

GLOBAL REPORT 6



DENYS  GLOBAL

Constructing the future





© Régine Mahaux

Johan Van Wassenhove / CEO Denys Group

On espresso machines and administrative hassle

What could be more human than innovation? The history of humankind is shaped by inventiveness, and one of the most fundamental qualities of our species is our ability to think outside the box - finding alternative ways to address given problems, and achieving results previously thought inconceivable. It's what makes humans stand out from the crowd. But I know what you're thinking: this trait hasn't just produced the wheel and the espresso machine, it has also given birth to appalling inventions like Little Boy and suicide vests. You're right, there may be a dark side to innovation, but it's still one of the forces for good in our lives. That's why we continually strive to be inventive and innovative. It helps us do simple, positive things, such as reducing costs and making funding agencies happy, as we recently did in Mozambique and Zambia. Efficiency and good organisation help us to drive forward a wide variety of life-improving projects. And new techniques such as WallSlotRobot provide the means to carry out underground infrastructure projects with only limited disruption of above-ground life. After all, we don't want to disturb people enjoying their espresso, do we? But if there's one thing that can irritate us it's the administrative hassle! In the Brussels Prison project, for example, the permissions procedure has been almost a nightmare. We're not complaining about people amending our proposals, we're very happy with that. But the process of obtaining the necessary permits was, and still is, severely hampered at the political level. We'd far rather have a system that is more responsive to the needs of the community.

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AFRICA WATER WORKS



Did you know:

It's mobile first



Source: Mail and Guardian Africa



Water, a multifaceted challenge

Africa is probably the most beautiful continent on our planet, but it's also the one facing the greatest challenges, many of which are related to the most precious resource on earth: water. Large parts of the African continent suffer from extended periods of drought, which according to climate experts are expected to become even more severe in the future. In 2015, African countries such as South Africa, Ghana and Ivory Coast faced their worst droughts in decades, causing a menace to farmers and the whole economy. And it doesn't stop there. Periods of drought are often followed by a month or more of heavy rainfall, with large tracts of land being destroyed by flooding. And then there are the additional problems of population growth and urbanisation with all the related water supply and waste water treatment challenges.

DENYS

10 years of happy collaboration



AFRICA WATER WORKS



It has been ten years since Denys began carrying out projects on the African continent. The first was in Ghana, and we are today still very busy in that beautiful West African country. What's more, we have developed a workforce of 100 to 150 local people there, workers and foremen trained by us, and who now travel the continent to work with us on our various projects. The whole experience has been ten years of happy collaboration for everyone concerned.

Infrastructure projects across the continent

Denys has been working on the African continent for ten years now, with a clear focus on water-related infrastructure. We have been laying water distribution networks, constructing rainwater collection and drainage systems, and building water treatment plants across the continent from Niger to Mozambique and from Ethiopia to Congo. It has been a great experience for us as well as for the extended workforce of local people we hired and trained for these jobs. And we are ready to take up the gauntlet again for more projects to come.

Booming water business

While almost all of the investment projects in oil and gas have been cancelled due to the low crude oil price, a large number of water infrastructure projects have been launched in Africa. A significant number of these have come our way as a result of our long-term presence on the continent and our proven expertise and commitment. We have tripled our turnover in Africa and nearly 25% of our staff is currently occupied on African projects.

And it's still scarce in Africa

Despite its critical importance, fresh water is still scarce in some parts of the world. The causes are either physical (inadequate natural water resources to supply a region's demand) or economic (limited access to funding to enable managing available water resources). While physical scarcity is somewhat difficult to combat, economic scarcity can be successfully addressed by means of water infrastructure projects.

WorldWaterStress

AFRICA WATER WORKS



- Little or no water scarcity
- Physical water scarcity
- Approaching physical water scarcity
- Economic water scarcity
- Not estimated

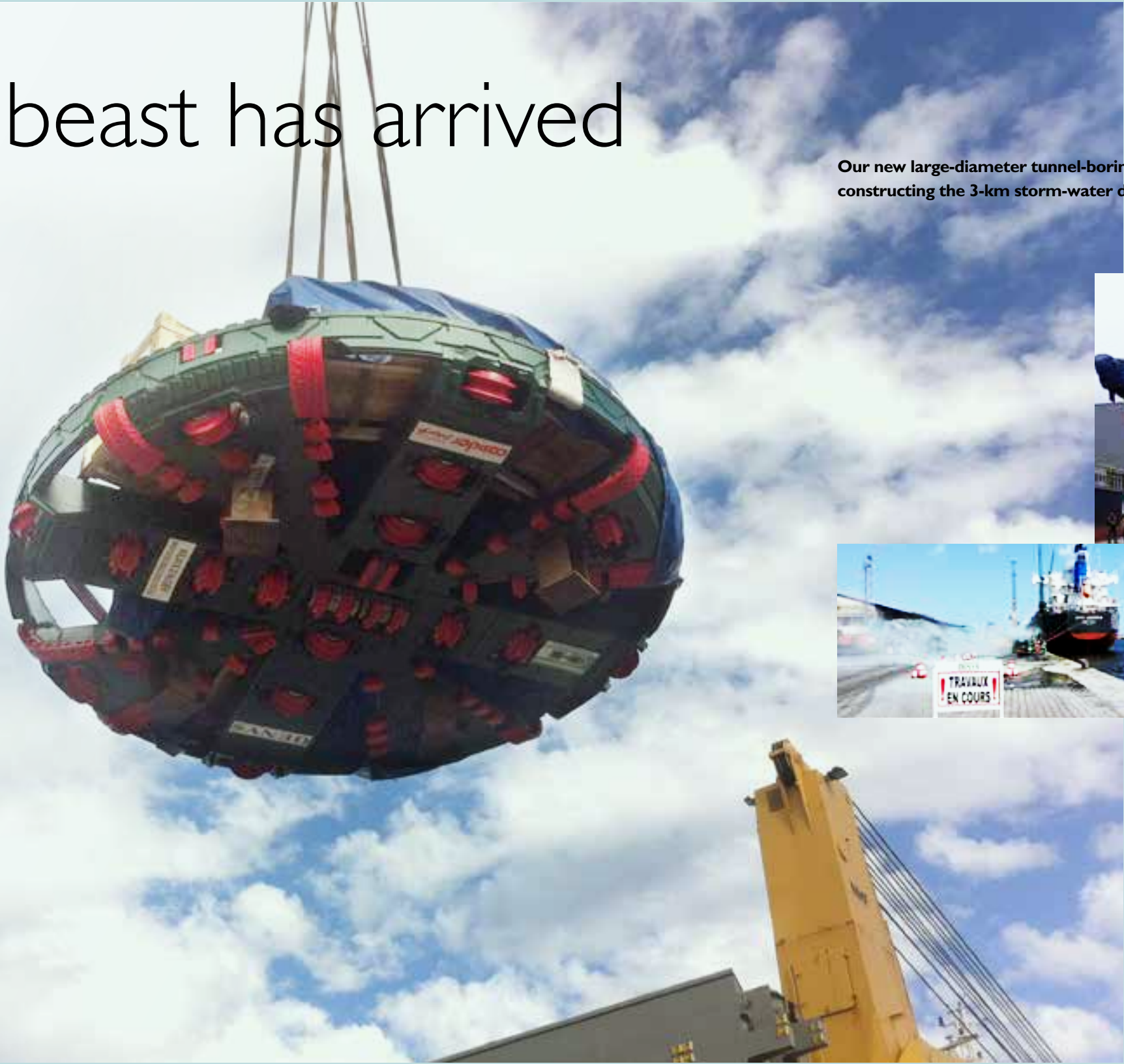
Catching up with infrastructure

Take a look at the **Water Scarcity Map** of the **International Water Management Institute**: it shows that **economic water scarcity** is particularly extreme in **sub-Saharan Africa**. But some countries are slowly catching up with vital infrastructure projects. A significant number of these have come our way as a result of our long-term presence on the continent and our proven expertise and commitment.

The beast has arrived

Our new large-diameter tunnel-boring machine has arrived in Algiers. In September 2016, we will start constructing the 3-km storm-water drainage system at Oued Ouchaiah in the eastern part of Algeria's capital city.

AFRICA WATER WORKS



Our new Herrenknecht machine is designed to construct tunnels with a 5-metre outer diameter.



AFRICA / **IVORY COAST**

Deepening the port

Denys is carrying out a pilot project in the port of Abidjan, the capital of Ivory Coast. The purpose is to deepen the port to allow larger vessels to enter. Over a length of 360 metres, quay walls are being reinforced by means of jet grouting, and the dock is being dredged.



AFRICA / **ALGERIA**

Great precision and care

Meanwhile, we're taking up another segment tunnelling project in the western suburb of Algiers called Raïs Hamidou, which was formerly known as Pointe-Pescade. It's a Design and Build commission, for which we're hiring a 3.3-meter diameter tunnel-boring machine to dig through the heterogeneous subsoil. We're also building a temporary factory nearby to manufacture the tunnel segments, an operation requiring a high level of precision and attention to detail.

AFRICA / **ZAMBIA**

Renovating a plant

One more country we've added to our southern Africa portfolio is Zambia. Recently, we were recently invited to tender for the \$45 million renovation of a water treatment plant in the capital of Lusaka and were successful. The job includes civil works, laying water pipes, and renewing electromechanical equipment.

Top quality african butter



AFRICA WATER WORKS



AFRICA / GHANA

Techiman is a small market town of approximately 100,000 people in the inland part of Ghana, which is generally less-developed than its coastal region. Here, Denys has been called in to modernise a shea butter plant owned by Fuji Oil Europe. Shea butter is a fat extracted from the nut of the African shea tree and is used by Fuji Oil Europe to improve the processability of chocolate. It's a small-scale but fascinating project where we have to deal with tight food safety requirements. We're working closely with Fuji Oil Europe to bring their plant up to the most demanding standards.



AFRICA / MOZAMBIQUE

Being smart

Denys has just won its first project in Mozambique by being smart. The project involves laying 93 kilometres of 1100-millimetre diameter water pipes in the coastal area of the capital, Maputo. Since the subsoil is rather heterogeneous and includes hard rock and sand, we knew that the standard method of trenching would be costly and time-consuming. Consequently, we proposed to deploy a huge trencher machine, a technique commonly used in oil and gas pipeline construction but apparently not very well known by our competitors. The machine represents a 1.5 million euro investment, but it will greatly facilitate and speed up the project. As always, we are hiring and training local staff for the job. Trench excavation started in May 2016 and the project should be completed in December 2017.



Improving the water supply

In Cape Coast, a coastal town of 170,000 residents in southern Ghana, Denys is replacing 70 km of worn-out polyethylene water pipes with cast iron pipes. In addition, we are building three huge water reservoirs as well as two new pumping stations.

Clean water at last

Financial difficulties had caused the Ghana government to delay the Es-akyere water supply project, but local chiefs have successfully maintained pressure on the president. As a result, we are now carrying out this project, which will finally bring clean water to approximately 400,000 inhabitants.

AFRICA / ETHIOPIA

AFRICA WATER WORKS



Improving the water treatment



In Addis Ababa, Ethiopia, we're continuing the construction of the 20-km wastewater collector system. The 1000-mm to 1500-mm diameter glass-reinforced plastic pipes are being laid at an average depth of 4.5 metres. The subsoil is somewhat heterogeneous, containing around 40% rock. The work is almost entirely carried out by local people who were given in-depth training to make sure they meet our high quality and safety standards.

The project is part of an investment programme for the rapidly growing city of Addis Ababa.

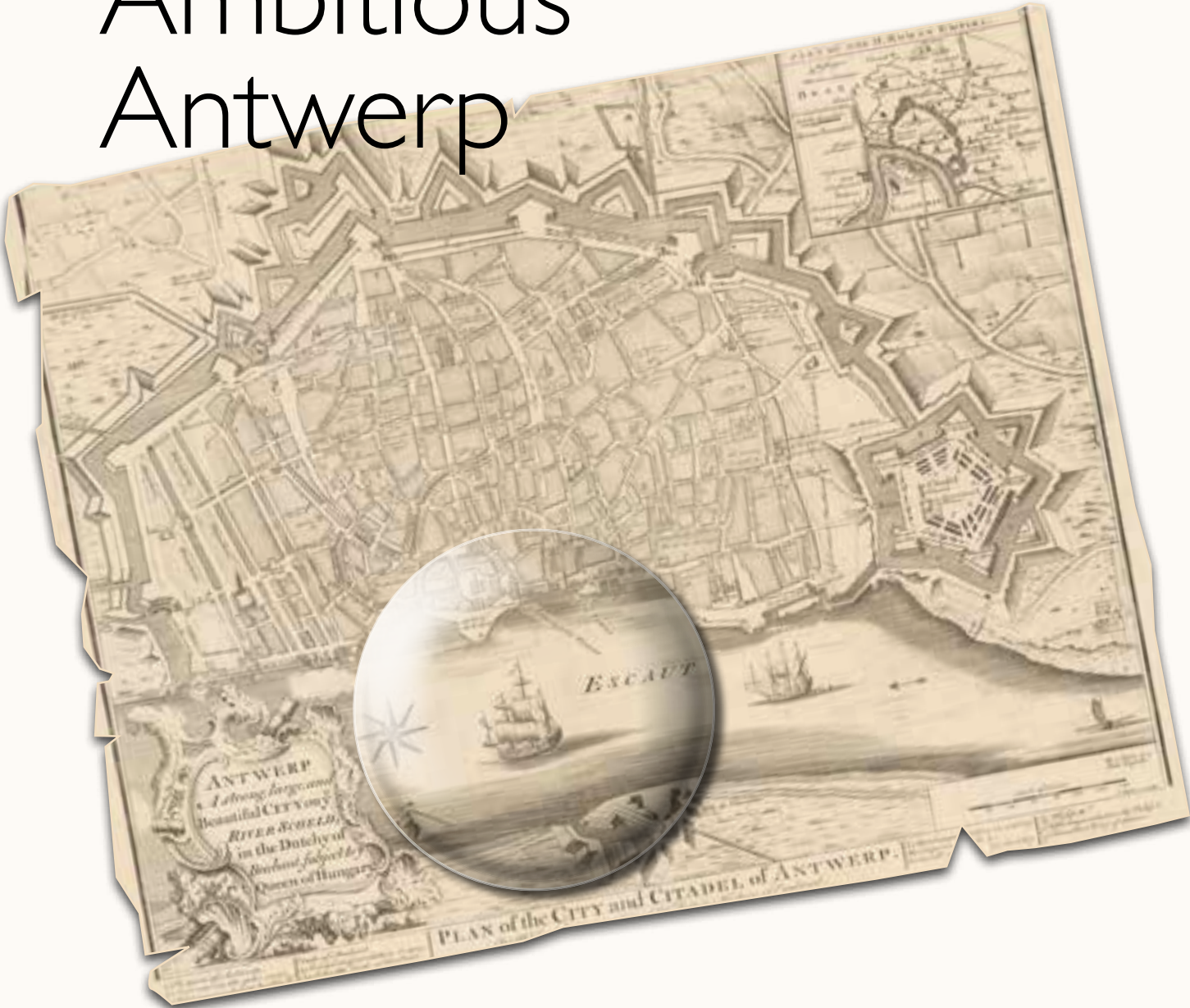
AFRICA WATER WORKS



Access to clean water is recognised as the key factor in alleviating poverty and improving socio-economic development, regional cooperation and care of the environment in Africa. There is still a long way to go, since currently only 5% of Africa's potential water resources are developed and only 5% of Africa's cultivated land is irrigated, leading to low productivity levels in African agriculture.

DENYS


Ambitious Antwerp



Redevelopment of the former stock exchange site
Restoration of the Saint Carolus Borromeus Church
Renovation of the Protestant Church
Renovation of the Borgerhout District Centre
Renovation and restoration of several buildings at Antwerp ZOO
Construction of the Forensic Psychiatric Centre
Construction of the new Province Headquarters

ANTWERP

Rich heritage and great ambitions



Antwerp is the second largest city in Belgium, with a rich cultural and architectural heritage as well as great ambitions for the future. In the past few years, Denys has won several bids for construction and renovation projects here, both in the city centre and on the periphery. Projects include the renovation and restoration of churches, 19th century commercial and administrative centres and other architectural masterpieces. In addition, we are completing the construction of the Forensic Psychiatric Centre on Antwerp's 'left-bank' and the curiously-shaped Province Headquarters and its urban park surroundings.

ANTWERP / FORMER STOCK EXCHANGE SITE



© Régine Mahaux



Surprisingly, we found no remnants at all of the original 1531 building. Instead, we uncovered the foundations of a series of dwellings which must have pre-dated the exchange. Archaeological investigations and preservation activities have been completed.

The heart of commerce

In the 16th century, Antwerp was one of the world's most important trade centres with more than 10,000 merchants operating in the city. Antwerp's merchant gathering place, a building erected in 1531, became a model for other stock exchange buildings in Europe, among them Thomas Gresham's Royal Exchange in London. Designed as a large rectangular courtyard surrounded by galleries, the floor of the exchange was accessible from all four sides since it was situated squarely on a crossroads.

Sculpted stone and more

Denys is now renovating the Handelsbeurs to transform it into an events hall and a series of congress spaces and business clubs. This involves carefully restoring the sculpted stone pillars and brick vaults of the galleries as well as renewing and improving the metalwork roof. In addition, a 290-unit underground parking space is needed, requiring us to completely rearrange the foundations according to a carefully worked-out plan. Jet grouting will be used to construct the temporary retaining walls.



A remarkable hybrid

Nothing of the original building now remains as it was completely destroyed by fire in 1858. In 1872, it was replaced by a two-storey building with an identical footprint but covered with a magnificent roof of glass. The new Handelsbeurs, designed by Joseph Schadde, fused neo-Gothic architecture with revolutionary metal construction techniques in the roof. Trade activities were conducted there until the Antwerp Stock Exchange was abolished in 1997, leaving the building abandoned for more than fifteen years.



ANTWERP / FORMER STOCK EXCHANGE SITE



A restaurant and a 5-star hotel too

In addition to the Handelsbeurs itself, two other buildings are included in the project. First, there is the former Schippersbeurs, a smaller stock exchange building which was built in neo-gothic style in 1894 against the northwest corner of the Handelsbeurs. It will be renewed to house a traditional restaurant. Second, there is a group of 16th to 19th century buildings to the northeast of the main building. This rather complex cluster will be transformed into a 5-star hotel, which is quite challenging given the exacting comfort requirements and the need to preserve some of the original elements such as windows and doors.



Conferring with residents

The Handelsbeurs and Schippersbeurs renovations will be completed in 2018 and the hotel a year later. Inevitably, both the construction activities and the eventual change of use of the building complex will have a significant impact on the immediate surroundings. Therefore, continuous consultation with local residents is a vital part of the project.

ANTWERP / ANTWERP ZOO

Building the ZOO of the future

The Antwerp ZOO, located right next to the beautiful Antwerpen-Centraal railway station, is the world's best kept 19th century ZOO. Recently, an ambitious masterplan was developed to build the ZOO of the future, a plan that includes a 1.5 ha expansion, a reorganisation of the animal houses, and renovation works. As part of the first phase of the plan, Denys is constructing a number of new buildings and renovating some older ones. In addition, we're restoring some of the finest buildings on the site.



A touch of ancient Egypt

One of the jewels of the Antwerp ZOO is the famous Egyptian Temple, the home of the Asian elephants, now being restored to its original splendour. The Egyptian Temple was built in 1856 by Charles Servais (1828-1892), who found inspiration in the temples of Dendera and the isle of Philae. It is beautifully decorated with painting and ornamentation referring to the culture of Ancient Egypt. Over the years, rising damp and salt ingress have caused much of the paintwork to deteriorate, a problem we are now addressing.

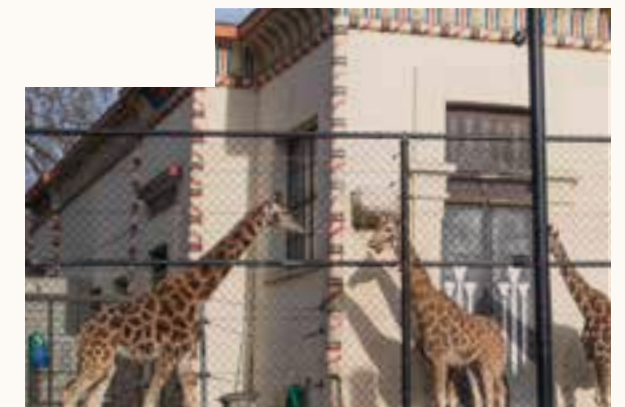
The remarkable decoration of the Egyptian Temple is being restored and protected against salt damage.

Considering the wellbeing of animals

Buildings to be constructed include a bovine house crowned by an aviary as well as a new restaurant, which will offer splendid views over the new ZOO savannah.

Careful planning and organisation of logistics are crucial to the project, since the ZOO remains accessible to the public during construction. We need to confer constantly with the ZOO's animal carers, because a large number of animals will have to be relocated more than once, and animal welfare is of the highest priority here.

The ZOO remains accessible to the public during construction, so careful organisation is crucial.



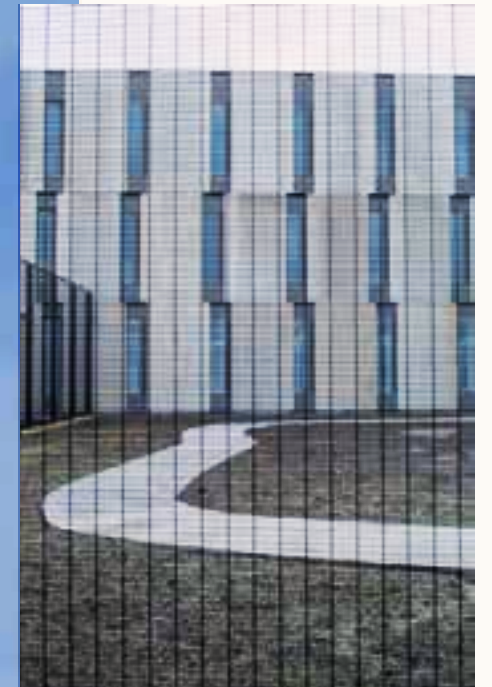


ANTWERP / FORENSIC PSYCHIATRIC CENTRE

Rich heritage and great ambitions

Drawing upon experience

© Régine Mahaux



We needed just two years and a few months to complete the new Forensic Psychiatric Centre on Antwerp's 'left-bank'. It is a little smaller than the similar FPC we constructed in Ghent a few years ago, but its architecture is more complex and the time constraints were more stringent. Nevertheless, our experience with the Ghent FPC came in handy, notably for the specialised construction solutions required in this type of building, including unbreakable glass and rock-solid wall finishing to take account of the unpredictable behaviour of some of the patients.

The curiously-shaped surrounding wall was constructed with prefabricated concrete segments.

Dealing with oddities

ANTWERP / PROVINCE HEADQUARTERS



© Régine Mahaux

Due to the irregular 3D-shape of the facades, a land surveyor must set out each individual window.



The Antwerp Province Headquarters must be one of the more distinctive buildings we have ever constructed. It is a 14-storey structure with a twisted outline designed by Xaveer De Geyter Architects. Particular challenges arose as a result of the remarkable pattern of triangular windows to be cast in situ using white fair-faced concrete. The odd geometry of the formwork, the very dense reinforcement and the exacting aesthetics can be challenging. For example, we have to cast the concrete through a tiny hole, which inevitably slows down the process and thus induces the risk of premature concrete hardening. Consequently, we had to cast quite a number of mock-ups to test and fine-tune the casting procedure.



ANTWERP / PLANTIN-MORETUS EXTENSION



The printers' type case

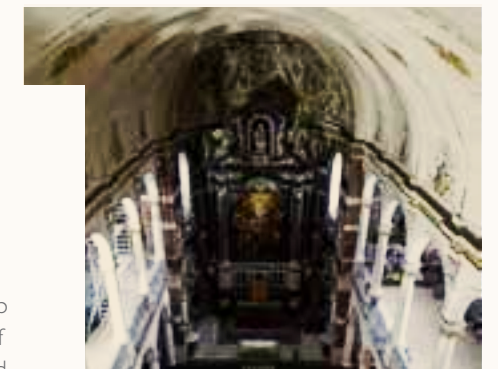
The façade of the Plantin-Moretus Museum's Gallery of Prints adds another beautiful landmark to the city. It is made of large timber beams of wood, subtly referring to an old printers' type case.



ANTWERP / SAINT CAROLUS BORROMEUS CHURCH

Restoring the Rubens church

In 2009, a fire broke out in the Saint Carolus Borromeus church in Antwerp as a result of the careless placement of temporary lighting. Thanks to the rapid and circumspect intervention of the fire brigade, paintings by baroque master Peter Paul Rubens, for which the church is famous, suffered only smoke damage. However, the fire caused some stability problems in the galleries and damaged part of the stucco work and the wooden furniture. While the stability problems and stucco damage were addressed



Some of the woodwork was damaged by the 2009 fire and is now being restored.

some years ago, Denys is now carrying out the second phase of the restoration campaign, which includes repairing woodwork, repainting the interior and removing soot from a number of paintings.

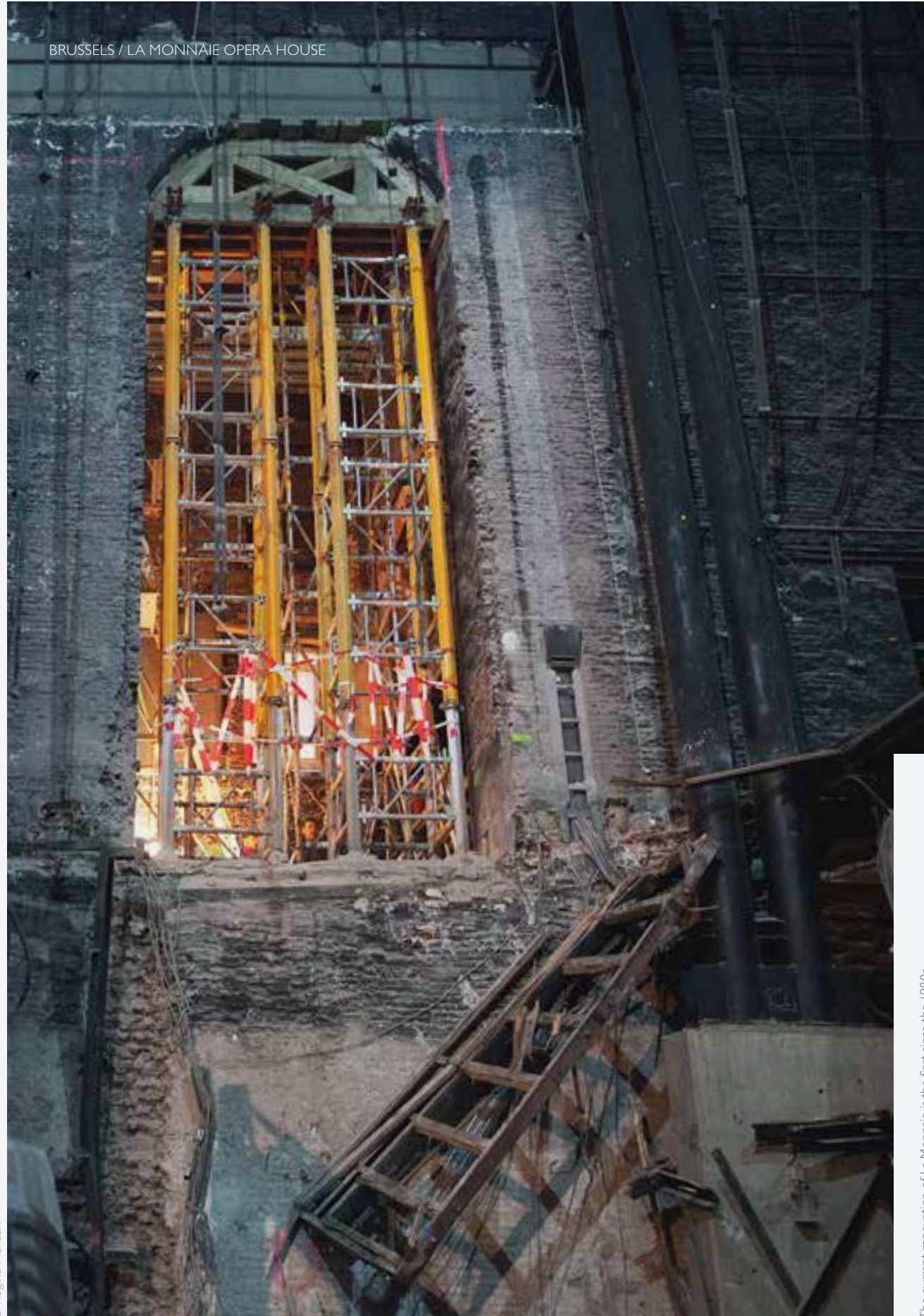
Old and new territories



Brussels / La Monnaie Opera House
 Tervuren / Royal Museum for Central Africa
 Knokke / Lake Front
 St-Niklaas and Leuven / Bus Depots
 Brussels / VUB Student Housing

Denys proudly continues its journey in building construction, and with some projects we are entering territories that are quite uncharted for us and where competition is fierce. Examples include the construction of 70 luxury apartments in Knokke and the creation of 650 student rooms in Brussels, projects that above all require high efficiency, which has always been one of our strengths.

BRUSSELS / LA MONNAIE OPERA HOUSE



A year at the opera

La Monnaie in Brussels, one of the top opera houses in Europe, urgently needed to renew or renovate parts of its magnificent building. Parts of the hall, which is classified as a historic monument, needed to be renewed in compliance with preservation guidelines, including the air conditioning at the parterre, the seats and some parts of the amazing ceiling.

The non-classified stage tower needed to be equipped with modern technology, in order to be ready for the newest productions. This included the installation of four 14.8 x 2.6-metre stage elevators and an additional elevator for scenery. Low energy hydraulic drive technology was chosen for the stage elevators, because it is powerful, compact, reliable and above all very quiet, essential during an opera performance. Project organisation was rather challenging given the limited manoeuvring space within and around the building.



The first La Monnaie Opera House was built in 1700, but the current building dates from 1819 and was refurbished several times in the decades that followed, needing to be rebuilt in 1855 after a disastrous fire. In the 1980s, director Gerard Mortier invited such artists as Sol LeWitt and Daniel Buren to be involved in a modernisation programme. The current renovation is the first since then.

In 1830, La Monnaie played an important role in the Belgian Revolution and the secession from the Netherlands, when an uprising followed the performance of Daniel Auber's opera *La Muette de Portici*.



The current renovation of La Monnaie is the first since the 1980s.



TERVUREN / ROYAL MUSEUM FOR CENTRAL AFRICA

Old and new territories

Coming home

The renovation and restoration of the Royal Museum for Central Africa isn't yet completed, but for practical reasons some of the most precious artefacts have already been brought back to the site. Such is the case for the 22.5-metre long pirogue, the dugout canoe used by King Leopold III of Belgium during his Congo visit in 1957, shortly after his abdication.

Meanwhile, the museum's famous stuffed elephant is awaiting project completion for its return. The renovation and restoration of the 1910 building by Charles Giraud is planned to be completed by October 2016, the starting point for refurnishing the museum.



In addition to the museum renovation project, Denys has been commissioned to restore the fountain lake in the museum garden.



© Régine Mahaux

KNOKKE / LAKE FRONT

BRUSSELS / VUB STUDENT HOUSING

Old and new territories

Tradition revisited



© Project Architects

The construction of the Lake Front apartment blocks in Knokke, on the Belgian coast, is a first for Denys. Lake Front is a development of 70 luxury apartments grouped around a lake, a few kilometres from the coast. It is designed in vernacular style with a somewhat complicated roof layout, but it is being built in high-quality concrete using state-of-the-art construction techniques.

We are very proud that we were chosen for this project, especially since it will be carried out using our own Belgian personnel exclusively, avoiding the need to hire cheaper labour from abroad. Efficiency and good organisation clearly pay off.



Although the architecture is very traditional, modern high-quality concrete is the material of choice for constructing Knokke Lake Front.



Buildings cum laude



© Régine Mahaux



Conix Architects designed a very elegant cluster of new buildings for the Vrije Universiteit Brussel. Denys is constructing the block containing 650 student rooms.



© Conix RDBM Architects



ST-NIKLAAS AND LEUVEN / BUS DEPOTS

Old and new territories

Close to the limit

The new bus depots in St-Niklaas and Leuven are due for completion before the summer of 2016. Both depots, which include a maintenance workshop, a service building, a fuel station and a cleaning facility, had to be completed in a very short timeframe of 14 and 15 months respectively. The available time for construction was further limited to nine months, since it had already taken four or five months to complete the detailed design and the depots need to pass through a 2-month test programme before going live. That's really a very tight schedule, close to the limit of what is feasible and possible. It required us once again to be very flexible during preparations. Luckily, the moderate Belgian winter was on our side.



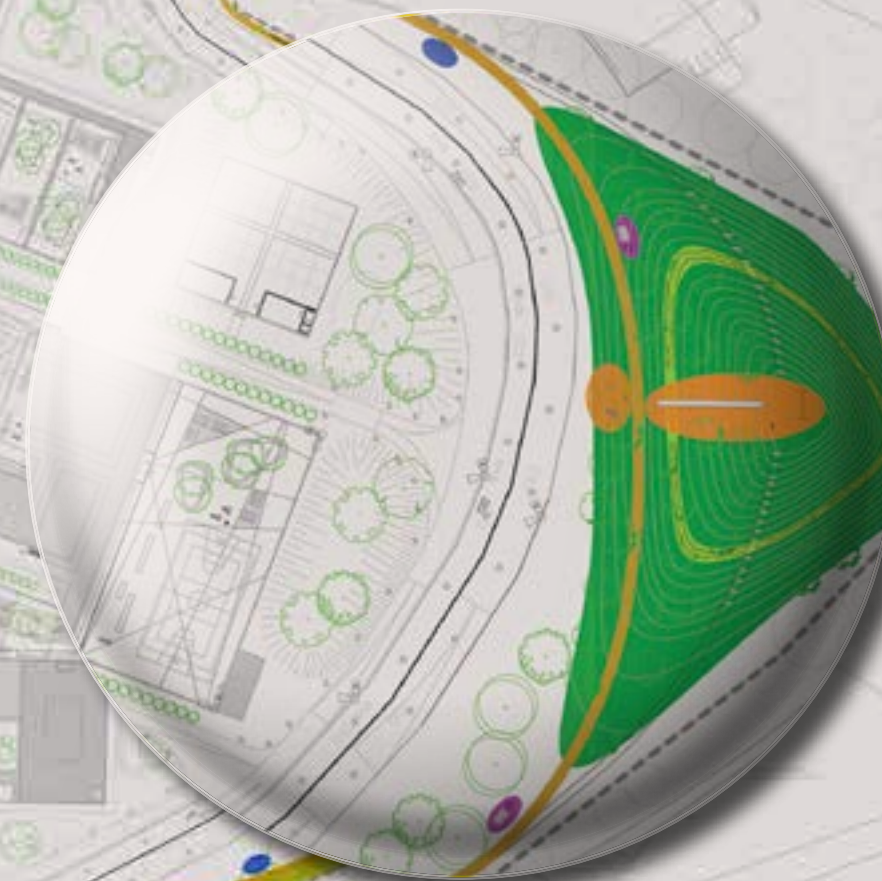
A maintenance workshop, a service building, a fuel station and a cleaning facility had to be built within nine months.

BRUSSELS / HAREN PRISON COMPLEX

Patience and perseverance



Haren prison in Brussels is a key element in the Belgian government's ambitious master-plan to address the problems of overpopulation and poor living conditions in the existing prisons in Saint-Gilles (in use since 1884), Forest and Berkendael (both in use since 1910). Initially, the idea was to have the new prison completed by 2017, but the project suffered from substantial delays due to a deluge of administrative stumbling blocks. Yet we don't give up.





BRUSSELS / HAREN PRISON COMPLEX

Patience and perseverance



We proposed to build an alternative route for the Keelbeekpad, an old country lane regularly used by locals and running through the site.

All systems go for the prison-village

The story begins in May 2013 when the Cafasso Consortium, spearheaded by Denys, was appointed preferred bidder to develop the new prison in Haren, Brussels. Accommodating 1190 inmates, it would become the largest prison in Belgium and the first to adopt the prison-village architectural concept. We were very excited by the prospect of contributing to more human detention practices, and we were preparing to apply for the necessary permits. Thinking that 6 to 8 months for obtaining the permits would be a reasonable delay, we estimated that building work would start in September 2014, and completion of the prison would be in 2017, in line with the government's masterplan.

Different authorities, different interests

Not so fast! The construction site is located in the Brussels-Capital Region, but it turned out that the proposed access road crosses the border of the Flemish Region at one point. This complicated matters because of the different interests of both authorities, leading to a four-month delay, eventually forcing us to rethink the site access. We submitted the new dossier on 23 December 2013 but additional requirements were subsequently issued, requiring us to submit a modified dossier on 11 February 2014.

A narrow country lane

But then we learned about a tiny but important detail: a narrow country lane called Keelbeekpad, which was said to be used frequently by locals, runs right through the site. Officials told us that we needed to provide an alternative for that, and we immediately integrated that into our concept.



The prison-village model allows various groups of detainees to co-exist in such a way as to promote reintegration into society.

Further delays

The procedure faced an additional one-month delay due to the illness of an official. Then we found out that we had to submit modified plans for the public inquiry, given that the original plans contained confidential information not to be disclosed to the general public. And the City of Brussels demanded that we translate our entire file into French, despite the fact that this was not a legal obligation.

Protests, amendments and objections

Meanwhile, activist groups have been turning public opinion against the project and a local environment preservation group pursued a legal case against our launching the environmental study. Although the initial plan was to start building in September 2014, we were only at the preparation phase by that time. The environmental study was submitted on 4 February 2015 and subsequently adapted to respond to the conclusions. This was followed by a public inquiry, which was severely hampered by a group of activists illegally occupying the site and tearing down our legally mandatory notice posters. A public meeting was organised at which the consultation committee issued a provisional positive advice. The environmental permit was granted on 25 June 2015.

A crucial signature

But between May and September 2015 we learned that the Keelbeekpad issue further complicated matters. According to a law of 1842, the procedure for re-locating a country lane like this requires the signature of the King, in this case represented by the City of Brussels. This authority wanted to discuss substantial financial compensation from the Region before they would sign. In addition, they asked us to modify our alternative proposal for the country lane. At that time, we still hadn't obtained the permit to build from the Brussels-Capital Region, who were concerned by the organisation of traffic flow. Between September and December 2015 we organised informal workshops with them to clarify these matters and compile a new dossier. So on 15 March, we submitted two new dossiers, one to obtain the building permit (with an alternative traffic flow scheme) and one for re-routing the Keelbeekpad. The associated public inquiry was concluded on 20 May 2015.

Longing to start

And one more thing: some of the project's stakeholders raised the question of why renovation of the old prisons in Saint-Gilles and Forest had not been considered as an alternative to the new Haren complex. As a result, we are carrying out a study for this option, with initial findings predicting huge costs and a great deal of upheaval for the public. With inquiries and studies still ongoing, it's clear that we haven't reached the finishing line yet and that additional delays may crop up. We now envisage that in the best case scenario we will start building work in early 2017, two and a half years behind schedule. Patience and perseverance are among our greatest qualities, so whatever happens next, we won't give up and we're determined to succeed. After all, the prison is greatly needed.



Standing out from the crowd



One of the things which makes Denys stand out from the crowd is our commitment to innovation. Unlike most construction firms, we are continually developing innovative techniques to work more efficiently, improve quality and safety, and limit disruption to every-day activities. In the past few years, we have strengthened our R&D department and we are ramping-up interaction between R&D and the other parts of our business. This means we can now more readily identify opportunities for improvement and innovation.

Digging without disrupting

More extensive use of underground space is believed to be one of the essential strategies for the urbanism of the future. There are, however, a few problems, including the cost of underground construction and the year-round disruptive impact it has on the urban fabric. And then there is the increasing tendency to list buildings in historic cities, a trend that seems likely to impede large-scale underground exploitation. But solutions are on the way. In the past few years, Denys has been developing a revolutionary technique called WallSlotRobot that enables us to build underground space with minimal disruption to above-ground life. We are now in the process of perfecting the technique, ready for use in real-life projects.

Valuable underground space anywhere

With WallSlotRobot we actually construct underground walls by automated trench excavation from a micro-tunnel or an existing underground level. With a micro-tunnel, above-ground disruption is limited to digging the starting and target pits. With this technique, the impossible becomes reality. It allows us to create valuable underground space almost anywhere, including beneath historic monuments, busy main roads and bustling marketplaces. Typical projects might include the creation of underground parking or shopping mall extensions.



With WallSlotRobot, underground space can be constructed with minimal disruption to the urban fabric.

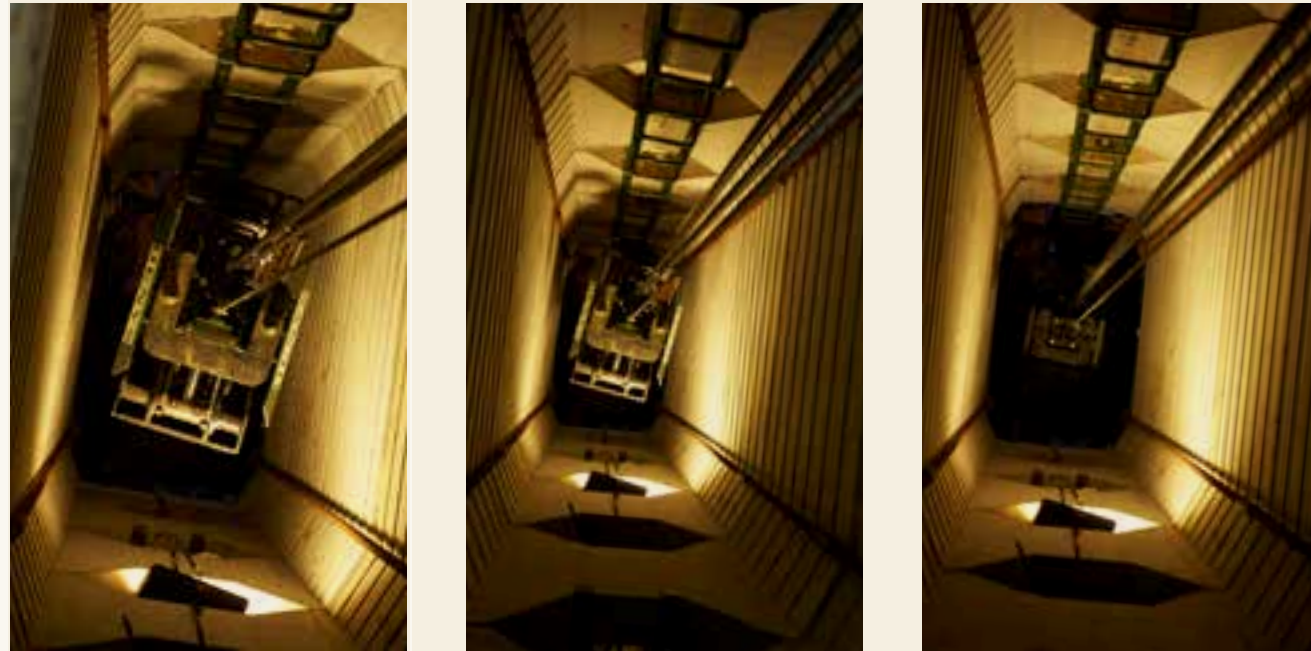


The technique allows the uncomplicated creation of underground parking and shopping malls.



INNOVATION

Standing out from the crowd



© Régine Mahaux

We are developing an improved WallSlotRobot prototype to be tested in the second half of 2016.



Improving robustness and efficiency

Last year, we built a first prototype of WallSlotRobot and carried out tests at an R&D site belonging to the Belgian Building Research Institute (BBRI) in Limelette, south-east of Brussels. The tests confirmed that the concept is viable. They also gave us important experience feedback, allowing us to optimise the machine for a variety of subsoils. Meanwhile, we have set up a company called Future Foundations NV, supported by the Flemish investment company PMV. This enables us to develop an improved prototype, which will be tested in the second half of 2016. We're convinced that this will allow us to further refine the concept, including improving its robustness and efficiency as well as streamlining site logistics. In 2017, we should be able to make the leap forward to a real-life project, one that might involve the construction of perhaps 8000 m² underground walls, preferably in a densely built city like Brussels.



INNOVATION



Automated rail welding

The FRIEX machine we built several years ago to develop and test automated pipeline welding is about to be given a second life thanks to the WRIST project funded by the European Commission H2020 programme. FRIEX, an acronym of Friction and Explosion, refers to a fixed phase controlled welding process that does not involve melting the material, thus ensuring high quality. The machine is now being re-engineered to allow the welding of tram or train rails. Tests are due to be carried out next year.



The FRIEX machine is being re-engineered in the framework of the EC-funded WRIST project to allow the welding of tram or train rails.



LE CLOITRE / LUXEMBURG

An extraordinary location



In the historic centre of Luxembourg, Denys is renovating the Cloître de Saint-François, a former Dominican monastery with origins in the 8th century. The location is extraordinary, crowning some of the remains of the 17th century Vauban fortifications, right in front of Luxembourg's medieval stronghold, and close to the Palais Grand-Ducal, the Eglise Saint-Michel and the houses Beim Engel and Ennert de Steiler. Yes, this is the site that acquired the historical epithet of the Gibraltar du Nord because of its impressive views and the apparent impregnability of the stronghold.



An extraordinary location



LE CLOITRE / LUXEMBURG

The remains of the medieval monastery were laid bare during excavations and will be open to the public.



The most beautiful balcony in Europe

The current building dates back to the early 17th century, although there are some remains from the 13th century monastery. For more than a century it has been used as a hospital, but it is now being renovated and converted into a high-class residence. The exterior will be restored to its original splendour, making the site more impressive than ever, both for residents and passers-by. From on top, the residents will enjoy a superb view over the Alzette valley from what is often referred to as 'the most beautiful balcony in Europe'.

Magnificent and unique

A significant part of the interior is being restored too, especially the magnificent ogival arches at ground floor level. The rest of the interior, however, is being fundamentally remodelled to accommodate a series of apartments of various sizes, ranging from 80 m² to 800 m². Each apartment will have its own unique character, since each occupant has engaged their own interior designer to create the home of their dreams.

The apartments are arranged around the monastery's inner courtyard, which will be an oasis of calm and beauty.



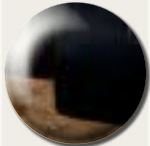
The spacious duplex loft being created in the former monastery chapel will be one of the most prestigious apartments in Luxembourg.

STORA ENSO – VOLVO CARS / GHENT

Heat networks are hot again



Heat networks are being developed all over the world, but primarily in Europe, North America, Japan and China.



Heat networks are hot again

STORA ENSO – VOLVO CARS / GHENT



District heating is hot again. Developed in the first half of the 20th Century as a system to distribute heat generated at a central location, district heating initially had only limited application, and even got a bad reputation as the inefficient and unreliable system widely used in the Soviet bloc. But things have moved on as a result of technological advances as well as a change of focus.

The heat networks being developed today are designed to capture and distribute excess heat from a variety of sources, including industrial processes, cogeneration units, geothermal sources, solar-thermal panels, heat pumps and heat accumulators. As a result, heat networks are now among the key technologies for reducing carbon emissions and enabling the transition towards 100% green energy supply.



Exchanging heat under the canal

In the Port of Ghent, Denys is constructing a 3.4-km heat network linking the sites of paper producer Stora Enso Langerbrugge and Volvo Cars. When completed, the network will transport excess heat (water at about 125°C) from the Stora Enso biomass steam and power generation unit to Volvo Cars. The heat will be used in the car paint shop and to heat a number of office buildings, reducing carbon emissions by 15,000 tonnes annually. The project involves directional drilling under the Ghent-Terneuzen Canal for a distance of 450 metres.



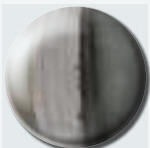
The heat network pipes are made from steel, with approximately 10 cm of PUR insulation and mostly a polyethylene coating.

HINKLEY POINT C POWERSTATION / UK

Nuclear new-build in the UK



Are we on the home straight in the launch of the Hinkley Point C project? Following a 2010 UK government decision, Hinkley Point C would be the first new nuclear power station to be built on British soil since 1986. Located on the Bristol Channel on the Somerset, England side, Hinkley Point has been a nuclear site since 1976, when the now-decommissioned Hinkley Point A plant was put into operation.



HINKLEY POINT C POWERSTATION / UK

Third-generation robustness

Hinkley Point C is a twin EPR reactor with a capacity of 3200 MWe. EPR reactors are the third generation of pressurised water reactors, four of which are currently under construction in Finland (Olkiluoto), France (Flamanville), and China (Taishan 1 and 2).

EPRs are designed to be more robust, safer and cleaner than any other nuclear power reactor. However, all of the ongoing projects have seen severely rising costs and delays, in part due to the Fukushima disaster which has led to additional safety constraints. At the time of writing, EDF is close to making its final investment decision for Hinkley Point C.

60 years of exposure to high pressure and salt water

Meanwhile, preparations are ongoing, and Denys is heavily involved. Our subsidiary Socea has been commissioned to design and manufacture the huge tertiary cooling circuit between the station and the Bristol Channel. The circuit will be built using reinforced concrete pipes with an internal steel core and welded joints, the most robust solution available on the market.

While we can draw upon our experience at Flamanville, additional challenges are at play here. First, we need to guarantee an extended lifetime of 60 years' exposure to salt water. This means that inside the pipes, the steel core must be covered with at least 50 mm of high quality concrete made from non-reactive granulates and a very specific type of cement. In addition, the inlet design pressure has been increased to 8 bar (compared to 6 bar at Flamanville), which means that the steel core itself will be 9 mm thick, rising to as much as 15 mm in the T-pieces.



Special storage measures

An additional aspect for consideration is storage. For planning reasons, it was decided to complete the manufacturing of all the necessary pipe elements before starting the installation, a lesson learned from the Flamanville project. However, this means that hundreds of pipe elements will be stored on site for several months, or even years, where they will be exposed to the salt water climatic conditions of the Bristol Channel. As a consequence, we need to apply a special coating to protect the steel core, a coating designed to be easily removed at the time of assembly to avoid disrupting the welding process.



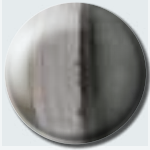
725 low-loaders

And then there's the transportation challenge. We'll be producing 810 pieces of pipe, 400 of them with an internal diameter of 3500 mm. This represents 15,000 tonnes of concrete and 2000 tonnes of steel, to be transported from our manufacturing plant in Oelegem near Antwerp to Hinkley Point. We estimate that transportation by low-loader and ferry is the most secure, as transport by maritime vessel would mean carrying out various loading and unloading operations, risking damage to the pipes.

As a result, the project will involve 725 low-loader transports with an average weight of 25 tonnes, including 16 special transports weighing more than 40 tonnes.

Transportation by low-loader and ferry is the most secure because it avoids loading and unloading operations that could damage the pipes.





HINKLEY POINT C POWERSTATION / UK



Meticulously documented

A further consequence of the Fukushima events is the requirement for suppliers to provide much more detailed information at delivery. So we meticulously document each of the pieces we manufacture, along with the procedures and techniques used. This goes into the minutest detail, greatly increasing the quantity of paperwork.



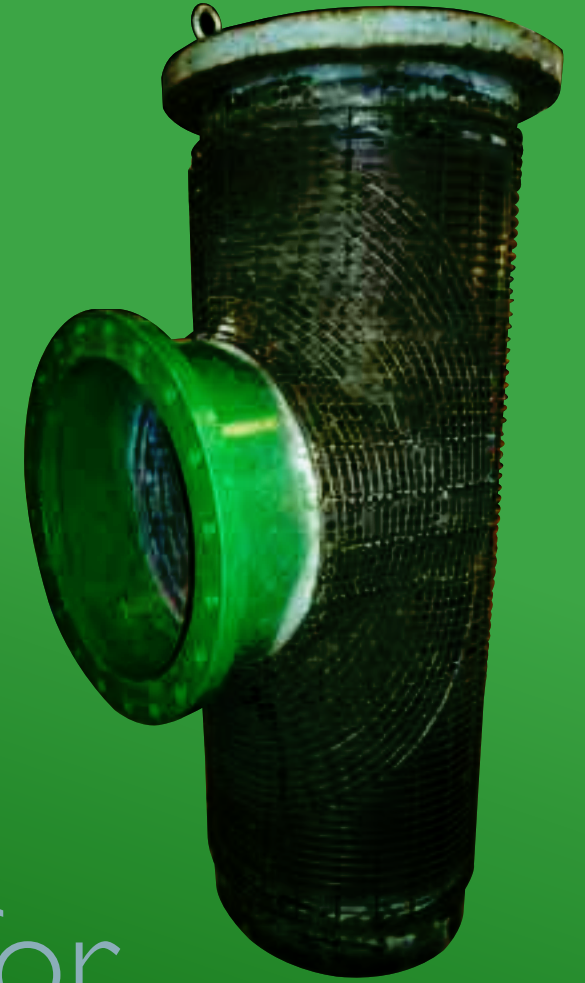
A design pressure of 8 bar means that the steel core should be at least 9 mm thick, rising to as much as 15 mm in the T-pieces.



PALUEL POWER STATION / FRANCE

Qualified for nuclear maintenance

Meanwhile, Socea is now qualified to supply pipes in the framework of maintenance on nuclear cooling circuits in France. We were called upon to supply substitute elements in the secondary nuclear circuit at the Paluel 3 unit in Normandy, which was done to the customer's complete satisfaction. A similar project at the Paluel 1 unit is ongoing.



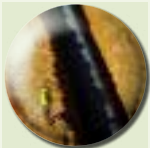
GAS PIPELINES IN EUROPE

Working safely and effectively



The construction of gas pipelines in Europe is now a well-established and recurring business for Denys. Currently, we're carrying out projects of varying scope in France, Belgium and the Netherlands. Customers tell us they appreciate our commitment to safety and quality, engineering expertise, versatility and effectiveness.

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GAS PIPELINES IN EUROPE

Micro-tunnelling
to keep risks
to a minimum

Through rocky soil

In France, for example, we are currently working on the fifth section of the Arc de Dierrey pipeline project for GRTgaz, due to be completed this autumn. Since it involves digging trenches through rocky soil, impeccable organisation is crucial for achieving a smooth and efficient sequence of work.

Meanwhile, we're at the detailed engineering stage of two sections of the Val de Saône project for GRTgaz in eastern France. Along the 75-km route there are three major river crossings. We are proposing to use micro-tunnelling, given the difficult geology and in order to keep safety risks to a minimum.



Benelux calling

We're also involved in various projects in the Benelux countries. In Belgium, we have just completed construction of the 25-km pipeline from Alveringem to Hoogdele, on a route that runs right through the former war-time front-line around Ypres. Later this year, we are constructing an 18-km ND600 pipeline between Tessenderlo and Diest, also for Fluxys. And in the Netherlands, we're kept extremely busy, mostly performing maintenance for Gasunie. We closed a contract for the upcoming years that will enable us to build a strong backbone.



No standstill

GAS PIPELINES IN SAUDI ARABIA

While low crude oil prices may have forced Saudi Arabia to cancel several of its major investment projects, the world's largest oil and gas company Saudi Aramco continues to invest. Various projects are being launched to improve and increase gas supply throughout the country to avoid the need to import natural gas in the future. Saudi Arabia's natural gas consumption is expected to almost double by 2030 from the 2011 levels of 3.5 trillion cubic feet (Tcf) per year. The country also needs to continuously maintain its pipeline infrastructure, leading to important renovation projects.

Expertise, capacity and efficiency

Denys recently won two of these projects for Saudi Aramco thanks to a combination of proven technical expertise, available capacity and high efficiency (and therefore reasonable pricing). The projects are run by our subsidiary, Denys Saudi Arabia, which will have a staff of about 1.000 at the height of the projects.

Inconel steel will be used for the transportation of sour gas.



Both the Khursaniyah and the Jubail projects were ordered by the state oil company Saudi Aramco.

SAUDI ARABIA / JUBAIL

Making room for the city

The city of Jubail, in the Persian Gulf, is rapidly expanding as a result of the Jubail Industrial City 2 project, planned to be completed in 2022. A number of problems have arisen as the city continues to grow. For example, some densely populated areas are expanding into a zone where there are critical oil and gas pipelines. For this reason, a project has been launched to construct replacement pipelines in a wider arc around the city, a commission that Denys has won.

Tricky permits

The project involves the construction of about 104 kilometres of 36-inch, 30-inch and 6-inch natural gas pipelines. We're currently in the engineering phase. Work is planned to start in the third quarter of 2016, and delivery is scheduled for the end of 2017. The permit process, however, may prove to be rather tricky, as the proposed trajectory crosses several important roads, and runs through an existing pipeline corridor and land governed by the Royal Commission.

SAUDI ARABIA / KHURSANIYAH

Roads and pipelines

We're currently in the engineering phase of a challenging multidisciplinary project at the Khursaniyah Gas Plant, located in Saudi Arabia's eastern province. 16-inch pipelines will be constructed leading from two gas-gathering manifolds to the treatment facility 28 kilometres towards the south-west. The pipelines have to cross several roads, including the Abu Hadriyah Highway, as well as a number of existing pipeline clusters. Thrust boring will be used for the road crossings. The stations collect sour gas, containing sulphur and water, from the Gas-Oil Separation Plant (GOSP), which means that special Inconel steel must be used for the gathering and transportation infrastructure.

In addition to the pipeline construction, the project includes the renovation of the Khursaniyah GOSP-I Road (10.4 km) and the construction of two access roads to the gathering manifolds (4.5 and 5.3 km).

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