

# DELTA<sup>®</sup>-TERRAXX

## The problem-solver

The ideal solution for horizontal structural drainage

PREMIUM QUALITY

## Spitalstiftung, Konstanz Green Roof for an Education Centre



### The property

Under a demonstration project entitled 'low-energy house controlled by the Deutsche Energie-Agentur (dena)', the Konstanz Spitalstiftung joined hands with a building and loan society for the construction of a new complex of buildings comprising an education centre and 32 apartments specifically designed for senior citizens. As the whole concept of the building was environment-friendly, it was only natural to give its flat roof an extensive herbaceous covering to demonstrate this basic idea to the world.

### The problem

In this case, the key concern was to ensure that large coherent areas could be drained safely and sustainably, and that operations could be completed within a tight schedule without technical or acceptance problems.

### The solution

DELTA<sup>®</sup>-TERRAXX showed itself capable of solving even this kind of problem. Proven in numerous applications, the dimpled sheet was favoured for this project because of its outstanding drainage capacity and the extreme speed at which its 30 m<sup>2</sup> rolls can be laid out.

### The contractor's experience

As the CEO of GDT explained, 'DELTA<sup>®</sup>-TERRAXX is an extremely user-friendly protection and drainage system which we use under flagstones, gravel, and green roofs.

Its ideal dimensions of 2.40 by 12.50 m enable us to lay out the material very quickly, and its low weight makes laying that much easier. Its fused-on filtration cloth prevents all those problems that typically occur in windy weather, and because the overlapping edges are sealed together we can be certain that no plant substrate can penetrate to the waterproofing'.



'Based on our experience with DELTA®-TERRAXX to date, we may say that the material sets new standards for protection and drainage systems.'



## Building data

<b>Property</b>	Spitalstiftung, Konstanz
<b>Contractor</b>	GDT Gründach Technik GmbH, D-72669 Unterensingen
<b>Material</b>	DELTA®-TERRAXX, approx. 1,000 m <sup>2</sup>
<b>Implementation</b>	June 2008

# Conergy AG, Frankfurt/Oder Construction of an Administration Building



### The property

When Conergy AG, one of Europe's leading providers of renewable energy systems, raised a new administration building, all essential elements of the air-conditioning system were installed on the flat roof. Thus, the floorspace within the building could be used much more economically.

### The problem

To facilitate routine maintenance activities, all parts of the system had to be freely accessible from all sides. Maintenance walkways paved with flagstones would not have been adequate for a system of that size; rather, it was to be expected that maintenance workers would be walking around at random on the entire roof surface. Therefore, it was decided to install a suitable protection layer between the waterproofing and the gravel cover.

### The solution

The decision to use DELTA®-TERRAXX was made because of its compliance with the requirements of DIN 4095 and 18195, its capacity to sustain heavy mechanical loads, and its low add-on thickness. The material offers optimum protection for the FPO waterproofing underneath.

### The contractor's experience

The contractor was convinced by the material's excellent mechanical protection properties and its reliable drainage performance. As there are no obstacles to hamper the drainage of surface water it is practically impossible for the gravel bed to become clogged with sludge. The large number of penetrations and seams did not raise any problems, and the fact that sheets are joined together by their integrated self-sealing edges into an unbroken homogeneous surface made it much easier to apply the gravel layer pneumatically later on. As the contractor said by way of conclusion, 'DELTA®-TERRAXX simply was the best thing we could get for this application.'



## Building data

Property	Conergy AG, Frankfurt/Oder
Contractor	DACHLAND GmbH, D-15827 Dahlewitz
Material	DELTA®-TERRAXX, approx. 2,500 m <sup>2</sup>
Implementation	Autumn 2007

# Heisebachhalle, Kassel-Oberzwehren Rehabilitation of a Sports Hall Roof



## The property

The roof of this convertible sports hall had to be rehabilitated after years of service. To protect the waterproofing as well as the interests of the environment, it was decided to put the roof under an extensive green roof.

## The problem

The lightweight configuration of the roof and the minimal height of the parapets dictated that the green roof should be designed so as to keep the square weight and the height of the covering to a minimum. Moreover, the structural drainage system had to be capable of handling the expected precipitation.

## The solution

Due to its low add-on height of no more than 9 mm, its low square weight, and its outstanding drainage performance, DELTA<sup>®</sup>-TERRAXX appeared predestined to solve the problem. As the area to be covered was large, the decision to opt for this material was also influenced by the fact that sheets come in a width of 2.40 m.

## The contractor's experience

The ease and speed of laying was fully up to expectations. No more than eight workers finished laying out 2,000 m<sup>2</sup> of the material in a mere two hours. Sealing the numerous penetrations did not raise any problems because the material can be simply folded and the resultant kink will retain its shape. Another convincing aspect was the behaviour of the material when the substrate was applied pneumatically later on: by virtue of their integrated self-sealing edges, the sheets formed an unbroken homogenous surface which remained in place without slipping or shifting. At the same time, the sealed overlaps kept substrate from



being blown under the sheets. Motivated by this positive experience, the contractor has been successfully using DELTA®-TERRAXX in other projects since then.



## Building data

<b>Property</b>	Heisebachhalle Kassel-Oberzwehren
<b>Planning</b>	Kassel Town Council
<b>Contractor</b>	Wegener Bedachungen, D-34123 Kassel
<b>Material</b>	DELTA®-TERRAXX, approx. 2,000 m <sup>2</sup>
<b>Implementation</b>	Autumn 2007

# Construction of an Underground Car Park, Essen



### The property

A housing estate owned by Wohnbau e.G. Essen was rehabilitated and enlarged under a comprehensive modernisation plan which also provided for building new parking spaces for cars. The roof of the underground car park built for this purpose was to be integrated in the overall landscape design of open and green spaces.

### The problem

To convey water away from the green spaces, walkways, parking spaces, and playgrounds on the roof of the under-ground car park, a continuous high-performance drainage system had to be installed.

### The solution

As structural and connecting heights were limited because of the constraints imposed by the existing development, a compact configuration was needed. The problem was solved by DELTA®-TERRAXX which, despite its low thickness, offers outstanding drainage performance.

### The contractor's experience

The economical two-in-one solution carried the day: consisting of a drainage layer and a filtration cloth, DELTA®-TERRAXX can be laid out in a single pass. What is more, the contractor was positively surprised at the simplicity and ease of laying as well as the workability of the self-sealing edges at low temperatures. Unlike individual panels, the coherent homogenous surface thus created offers outstanding walk-on safety as well as protection from the penetration of soil or substrate underneath the material. The contractor was as impressed by the reliability of the protection offered by the robust fused-on cloth to the drainage level as he was by the simplicity with which details and seams could be handled.



## Building data

Property	Underground car park Welterstraße, Essen-Frohnhausen
Planning	Architektenbüro Joachim Osterland
Contractor	Classen Garten- und Landschaftsbau, D-45257 Essen
Material	DELTA®-TERRAXX, approx. 400 m <sup>2</sup>
Implementation	11-2006 to 2-2007

# Terrace Condominium, Hagen Roof Terrace Rehabilitation



## The property

After a service life of several decades, the roof terrace of a condominium had to be rehabilitated from the ground up.

## The problem

To conform to the low covering and connecting heights of no more than c. 10 cm dictated by the existing development, the warm roof which had previously been refurbished with a waterproofing sheet had to have a walkable deck added to it. Surface water was supposed to drain away through open gaps between large concrete flagstones.

## The solution

As the contractor was anxious to avoid point loads on the warm-roof package after rehabilitation, there was no question of using stilts to support the surface flagstones. Instead, they were to be placed on a 4 cm layer of expanded slate spread across the entire surface. What is more, flexible ducting was to be laid out within this layer of granular material to receive the cables for the terrace lighting system. To ensure the unobstructed drainage of surface water and keep the granular layer from getting waterlogged, a high-performance drainage system was indispensable. With its low add-on height of no more than 9 mm, DELTA<sup>®</sup>-TERRAXX provided the optimum solution.

## The contractor's experience

Although the site was hemmed in comparatively tightly, laying the sheets off the roll and trimming them to size presented no difficulties. Another convincing advantage was that sheets remained firmly in position. Their bonded overlaps reliably prevented any of the bulk material from migrating underneath the sheets. Thanks to its outstanding workability, the technical support lent by the manufacturer and, most importantly, the cost effective nature of DELTA<sup>®</sup>-TERRAXX succeeded in winning over another user.



## Building data

Property	Terrace condominium, Hagen
Planners/ contractors	Richter und Schmidtke, Garten- und Landschaftsbau, D-58099 Hagen
Material	DELTA®-TERRAXX, approx. 55 m <sup>2</sup>
Implementation	June 2007

# Underground Car Park Roof, Karlsruhe Construction of a Sports Facility



### The property

The Europabad in Karlsruhe offers a range of interesting recreation and sports activities. When an underground car park was built, it was intended to make its function a consistent part of the surrounding development concept. The owner had decided to cover it with a synthetic-turf football pitch.

### The problem

As the field was supposed to become usable again without too much delay even after a heavy downpour, a drainage layer was needed that was efficient enough to guarantee outstanding drainage even at the low gradient dictated by local conditions.

### The solution

One crucial reason why the contractor opted for DELTA®-TERRAXX was its high compressive strength of 400 kN/m<sup>2</sup>. In addition, the width of the rolls promised that the project could be completed swiftly despite the size of the area involved.

### The contractor's experience

Martin Sautter, site manager of bau + grün AG of Sinzheim: 'The convincing mechanical properties of DELTA®-TERRAXX greatly enhanced the efficiency of our operations. Once the gravel layer had been applied, a seven-ton wheeled loader could move around on the surface without the drainage sheet suffering any damage. The roll size of 2.40 x 12.50 m was ideal for laying. The self-sealing lateral overlaps keep the material from slipping, eliminating the need for laborious corrections. At the end of the day, therefore, the time required for laying was markedly shorter than with other systems. Moreover, the material conforms to applicable DIN standards and bears the CE seal, so that it will stand up under the scrutiny of any critical expert. What I liked best, however, was Dörken's helpful cooperation. Their competent, object-specific technical advice was simply super.'



## Building data

Property	Underground car park, Europabad Karlsruhe
Contractor	bau + grün AG, D-76547 Sinzheim
Material	DELTA®-TERRAXX, approx. 5,000 m <sup>2</sup>
Implementation	May 2007

# Many Applications – One System

## Construction of a Day-care Centre in Neu-Isenburg



### Building data

<b>Property</b>	Construction of a day-care centre in Neu-Isenburg
<b>Application</b>	Protection and drainage layer under the extensive green roof / gravel roof
<b>Contractor</b>	GDT Gründach Technik GmbH, D-72669 Unterensingen
<b>Material</b>	DELTA <sup>®</sup> -TERRAXX, approx. 3,000 m <sup>2</sup>
<b>Implementation</b>	July 2008

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## Rehabilitation of an Underground Car Park in Winterthur



### Building data

Property	SPAR supermarket, Winterthur, Switzerland
Application	Drainage layer under a deck of interlocking paving stones
Material	DELTA®-TERRAXX, approx. 400 m <sup>2</sup>
Implementation	September 2006

## Construction of a Housing Estate and Underground Car Park in Thiene



### Building data

Property	Construction of a housing estate in Thiene, Italy
Application	Drainage layer under the pavement of an underground car park roof
Material	DELTA®-TERRAXX, approx. 300 m <sup>2</sup>
Implementation	September 2005

# DELTA®-TERRAXX

## Technical Data Overview:

Dimpled sheet material	High-density polyethylene
Geotextile material	Polypropylene
Dimple height	approx. 9 mm
Compressive strength	approx. 400 kN/m <sup>2</sup>
Air gap	approx. 7,9 l/m <sup>2</sup>
Service temperature range	- 30 °C to + 80 °C
Roll size	12,5 m x 2,4 m
Geocomposite for application in drainage systems	D + F
Tensile strength	MD 6 kN/m/CMD 6 kN/m (EN 10319)
Dynamic perforation resistance	40 mm (EN 918)
Characteristic opening size	150 µm (EN ISO 12956)
Water flow capacity	8 · 10 <sup>-2</sup> m/s (EN ISO 11058)
Water flow capacity in the plane	3,1 · 10 <sup>-3</sup> m <sup>2</sup> /s (EN ISO 12958) 20 kN/m <sup>2</sup>
Durability	To be covered within 2 weeks after installation. No deterioration after 25 years in natural soil having a pH value between 4 and 9 and a temperature of < 25 °C.

