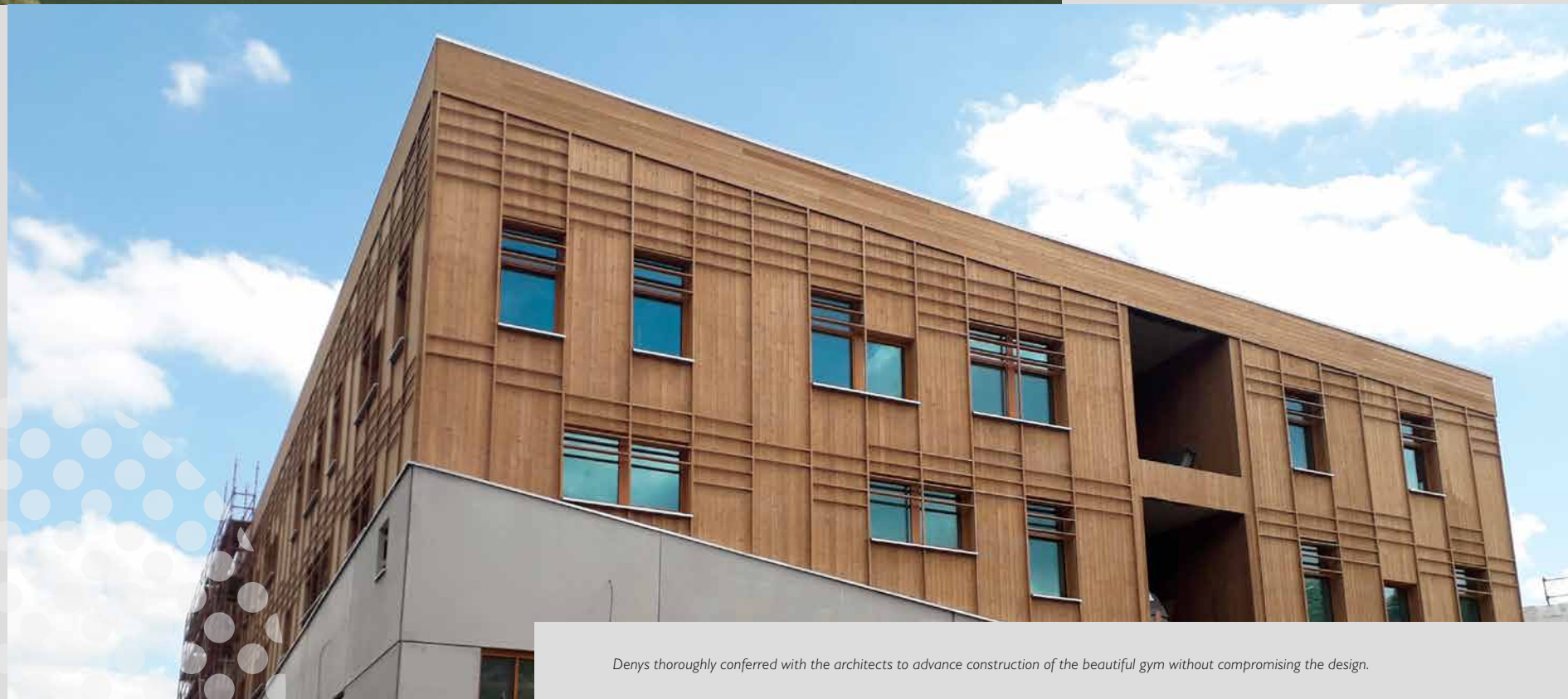
The exemplary new nursery and primary school Vuurkruisen in Brussels will open its doors in the summer of 2018. It's an ambitious DBFM project developed by Denys in collaboration with B2Ai architects. The design aims to stimulate 'active education', encouraging teamwork among pupils rather than ex cathedra teaching. This is reflected, among other things, in the L-shaped classrooms which centre around a common space in clusters of four. The school's architectural richness and topological variety, with its various outdoor areas, aims to stimulate the imagination and curiosity of the 880 children.

### Minimizing the environmental impact

Vuurkruisen will be a zero energy school. Borehole thermal energy storage, extensive thermal insulation, smart spatial organization and triple glazing make for an annual energy demand below 15 kW/h/m<sup>2</sup>. A well thought out waste management system, re-use of rainwater, smart construction methods such as lightweight airdeck floors, and the use of natural materials further minimize environmental impact.

#### BUILDING WORKS

VUURKRUISEN SCHOOL  
BRUSSELS



Denys thoroughly conferred with the architects to advance construction of the beautiful gym without compromising the design.



Being flexible and cooperative



BUILDINGWORKS  
STUDENT ROOMS VUB  
BRUSSELS

Denys proposed a few changes to the structural engineering which would facilitate construction.

© Régine Mahaux



We're completing the construction of the student housing project at the Etterbeek Campus of Brussels University. Planning was the main challenge here, particularly due to some of the design decisions and last-minute changes. One example was the decision to put all stairs and circulation areas outside the buildings in separate steel structures. The engineering office presumed that the stairs and gangways would be constructed simultaneously with the floors. However, that would have significantly impacted the planning process, so we proposed a few structural changes which would allow for the consecutive construction of the buildings and circulation areas.

BUILDING WORKS  
STUDENT ROOMS VUB  
BRUSSELS



In addition, details of connections to centralized boiler installations, HV cabins and water supply were provided late, requiring us to be flexible. We also had to take precautionary measures to account for the possible presence of subsoil hollows as well as polluted substances. As usual, we addressed these challenges resolutely, without complaint.



# A rich social mix



## Services for the entire community

The care centre will include a day nursery, restaurant, medical and paramedical services, a number of dance and leisure rooms, and wellness and fitness facilities. Importantly, the centre is accessible to the entire Merelbeke community, not just Bergbos residents. The permanent presence of a housekeeper further enhances resident safety and wellbeing.



*Merelbeke Bergbos offers affordable dwellings with optional shared services in a pleasant green environment, attracting a rich social mix.*

BUILDINGWORKS

BERGBOS  
MERELBEKE  
BELGIUM

We are further developing the Merelbeke Bergbos residential project, and will soon start building the integrated care centre. The concept of the project is quite unique: rather than building typical small service flats with high rental and service fees, we're developing a cluster of larger dwellings and apartments in a pleasant green environment with optional access to shared services. This allows Bergbos to attract a rich social mix of different ages and incomes.



## Pushing the boundaries



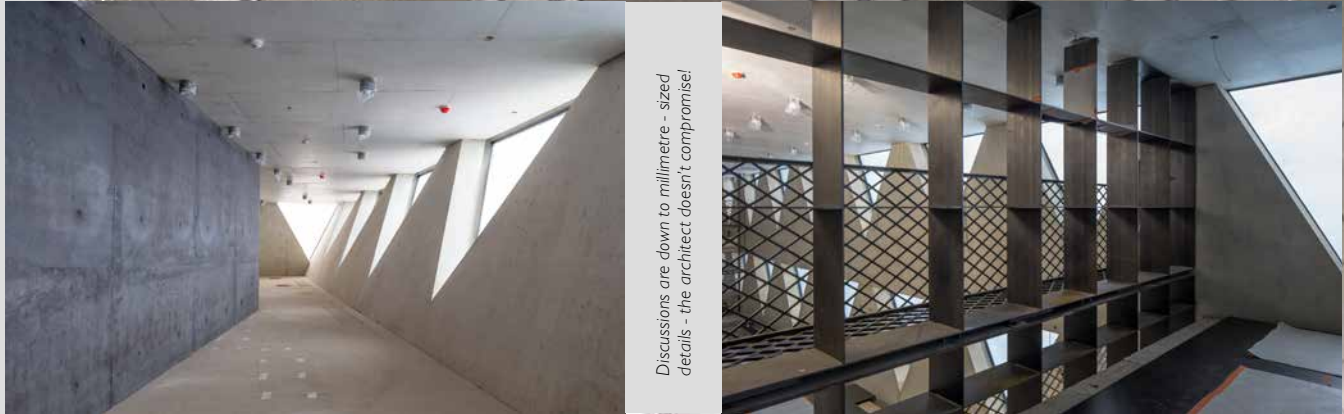
The spiral staircases came in three pieces that were carefully welded together and subsequently coated.

© Régine Mahaux



The Antwerp Province Headquarters project reached the 57.7-metre level in August 2017, less than three years after the project began. It signified a tremendous success, especially given the highly challenging design by Xaveer De Geyter Architects.

Challenging or not, we didn't give anyone the chance to be disillusioned. We drilled 350 bore-holes to a depth of 150 metres for the thermal energy storage system. Tailor-made formwork and a meticulously detailed construction plan were developed to erect the odd-shaped twisted concrete structure to extremely tight tolerances, into which we integrated cable channels. Due to design decisions, we needed to install air-conditioning equipment in parallel with carcass work, and we developed custom-made triangular windows which we installed following a unique procedure using a specially made supporting structure. Climate chamber testing was used to evaluate the solution we proposed for finishing the 3D-curved façade. And we are completing the interior to the highest standards imaginable. In addition, many of these activities required us to make special safety arrangements to manipulate heavy and bulky equipment and materials. Talk about a project that pushes the boundaries.



Discussions are down to millimetre - sized details - the architect doesn't compromise!



© Régine Mahaux



Keeping focused on searching solutions



QSHE-WORKSHOP  
SUB-SAHARAN  
AFRICA

The French writer Victor Hugo (1802-1885) reportedly said that perseverance is the secret of all triumphs. Each of our projects in sub-Saharan Africa is additional proof of the wisdom of this old axiom. Challenges are always abundant and circumstances often difficult while funding is understandably quite restricted. This may lead many a contractor to give up half-way and leave a project unfinished through lack of perseverance. We don't do that; we will always keep focused on searching for solutions, eager to bring a much-awaited infrastructure improvement to successful completion.





## Honoured to contribute

Admittedly, referring to Victor Hugo with respect to Africa is rather delicate. Like most Europeans of his time, the writer held colonialist views and used to describe Africans as barbaric people. Luckily, times and opinions have changed since then. At Denys, we consider the African continent among the most fascinating places on earth, and it's an honour to be able to contribute to the further development of these beautiful regions.

QSHE-WORKSHOP  
SUB-SAHARAN  
AFRICA



At the end of each year, Denys organizes a comprehensive QSHE-workshop in Mozambique.



ETHIOPIA / KALITI – ADDIS ABABA

## Obstacles taken in our stride

In Ethiopia, we're about to complete the construction of the 20-km wastewater collector and treatment system at Kaliti, in the southern part of the capital of Addis Ababa. We started the project at the end of 2015, but faced quite a few unforeseen obstacles along the way, including unexpected heterogeneities in the subsoil and unusually long administrative procedures for granting rights of way or allowing special techniques. It involved a lot of patience and persistence, but in the end we took all the obstacles in our stride.

GHANA / UPPER EAST

## Another challenge to be addressed

The north of Ghana is very well known for the abundant presence of *Adansonia digitata*, commonly known as the African Baobab or, more popularly, the dead-rat tree, the monkey-bread-tree or the upside-down tree. Baobabs are impressive specimens that can store huge amounts of water in their trunks (up to 120,000 litres) to endure harsh drought conditions for up to nine months.

The feature helps Baobabs to survive in dry Sahel-regions such as upper east Ghana. Water supply is substandard here, with most people being forced to use groundwater, which is rich in fluoride and hence should be treated before consumption. The region also faces a lot of poverty. But improvement is on the way. The Ghanaian government has launched a water treatment and distribution project, involving the construction of a water intake at the Tono Dam, a treatment plant, a pumping station, about 200 km of transport and distribution pipes, and a number of water towers.

Denys will be carrying out the entire project, which should be completed by 2021. One of the main challenges is the subsoil, which is heterogeneous and contains various types of rocks. Other difficulties will no doubt emerge along the way, but they won't deter us. They're just further challenges to be addressed.

AFRICA WATER WORKS  
ETHIOPIA - GHANA



Foundations for the treatment plant need to take into account the subsequent construction of a bridge.



AFRICA WATER WORKS  
NIGER



#### NIGER / NIAMEY

### A tight spot

In Niamey, Niger, we are completing the construction of the city's 16th elevated water reservoir. In addition, we have started designing and constructing a new treatment plant that is part of a water distribution project to serve a population of 650,000. The design is a challenge since in the meantime authorities have planned the construction of a large bridge at the very same spot.





Denys provides training programmes for local engineers and workers.



AFRICA WATER WORKS  
MALI



In Mali, work is continuing on the 200 km of water mains supplying the city of Bamako. Being lean makes all the difference here. We're using automatic trencher machines to gain time upfront. In addition, the complex network topology, consisting of a large number of fairly short tracks, encouraged us to optimize our organization of activities to speed up the construction process. We are also taking great care to closely involve local people in this project. As a matter of fact, we're training local engineers to master some of the special techniques we use, sharing expertise to everyone's benefit.



Good preparation was essential



Two micro-tunnels were built for the pipeline to cross the Saône and Doubs Rivers.



We completed the construction of two sections of the Val de Saône project for GRTgaz in eastern France. The 75-km project required us to lay no less than 40 km of construction roads to prevent heavy equipment from impacting the soil.



© Régine Mahaux





We used micro-tunnelling for the Saône and Doubs River crossings. This helped us to keep safety risks to a minimum, which was important given the difficult geology. Good preparation and a smart choice of cutting wheel were also essential. And we made special arrangements to deal with flooding risk.

After completion of the Val de Saône project, personnel were immediately transferred to Germany for the MONACO project.



© Régine Mahaux



Denys France taking off



Denys is constructing two micro-tunnels for the Vinci water basin at Ris-Orangis Paris.



Meanwhile, our newly established French office in Bordeaux is already broadening our market in France. Contracted projects include the construction of a 300-m gas pipeline for Teréga (formerly known as TIGF) in Lussagnet (between Bordeaux and Pau), the relocation of a NATO kerosene pipeline for Trapil (Transports Pétroliers par Pipeline) near Avignon, and the construction of two 500-m by 1900-mm micro-tunnels for a Vinci water basin in Ris-Orangis, Paris. We expect that Denys France will be very instrumental in winning more projects in France, including some major pipeline and micro-tunnelling projects.





Top-class welding for Germany



Complex parts for the MONACO track were prefabricated at our welding workshop in Moerdijk, the Netherlands.



In the summer of 2018, Denys will complete its first gas pipeline project in Germany, a 40-km 48-inch track that is part of the Bayernets MONACO project east of Munich. This was a technically challenging project in which we were able to fully put our project management skills into action. We prefabricated the above ground installation at our welding workshop in Moerdijk, The Netherlands. This is where we concentrate and continuously develop our top-class welding expertise, a skill that will become increasingly important for future projects.



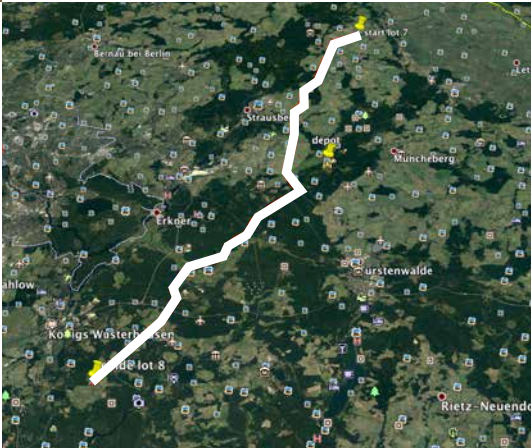
© Régine Mahaux



# East and west

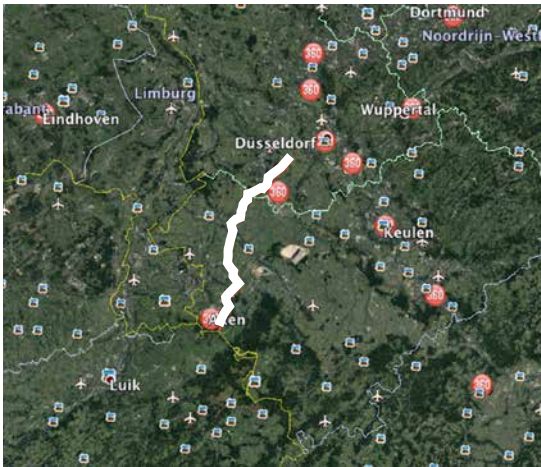


The EUGAL pipeline will run from the Baltic Sea to the Czech border, crossing the Spree River at the Löcknitz natural reserve.

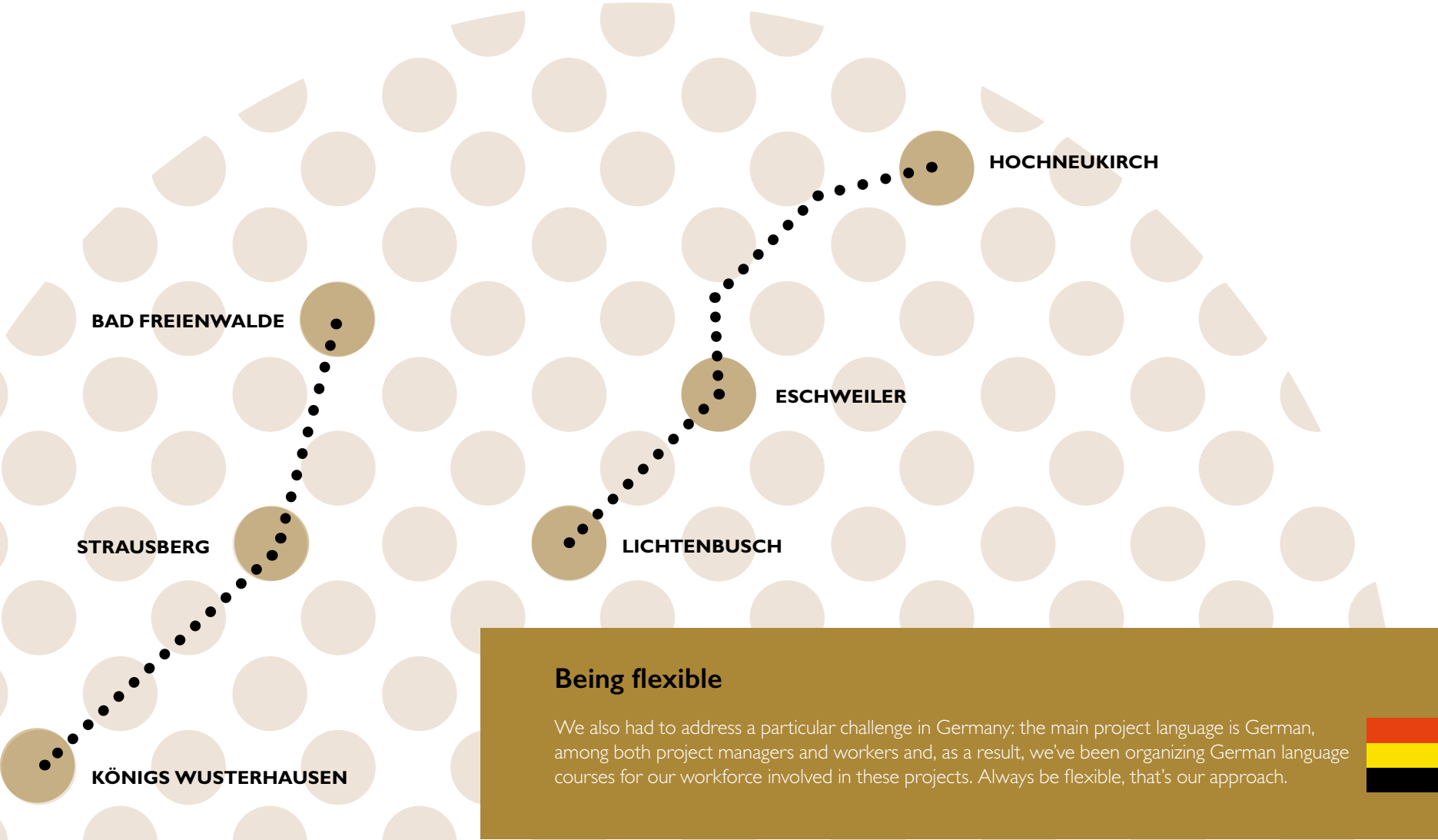


Our gas pipeline activities in Germany continue with two projects. The first concerns two lots of the Gascade EUGAL project (European Gas Pipeline Link) in the east of the country, a 485-km 56-inch pipeline running from the German Baltic sea to the German-Czech border. We've put in additional investment to ensure sufficient capacity for this large-diameter work and will be further optimizing our automated welding and coating techniques. The project also involves crossing the Spree River at the Löcknitz natural reserve. This last obstacle will be crossed using micro-tunnelling.

The Zeelink pipeline will run from Lichtenbusch to Hochneukirch near Mönchengladbach.



In addition, we've been assigned the first two lots of the Open Grid Europe Zeelink project, involving the construction of a 61-km 40-inch pipeline from Lichtenbusch at the Belgian border to Hochneukirch near Mönchengladbach. It's a rather complex project which will be carried out using various trenchless techniques.



## Being flexible

We also had to address a particular challenge in Germany: the main project language is German, among both project managers and workers and, as a result, we've been organizing German language courses for our workforce involved in these projects. Always be flexible, that's our approach.





# Plug in to the grid

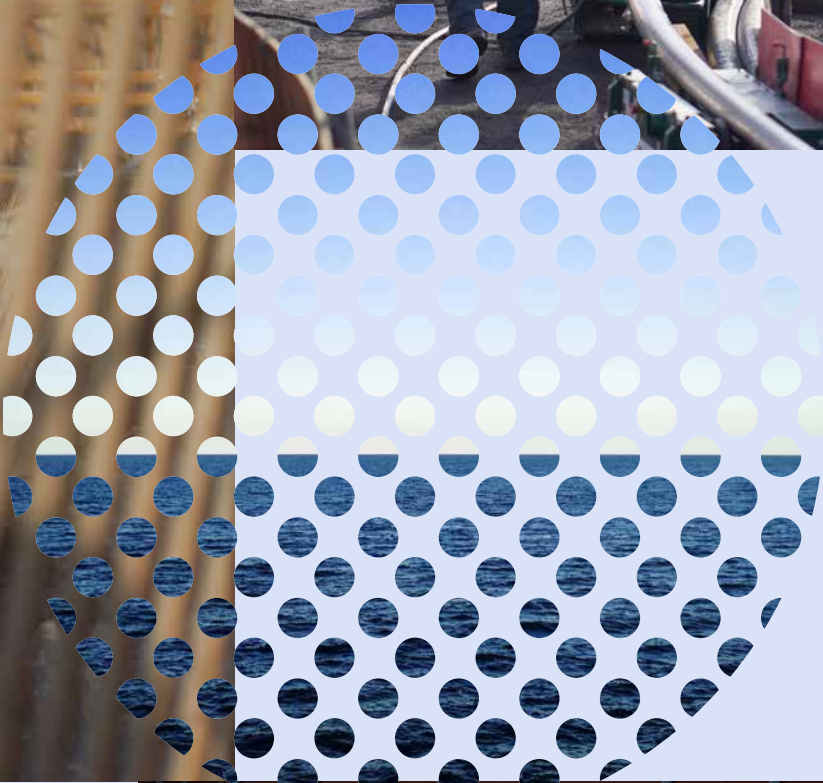
Belgian transmission grid operator Elia is developing a modular offshore grid (MOG) including an offshore switchyard (OSY) to facilitate grid interconnectivity with the UK, the Netherlands, and Scandinavian countries and to allow future offshore windfarms in Belgian territorial waters to easily plug in to the grid. The project also requires that onshore high-voltage capacity be increased. Within this framework, Denys is currently laying the final 2.5-km section of the underground high-voltage connection to the onshore switchyard at Zeebrugge.



Denys' proposal to use trenchless techniques significantly limits any negative impact on economic activities.



© Régine Mahaux



## Handling the underground chaos

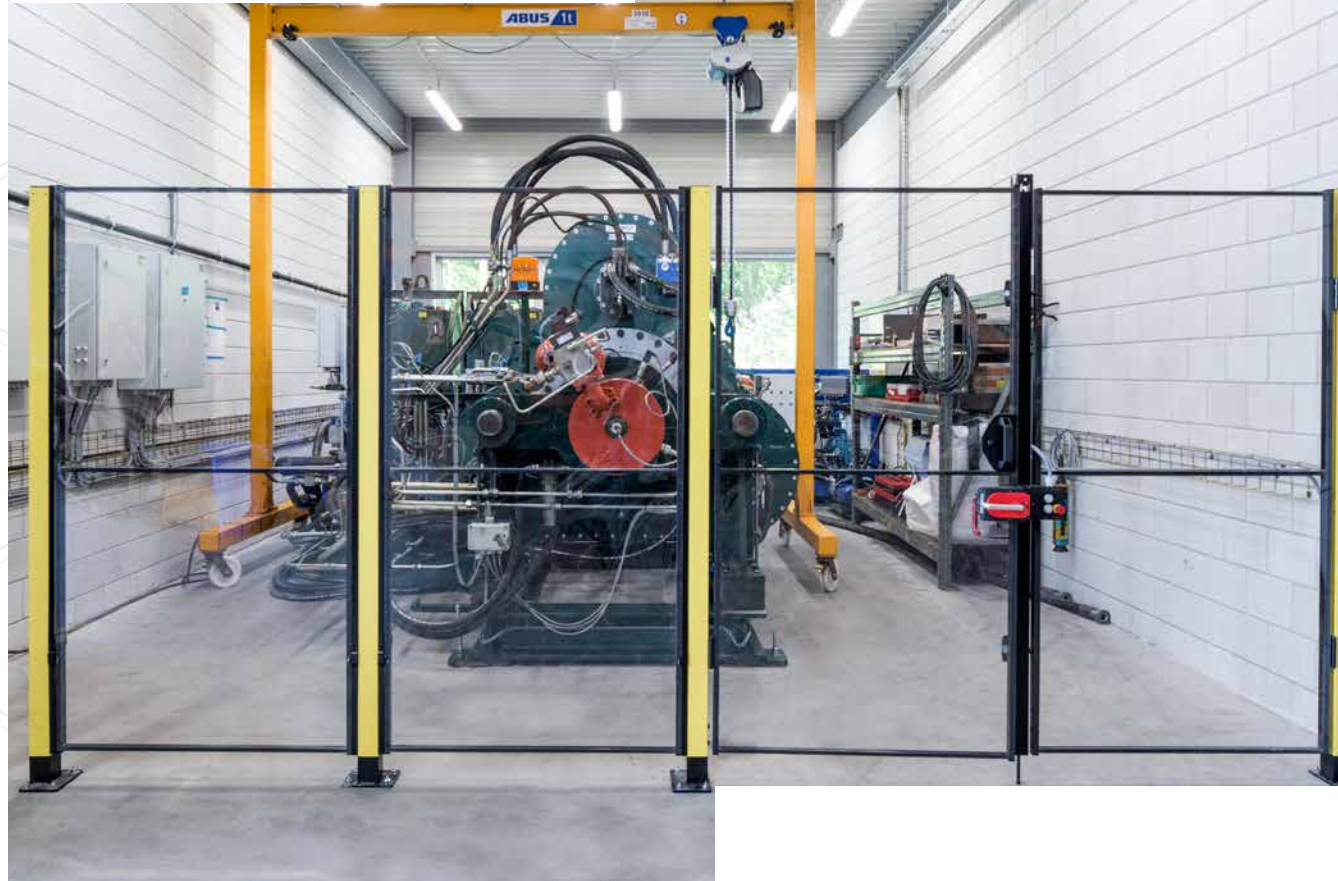
The project's main challenge is that we must deal with what we jokingly call the underground chaos. Historically, cables of different kinds have been laid all over the place, without accurate as-built documentation, leaving us to painstakingly figure out what is actually going on. Another important need was to limit any negative impact on economic activities and traffic. That's why we optimized the design to use trenchless techniques.

HIGH VOLTAGE CABLES

ZEEBRUGGE  
BELGIUM



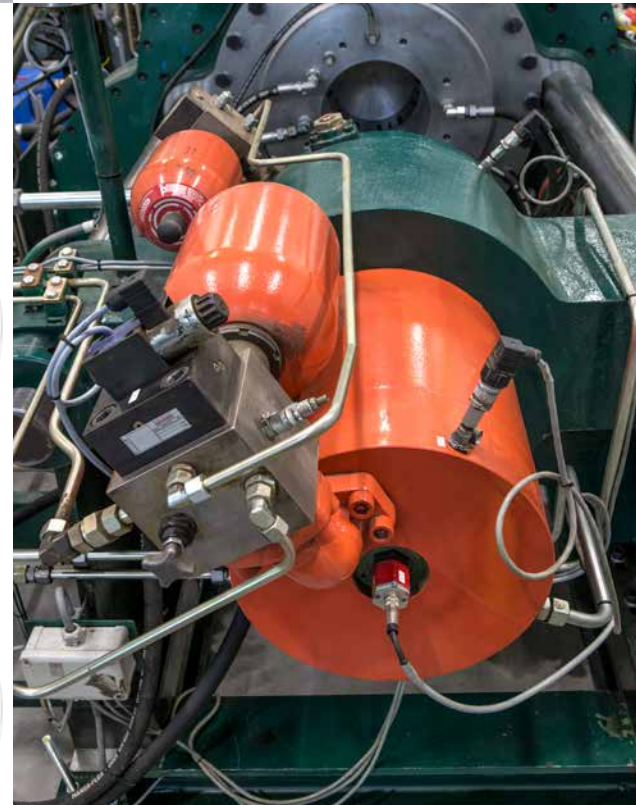
## Innovation



### Wallie's ready to go

In February 2018 we successfully completed the third and final series of tests on our revolutionary excavation system, WallSlotRobot (nicknamed Wallie), at Limelette, Belgium. The machine can now be equipped with different cutters for different subsoil types, and has been made more robust and user-friendly. A version for use in non-rocky subsoil is ready to carry out a real-life project later this year, allowing us to demonstrate Wallie's performance as well as its benefits for worker safety and convenience.

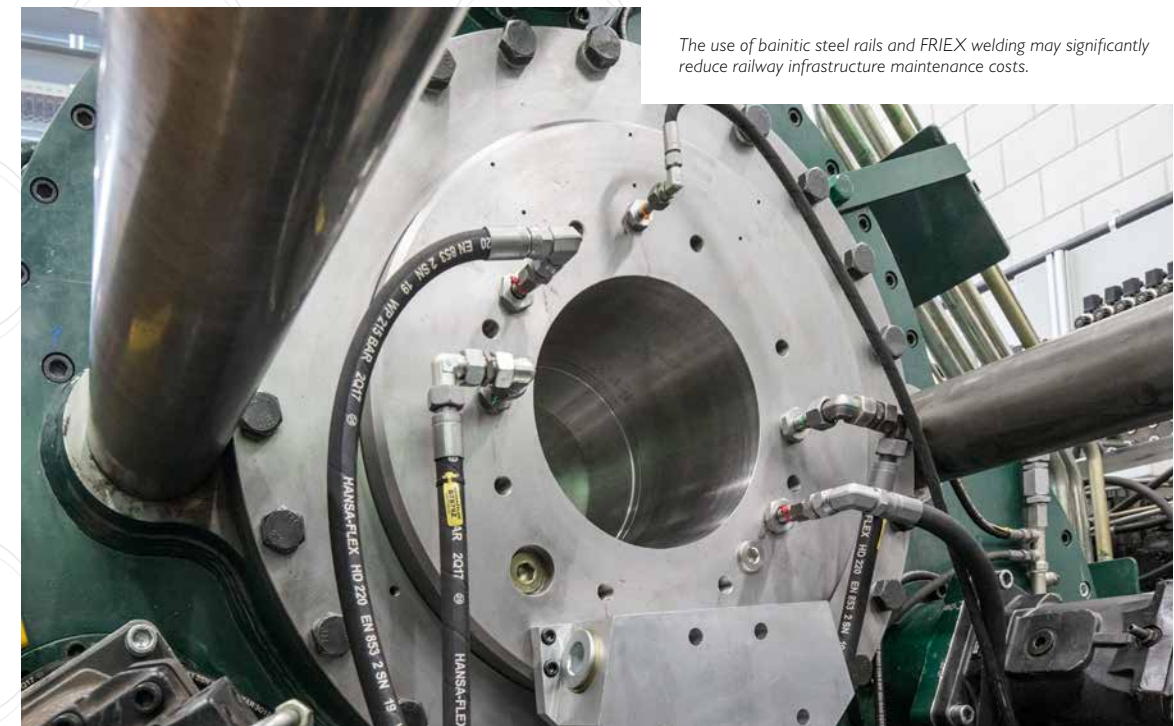
In the meantime, we're further developing the machine. A cutter for use in rocky subsoil is under development, and concepts are being refined for its use below groundwater level.



### Automated welding of bainitic steel rails

Denys is further developing the FRIEX technology for automated welding of bainitic steel rails within the framework of the European WRIST project, which has received funding from the European Union's Horizon 2020 research and innovation programme. FRIEX is an acronym for Friction and Explosion and refers to a controlled welding process that does not involve melting the material, thus ensuring a high quality weld. The WRIST project merges the FRIEX technology with orbital friction welding, creating a unique automatic welding method to produce high-performance rail joints. Initial testing is being carried out at Zwijnaarde Science Park.

WRIST has received funding from the European Union's Horizon 2020 research and innovation programme under agreement No 636164.



The use of bainitic steel rails and FRIEX welding may significantly reduce railway infrastructure maintenance costs.

### Automated protection of pipe welding joints

In the Bayernets MONACO pipeline project near Munich, we used our innovative automated vacuum field joint blasting technique for the first time. Developed by Denys and awarded the IPLOCA New Technologies Award, the technique involves sand-blasting the pipe welding joints and protecting them with a special tape, all in one automatic process.

INNOVATION

GLOBAL

© Régine Mahaux



## Hard hat women



Stefanie manages several renovation projects in Belgium.

Of all sectors, the construction industry may have the lowest participation of female workers. The UK Construction Industry Training Board estimates the rate of female employees at around 14% while the US Bureau of Labor Statistics assesses the proportion as low as 9%. And these figures even include the many women working in back-office situations. Women wearing hard hats, whether construction workers or project managers, are still in a tiny minority. It's a super male-dominated industry.

### Lunatics ready to go

However, female presence in the construction industry is on the rise, including at Denys. Annelies, a 31-year old engineer managing projects in sub-Saharan Africa, recalls that five years earlier she was the only female member at the expat meeting. Today, there are five. "Five female lunatics," she jokes. "Lunatics ready to go all the way."



Bieke is Denys project manager at the Hinkley Point nuclear power plant site in the UK.



Annelies manages projects in sub-Saharan Africa.



### Empathy and patience

Stefanie, who manages several renovation projects in Belgium, agrees: "A woman must fight twice as hard for her position. It's often a battle with male egos. The point is not to give in, keep your cool and use your natural strengths." What are these strengths? "Empathy and patience. We tend to be more forgiving of the occasional mistake. We also take more time to openly discuss issues with people. That helps overcome difficulties."

### Keeping up with the demands

Do women in the construction industry feel like they're trapped in an 'old boys club'? "We don't let them trap us," says Bieke, Denys project manager at the Hinkley Point nuclear power plant construction site in the UK. She does confirm being mistaken for the secretary or assistant once in a while, but that is only before anyone speaks. "Mutual respect grows once they understand that I can keep up with the demands of my job. Although we often need to go the extra mile to prove ourselves."

### Being a mother too

Managing the work-life balance is another challenge for women in the construction industry. Stefanie, a mother of two young children: "It's a very tough job to combine with family life. Luckily, there's a very collaborative atmosphere at Denys and we do have our say when it comes to assigning new projects."



## District heating networks



### A major pipeline market



Climate change, the Paris Agreement and the ongoing energy transition are encouraging the development of district energy networks all over Europe, and Denys is at the forefront of this movement. We've already demonstrated our expertise in the Stora Enso Volvo project in Ghent, and now we're working on other district heating network projects. For example, in Enschede, the Netherlands we're building a network for Ennatuurlijk, meant to distribute 120°C steam produced at the Twence biomass energy station. It looks like district heating will become a major pipeline market in Europe in the years to come.

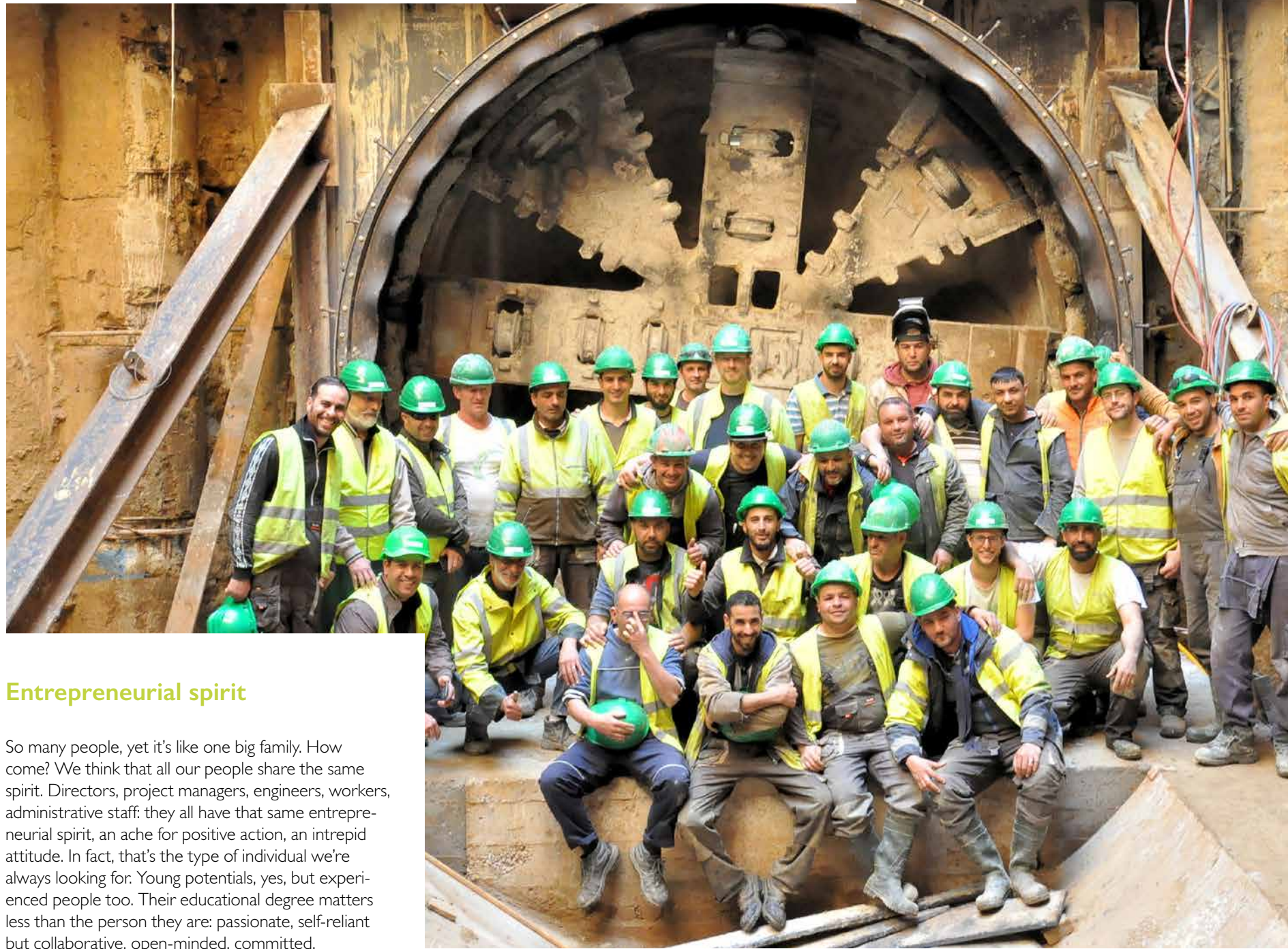
HEATING NETWORKS

ENSCHDE  
THE NETHERLANDS



# A growing international workforce

Denys is growing steadily and at a fast pace, with the number of FTEs increasing from just 852 in 2014 to 2578 in 2017. The number of employees in our home country of Belgium went up from 100 to 250, but the most spectacular increase was created in the international context, not just in neighbouring countries such as Germany and France, but more importantly via our Middle East and African branches. A telling example is Zambia, where we have more than 400 people working to rehabilitate the Lusaka water treatment plant. Thanks to this international growth, our workforce currently includes no less than 44 nationalities.



## Entrepreneurial spirit

So many people, yet it's like one big family. How come? We think that all our people share the same spirit. Directors, project managers, engineers, workers, administrative staff: they all have that same entrepreneurial spirit, an ache for positive action, an intrepid attitude. In fact, that's the type of individual we're always looking for. Young potentials, yes, but experienced people too. Their educational degree matters less than the person they are: passionate, self-reliant but collaborative, open-minded, committed.

## Supportive environment

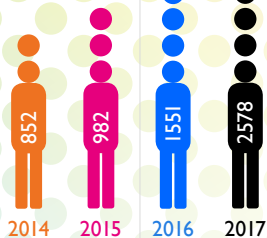
In return, we offer an atmosphere where they can grow, a supportive environment of people willing to go the extra mile for their colleagues, a culture of open dialogue where employees have a lot of autonomy and are encouraged to confer about their next big project. In addition, we invest a lot in developing people's skills and leadership capabilities. As a result, a job at Denys is more than a job, it's a career.

## Smart and creative

We're also smart in improving employee work-life balance. Just one example: our shuttle service from the Scheldt left bank to our Handelsbeurs construction site in the centre of Antwerp means that people can avoid the prickles of daily traffic jams.

And, of course, there are the off-work activities to reinforce team spirit. For example, there's a cycling team who participate at special events. We've got the Young Denys programme, which includes four cross-department activities each year combining education and leisure. And there's the annual family day for all.

The Denys workforce has grown steadily in the past few years thanks to increased international success.





# Top-quality maintenance facilities



© Crepain Binst Architecture

The design by Crepain Binst Architects is a distinct continuation of the signature architecture they created for us in 2011.

Triggered by our international growth, we're currently building a brand-new 5500-m<sup>2</sup> material and maintenance depot and an additional three-storey office building at our home site in Ghent. The depot includes facilities for top-quality maintenance, welding and painting services and will be appropriately equipped with overhead cranes, allowing us to organize the maintenance of the larger items of equipment we deploy all over the world, including trenchers and boring machines.

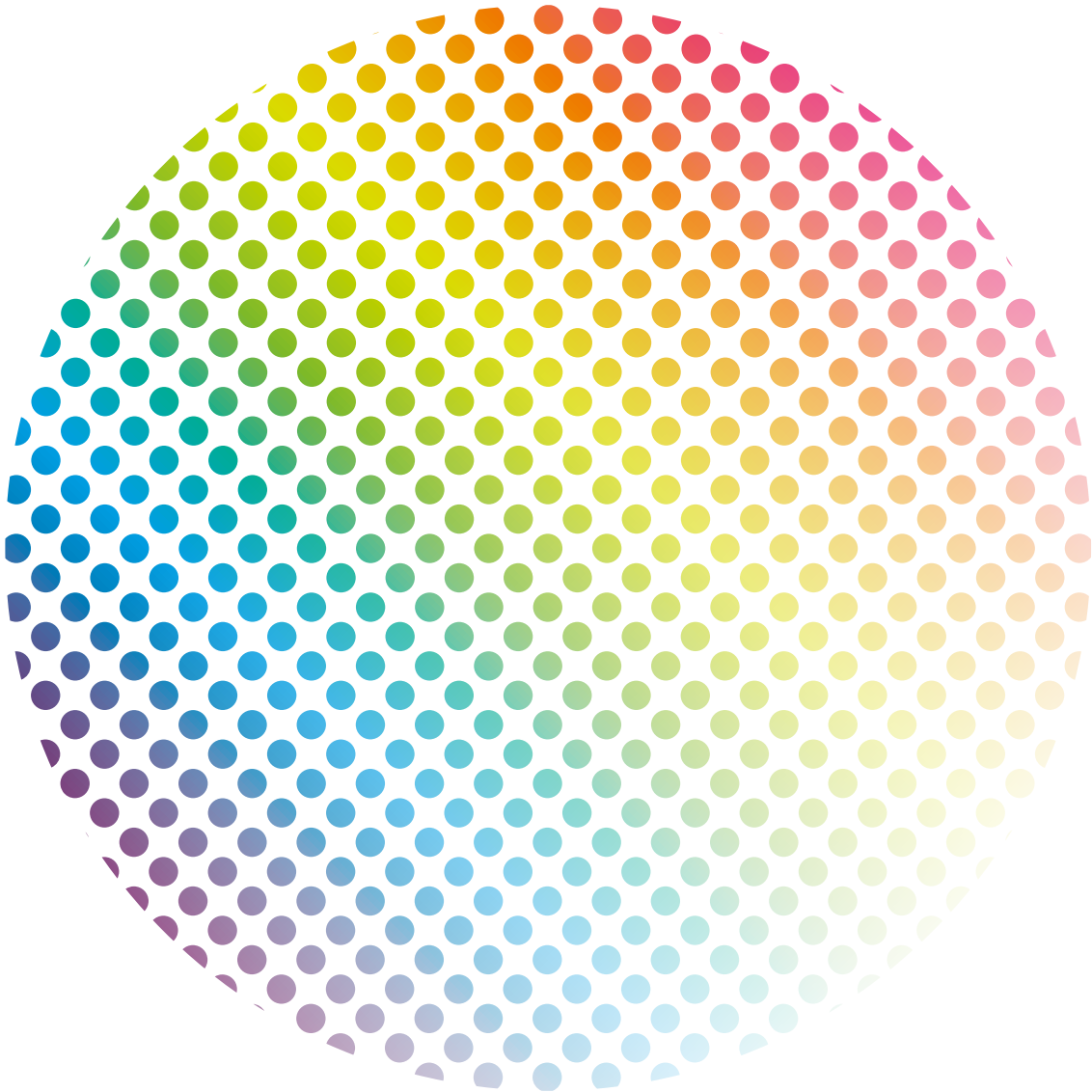
## Nearly zero energy

The office building will be equipped with concrete core activation as well as borehole thermal energy storage for heating and cooling, requiring the construction of 36 boreholes, 100 metres deep. The photovoltaic panels on the roof also contribute to making this a nearly zero energy building. Yes, we are committed to the green cause.



# Connecting the dots and disciplines

- PIPELINES
- CABLE WORKS
- TUNNELLING
- BUILDINGS
- INFRASTRUCTURE
- WATER WORKS
- RESTORATION & RENOVATION
- DISTRICT HEATING
- RAIL WORKS
- SPECIAL FOUNDATIONS
- INJECTION TECHNIQUES
- DREAM WORKS



Sometimes we like to picture our company as a big sphere covered in a multitude of uniquely coloured dots. Each dot represents one of the many disciplines we master. By connecting up the dots, we create value. Way more value than just the sum of the dots alone. This Global Report gives just a glimpse of this joined-up multidisciplinary strength. Check it out on our revitalized new website: [www.denys.com](http://www.denys.com)



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Working  
below the tip  
of the iceberg

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