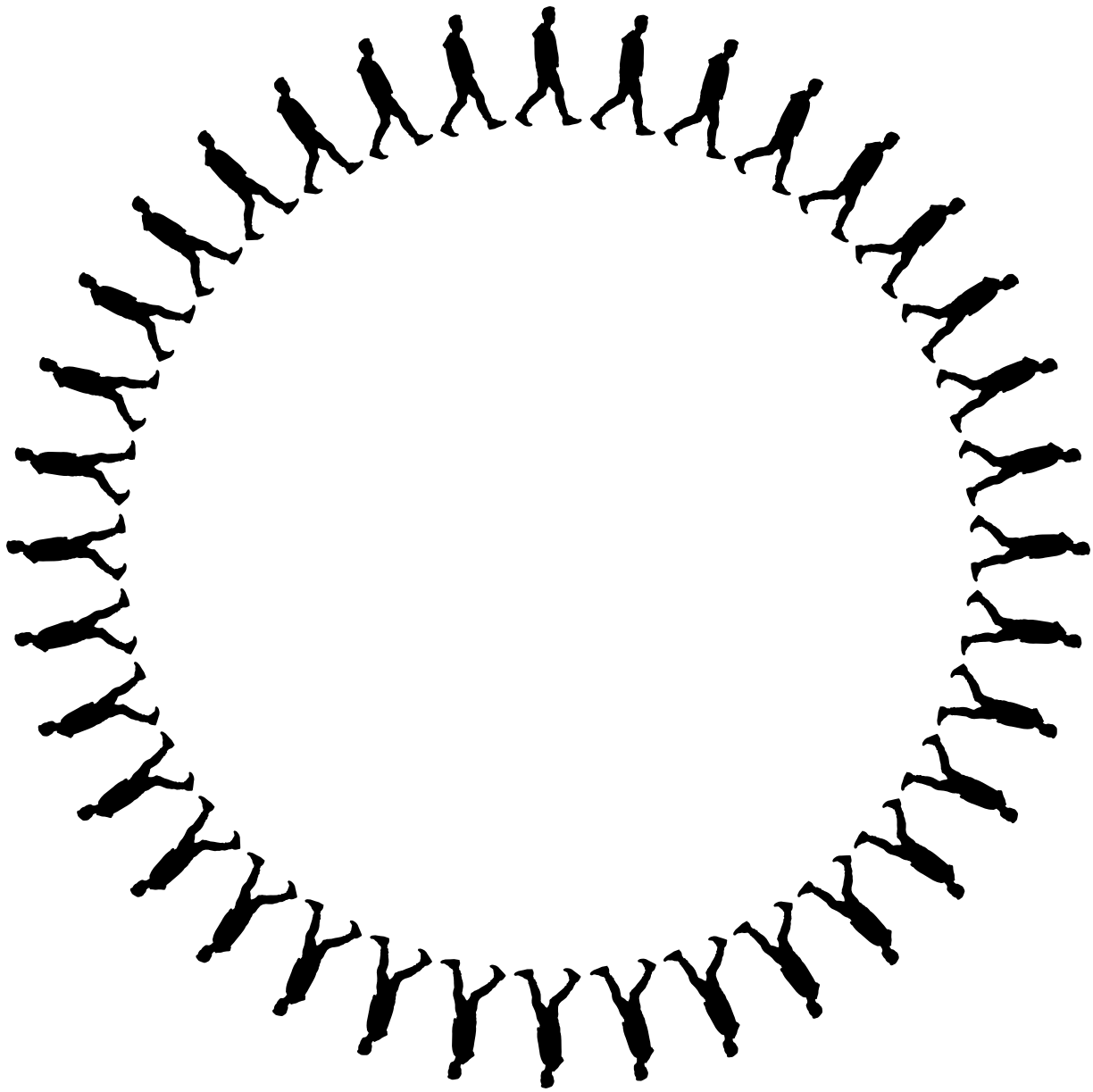
GLOBAL REPORT 5



DENYS GLOBAL

Reaching beyond expectations

The art of reframing the case

The world is in the process of increasing urbanisation, with 70% of the population projected to be living in cities by 2050.

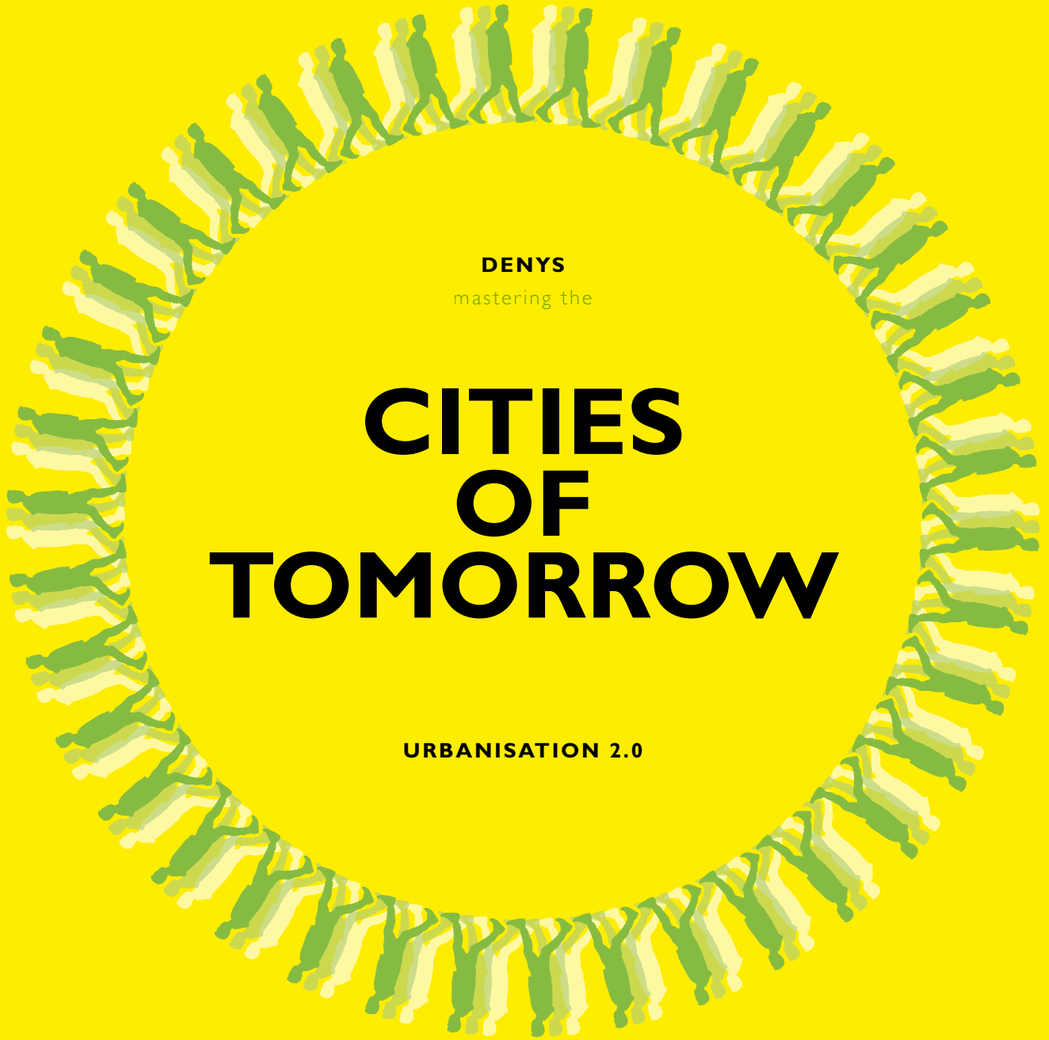
This requires an urgent call to action: infrastructure of quality must be built and the existing infrastructure must be upgraded to meet the expectations and needs of future generations. We cannot take this lightly.

The urbanised world of tomorrow will not come to fruition if we rely on today's recipes alone. We need new ideas and concepts if we're to consign slum housing, hostile neighbourhoods and traffic jams to the realms of history. We need bright minds developing bright ideas.

At Denys, we have quite a number of such bright minds on board. As you'll see in this Global Report, we like to think of our company as a giant box full of engineers fully engaged in our modern world.
And we want to keep them engaged.
That's why we encourage our engineers to always consider alternative ways to address a given problem, to approach projects from different angles and to allow themselves to think outside the box although without reduction of all our QSHE- and social values!
It's proving to be a fine strategy.
As a matter of fact, we have learned that winning a commission often comes down to reframing the case in such a way that problems disappear and opportunities arise.

Johan Van Wassenhove
CEO Denys Group

© Régine Mahaux



DENYS

mastering the

CITIES OF TOMORROW

URBANISATION 2.0

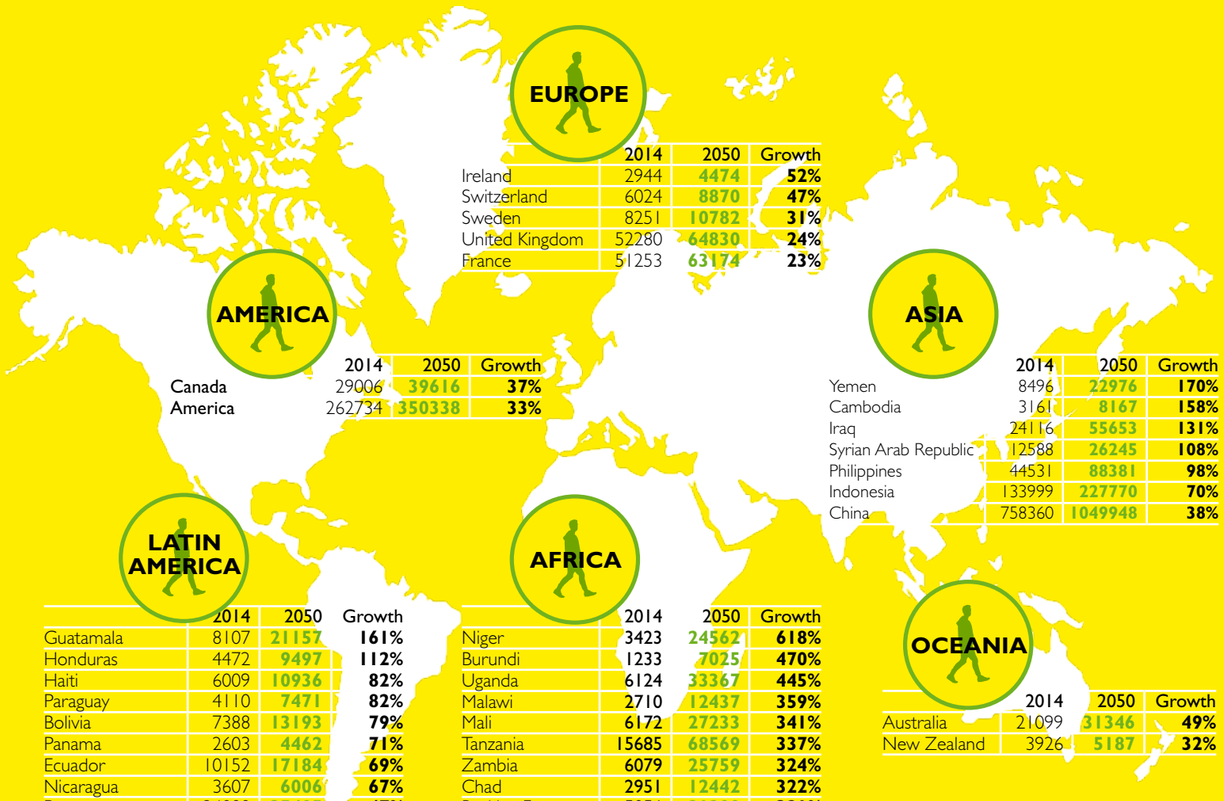
Engineering a bright future

The continuing urbanisation of our world calls for extraordinary solutions. Together let's make our cities more resilient to the challenges they are facing, and develop new techniques to build the infrastructure of tomorrow. Let's engineer a bright future.

CITIES OF TOMORROW

URBANISATION 2.0

URBANISATION PROSPECTS, LOOKING TO 2050



EUROPE

	2014	2050	Growth
Ireland	2944	4474	52%
Switzerland	6024	8870	47%
Sweden	8251	10782	31%
United Kingdom	52280	64830	24%
France	51253	63174	23%

AMERICA

	2014	2050	Growth
Canada	29006	39616	37%
America	262734	350338	33%

ASIA

	2014	2050	Growth
Yemen	8496	22976	170%
Cambodia	3161	8167	158%
Iraq	24116	55653	131%
Syrian Arab Republic	12588	26245	108%
Philippines	44531	88381	98%
Indonesia	133999	227770	70%
China	758360	1049948	38%

LATIN AMERICA

	2014	2050	Growth
Guatamala	8107	21157	161%
Honduras	4472	9497	112%
Haiti	6009	10936	82%
Paraguay	4110	7471	82%
Bolivia	7388	13193	79%
Panama	2603	4462	71%
Ecuador	10152	17184	69%
Nicaragua	3607	6006	67%
Peru	24088	35405	47%
Costa Rica	3749	5482	46%
Dominican Rpl	8219	12003	46%
Colombia	37265	53083	42%
Venezuela	27439	38964	42%
Argentina	38293	48339	26%

AFRICA

	2014	2050	Growth
Niger	3423	24562	618%
Burundi	1233	7025	470%
Uganda	6124	33367	445%
Malawi	2710	12437	359%
Mali	6172	27233	341%
Tanzania	15685	68569	337%
Zambia	6079	25759	324%
Chad	2951	12442	322%
Burkina Faso	5056	21299	321%
Eritrea	1451	6029	316%
Rwanda	3369	13349	296%
Ethiopia	18363	70522	284%
Madagascar	8125	30518	276%
Kenya	11476	42636	272%
Somalia	4223	15664	271%
Angola	9580	34676	262%
Nigeria	83799	295480	253%
Mozambique	8454	29440	248%
Congo	29115	93864	222%
Senegal	6313	19910	215%
Guinea	4418	13764	212%
Sudan	13034	38388	195%
Benin	4612	13574	194%
Cameroon	12281	34003	177%

OCEANIA

	2014	2050	Growth
Australia	21099	31346	49%
New Zealand	3926	5187	32%

Towards a 70% urbanised world

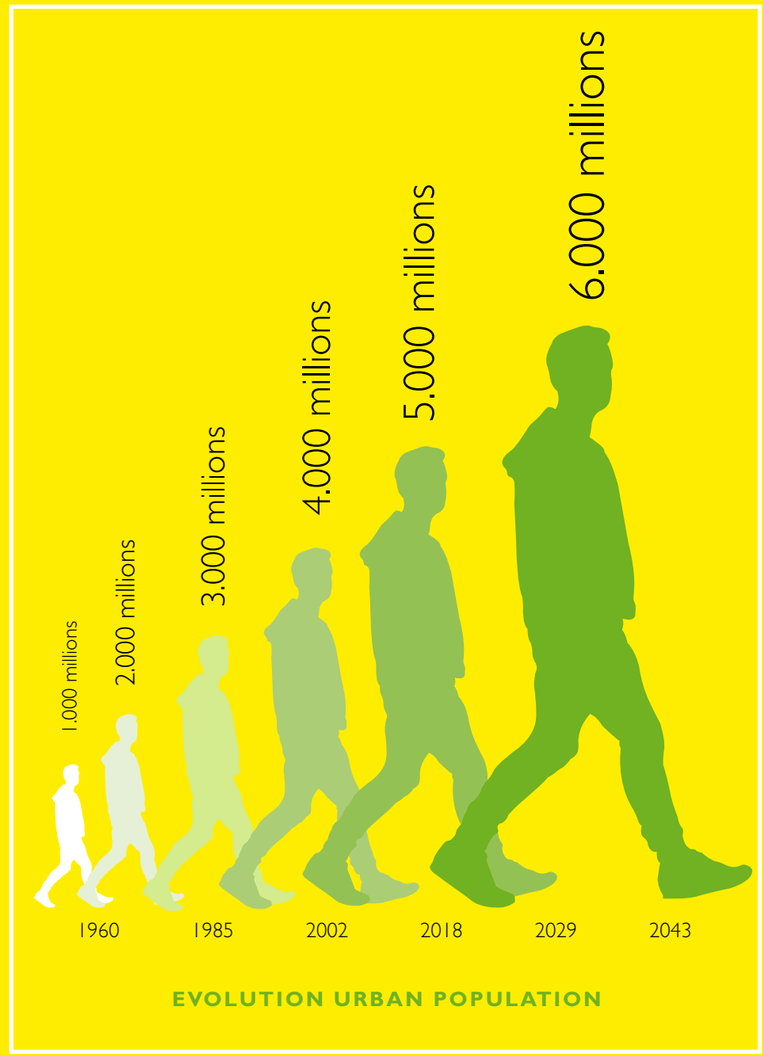
Worldwide urbanisation continues at a steady pace. In 2008, for the first time in human history, the majority of the world's population were living in cities. The United Nations estimate that by 2050 70% of the world's population will live in urban areas. In the developed world, the urbanisation level will even reach 86%.

Facing great challenges

Urbanisation has already profoundly changed the world as we knew it in the 20th century and will continue to impact the lives of each one of us in the coming decades. However, there are many different facets to urbanisation. In Europe and North America, the process of suburbanisation continues, requiring city administrations to rethink their city centre and develop adapted housing and transportation strategies. In many Asian countries, rapid urbanisation involves the creation of modern megacities on a scale that was unimaginable fifteen years ago. In Africa and parts of Latin America, rural depopulation still leads to millions of people living in slums, deprived of public infrastructure, decent housing, electricity, clean water, health care and education. Cities all over the world are facing great challenges.

Vibrant, enjoyable places

Great challenges? That should not stand in our way. We need to embrace the ongoing urbanisation; it offers many opportunities. Consider just the fact that most people tend to strongly identify with the city they live in, even more than with their place or country of birth (except during World Cup football). City administrations all over the world increasingly understand and support this intimate relation between the city and its inhabitants. As a result, several cities have been transformed from anonymous, dirty and often hostile environments into more vibrant and enjoyable places in the past few decades, especially in the developed world. In addition, city administrations throughout the globe are sharing ideas and experiences, for example through the Rockefeller Foundation initiative 100 Resilient Cities. We should continue to develop these efforts and make this Urbanisation 2.0 happen everywhere. In the rapidly expanding cities, in the new megacities, and in the historic cities large and small.



EVOLUTION URBAN POPULATION

CITIES ALL OVER THE WORLD ARE FACING GREAT CHALLENGES

Source: United Nations, WorldUrbanisation prospects, revision 2014

CITIES OF TOMORROW

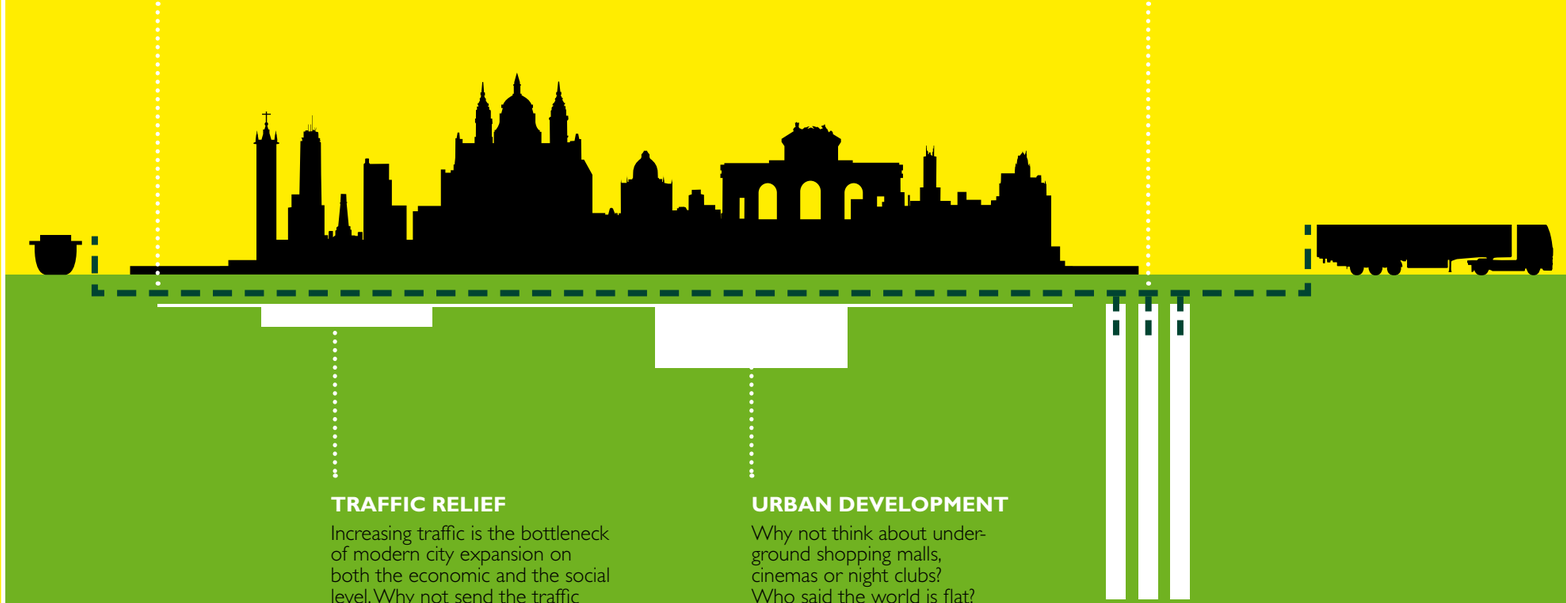
GOING UNDERGROUND

SMART NETWORKING

The smart cities of tomorrow need intelligent utility networks that are easy to access for maintenance activities. Why not go all the way with this? Why not develop real underground utility highways that include waste collection and urban heating systems?

SUSTAINABLE ENERGY

The transition towards renewable energy is crucial for our future. But it requires reliable and efficient ways of storing energy. Going underground offers plenty of opportunities, including thermal energy production and storage, pumped hydroelectric storage and compressed air storage.



TRAFFIC RELIEF

Increasing traffic is the bottleneck of modern city expansion on both the economic and the social level. Why not send the traffic below ground and let the city and its people breathe again?

URBAN DEVELOPMENT

Why not think about underground shopping malls, cinemas or night clubs? Who said the world is flat? Let's take urban planning to the next dimension!

Underexploited territory

While underground transport systems have been around for more than 150 years (the first metro line was London's Metropolitan Railway, inaugurated in 1863), the underground is still highly underexploited territory in our cities. Of course, we can't move the entire road network of a city underground. But we can use subsurface space much more than we do now.

Subsurface space opportunities

Should we still accept garbage trucks driving through our cities to collect household waste? No, we shouldn't. It is perfectly possible to build underground waste collection systems. Similarly, we could build underground transportation systems for the supply of retail stores. Or we can make more of the existing underground infrastructure, for example by transporting waste produced by demolition works through pipes temporarily installed in the sewer system. And why shouldn't we use the underground for energy storage? Subsurface space offers plenty of opportunities. We should just grasp them.

In the developed world, the urbanisation level is expected to reach 86% by 2050.

City administrations are sharing ideas and experiences through initiatives such as 100 Resilient Cities.

Denys' innovations include a non-disruptive way of constructing tunnels under railway tracks and a visionary underground container transport system.

Your one-stop shop…

Improving infrastructure is an essential element in meeting the challenges of our cities. That's Denys' specialty. We dig tunnels and parking spaces, lay tramways and construct and maintain water supply networks and sewer systems. We also construct all types of buildings, including offices, retail shops, schools, nursing homes, hospitals, and even detention centres. In addition, we have a lot of expertise in renovation and restoration, important for the growing number of projects in historic cities faced with the challenge of preserving their valuable architectural legacy. You could safely say that we are a one-stop shop for city infrastructure.

…for innovative and top quality solution

Not only do we stand out for our comprehensive range of services, we also have high credentials in terms of quality, and a strong drive towards innovation. In the past few years, Denys has developed several innovative construction solutions, including automatic pipeline welding and sealing, a non-disruptive way of constructing tunnels under railway tracks, a visionary underground container transport system, and a revolutionary underground construction technique that's semi-automated. Research & Development is of key importance to us; we are always looking for ways to do things better, faster, and with less disruption. And we put into practice effectively what we develop. That is what we bring to the cities of tomorrow.

INNOVATION PUT INTO PRACTICE

CITIES OF TOMORROW

CONGESTION CHAMPION

The capital of Belgium and Europe is a highly complex, historic city facing many challenges. Almost 1.2 million people live there and the population is rapidly growing with a projected increase of 120,000 by 2020. On top of that, more than 300,000 people living in other parts of the country commute to Brussels for their job and many more frequently visit the capital for both business and leisure. A great number prefer to travel by car, given the overcrowded and often failing public transport systems. No wonder Brussels is reported to be the most congested city in Europe and North America and that streets are constantly jammed with parked cars.

Underground parking space without disruption

One proposal to improve daily life in Brussels is to provide additional underground parking in the city centre and eliminate a number of street-level parking spaces. However, this scheme is already heavily opposed, forcing the authorities to cancel the plan for a parking space below the Vossenplein, one of the most lively, popular and characteristic market-places in the entire city. The construction project would mean transforming the Vossenplein into a large excavation site for about two years. Similar objections are raised in the Sablon case, an equally emblematic market place near the Palais de Justice.

Now, Denys is working on a solution for this. We are developing a unique concept called

WallslotRobot

which enables us to construct underground spaces with minimal disruption of above-ground activities. The concept involves boring micro-tunnels and work from there, largely hidden from the eye of the public. Amazing: while we work, the city can continue to live its normal life.

BREAKTHROUGH INNOVATION

Faster horses?

One of the funniest quotes commonly attributed to Henry Ford is this one: "If I had asked people what they wanted, they would have said faster horses." However, Ford never said anything like that. It would have made little sense, as limited speed was hardly considered to be an issue with horses in the late 19th century. Horses were a fast and fairly reliable means of transportation even in urban areas, although they also attracted flies, spread disease and produced an awkward smell as well as tonnes of manure. Maybe it would be more accurate to say that people wanted less horseshit, as design blogger Erik Flowers recently joked. But we all know that Henry Ford wasn't preoccupied by horse-related urban problems, he wanted to sell automobiles to the middle-classes.
As a result he revolutionised not only transportation habits but also industrial manufacturing practices.
Now that's the kind of innovation we like, smart solutions that have an impact far greater than initially planned.

SUDDENLY, ANYTHING GOES WITH THE WALLSLOTROBOT!

A new concept in constructing walls underground

In the past few years, Denys has developed a revolutionary semi-automated underground construction concept called WallslotRobot. It is designed to construct 20 to 30-metre walls underground in densely built-up areas where there is limited room for manoeuvre above ground. Think historic town centre in need of extra underground parking space, something like that.

Automated excavation from a micro-tunnel

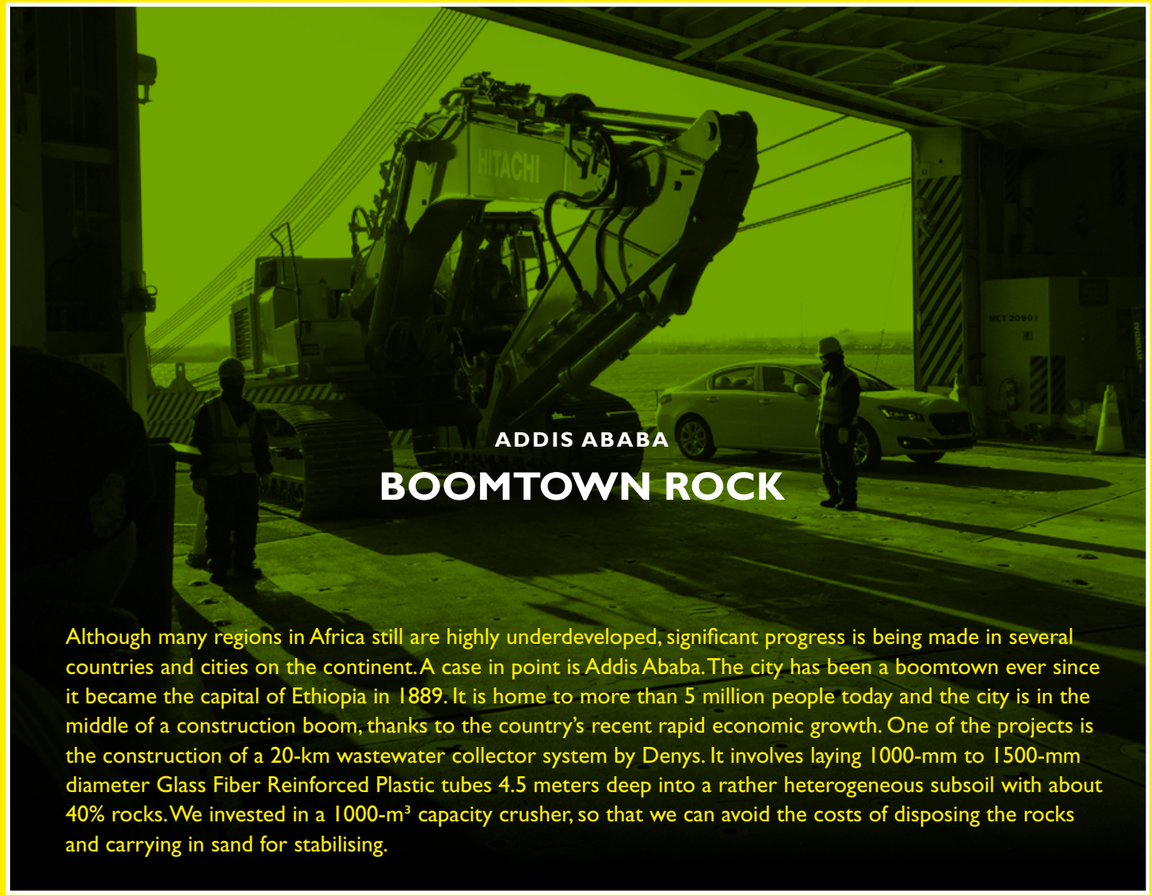
WallslotRobot is simple but smart. It combines micro-tunnelling with automated trench excavation. First, we bore a 3-metre diameter micro-tunnel and equip it with rails. Then, from an opening in the micro-tunnel, we drive reinforced concrete casings (about 1 by 3 metres) into the ground while an excavator attached to the bottom casing digs up the soil. A worker in the micro-tunnel operates a crane and gripper to take up the soil and have it removed via rail. Once the entire shaft is finished, we remove the excavator, put reinforcement bars into the shaft and cast concrete in place.

Creating underground space anywhere

One aspect of WallslotRobot is plain productivity: you can finish one segment of a wall in just two days (instead of a week using traditional methods) and the neighbouring segment can be excavated consecutively. Another aspect is humanitarian: WallslotRobot avoids constructors having to send people down the shaft to carry out excavation works in an intimidating tiny space underground.

But WallslotRobot is so much more than that. With the combination of micro-tunnelling and automated excavation, the impossible becomes reality. You can construct large underground parking spaces without the need for a huge excavation ruining your urban space for years. What's more, WallslotRobot allows you to carry out excavation works below groundwater level, meaning that you avoid subsidence due to draining the site. In short, with WallslotRobot you can create valuable underground space almost anywhere, including beneath historic monuments, busy main roads and bustling marketplaces.

With our unique concept WallslotRobot it would be possible to build a parking space below the Vossenplein without disrupting above-ground activities.



ADDIS ABABA

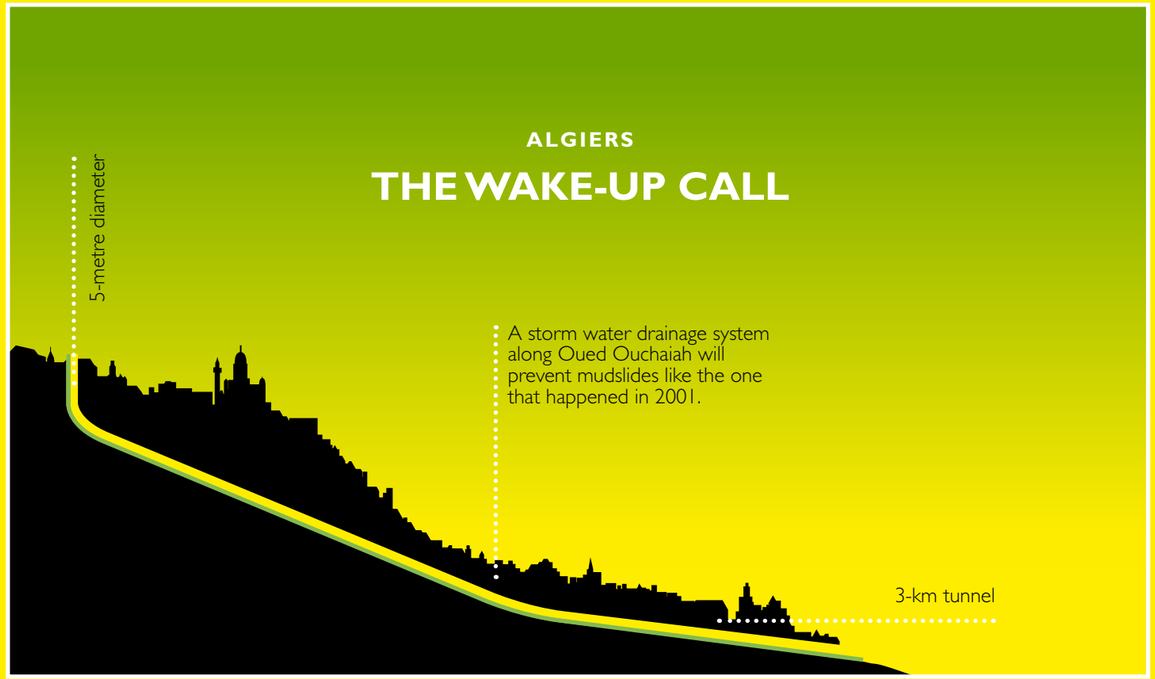
BOOMTOWN ROCK

Although many regions in Africa still are highly underdeveloped, significant progress is being made in several countries and cities on the continent. A case in point is Addis Ababa. The city has been a boomtown ever since it became the capital of Ethiopia in 1889. It is home to more than 5 million people today and the city is in the middle of a construction boom, thanks to the country's recent rapid economic growth. One of the projects is the construction of a 20-km wastewater collector system by Denys. It involves laying 1000-mm to 1500-mm diameter Glass Fiber Reinforced Plastic tubes 4.5 meters deep into a rather heterogeneous subsoil with about 40% rocks. We invested in a 1000-m³ capacity crusher, so that we can avoid the costs of disposing the rocks and carrying in sand for stabilising.

Thanks to our high-capacity crusher we avoid the costs of disposing the rocks and carrying in sand for stabilising.

Training local people

Of course, we are again hiring local people for the job. Ethiopians are proud people who are keen to work hard. We give them in-depth training to make sure they meet our high quality and safety standards. It is also a long-term policy of Denys, as the availability of skilled local personnel will help us in making even more attractive bids for future projects in the region.



ALGIERS

THE WAKE-UP CALL

Algiers is another of those fast-growing cities struggling with its infrastructure. Algerians still remember the 2001 disaster, when heavy rainfall resulted in mudslides which devastated the Bab El Oued district, causing the deaths of more than 700 people. This was a wake-up call for the administration to improve the city's sewer system. Quite a number of projects have been carried out since.

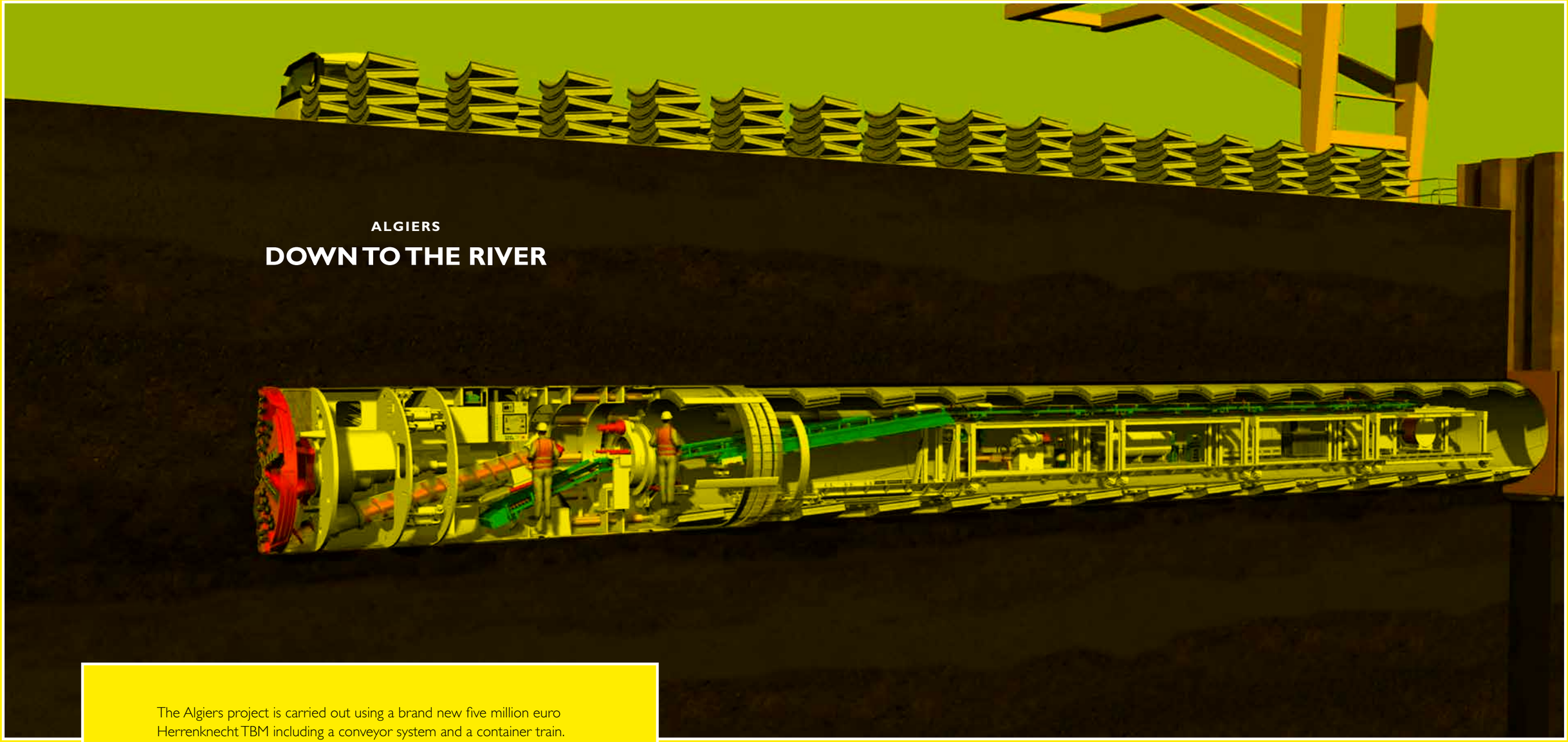
An exciting first-timer

Denys have just obtained the commission to build a storm water drainage system at Oued Ouchaiah, in the eastern part of the city. We are to construct a 3-km tunnel with a 5-meter section, the largest we have done so far. It meant we had to invest a lot - including ordering the required Herrenknecht tunnel boring machine - but we are very excited about this. No doubt the project will act as a reference and enable us to successfully bid for other large diameter tunnelling projects in the future.

Rainwater rapidly searches its way down in the densely built-up hillsides of Algiers, hence the importance of a reliable solid storm water drainage system.

The Oued Ouchaiah storm water drainage project is likely to act as a reference.

CITIES OF TOMORROW



ALGIERS

DOWN TO THE RIVER

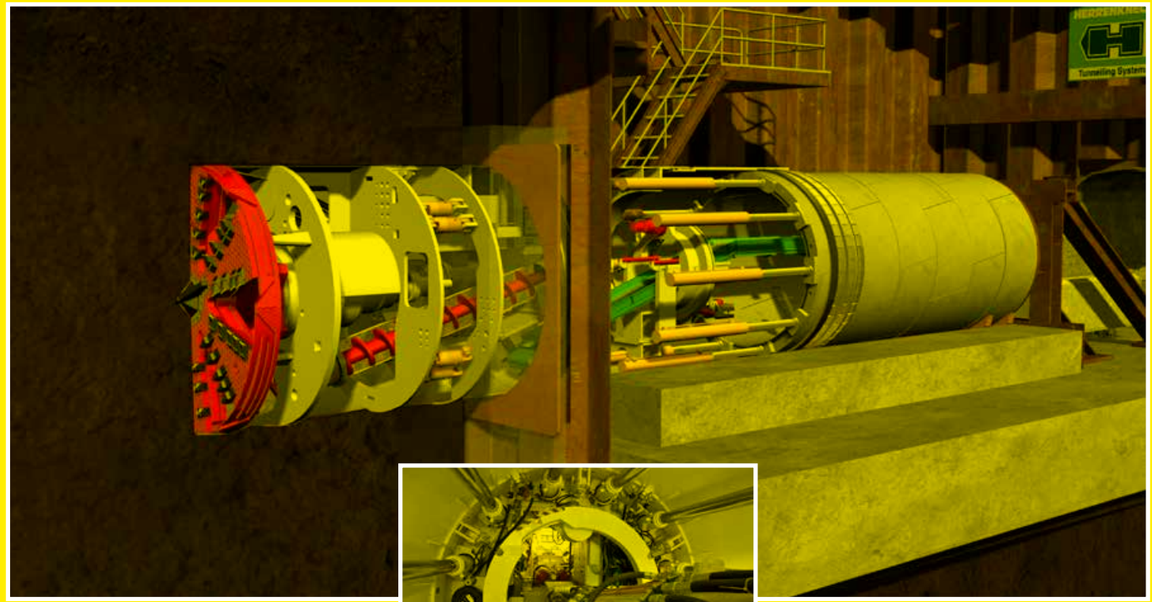
The Algiers project is carried out using a brand new five million euro Herrenknecht TBM including a conveyor system and a container train.

© Herrenknecht

CITIES OF TOMORROW

EXCAVATING, CONDITIONING AND REMOVING SOIL

OUR STATE-OF-THE ART BORING MACHINE



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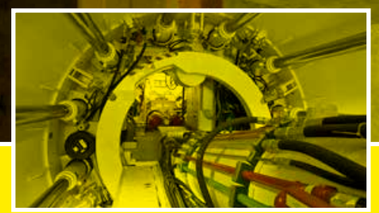
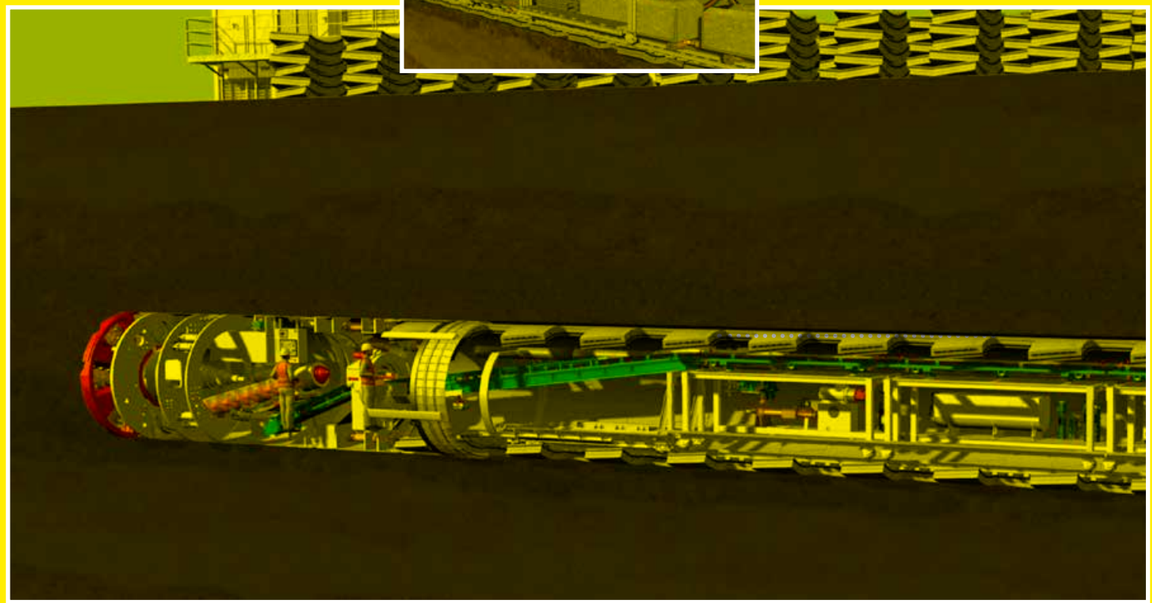


The climatic and topographical situation clearly necessitated the construction of a large diameter tunnel, so segment tunnelling was the technique of choice. We invested in a brand new 5 million euro Herrenknecht tunnel boring machine (TBM) with a tungsten carbide boring head and an excavation chamber allowing for soil conditioning with foam injection. This forms a paste-like substance, thick enough to keep out groundwater. At the rear of the excavation chamber the substance is removed by a built-in screw conveyor transporting it onto a belt which finally loads it into a train container.



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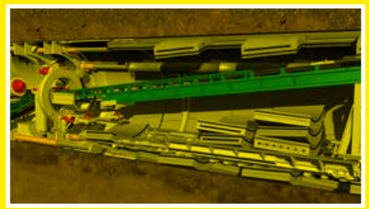


An impressive array of tools …

The construction of a segment tunnel is a really fascinating story. The tunnel is in fact constructed by alternately moving forward (tunnelling) and constructing (segment lining).

During the tunnelling phase the bore head cuts its way through the soil, which is conditioned and removed. During the segment lining phase, prefabricated concrete segments, 1.2 metres long, are transported to the front and put in place one by one.

The entire Herrenknecht machine, including the conveyor system and container train, measures no less 80 metres and hosts an impressive array of hoisting and manipulation tools as well as a large battery of control equipment.

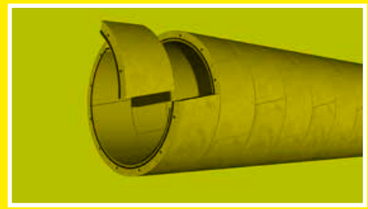
Thanks to this high-tech wonder construction advances at a steady pace.

… and smart logistics

There's a magnificent display of technology inside the machine, but segment tunnelling also requires the constructor to be smart. Consider the logistical challenge being played out in the background during each 20 minute segment construction phase.

The train is driven out of the tunnel where it needs to be discharged quickly. Meanwhile a second train is loaded with segments and empty containers and brought into position for the next phase. Smooth coordination of activities is crucial.

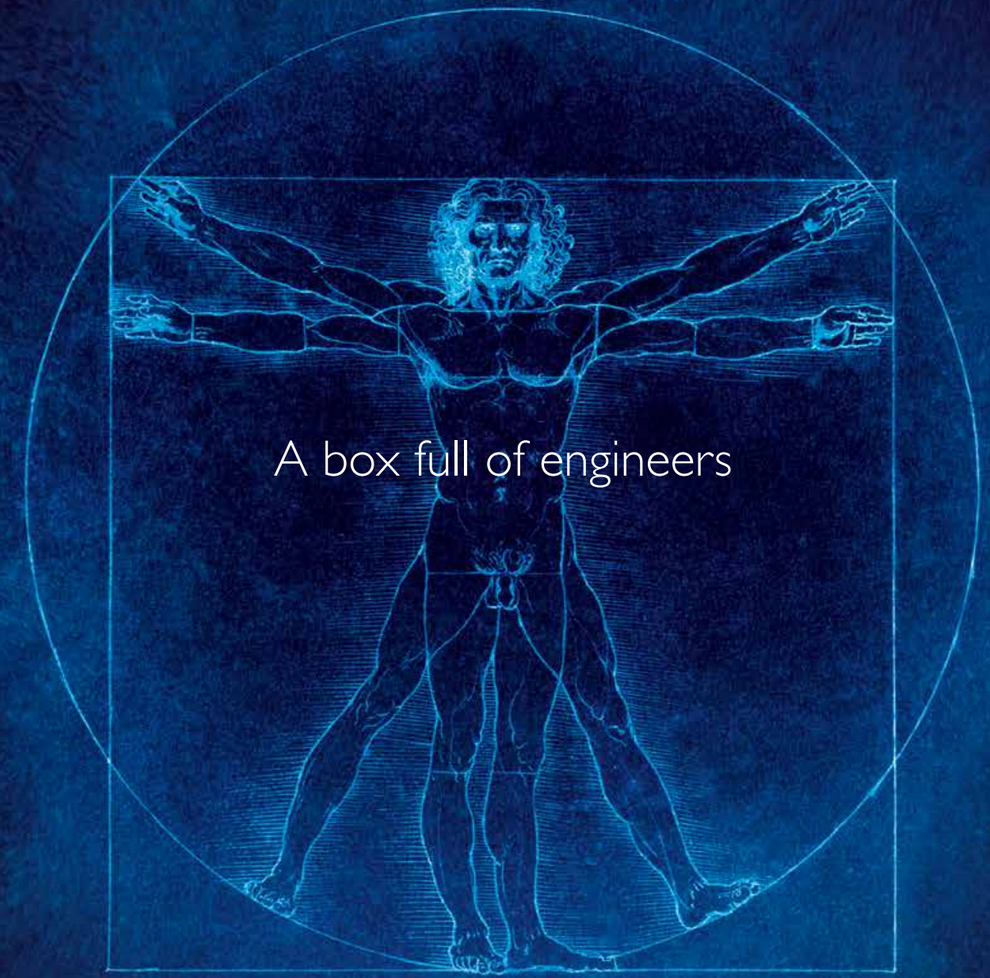
Denys takes on the entire project, from soil investigations to tunnel construction.



CITIES OF TOMORROW

Let's make this Urbanisation 2.0 happen
all over the world

DENYS



A box full of engineers

Sometimes, we think of our company as a giant box full of engaged engineers. We have about two hundred of them. You should see them during their lunch hour, always busy discussing one or other technical idea or construction challenge. That's what occupies their minds, that's what moves them, that's what makes their day.

Discovering opportunities

How fitting! Our engineers get plenty of food for thought from our projects. We seldom deal with easy matters; most of our projects offer at least a few tough challenges. That is what engineers are for, they make sure we quickly comprehend the implications of a given requirement as well as discover opportunities that may be hidden or obscured.

On many projects, the strength of our engineering force is what makes us different. We are able to approach a project from different angles, think out of the box and develop smarter (though often out of the ordinary) solutions.

Our engineers make sure we quickly comprehend the implications of a given requirement as well as discover hidden opportunities.

NEW PRISON, HAREN

Not a waiting game

Construction of the new prison complex in Haren (Brussels) is expected to start mid-2016, which is two years after our consortium was nominated as preferred bidder. Two years is a long time, but it's not a waiting game. This is a full DBFM project, so we take 100% responsibility for all aspects of it, including design, construction, financing and maintenance.

Encouraged to fully optimise the design

There are many advantages which come from being responsible for the design. First of all, we were able to propose a new 21st Century prison concept, a promising alternative to the outdated star-shaped prison layout developed 200 years ago. Secondly, we can fully optimise the design to speed up construction, lower usage costs (near-passive thermal insulation and borehole thermal storage) and improve maintainability (design details, operational ergonomic considerations and choice of finishing materials). What's more, the DBFM concept encourages us to do so, since we are also ultimately responsible for maintenance.

We use near-passive thermal insulation and borehole thermal storage to lower usage costs.

BUS DEPOTS, DE LIJN

Optimised for a 25 year lifetime

Our pro-active design approach was instrumental in obtaining the commission for building three new bus depots for the Flemish public transport company De Lijn in Leuven, Sint-Niklaas and Hasselt. The customer particularly appreciated that we provided easy access to maintenance-sensitive parts and that we systematically checked our design against operational scenarios using a 3D Building Information Model. In addition, we proposed an alternative to the initial specifications in that we maximised thermal insulation and made use of geothermal heating technology, thereby significantly reducing operational costs. Our calculations over a 25 year operational lifetime were very convincing.

We provided easy access to maintenance-sensitive parts and systematically checked our design against operational scenarios.

We proposed an alternative to the initial specifications. This enabled us to significantly reduce the 25-year lifetime cost.

PUBLIC PRIVATE PARTNERSHIPS

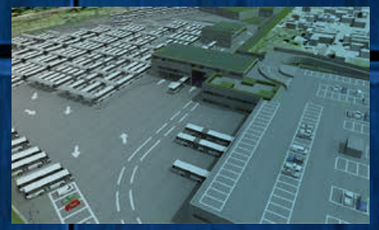
Fuel for public infrastructure

Public Private Partnerships (PPP) continue to provoke our interest despite the inconveniences they can bring. The main drawback of PPPs is the sometimes enormous amount of upfront work involved. For example, the Cluster 2 project for De Lijn, a 55 million euro contract, required six years of preparation before construction could start. Likewise, preparatory work for the Haren prison complex project will take at least four years.

Crazy? Sometimes yes; some of the PPP projects would certainly benefit from being managed and organised more efficiently. But at Denys we remain positively inclined towards PPPs, because quite a number of large public infrastructure projects simply would not go ahead without private funding. PPPs provide the fuel that public infrastructure needs.

Half the battle

The main reason for the lengthy preparatory phase is the complexity inherent in the Design, Build, Finance and Maintenance (DBFM) approach. It means that the public authority must clearly define its long-term objectives and take the time to analyse proposals and negotiate with bidders. Furthermore, it implies having several partners in the game, including one or more contractors for design and construction, companies taking care of maintenance and a finance organisation securing the necessary funding. The risks and responsibilities of everyone involved should be clearly defined and outlined in the contracts, including the crucial interface-contract between the building contractor and the maintenance partner, ensuring good cooperation during the post-construction warranty period. These preparatory steps inevitably consume a lot of time, but we must keep in mind that a good start is half the battle.



Ready for partnerships

Another positive element of PPPs is that they encourage us to team up with specialist companies from all over the world. The continuing quest for partners helping us to be successful is indeed an essential aspect of our growth model. Partners enable us to enter into new territories, learn additional skills and extend our reference base. We offer exactly the same in return, and that's what our partners appreciate in us.

Partnerships enable participants to enter into new territories, learn additional skills and extend their reference base.

The interface-contract between the building contractor and the maintenance partner is of crucial importance for ensuring good cooperation during the post-construction warranty period.

PUBLIC PRIVATE PARTNERSHIPS

Access to expertise

We still believe that PPPs have a great future in Africa, that extraordinary continent that always displays great enthusiasm but often suffers a lack of access to financial resources. There are plenty of challenges here. While the majority of African cities now have drinking water supply and distribution networks, they still have a need to build infrastructure such as wastewater and solid waste processing systems. The PPP concept can be the perfect vehicle for this. It would give Africa access to the expertise needed for these investment projects to happen.

Many African cities still need to invest in wastewater and solid waste processing systems.

Lust & Passion

Lust & Passion

In a corner of the Brussels Parc du Cinquantenaire stands one of the earliest works of architect Victor Horta called the Pavilion of Human Passion. This neo-classical tempietto borrows its name from the controversial piece of art inside, an impressive twelve by eight meter neo-baroque relief by sculptor Jef Lambeaux (1852-1908). At its inauguration in 1899, the work created scandal among conservative catholic people, as it depicts (naked) human lust and passion under the all-seeing eye of the devil. Later, the pavilion was presented as a gift to King Khaled of Saudi-Arabia and the interior was mostly kept hidden from the general public. Critics say this was as a result of Belgian King Baudouin's contempt for the sculpture.

The most looked-through keyhole in Belgium

For decades, the pavilion has been known for having 'the most looked-through keyhole in Belgium', given the numerous passers-by trying to get a glimpse of the Lambeaux relief. No more keyholes to look through now though, as the pavilion finally opened its doors in 2015 after a two-year restoration by Denys. The pavilion was in rather bad shape due to yearlong rain infiltration. We had to entirely renew the roof and clean and restore the façades as well as parts of the interior.

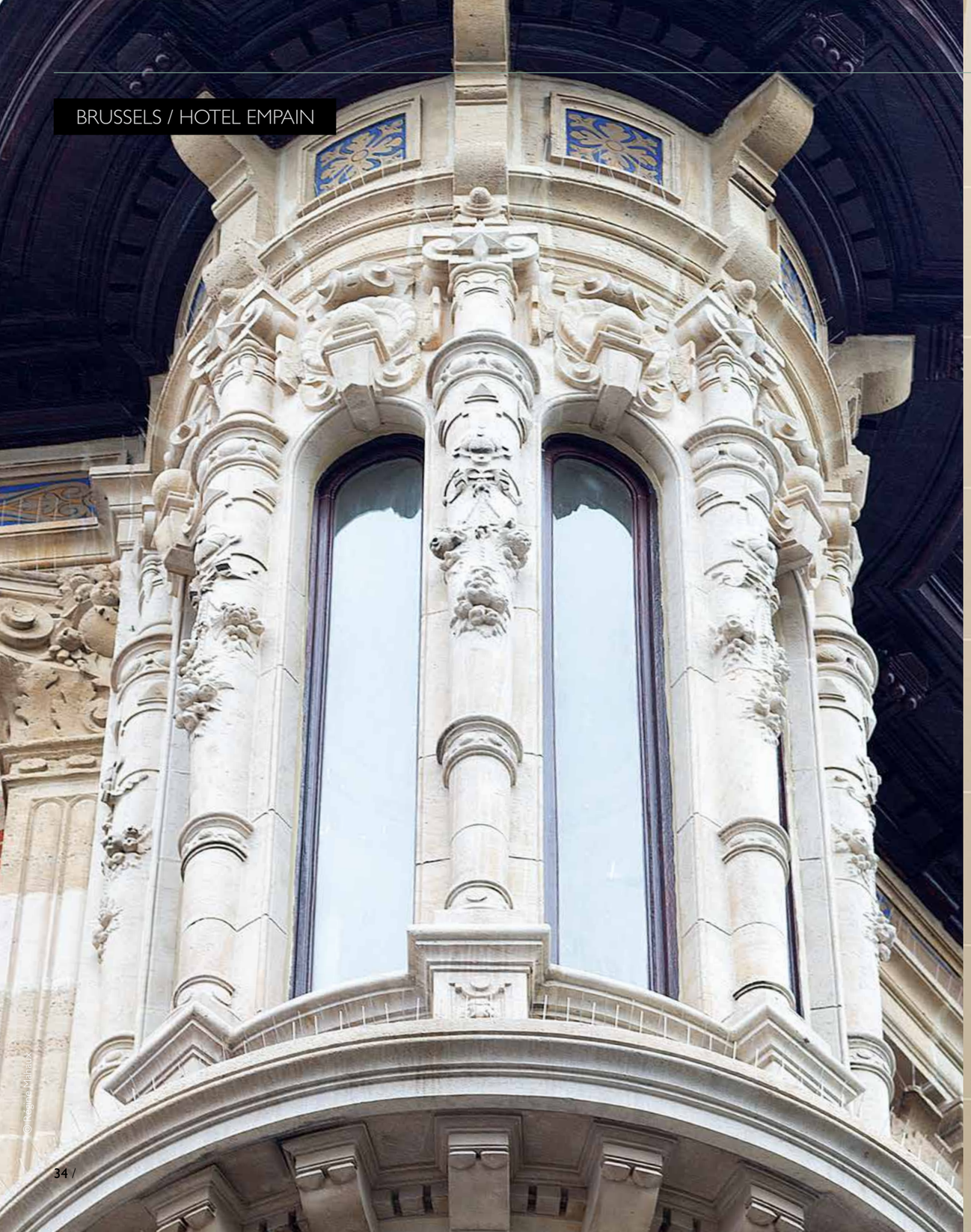
Precious yellowish Siena marble

The latter was the most difficult part. The interior was decorated with 3-cm plates of precious yellowish Siena marble, which were partially damaged. We had to carefully remove the plates and slice them in two to be able to recreate the original effect. The slicing operation was carried out in Italy using a special horizontal band-saw. Then we polished the marble plates - that during the preservation process had been glued onto 1.5-cm thick composite plates - and attached them to the wall.

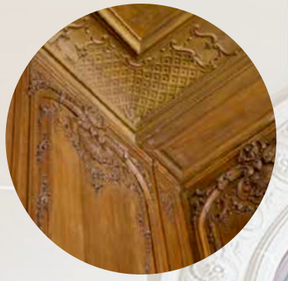
Human Passion by Jef Lambeaux created scandal for its depiction of (naked) human lust under the all-seeing eye of the devil.

The 3-cm marble plates had to be carefully sliced in two.

BRUSSELS / HOTEL EMPAIN

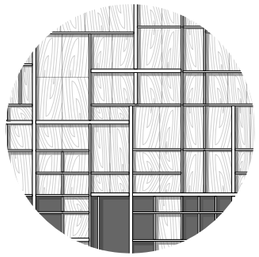


3D woodcarving robot



The renovation of the Hôtel Knuyt de Vosmaer in Brussels, commonly known as the Hôtel Empain, is near to completion. The building was erected in 1879 in neo-Renaissance style and parts of it were refurbished in 1930 in art deco style.
One of the most challenging aspects of the project was the restoration of the splendid neo-Renaissance oak woodcarving throughout the interior. We joined forces with a specialist to develop a 3D carving robot for this task, akin to our stone robot but operating at a much higher rotational speed. This enabled us to finish the work within the tight schedule imposed. The renovation included restoring blue and white sgrafitto, reconstructing roofs, reinforcing historic wooden floors, restoring historic interior and exterior doors and windows, and installing HVAC, electricity and building automation. It took 24 months, exactly as planned.

ANTWERP / PLANTIN-MORETUS EXTENSION



Wonderful typography

We are currently renovating and extending a wing of the famous Plantin-Moretus Museum in Antwerp, a UNESCO World Heritage Site. The museum is dedicated to the work of 16th Century book printers and publishers Christophe Plantin and Jan Moretus, which was crucial in spreading knowledge across Europe. The museum displays books, drawings and engravings as well as a marvellous collection of typographical material such as print types and type cases.

A perfectionist attitude

The façade of the museum extension, a conception of artist Benoit van Innis, looks just like such a printers' type case. It is subdivided by large horizontal and vertical timber beams of tropical wood. Construction of the façade is a high-precision job requiring skilled craftspersons with a perfectionist attitude.

© Frederik Vercruysse

© Frederik Vercruysse

The façade of the museum extension looks just like a printers' type case.

YPRES / SAINT MARTIN'S CHURCH

What a spire!

In May 2015, we completed the restoration of the tower of Saint-Martin's Church in Ypres. The original church (then a cathedral) was built between 1230 and 1370 but was almost entirely destroyed during the First World War. Subsequently the ruins were removed and the church was entirely reconstructed. Exactly as it was before? Not quite. Post-war rebuilding of Belgian monuments always meant adding one or two elements to the original plan so as to make them even more impressive than before. In this case, the church was given a higher, loftier spire than the original.

Taking it off for renovation

A century later, some of the wooden beams in the spire and most of the figurative lead-covered woodwork surrounding the tower had greatly deteriorated, requiring urgent repair and restoration. We removed the lead-covered woodwork to give it to a museum and replaced it with polyester figures of identical shape and patina. Repair and replacement of the wooden beams was a bigger challenge, as the stability was weakened as a result of water infiltration and wood worm activity. We found there was a significant risk of collapse, especially since the work involved using heavy equipment such as a band-saw. As a result we had to carefully lift off the spire using a 400-tonnes crane and carry out the renovation on the ground.

The spire was a post-war addition to the original plan in order to make the church even more impressive.

A 400-tonnes mobile crane was used to lift off the spire and replace it after renovation.

BRUSSELS / CLEANING AND MAINTAINING WORKS OF ART

Bronze, steel and the like

The Ministry of the Brussels-Capital Region regularly hires us to clean and/or maintain a number of their sculptures and works of art in public places. This is a beautiful and fascinating task. Of course, it involves some routine activities such as removing lime wash and applying an anti-corrosion film on pre-20th Century bronze sculptures.

Weird shapes in weird materials

Modern works of art are a different matter. They often present complex shapes made of a combination of modern materials such as plastic, stainless steel and Corten steel, and are frequently targeted by graffiti vandals. As a result we often have to do a little research to find a suitable non-invasive cleaning and restoration method. There's no handy handbook of household cleaning tips for this.

The work involves cleaning and protecting a number of beautiful pre-20th Century bronze sculptures.

© Régine Mahaux

LEUVEN / SAINT DONATUS RAMPART TOWER

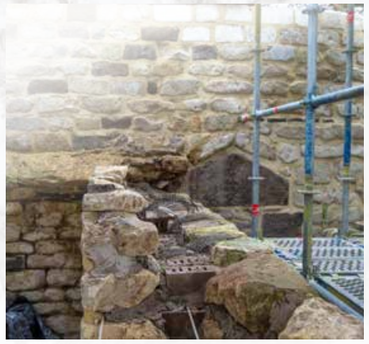
Reconstructed with utter precision

Denys has just completed the restoration of the Donatus Tower in Leuven. Donatus was one of the original 31 towers along the 12th Century 2,750-meter rampart which was in use until 1360 when a larger fortification was built. While most of the towers were torn down in the 18th Century, this one was left undisturbed. However, all kinds of plants overgrew the building, gradually destroying it. The tower's domed roof had fallen into ruin long ago and stones occasionally came loose, requiring the installation of a safety perimeter.

We digitised the centring and made a computer model so that the 3D stone robot could prepare the voussoirs.

Reliable Rudy

We were asked to entirely reconstruct the tower. At first, the idea was to re-use at least some of the fallen stones and meticulously put them together like solving a giant jigsaw puzzle. However, this proved impractical as most of the stones were in poor shape. As a result, we tailor-made new stones for the project, with a little help from our 3D carving robot. Utter precision was crucial for the reconstruction of the 6-meter diameter dome. We manufactured a large wooden centring to support the arch during construction. Once this centring was in place, we digitised it, making a 3D computer model of the arch, including the dimensions of each one of the voussoirs. Our robot made sure that they fit perfectly. Should we call him Reliable Rudy?



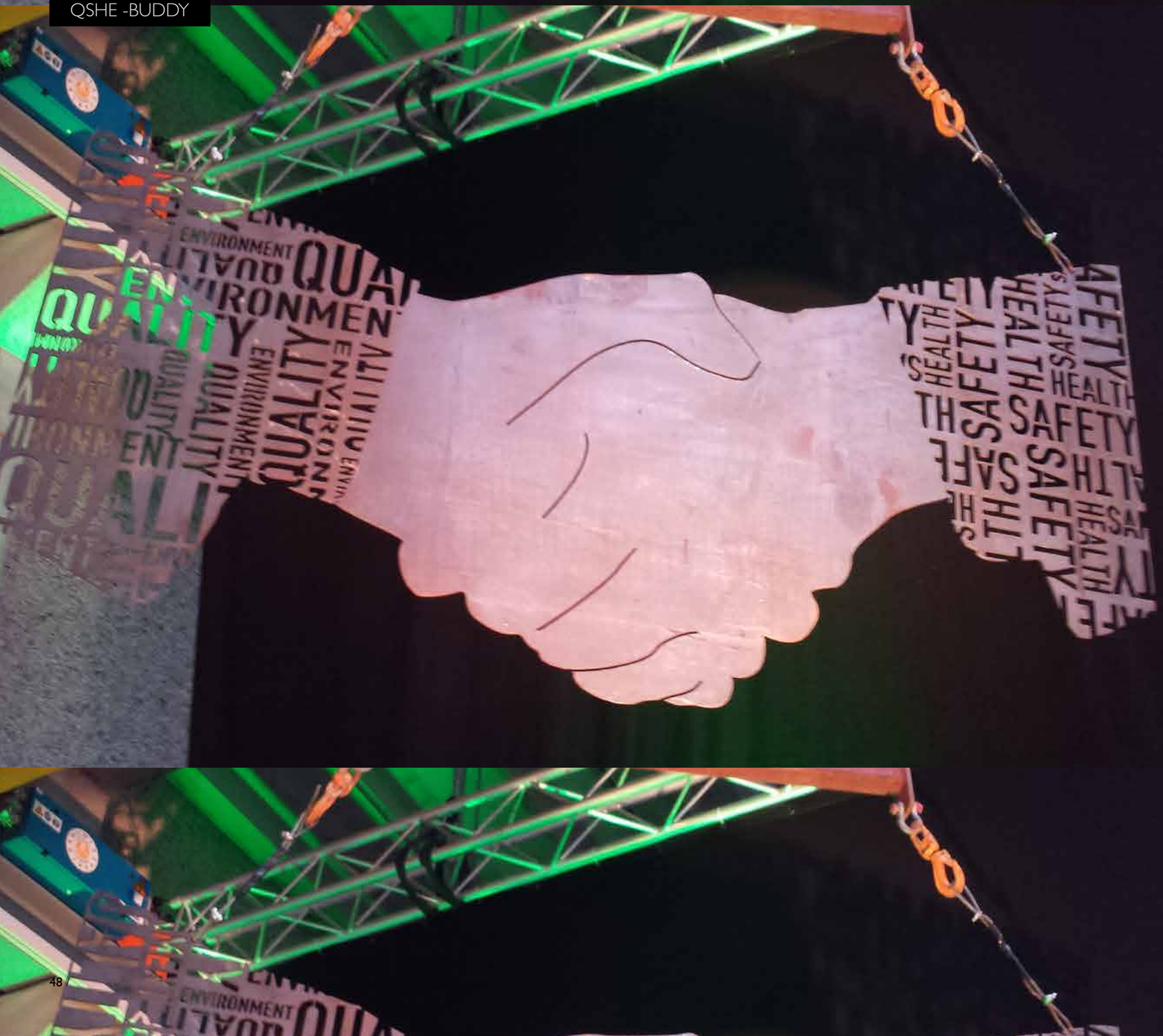
QSHE -BUDDY

Like Jiminy says...

One of our most valuable colleagues at Denys is Jiminy. He's not really flesh and blood, and yet he's there everywhere we go. Jiminy is our QSHE-buddy, constantly reminding us how important it is to deliver quality, work safely, stay healthy and care for the environment. He tells us things like 'The safe way is the only way' and 'My work area is clean, and therefore safer'.

Jiminy reminds us of the horrible things that can happen to people breaking the rules.

QSHE -BUDDY



Embracing the spirit of safety

Does Jiminy sound like a dull character? Not at all, to us he's totally simpatico. At Denys, we've learned to appreciate the strong focus on QSHE themes. We've learned that working in the spirit of safety actually helps improve quality. It also helps speed up the work rather than slow it down. The focus on QSHE also goes hand in hand with our drive for innovation. Consider techniques such as automated pipeline welding and sand-blasting, or the WallslotRobot underground construction technique: these are innovations that make work more comfortable, and consequently improve safety and quality.

A trendsetter in QSHE themes

Denys has been a trendsetter in QSHE themes for a long time. For example, we were among the first companies to implement quality, safety, health and environmental issues into one integrated management system, called QSHE-MS. This makes for a rigorous application of QSHE themes throughout the entire organisation, an approach which clearly contributed to a 60% decrease in incidents between 2009 and 2014. In addition, Denys has had zero incidents with permanent injury or fatality casualties during the past fifteen years.

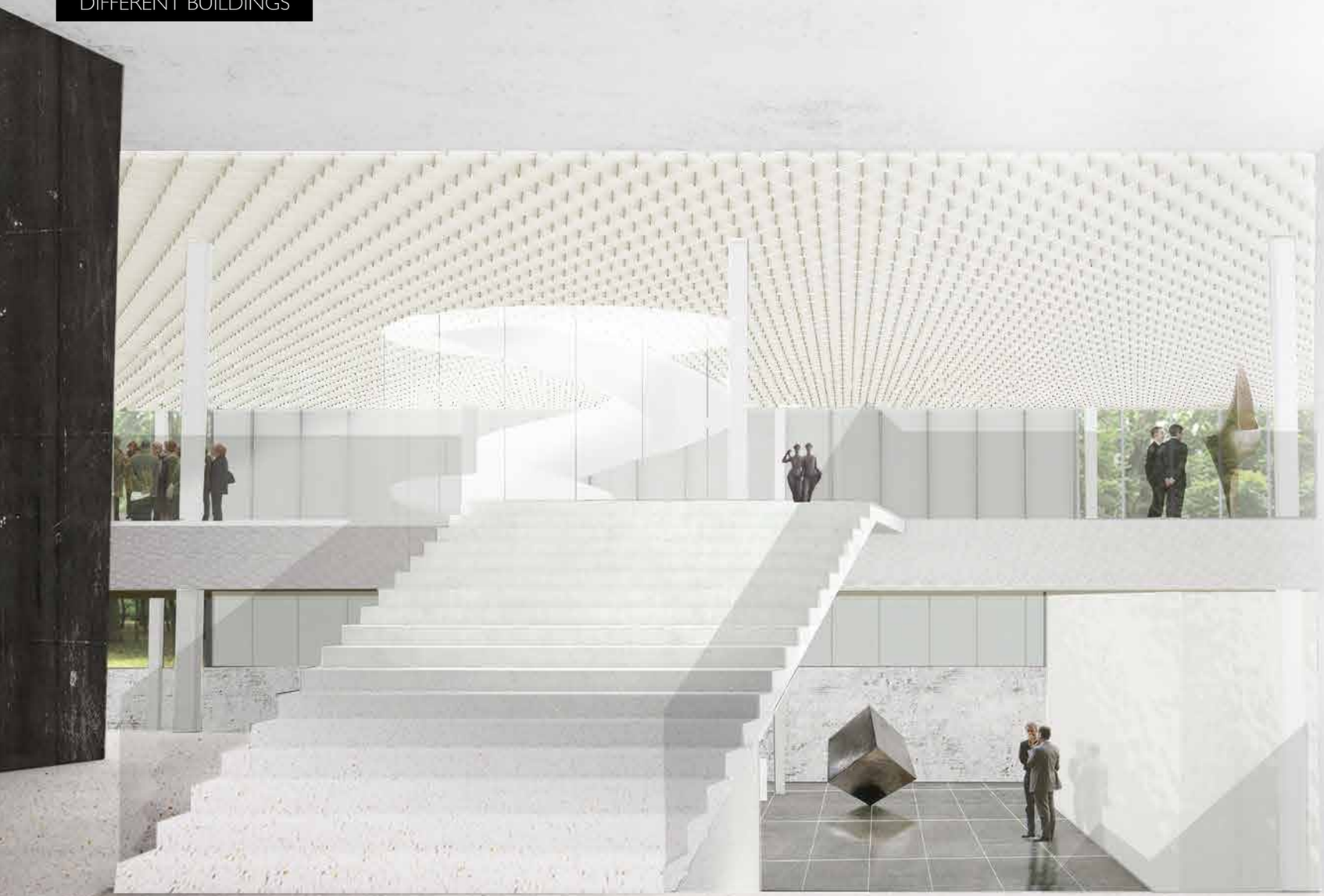
Every detail counts

We intend to keep it that way. Our 25-member QSHE staff team constantly increases awareness among our project managers and workers through dedicated training sessions, monthly poster campaigns highlighting selected QSHE themes, and a yearly QSHE day. More than 500 collaborators attended this year's edition of the QSHE day on 5 February. They followed sessions on fire prevention and fire-fighting, fitness and health, energy efficient work practices, and quality-related failure costs. There were also practical sessions, including an entertaining but instructive trim trail, and a surprise check of tyre pressure on all vehicles. It was a great way to confirm that every detail counts when it comes to safety.

At the QSHE day in February, Jiminy's rules for working safely were presented.

Quality and safety shake hands because working in the spirit of safety actually helps improve quality.

DIFFERENT BUILDINGS



AN ESTABLISHED NAME

After eight years of activity in the building construction business, we can proudly say that we have become an established name. We certainly profit from our great reputation in related fields such as restoration, tunnelling and piping. Our expertise in these fields often feeds our construction activities with fresh and smart ideas, especially when it comes to complex building projects dealing with challenges such as a difficult construction site, the presence of historic patrimony, or a peculiar architectural design. Yes, we are determined to further develop our reputation in this area too.

Our expertise in restoration, tunnelling and piping often feeds our construction activities with fresh and smart ideas.

PROVINCE HEADQUARTERS, ANTWERP

Twisted outline

In Antwerp, we have started construction of the new Province Headquarters, an audacious design by Xaveer De Geyter Architects. This remarkable white 14 storey office building with its twisted outline and pattern of triangular windows appears like a sculpture in the middle of a new urban park. It's definitely different.

Part of the project is the creation of a new urban green space around the building.

The load-bearing facades act as truss structures to span the existing foyer volume.

CHILD DAY-CARE CENTRE, BRUSSELS

Speedy Gonzales

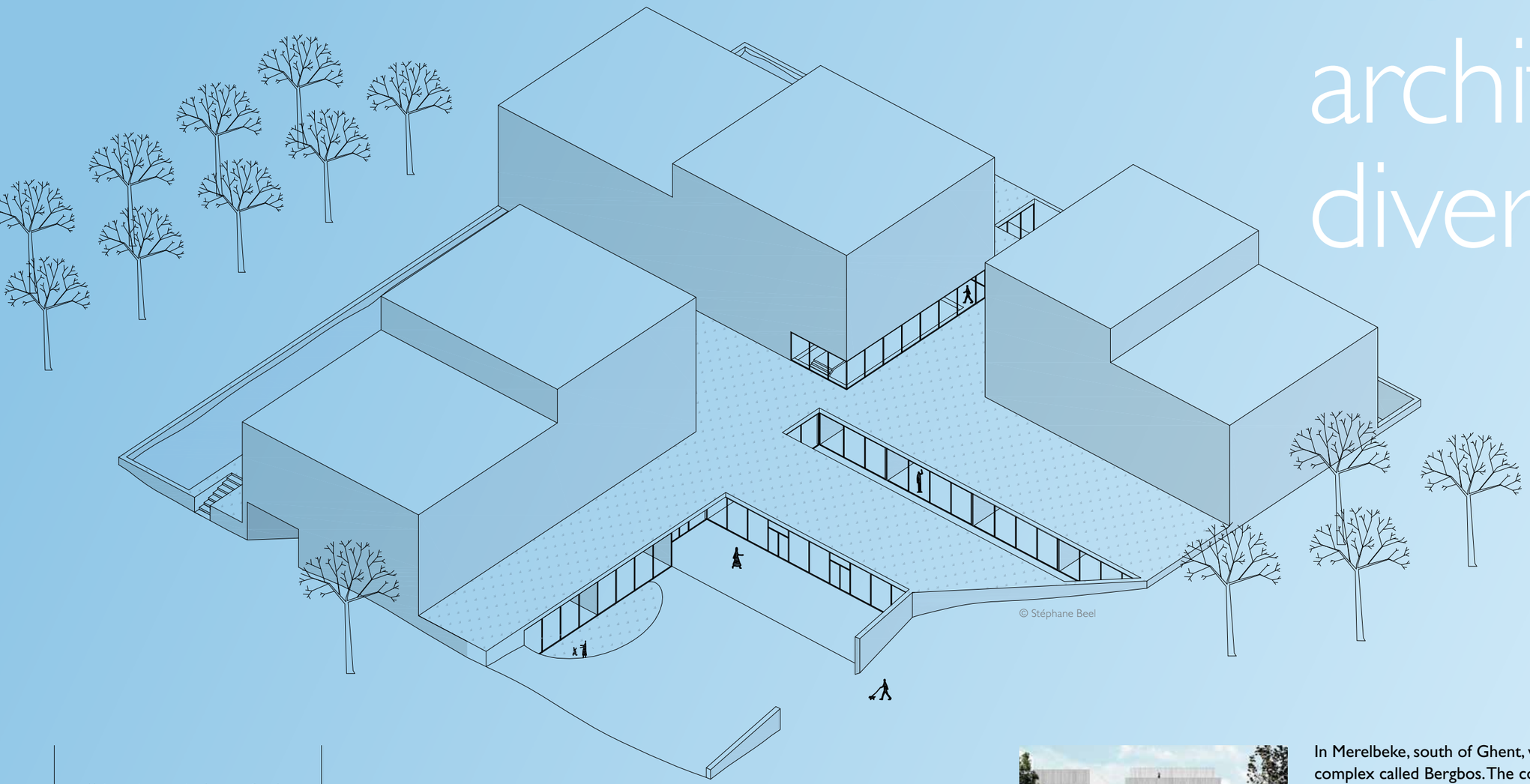
With Dr Shelter, we were able to deliver a wind and watertight framework within two weeks.

Speed of construction can be a great game-changer when it comes to winning a project. A prime example is the child day-care centre we recently built in Brussels. While the architects proposed a container-like design, we convinced them to alter the concept and adopt our quality modular construction system Dr Shelter. This enabled us to dramatically shorten the required construction time from 150 to 90 workdays, allowing the customer to save a substantial amount on rental fees.

dr.shelter

BERGBOS HOUSING COMPLEX, MERELBEKE

Rich architectural diversity



© Stéphane Beel

Various eminent practices have contributed designs to make for a stylish and well-organised architectural mix.

Bergbos is an Artenys project, a joint-venture of ArcaTerra and DenysGlobal.

In Merelbeke, south of Ghent, we are developing an innovative housing complex called Bergbos. The complex consists of a community centre surrounded by eight residential clusters, each one of them displaying an entirely different architecture. No, this is not meant to add to Ugly Belgian Houses. With each cluster being designed by a practice of great reputation, the complex will display a rich diversity of undisputed architectural quality.

Rich architectural diversity









GAS PIPELINES IN BELGIUM

Site peculiarities

While a number of international infrastructure investments have been put on hold as a result of low energy prices, there is still a great deal of work in the renewal of existing gas pipelines and in bringing high-voltage power lines underground. Some of these projects can even present special challenges, such as dealing with explosives from the First World War, crossing high speed railway lines, or managing the multitude of stakeholders involved with the projects. In addition, our cable and pipeline departments are increasingly active on industrial sites such as Total and Praxair, where safety requirements are very high.

In Flanders Fields

A century after the First World War, we are in the middle of Flanders Fields, constructing a Fluxys natural gas pipeline from Alveringem to Hooglede which for 25 km runs right through the former front line war zone around Ypres. This means we have to proceed carefully: the zone is still dotted with the explosive remnants of war. For this reason, a team of certified mine clearance specialists is working with us to clear the zones where we have to operate.

Directional drilling

At some points along the 36-km course of the pipeline, we use directional drilling to cross obstacles such as the Yzer waterway. We implement the same technique in the Fluxys project around Ghent, where at certain points we have to cross the E17 and R4 highways. This project involves replacing some older pipelines and constructing a number of new pipeline sections.

Part of the course of the pipeline between Alveringem and Hooglede is still dotted with remnants from the First World War.

© Régine Mahaux

Stringent safety

TOTAL AND PRAXAIR, ANTWERP

Our experience in laying underground high-voltage cables for transmission grid operator Elia allowed us to win a major commission from the Total refinery in the Antwerp harbour. On this site, Total is constructing a number of new units as part of the Optara expansion project. We are laying the required cables for these units, a network of 112 km high-voltage cables in a 2.5-km trench.
At two points, we have to construct micro-tunnels to cross obstacles, access roads and railways. The project involves carrying out complex construction work on an operational petrochemical site, which means dealing with the most stringent safety requirements imaginable. Total have already expressed their satisfaction, since in January 2015 they granted us the 'Contractor of the Month' award for our performance in terms of Health, Safety and Environment.

At Total, Denys received the Contractor of the Month award in January 2015.

The new oxygen and hydrogen pipelines are adjacent to existing pipelines connecting the Schelde left and right bank.

Oxygen, hydrogen and natural gas

Similar safety and environmental requirements are at stake in the Praxair expansion project in the Antwerp harbour. For Praxair, we are constructing the 20-km 10-inch diameter oxygen pipeline with interconnecting hydrogen and natural gas lines on their new site at Schelde right bank.

GAS PIPELINES IN FRANCE

Under rivers

In France, we have completed our work on part 2 of the Arc de Dierrey project, a gas pipeline east of Paris which involved the construction of a number of micro-tunnels to cross high speed railway lines. This is always a delicate operation involving various stakeholders, including environmental authorities, railway operators, local authorities and farmers. We also had to pass under the rivers Marne (450 metres) and Ourcq (600 metres) through subsoil with a difficult geology. Directional drilling was no option here, given the higher risks and environmental impact in this type of geology. Instead, we constructed large concrete siphons, filled them with water and pulled the gas pipeline through them. Our combined expertise in micro-tunnelling and pipelines came in handy once again.

Using micro-tunnelling, we constructed large concrete siphons to pass the gas pipelines under the rivers Marne and Ourcq.

MICRO-TUNNELLING IN LUXEMBURG

Construction without disruption

The Chemin de Fer de Luxembourg (CFL) is building a new road-rail transport hub in Bettembourg-Dudelange, near the French border. We are constructing six micro-tunnels there, with diameters ranging from 1.8 to 2.2 meters. The micro-tunnels pass beneath the A13 highway and the railway, which means we have to keep subsidence below 8 mm. In addition, the drilling work is carried out during weekends to avoid disruption of economic activities and allow easy rescheduling of railway services.

Micro-tunnelling is planned during weekends to allow rescheduling of railway services with minimal disruption.










Denys - dynamics in construction

Enthusiasm has an amazingly dynamic effect on people and organisations. It is so contagious - you sense it at every moment.
When you enter the world of Denys, you meet hundreds of enthusiastic people. It is as if while they're working they feel like jumping over hurdles, or dancing, or singing a song.

Experience the passion of Denys' people.
Scan the QR code and enjoy the video.

DENYS

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