

NOE[®] report

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Concreted in one pour

NOEtop wall formwork allows a bridge to be concreted in one pour on the B466 Süssen Bypass

Süssen Bypass is intended to relieve through traffic from the town centre. An overpass was built as part of this project. Andreas Stark GmbH & Co. KG from Aalen was awarded the contract to build the overpass. The contractor decided to use NOEtop wall formwork manufactured by NOE-Schaltechnik, Süssen.



The new farm access bridge over the B466 was concreted in one pour. The NOEtop large area formwork panels with integrated bracing allow NOEtop wall formwork to be used as "beam formwork". They also make it easier to form technically challenging abutments such as these on the B466 at Süssen.



It is rather unusual for a public construction project to begin three years before its originally scheduled date. However, this was what actually happened in Süssen, a town with approximately 10,000 inhabitants in the district of Göppingen: the groundbreaking ceremony was brought forward from an unspecified date in 2016 to 25 July 2013 – to the immense joy of the inhabitants, who have to endure more than 15,000 vehicles running through the streets of their town every day. This means not only high noise pollution for local residents, but also a considerable risk of accident for those who use the town's roads. Moreover, the construction works are an important capital project in terms of the trans-regional roads infrastructure because the network as a whole is enhanced by the linking of the B10 and B466 federal routes.

B466 Bypass

The new bypass has a total length of 2.1 kilometres and includes the construction of a 28 m long, 6 m wide bridge. This bridge takes a farm access track over the new B466. It was built by Andreas Stark GmbH & Co. KG from Aalen. At Süssen, the contractor's task was to construct the foundations, abutment walls, carriageway deck, road surfacing and the parapet rails on the farm access bridge. The entire bridge had to be concreted in one pour to ensure the structure would act as a portal frame. This presented the contractor with several challenges: since the volume of the abutments is quite large, there was a risk that the heat of hydration of the cement would produce temperatures of 45 °C or more in the concrete, which could lead to it cracking. In addition, the bridge is built to a slight curve, which meant that the contractor's concreting gang had to work "uphill". Added to this is the asymmetry of the bridge, with one abutment being higher than the other, which makes concreting operations even more difficult.

With dimensions of 5.30 x 2.65 m and more than 14 m² in area, the NOEtop formwork system offers one of the largest formwork panels available on the market. The tie rods can be positioned anywhere within the integrated bracing.



The curvature of the bridge and the abutments being at different levels presented a special challenge for the Aalen-based contractor, Stark. A task that was accomplished very well with NOEtop wall formwork.

NOEtop large area panels – formwork with integrated bracing

In order to avoid any risk, the Andreas Stark site team decided to use NOEtop manufactured by NOE-Schaltechnik for the bridge abutment and wing wall formwork. This proven formwork system is extremely durable and easy to assemble and erect. It is designed to withstand concrete pressures of 88 kN/m². The abutment formwork on the bridge at Süssen had to be angled in the bearing area. With conventional formwork, this would have entailed using appropriately shaped timbers but, thanks to NOEtop integrated bracing, the shape was achieved without the use of specially made elements. The integrated bracing is also the reason why the frame formwork can be used where necessary as “beam formwork”.



The manufacturer offers the formwork system in many different sizes to allow it to be used for a variety of applications. This includes an XXL variant. With dimensions of 5.30 x 2.65 m, it is one of the largest formwork panels on the market. At Süssen, it meant the site team could form an area of over 14 m² in one operation, without construction joints. Giuseppe Maniscalco, the site foreman, says: “NOEtop made our work much easier – which was one crucial reason why we opted for NOE. Another was something that the site team knew they could

Site board:

■ Main contractor:

Andreas Stark GmbH & Co. KG,
Aalen

rely on: when the need arises, a NOE expert is always available and able to come up with a solution.” It is always nice when a company receives such good customer feedback on its products and services.

Clearly visible at this point: the two different abutments of the farm access bridge over the B466. A construction task in which the NOEtop large area panels were able to bring all their advantages to bear.



A flexible formwork system for complex formwork tasks

Slender bridge columns built using the flexible NOEratio beam formwork system

The result is impressive and a delight to see: visually through the perfect surface finish and economically through the use of NOEratio beam formwork.

The residents of the "Seven-Hill Town" of Kirchberg near Zwickau can look forward to being relieved of the daily traffic rolling through their delightful town with the completion of a bypass. A steel girder bridge is currently being built to the south west of Kirchberg as part of the works. The bridge superstructure rests on 18 columns. The columns are so slender that an extremely flexible and yet robust formwork system was required to construct them: NOEratio manufactured by NOE-Schaltechnik, Süssen in southern Germany.

The Saxony State Directorate approved the construction of the S 282 n Kirchberg Bypass in 2012. The aim of the project was to improve the traffic situation in the small Saxon town and build a link to the federal road B93, one of the region's most important north-south routes. One of the structures required in order to complete the project was a bridge over the Leutersbach valley. This 254 m long structure was designed as a steel girder bridge supported on 18 columns in 9 piers, each pier consisting of a pair of columns. Each pair of columns is connected at the top and share a common foundation. Each of the pairs of columns have the same rectangular cross section but are of

different heights to suit the topography. The tallest pair is just short of 16 m high.

Column positions

The most noticeable feature of the columns is their small cross section of only 1.10 x 1.40 m. This gives the substructure a very slender appearance. The small cross sections and the short distance of only 4.26 m between the columns presented a special challenge to the formwork team on site. As a consequence, the available space, for example to attach the climbing scaffold and to integrate the screw anchors, was extremely tight. The beam that joins each pair of columns across



The 25 cm panel width of the NOEratio beam formwork proves itself of particular benefit on the slender cross section of the columns supporting the bridge over the Leutersbach valley.



All the advantages of the NOEratio beam formwork came into play when erecting the forms for the column pair head.

their tops also had to be cast together with the columns in one pour. As a result of the confined space, the bottom form of the beam had to be light enough to be handled manually. In order for these requirements to be fulfilled efficiently, the main contractor, Artl Bauunternehmen GmbH, Frankenhain, decided to use NOEratio from NOE-Schaltechnik. This is an extremely flexible beam formwork system specially designed for engineering and system-built structures. It consists of three main elements: steel bracing, NOE H 20 timber beams and NOEform facing. Engineers based in NOE's Cottbus office design the formwork for each project individually to ensure it can be used as efficiently as possible.

NOEratio

The formwork elements are assembled in the factory at NOE Cottbus so that the formwork arrives on site ready for use. NOE-Schaltechnik offers an extensive range of accessories for the NOEratio system, such as climbing brackets and working scaffolds. These also eased the task of the contractor in constructing the steel girder bridge.

Thanks to the panel grid width being only a very helpful 25 cm, the site team installed the formwork without any problems, even with the tight gap between the columns.

Despite the narrow panel width, NOEratio is capable of forming large areas in a single pour because the system allows forms of up to 36 m² in area to be moved in one piece. In general, the panels are tied with 15 mm diameter tie rods. The formwork is torsionally very stiff, which allows a relatively free choice of tie rod positions. The only other aspect to take into account is the allowable concrete pressure of 50 kN/m² for a maximum tie rod spacing of 120 cm. With tie rods spaced at a maximum of 100 cm, the allowable concrete pressure rises to 60 kN/m².

Special solutions

This flexibility also proved beneficial to contractor Artl on the bridge over the Leutersbach valley: originally, the contractor intended to use four tie rods over a form height of five metres. In order to work more efficiently and achieve a better final appearance, the site manager proposed using as few tie rods as possible on this structure. The NOE engineers at

the Cottbus office were able to satisfy this wish with NOEratio and reduce the number of tie rod positions to only two – one in the top and another in the bottom part of the formwork element. Moreover, they offset the tie rods in height by 10 cm to ensure they did not intersect one another. The rate of pour had to be slightly reduced to compensate. The overall effect was to make the work on site much simpler and quicker.



The Kirchberg Bypass crosses the Leutersbach valley on nine pairs of columns up to 16 m high.

In response to the contractor's request, the tie rods in the NOEratio beam formwork were reduced to one in each of the top and bottom parts of the formwork element.

The finished job not only looked good but was also economically efficient. The columns were absolutely flawless in shape and quality of surface finish, and the use of NOEratio proved highly economical compared to the alternative of expensive special formwork, which would have required more time to fabricate. In conclusion, the project partners can only be congratulated on their planning and execution of the works.

Site board:

- **Client:**
Landesamt für Straßenbau und Verkehr, Plauen Office
- **Main contractor:**
Arlt Bauunternehmen GmbH,
Frankenhain



Stylish flood defences for Dresden

Concrete flood prevention wall wins admirers with a natural stone look achieved using NOE Combi 70 and NOEplast textured formliners

The Elbe dykes at Cossebaude not only provide protection against a 100-year flood, they also impress through their visually appealing design.

A number of water retention systems are currently being built to protect the people living in and around Dresden against floods. Although one of them is made out of concrete, it has the appearance of a masonry wall, thanks to textured formliners from NOE-Schaltechnik, Süssen. The construction of the protection wall looks very simple at first glance, but as is often the case: the devil is in the detail.

Dresden, the capital of Saxony, lies on the Elbe and is also known as the "Florence of the Elbe" because of its wealth of art and high-quality architecture. During the floods of 2002, 2006 and 2013, however, many parts of the city looked more like Venice: countless streets, some of them quite a distance from the banks of the Elbe, stood under water and it was impossible to reach the houses without getting your feet wet. Cellars were flooded, works of art endangered and buildings damaged. In the worst year, 2013, the water level reached a record height of 9.40 m. This was reason enough for a new flood prevention system to be designed for the city.



Cossebaude

Part of this system is the dyke currently being built north-west of Dresden, in the district of Cossebaude. It is being constructed by Otto-Heil GmbH & Co. KG from Taucha. At a height of approximately 110.02 m above the national reference datum, the dyke is designed to be higher than the level of a 100-year flood. Because the dyke wall projects nearly 2 m out of the ground and will affect the look of the river bank over a length of 890 m, the decision was made to give the wall an attractive appearance, which was to be achieved with the help of NOEplast textured formliners.

These formliners can be either placed into the formwork (precast concrete) or glued onto it (in-situ concrete). Then follows the concreting. As soon as the concrete has sufficiently hardened, the forms are struck and the chosen texture revealed.



Something only NOE can do: textured formliners and concrete formwork from a single supplier. Delivered to site, ready for immediate use, including the formwork reuse plan and concreting schedule.

In the case of the dyke wall at Cossebaude, the choice fell on the “Murus Romanus” texture. It is one of the standard textures in the NOE-Schaltechnik range and gives the observer the impression that the wall is made from natural stone masonry.

The manufacturer also offers customers the possibility of realising their own individual motifs, so that they can always create an appearance in accord with any language of architecture.

A further advantage of the formliners: they can be used up to 100 times, which makes them extremely efficient. These advantages came in very useful for the team at the dyke construction site. Following the arrangement concept developed by NOE, they required only 185 m² of formliner for a formed surface of approximately 3,700 m² and managed to reuse the NOEplast textured formliners up to 26 times.

NOE service

To progress the works quickly, the contractor took advantage of a service that only NOE can provide as a single company manufacturing and supplying both formwork and textured formliners: on request, NOE undertakes the job of attaching the textured formliners to supporting boards and installs them on the basic formwork surface, all ready for use. The advantage for the contractor is that he has only to erect the already assembled elements and can therefore begin preparing for the concrete pour without losing any time. This service from NOE is finding use more and more often, above all on in-situ concrete sites.

However, at Cossebaude the service from NOE went considerably further: the manufacturer’s team worked out a special formwork concept and performed all the formwork panel utilisation planning on behalf of the contractor. A task that proved to involve considerably more work than it would appear at first glance. The 2.78 m high wall is conical, narrowing towards the top. At the foot, the wall is 100 cm wide, while at the crown the width is only 40 cm. To add to the complexity, the wall has many sharp changes

in direction and several 60 cm deep stepped-down sections of the crown to provide views for the local residents. This meant: to build the structure using 34 different segment types required only six standard forms, which were augmented by three optimally designed special system solutions and used in various combinations to suit the wall geometry and casting sequence.

NOE Combi 70

The specification called for no tie bars in the visible areas of the wall, a stipulation that was perfectly fulfilled by using NOE Combi 70. This formwork system is stiffened by 70 cm deep galvanised lattice girders spaced between 100 and 150 cm apart to suit the loading, and can resist high concrete pressures. The actual formwork element consists of a grillage of multi-hole channels and vertical NOE top edge profiles attached to a 21 mm thick basic panel facing. Any type of liner for creating fair-faced concrete surfaces can be applied and screwed on to the opposite face. The special aspects of this system: ties are required only at the top and bottom ends of the lattice girders. On the dyke wall at Cossebaude, this had the



With the NOE Combi 70 system, the ties were placed in the plinth area and above the formwork. There were no ugly tie bar marks in the fair-faced concrete surfaces.



Release spindles in the lower part of the forms ensured they were stripped gently.

advantage that the ties were only 10 cm above the base and approximately 290 cm above the top of the wall. No cosmetic filling of tie rod cone holes in the surfaces produced by the textured formliners was necessary. All the assembled formwork panels, which had the formliners and smooth facing attached at the factory

and included all the special solutions, were delivered to site by NOE's Cottbus branch. The panels were a maximum size of 300 x 512.5 cm, so that e.g. 9.60 m long wall segments could be concreted using only four formwork panels. The joints between the panels are hardly noticeable.

One detail in particular concerning the close working relationship between the contractor and the formwork supplier should not go unmentioned: after the trial section of wall was constructed, working in conjunction with the site management team NOE developed a special release spindle for use on the Combi 70 system, which was integrated into the plinth area of all the panels. This ensured a particularly gentle stripping of the highly textured fair-faced concrete surfaces.



NOE Combi 70 – a formwork system primarily used in housing construction because the ties can be placed in the plinth area and above the formwork, which is perfect for places where smooth, wallpaper-ready concrete surfaces are required. At Cossebaude, this system was used to ensure the fair-faced concrete surfaces were free of tie bars.

Further cooperation

The service NOE provided through its Cottbus branch, even during the preparations for this project, impressed the staff at Otto-Heil GmbH & Co. KG so much that they decided to build the two 3-storey pump houses at the start and end of the dyke in cooperation with the formwork manufacturer. The NOEtop formwork system was used to form the 5,200 m² of concrete.



The panels had a max. size of 300 x 512.5 cm, so that 9.60 m long wall segments could be concreted using only 4 formwork panels.

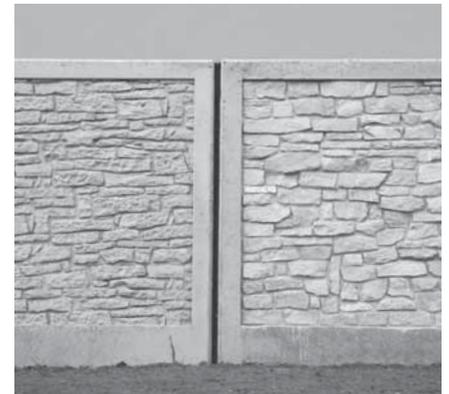


The contractor decided to use the proven NOEtop formwork system for the pump houses at each end of the Elbe dyke.

This is a steel frame formwork system for constructing walls. It can resist concrete pressures of up to 88 kN/m² and, as a tried and tested system, is very easy to assemble. This system was able to bring all the advantages, e.g. of its well-designed selection of panels, to bear on this building at Cossebaude, with its disjointed wall geometry, many stiffening piers and intermediate walls, some with haunches, and the various storey heights of 6.40 to 4.16 m. Thus it was possible to reduce the residual areas to be specially formed to a minimum.

Each storey was concreted in five steps. As both pump buildings were the same as far as their construction was concerned, the site operatives used the formwork units in one building before moving them to the next. The flood prevention wall and the two pump houses involved approximately 7,000 m³ concrete (of which approx. 2,000 m³ were for the bored piles).

By using a well-designed special formwork and a flexible formwork system, Otto-Heil GmbH & Co. KG was able to construct the complex flood prevention system very efficiently, achieving the objective of reliably protecting Dresden's population and the surrounding communities from future floods.

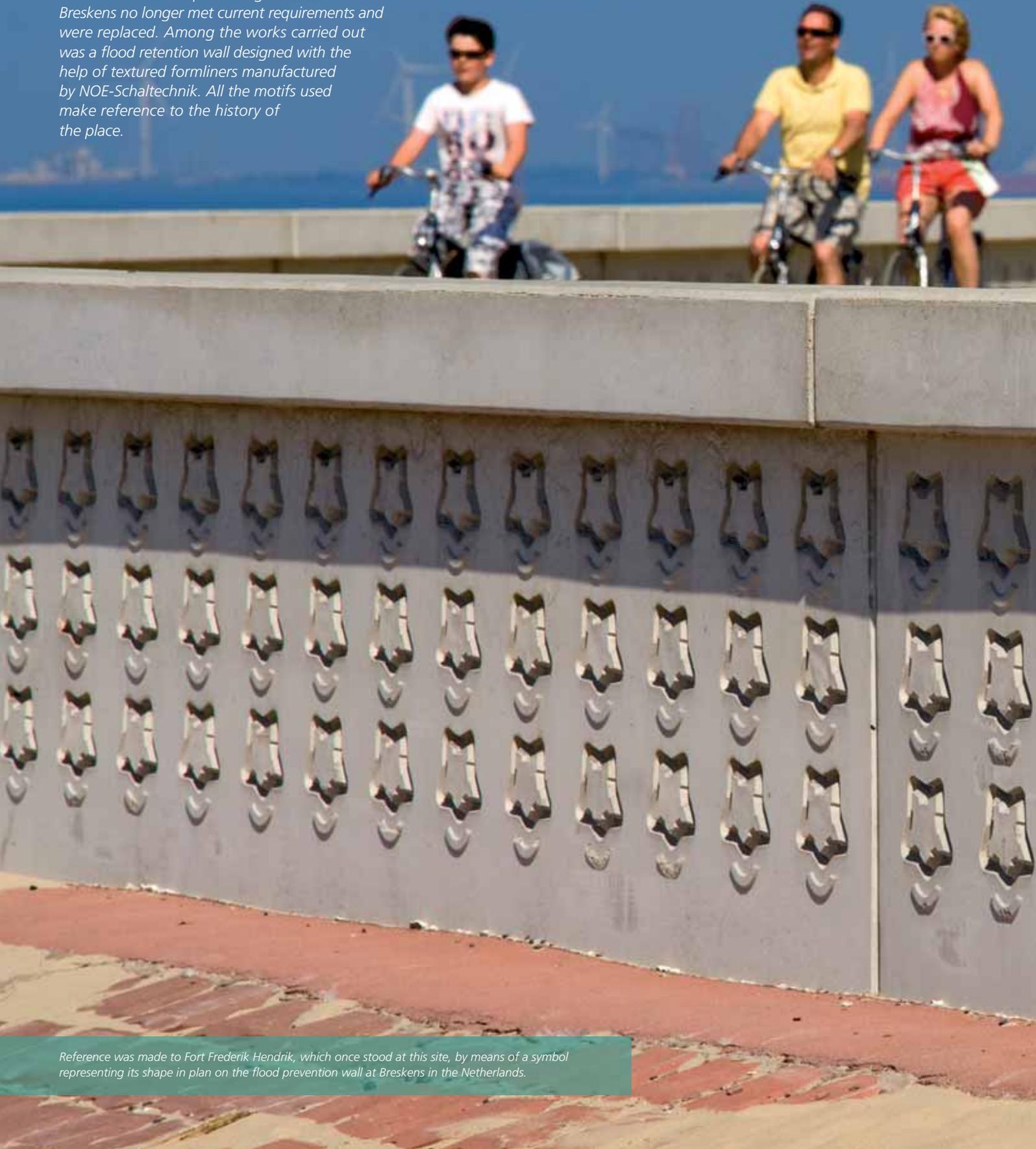


Can you tell the difference between concrete and real stone in this black and white photograph?

A wall drenched in history

Flood prevention wall at Breskens, Netherlands designed with NOEplast textured formliners

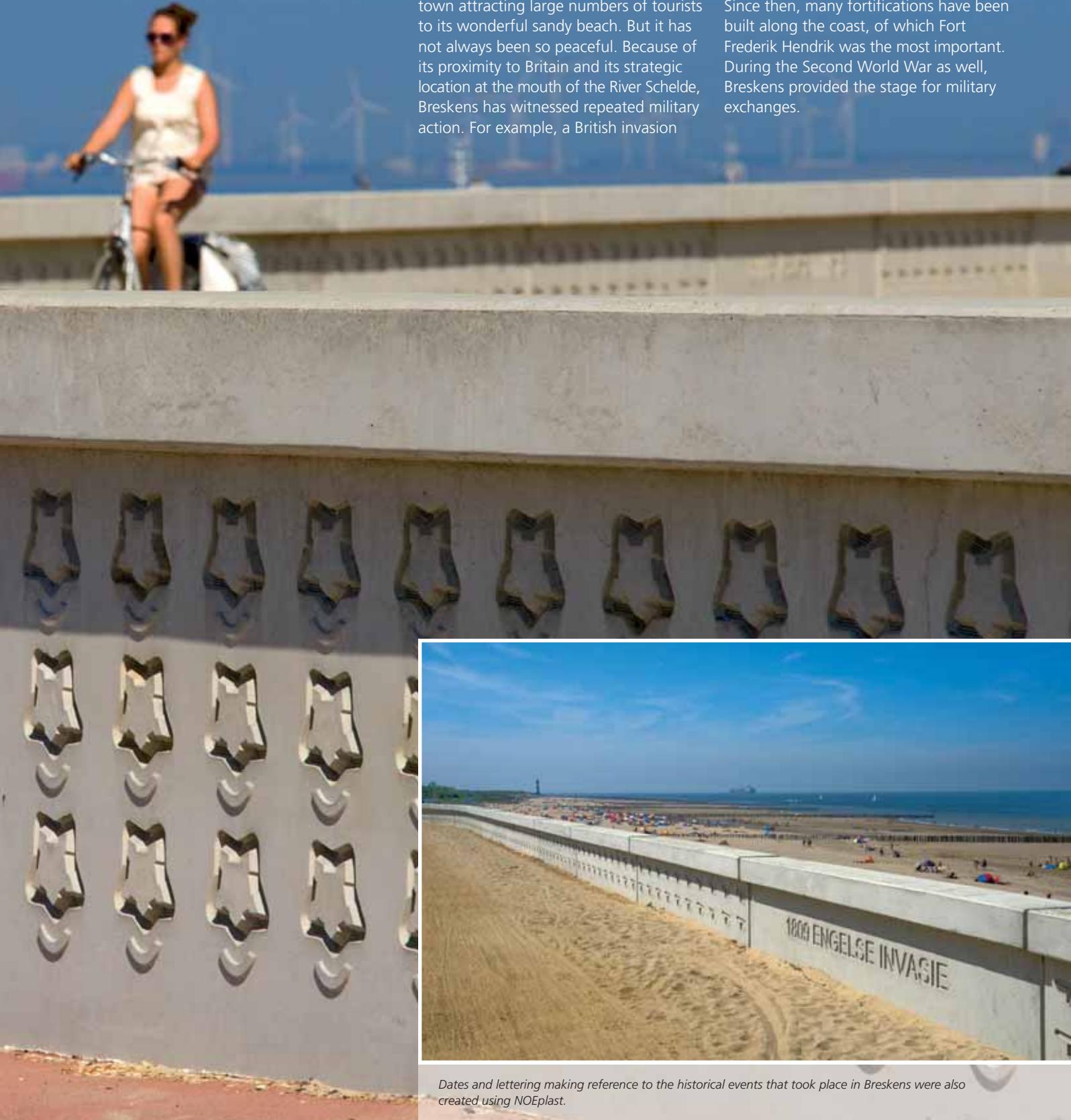
The flood defences protecting the Dutch town of Breskens no longer met current requirements and were replaced. Among the works carried out was a flood retention wall designed with the help of textured formliners manufactured by NOE-Schaltechnik. All the motifs used make reference to the history of the place.



Reference was made to Fort Frederik Hendrik, which once stood at this site, by means of a symbol representing its shape in plan on the flood prevention wall at Breskens in the Netherlands.

Today, Breskens is a small, tranquil harbour town attracting large numbers of tourists to its wonderful sandy beach. But it has not always been so peaceful. Because of its proximity to Britain and its strategic location at the mouth of the River Schelde, Breskens has witnessed repeated military action. For example, a British invasion

began here during the Napoleonic Wars. Since then, many fortifications have been built along the coast, of which Fort Frederik Hendrik was the most important. During the Second World War as well, Breskens provided the stage for military exchanges.



Dates and lettering making reference to the historical events that took place in Breskens were also created using NOEplast.



With NOEplast, even the finest lines that symbolised the water in the moat were able to be depicted in the concrete.

Efficient support

The designers of the flood prevention walls at Breskens placed their trust in the know-how and abilities of NOE-Schaltechnik's Dutch subsidiary. The formwork manufacturer from Süssen, Germany, has been marketing textured formliners under the name of NOEplast for over 40 years. In addition to an extensive range of formliners with attractive standard motifs, the company also offers customers the opportunity to realise their own individual ideas. NOE engineers make themselves available to support their customers at all times, contributing their great experience and suggesting efficient solutions from conception to final implementation. For the flood prevention wall at Breskens, they suggested something different to the usual solution of large sheets of formliner several centimetres thick: manufacturing the selected formliner out of NOEplast but with motifs no bigger than the palm of your hand in some places. These were then glued to a supporting board that was in turn fixed onto the formwork. This had the advantage of using considerably less material and reducing costs. The same process was used for the symbols and lettering on the walls.

Advice right down to the detail

Taking the symbol for Fort Frederik Hendrik as an example, the designers first proposed a motif composed of a five-pointed star chamfered at its edges, a deep groove and a raised arc. The five-pointed star represented the fort, the groove the moat around it and the arc a battery of cannons that once stood in

Coastal defences

Until now visitors to the tourist town saw very few signs of its eventful history. This has changed, however, since the recent improvements to the flood defences. As part of these works, the authorities have built a 486 m long flood retention wall. The wall is constructed of precast concrete units that project about a metre out of the sand and extend to the same depth below. The surfaces of the units are decorated with a relief of symbols and lettering that make reference to the history of the place. The flood prevention measures were designed by Dutch landscape architects Planklaan, Den Bosch.

History in symbols

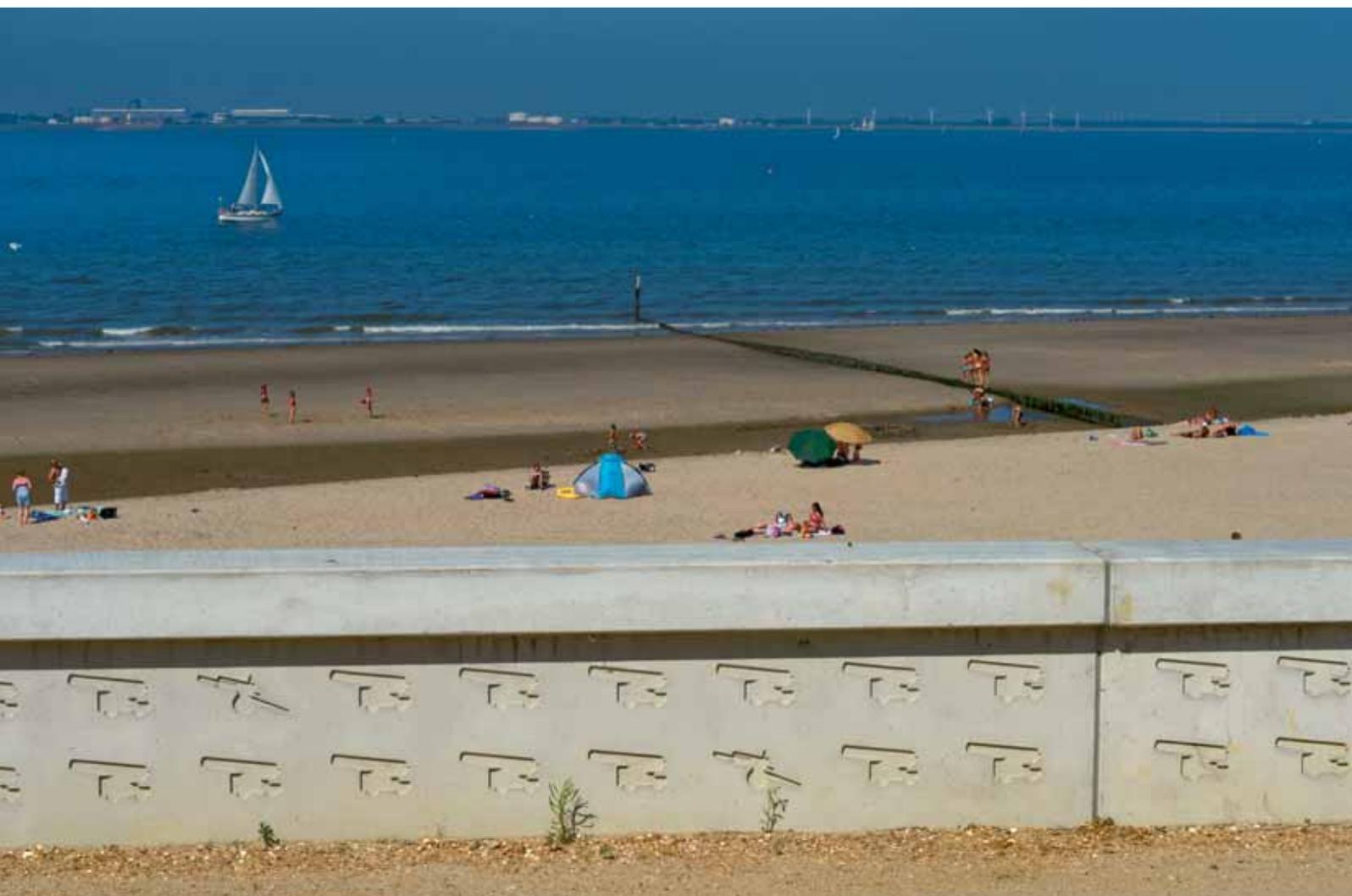
The architects at Planklaan thought carefully about the aspect of historical reconstruction. They paid special attention to Fort Frederik Hendrik. Built by Napoleon in 1814, it had to surrender in later years to a holiday and beach park. Because the fort had a pentagonal layout in plan, the architects opted for a star-shaped symbol. It can be seen on most of the concrete wall surfaces. Another relief shows cannons from earlier and later times. Different historical events in the area are recalled in variously sized lettering along with their dates. Two examples are the British invasion and the 1830 Belgian revolution.

The designers chose to use NOEplast textured formliners to transfer the motifs onto the concrete surface. The PU textured formliners are glued or placed in the formwork. Then the concrete is poured. As soon as the concrete has adequately hardened, the forms can be struck to reveal the selected surface relief.

front of the fort and pointed out to sea. In designing the NOEplast elements, it soon became clear to NOE that the groove created with the formliner would be too deep and narrow for the formwork to strip well from the concrete. To the architects, on the other hand, this geometry was important because they feared the desired shadow effect would otherwise not be visible. With this aim in mind, NOE suggested a very minor modification to the motif. This was to the benefit the design's aesthetics and its technical implementation. NOE advised the architects to make the groove slightly wider and shallower. A further suggestion was to integrate three smaller grooves in the main groove. In addition to symbolising the water in the moat, they would also

To make material savings, the palm-sized symbol of the fort was manufactured in NOEplast and glued to a supporting board.

Cannons from different epochs are represented on the flood prevention wall to recall Breskens' past.





create the architects' desired shadow effect. The architects liked this suggestion so much that they adopted it. This example shows how an attractive result was achieved through careful design and a good cooperative relationship between

the architects and NOE's engineers. Today, the flood prevention wall not only keeps the town of Breskens safe, but also brings the history of the place to the attention of the visitor in an attractive and interesting way.

Lettering – created with NOEplast – also recalls real events in the history of Breskens.

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The images in NOEreport are situational moment shots of construction sites. Therefore security and anchorage details can not always be considered as final.

Cover: The NOEtop large area formwork panels with integrated bracing allow NOEtop wall formwork to be used as "beam formwork". They also make it easier to form technically challenging abutments such as these on the B466 at Süssen.
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NOE-Schaltechnik
Georg Meyer-Keller
GmbH + Co. KG
Kuntzestr. 72
73079 Süssen,
Germany
T +49 7162 13-1
F +49 7162 13-288
info@noe.de
www.noe.de
www.noeplast.com

Austria
NOE Schaltechnik
www.noe-schaltechnik.at
noe@noe-schaltechnik.at

Belgium
NOE Bekistingstechnik N.V.
www.noe.be
info@noe.be

Brazil
Mills do Brasil
Estruturas e Serviços Ltda.
www.mills.com.br
millsbr@cepa.com.br

Bulgaria
NOE Schaltechnik
www.noebg.com
noe-bg@netbg.com

Croatia
NOE oplatna tehnika d.o.o.
www.noe.hr
noe@noe.hr

France
NOE France
www.noe-france.fr
info@noe-france.fr

Netherlands
NOE Bekistingstechnik b.v.
www.noe.nl
info@noe.nl

Poland
NOE PL Sp. z o.o.
www.noe.com.pl
noe@noe.com.pl

Russia
NOE Moscow
info@noe-moscow.ru
NOE St. Petersburg
noe@sovintel.ru

Saudi Arabia
NOE Global Trade Est.
NOE – The Formwork
www.noe.de
jeddah@noe.de

Serbia
NOE Sistemske Oplate d.o.o.
www.noe-scg.com
noe-scg@eunet.rs

Switzerland
NOE Schaltechnik
www.noe.ch
info@noe.ch

Turkey
NOE Beton Kalıpları A.Ş.
www.noe.com.tr
info@noe.com.tr