

Issue 15 / December 2017
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Geofoam MEGA PROJECTS SPECIAL EDITION

AUSTROTHERM GEOBLOCK® APPLICATIONS WILL GAIN MOMENTUM IN TURKEY

Austrotherm geoBLOCK® is becoming widespread around Turkey with its well proven applications.

THE FIRST GEOFOAM ROAD APPLICATIONS IN TURKEY HAVE GOTTEN FULL MARKS FROM THE EXPERTS

The first geofoam applications of Turkey were inspected by roadway experts on technical site visits hosted by EPSDER and Austrotherm.

DEVELOPMENT OF THE GEOFOAM TECHNOLOGY IN TURKEY AND CURRENT APPLICATIONS

The data and knowhow that will be collected from the first applications of the geofoam technology in Turkey will shed light on the design and construction of the new geofoam structures.

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AUSTROTHERM
Yalıtım Malzemeleri



Tolga Celayer
Marketing and Business
Development Manager

Dear readers,

We have concluded another successful year as one of the pioneering corporations in thermal insulation industry in Europe and Turkey. Austrotherm has initiated many unique projects in 2017. We have started to provide geofoam lightweight landfill solution services through our “Civil Engineering Applications Department” established this year. Geofoam technology had been known and applied around the world for over 40 years but never been implemented in Turkey until 2017. We have carried out groundbreaking applications with the Austrotherm geoBLOCK® lightweight EPS fill material. Therefore, we have dedicated the last Austrotimes issue of the year to the mega projects carried out in Turkey utilizing our geofoam lightweight fill material. I would like to briefly mention these accomplishments which you will find the details in the following pages of this bulletin.

The Austrotherm geoBLOCKs® were used in various applications in Turkey for the first time in 2017. Fast and economical solutions were obtained by utilizing Austrotherm geoBLOCKs® in a subway station in İstanbul, the E5 connection road embankment constructed above the buried pipelines in front of the Acıbadem Akasya Shopping Mall, the backfill behind the retaining wall at the İbn Haldun University and the landscape fill applications at the Alaçatı Biblos Hotel Resort & SPA constructed in Çeşme.

We have participated in numerous activities and events throughout the year regarding the geofoam engineering solution that we are trying to pioneer. The feedbacks and projects we received reveal the advantages and convenience of the Austrotherm geoBLOCK® are well adopted by the Turkish construction industry. The project and field technical support services provided for our business partners played major role on the development of geofoam applications.

On the other hand, we are starting to share the “Diamond Collective” partners community, a first in the EPS industry, and its activities in this issue. We strongly believe that this entity, bringing EPS manufacturers from all around Turkey together, will introduce an essential vision in the EPS industry.

Our goal in 2018 is to increase our market share with our new products and applications, continue to provide added value to Turkey and the industry without compromising on quality as a corporation that shapes the market.

I would like to take this opportunity to wish all our readers a good year and hope that 2018 brings peace and tranquility to Turkey and the whole world.

So long...

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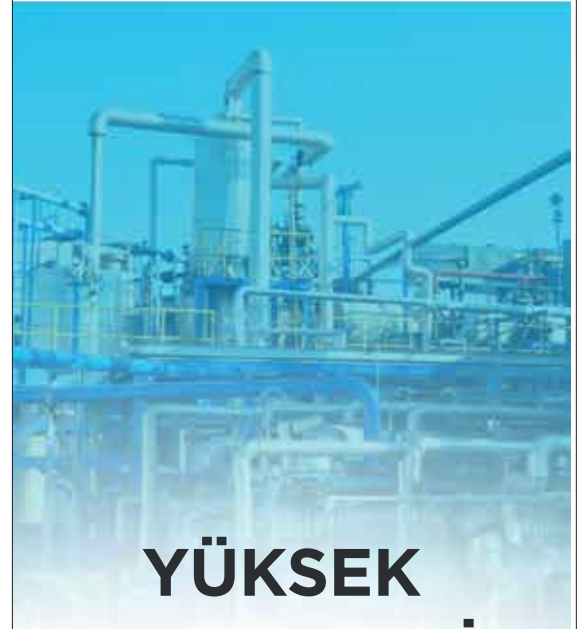
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GEOFOAM APPLICATIONS WILL GAIN MOMENTUM IN TURKEY

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2nd Highways, Bridges and Tunnels Special Fair
- June 2017**
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Biblos Resort Hotel, İzmir
- July 2017**
Diamond Collective Partners Meeting,
Austrotherm geoBLOCK® Collaboration Meeting
- August 2017**
Austrotherm geoBLOCK® Online Seminars "Austrotalk"
- September 2017**
The First Lightweight Backfill Behind the Retaining Wall Application in Turkey
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Austrotherm geoBLOCK® Application Educational and Technology Awareness Seminars
TCDD Datem
Gaziantep Metropolitan Municipality Civil Works and Infrastructure Department
İMO - Chamber of Civil Engineers
BOTAŞ - Petroleum Pipeline Company
METU
İLBANK
KTU
Dokuz Eylül University



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ÇEVRE YOLU UZUNÇAYIR-HAREM, İSTANBUL HIGHWAY LIGHTWEIGHT FILL

The very first **lightweight roadway embankment** constructed in Turkey

The construction of the roadway embankment was realized utilizing the lightweight fill technology, an alternative solution to the traditional compacted earth fill. The Austrotherm geoBLOCK® solution enabled construction of the roadway embankment without causing any service loss in the water main lines and possible structural damages risk to these lines were prevented.

As part of the project for diverting a part of the traffic in the direction of Harem on the Uzunçayır exit of the İstanbul Motorway towards Acıbadem district and Akasya Shopping Mall, the Austrotherm geoBLOCKs® were used to construct roadway embankment. This very first Austrotherm geoBLOCK® roadway embankment in Turkey was opened to traffic in April 2017. There were two main water distribution lines of İSKİ (Istanbul Water and Sewerage Administration), 2.2 m in diameter, approximately 3.8 - 5.6 meters below the bottom of the roadway embankment. If traditional compacted earth fill has been used for constructing the roadway embankment, the stress increase acting on the water distribution lines would have caused structural damages. Therefore, the roadway embankment was realized by utilizing the lightweight fill technology as an alternative to the traditional compacted earth fill. The Austrotherm geoBLOCK® solution enabled construction of the roadway embankment without causing any service loss in the water distribution lines and possible risks of structural damages were prevented.

A total of 650 m³ Austrotherm geoBLOCKs®, 1.2 m x 2.5 m x 1 m and 1.2 m x 1.25 m x 1 m in dimensions and 22 kg/m³ in density, were used to construct the roadway embankment that is 37 meters long, 6.6 meters wide and 3 meters high. The Austrotherm Civil Engineering Applications Department provided site-specific design services. In order to distribute the motor

vehicles' axle load uniformly on the surface of the geoBLOCK® roadway embankment, the superstructure of the road was built as recommended by The National Cooperative Highway Research Program (NCHRP) of USA. The pavement system of the roadway, the minimum thickness of which was suggested to be 61 cm, was designed to comprise of (1) a 10 cm-thick reinforced concrete load distribution slab, (2) a 43 cm-thick stabilized subbase-base layer, (3) an 8-cm asphalt wearing surface, from the bottom to the top respectively. In addition to design services, the Austrotherm Civil Engineering Applications Department also supervised the block installations.

Deformation measurements in the first 8 months

In order to quantify the deformations under the service loads during and after the construction of the first Austrotherm geoBLOCK® roadway embankment in Turkey, instrumentations consisting of magnet settlement plates were installed. The post-construction cumulative deformation shall be below the elastic limit (1% of the total embankment height) at a roadway embankment built using EPS blocks.



Project Highlights

Application: Roadway embankment
Roadway length: 37 m
Roadway width: 6.6 m
Material used: Austrotherm geoBLOCK®
Density: 22 kg/m³ (CS1 = 50 kPa, ASTM D6817)
Dimensions: 1.2 m x 2.5 m x 1 m and 1.2 m x 1.25 m x 1 m
Embankment height: 3 m

In this project, the post-construction deformation on the Austrotherm geoBLOCK® roadway embankment was measured to be 0.5% of the total embankment height (1.5 cm).

At the end of the eight months since the opening of the roadway to traffic, the cumulative deformation (post-construction deformation plus creep deformation) has reached 0.8% of the total road embankment height (2.4 cm). In other words, a 0.3 cm creep deformation occurred within the period from the opening until today. Based on the measurements taken on a monthly period since the opening of the roadway to service, the cumulative deformation of the Austrotherm geoBLOCK® road embankment at the end of the 50-year economic life is projected to be 1.7% of the total embankment height (5.2 cm). This value is below the total allowable deformation limit of 2.0%.

Thanks to this innovative engineering solution, construction of the roadway embankment in an area with dense urban buried infrastructure facilities was completed by eliminating relocation costs of water distribution lines that would otherwise be costly and logistically problematic.



Traditional compacted earth fill is now a burden on the projects

Utilization of "high compressive strength EPS blocks" for highway and railway construction ensures a lightweight, fast and economical engineering solution.

In Turkey, when highway and railway alignments are to be built over weak soil sites with high settlement potential and low bearing capacity such as soft clays, peats, etc., soil stabilization is implemented using traditional soil improvement methods prior to construction of the embankment. Methods such as; drilled shafts, jet grouts, stone columns, prefabricated vertical drains, deep mixing and pre-loading techniques are generally used in these applications. After soil improvement against the settlement and bearing problems completed, the highway embankments and bridge approach ramps are constructed using traditional compacted earth fill. However, soil improve-

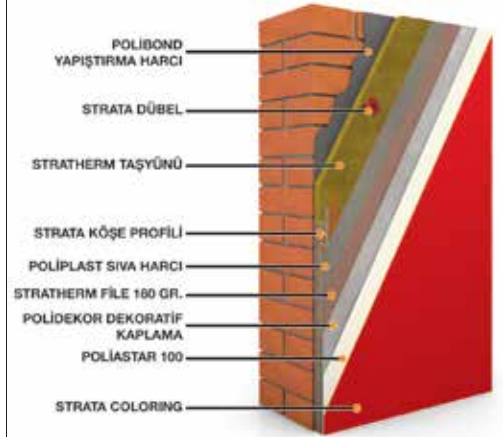
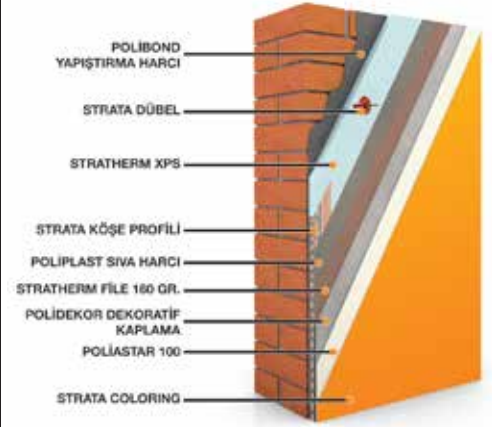
ment applications not only requires additional costs but also takes long time to complete. Alternatively, constructing the highway embankment using EPS blocks instead of compacted earth fill minimizes the design loads significantly. Therefore, the design criteria against the settlement and bearing problems are met without implementing a soil improvement technique for the weak foundation soils. Based on the experience in cases where weak soil layers are extending down more than 15 meters, construction with EPS blocks presents an economical alternative solution when compared to that of traditional compacted earth fill embankments over improved subsoil conditions.

In addition, using EPS blocks allow for fast construction in comparison with the traditional application techniques.



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ÇEVRE YOLU UZUN ÇAYIR-HAREM, İSTANBUL HIGHWAY LIGHTWEIGHT FILL

A product that accelerates the construction process wherever it is applied



İ. GÖKŞİN DURUSOY
Akış REIT Inc.
Board Member and
General Manager



The fill material we were going to use for a critically located road in our project had to be lightweight with a high strength. There was a special condition which required that a new roadway embankment transferred almost no stress increase onto the water supply network underneath the road.

Could you tell us about your company?

Akiş REIT Inc. was founded within the structure of Akkök Holding in 2005 and has been continuing to work on a variety of projects utilizing its experience and expertise in the real estate field which is positioned among the strategic fields of business by the holding. Akiş REIT received the REIT (real estate investment trust) status on 18 May 2012 upon the application tendered to the Capital Markets Board of Turkey and has started to be traded at the stock market (Borsa İstanbul) on 9 January 2013. Following the significant success achieved with Akbati that opened in 2011, Akiş REIT has concluded another outstanding project with the completion of Akasya, of which it also is a shareholder, in 2014. Merging with SAF REIT in 2017, Akiş REIT further strengthened its place within the real estate sector.

Adopting an alternative approach to its investments in shopping malls and pioneering among the real estate investment trust companies, Akiş REIT shifted its focus on street retailing. It aims to create regular dividend income for its partners with new sources of rent-

al income at four different locations on Bagdad Street. Akiş REIT has become one of the most important players in the sector with its trend-setting projects developed at the right time and the right location and it will continue to create distinctive projects by closely following trends in the ever-changing sector and the socio-economical developments.

What made you prefer a lightweight backfill material for the application? How were you informed about the Austrotherm geobLOCK® that you used in the project?

The fill material we were going to use for a critically located road in our project had to be lightweight with a high strength. There was a special condition which required that a new roadway embankment transferred almost no stress increase on the water supply network underneath the road. It was not possible to utilize prefabricated construction elements for crossing the spacing that had 35 m of length, 6 m of width and 3.5 m of average height. For that matter, while making a research on the alternative solution for an approximately 750 m³ of fill, our paths crossed with HDS, a company

constructing geofilm applications, and consequently, we found your company. We were very excited to hear to use EPS blocks which we were using as a lightweight fill material in various fields of our project could also be utilized at this critical location due to its high strength under heavy traffic loads. We have come together with engineers at Austrotherm and HDS accompanied by Mr Kutay ÖZAYDIN, one of our consultants, and received detailed information regarding the product. We have examined documentation on numerous applications from around the world and decided to use it in our project.

Could you elaborate on the advantages of the field technical support provided by Austrotherm during the application phase?

The competent and authorized Austrotherm team was in charge of every phase of the roadway construction and provided full support in every step. The geoblocks were applied in road embankment for the first time in Turkey and the need to use various sizes of blocks due to the complications of the project boundaries required a meticulous operation. The field technical support provided by Austrotherm and the implementing company has contributed immensely in flawless completion of the project.

What would you like to say about this innovative solution?

Speed and price competition are of utmost importance in the ever-growing construction sector. For that reason, it is our expectation that cost-oriented improvements are to be made so that usage of this fine product, which accelerates the construction process wherever it is applied, becomes prevalent.





The first geofoam roadway applications in Turkey have gotten full marks from the experts

The first geofoam roadway applications of Turkey were inspected on a technical site visit hosted by EPSDER and Austrotherm between 22nd and 23rd of November 2017. Approximately 50 participants composed of transportation officials, academicians and engineers visited the Lightweight Backfill Behind the Retaining Wall Project completed in Kayaşehir and the Highway Lightweight Embankment Project constructed for İstanbul Motorway in the direction

of Uzunçayır-Harem exit. Both projects got full marks from the experts.

The participants also had the chance to observe the production lines and inspect the quality of geofoam products in our Austrotherm Dilovasi Factory. They also were briefed on the benefits of geofoam applications in the technical presentations conducted at the plant.



EPS manufacturers came together

Diamond Collective Partners Meeting was held with the participation of high-level representatives of the EPS industry. EPS manufacturers from all around Turkey came together

at the meeting organized under the guidance of Austrotherm. The keynote speech was given by Austrotherm Turkey CEO Özgür Kaan Alioğlu at Limak Eurasia Luxury Hotel. Okan University Civil Engineering Department Head Associ-



ate Professor Dr. A. Tolga Özer made a presentation titled Austrotherm geoBLOCK® Applications in Highway and Bridge Approach Embankment Constructions. Austrotherm Turkey Civil Engineering Applications Representative Dr. Emre Akinay gave information regarding Austrotherm geoBLOCK®. With this event, the participants had the opportunity to closely examine the geofoam applications.



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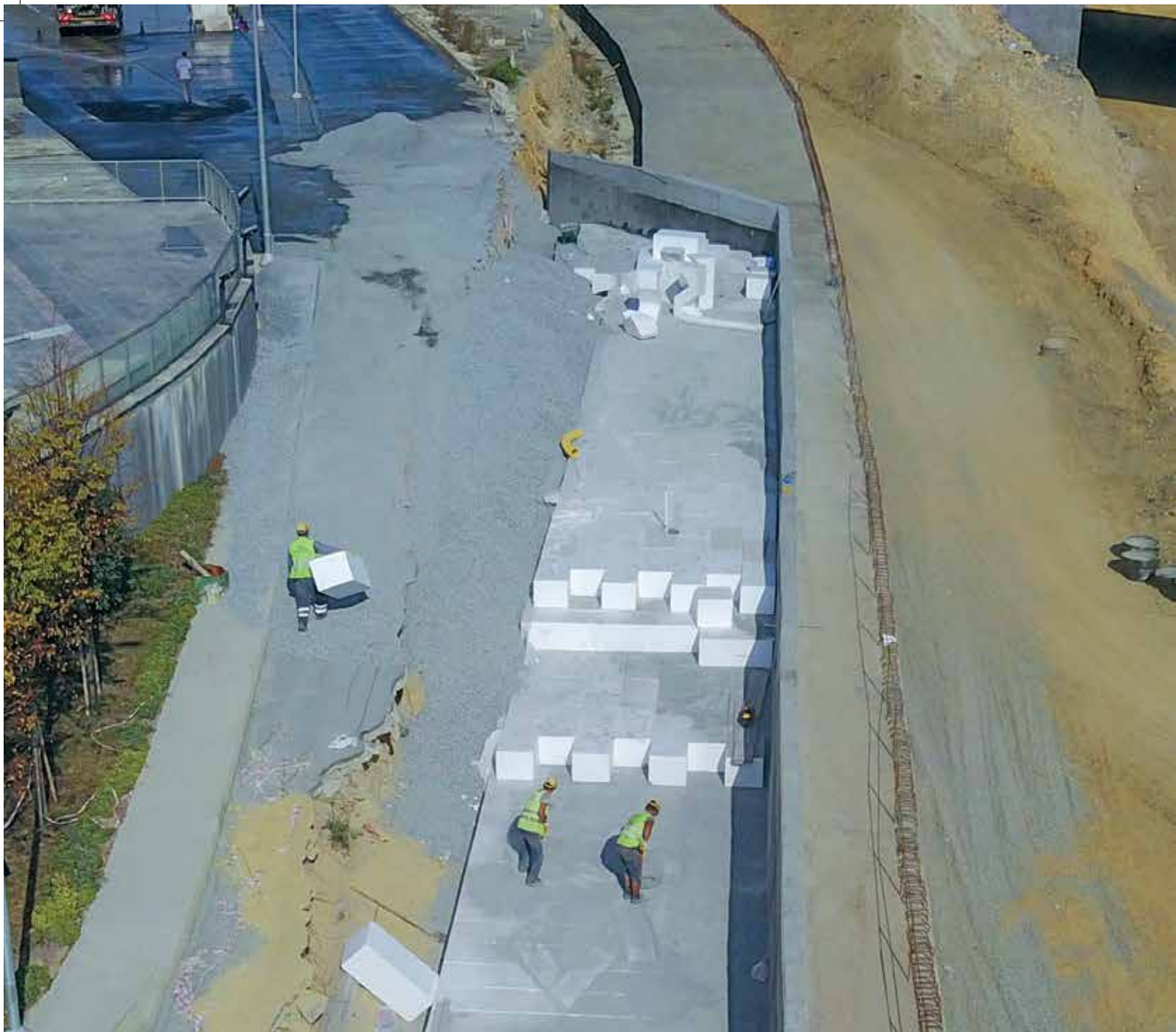
“dış cephenizin yeni modası”

Yarı sinüs formulu, gizli vidalı cephe panelimiz ile binalarınıza teknik ve estetik çözümler sunuyoruz.



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IBN HALDUN UNIVERSITY, KAYAŞEHİR, İSTANBUL

LIGHTWEIGHT BACKFILL BEHIND THE RETAINING WALL

Lightweight
backfill behind the
retaining wall:

A case study



A roadway embankment was built using Austrotherm geoBLOCKs® above the capping beam of a double-row drilled shafts which had been constructed for a deep excavation within the scope of viaduct and underpass works for the Yavuz Sultan Selim Bridge connection roads in Kayaşehir, İstanbul.

The main contractor, İstanbul Ust Yapı Inc., was decided to build an approximately 3-meter high approach embankment, above the capping beam of the drilled shafts after the completion of the construction. By selecting Austrotherm geoBLOCKs® to construct the embankment instead of traditional compacted earth fill, transfer of additional vertical stresses, which had not been initially considered for the original design of the drilled shafts, was prevented. By using the geoBLOCK® technology, the additional stress that potentially affect the performance of the drilled shafts were reduced by approximately 100 times allowing for the drilled shafts to perform under the designed service loads. In addition to significantly reducing the vertical stress acting on the piles, the geoBLOCK® engineering solution composed the backfill of the retaining structure as well. It also served to reduce the horizontal stress acting on the retaining wall to negligible levels. This application is the first known retaining wall backfill project in our country that was constructed by using geoBLOCKs®.

Civil Engineering Applications Department of Austrotherm provided field technical support

Within the scope of the project, a 100 meter long and 4.4 meter wide approach ramp that elevates up to 3 meters was constructed using a total of 500 m³ geoBLOCKs® that are 0.6 m x 1.25 m x 0.5 m and 0.6 m x 0.65 m x 0.5 m in dimensions and 20 kg/m³ in density. In order to distribute the motor vehicles' axle load

Project Highlights

Application: Road embankment, backfill of the retaining wall
Employer: İstanbul Ust Yapı Inc.
Roadway length: 100 m
Roadway width: 4.4 m
Material used: Austrotherm geoBLOCK®
Density: 20 kg/m³ (CS1 = 40 kPa, ASTM D6817)
Dimensions: 0.6 m x 1.25 m x 0.5 m and 0.6 m x 0.65 m x 0.5 m
Embankment height: 0 -3 m

uniformly on the surface of the geoBLOCK® approach embankment, a reinforced concrete load distribution slab with a minimum thickness of 20 cm was built on the geofoam embankment. The superstructure was completed by laying a 7 cm asphalt wearing surface on top of the reinforced concrete load distribution slab. Austrotherm Turkey Civil Engineering Applications Department has become a solution partner in this project not only by providing design support (geoBLOCK® density, dimensions and block layout plan) but also field technical support during the block installations.

Austrotherm Turkey Civil Engineering Applications Department installed a performance monitoring station at a section where the geoBLOCK® road embankment is 2 meters high and implemented an extensive instrumentation monitoring program. Within the scope of the instrumentation program, (1) one VW total pressure cell to measure the lateral stress acting on the retaining wall, (2) one VW total pressure cell to measure the vertical stress at the bottom of the geoBLOCK® road embankment, and (3) one magnet settlement plate to observe the cumulative deformation of the geofoam road embankment under the service loads were installed. First readings were collected immediately following the installation of each instrumentation equipment. Once the roadway is open to traffic the readings will be collected and evaluated on a monthly period.

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LIGHTWEIGHT BACKFILL BEHIND THE RETAINING WALL

Its longevity and ease of installation during construction are huge advantages



BARIŞ KOÇ
Purchasing Director
At Istanbul Ust
Yapı Construction
And Trade Inc.



would directly affect the performance of the application. Austrotherm Turkey Civil Engineering Applications Representative Dr. Emre Akınay has supervised the application all the way from the beginning till the end and ensured that the project was executed successfully by providing field technical support for the field construction crew. The Austrotherm Turkey Civil Engineering Applications Department has carried out an extensive instrumentation program following our approval. We strongly believe that the data that will be collected here will shed light on the development of the lightweight fill technology in Turkey.

The Austrotherm geoBLOCK® has gotten full marks from us for enabling an easy and fast construction during this application.

What made you prefer a lightweight backfill material for the application? How were you informed about the Austrotherm geoBLOCK® that you used in the project?

We preferred to use the lightweight fill technology in order to reduce the vertical surcharge that would act on the drilled shafts located in the area of application. In addition to being lightweight, its high compressive strength, longevity and economy on the project completion time with the ease of handling during the block

placement motivated us to prefer the Austrotherm geoBLOCK® solution. We heard about the Austrotherm geoBLOCK® solution through social media, which is today's reality, as well as the printed and visual media.

We were aware that the Austrotherm geoBLOCK® application enabled an easy and fast construction. In addition, we also knew that there were details to be taken into consideration during the construction phase which

What would you like to say about this innovative solution?

The Austrotherm geoBLOCK® has gotten full marks from us for reducing the design loads and enabling an easy and fast construction during this application.

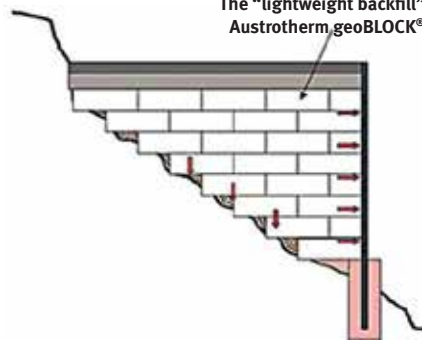


DID YOU KNOW THAT

The lateral earth pressures acting on a retaining structure can be reduced to zero by the Austrotherm geoBLOCK® application.

In traditional application, a retaining structure is built in order to prevent the lateral movement of the backfill prior to constructing earth fill on the naturally stable or mechanically stabilized soil slopes. The cross-section of this retaining structure is designed to resist forces to be transmitted by the traditional compacted earth backfill.

The EPS density is approximately 1% of the compacted earth fill density. Consequently, the lateral stresses acting on a retaining structure due to backfill constructed by utilizing Austrotherm geoBLOCKs® are at negligible levels in comparison to that of traditional earth fill. Concurrently, since the Poisson's Ratio of EPS is too low (less than or equal to 0.1), the lateral forces acting on the retaining structure



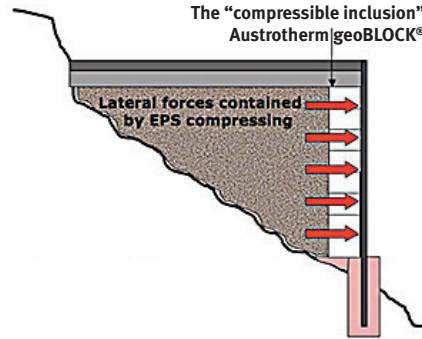
applied by the geofoam block backfill will be at negligible levels. You may ask, "Then why would we construct retaining structures to construct road embankments that are to be built at or near the toe of stable slopes?" That is correct. You won't need to construct a retaining wall in such applications. On the other hand, a cover system on the vertical face of the backfill to isolate the Austrotherm geoBLOCK® embankment from the external environment and prevent it from being exposed to UV lights is needed.



DID YOU KNOW THAT

The lateral earth pressures acting on a retaining structure can be significantly reduced by the "compressible Austrotherm geoBLOCK®" application.

In this application technique, low-density ($\rho = 10 - 15 \text{ kg/m}^3$) Austrotherm geoBLOCKs® are placed between the retaining structure and the earth backfill. Low-density Austrotherm geoBLOCK® is a "compressible material" and Austrotherm geoBLOCKs® placed behind the retaining structure are expected to be compressed by lateral pressure imposed by earth backfill. Such a compression results in lateral movement within the earth backfill and consequently, the lateral stresses decrease by transitioning from at rest to active state. This decrease depends on the amount of movement,



in other words, on the density and thickness of Austrotherm geoBLOCKs®.

This compressible inclusion technique allows for significant savings in the total cost of reinforced concrete retaining wall when the existing soil slope is not stable and construction of a retaining structure in order to prevent lateral movement is needed.

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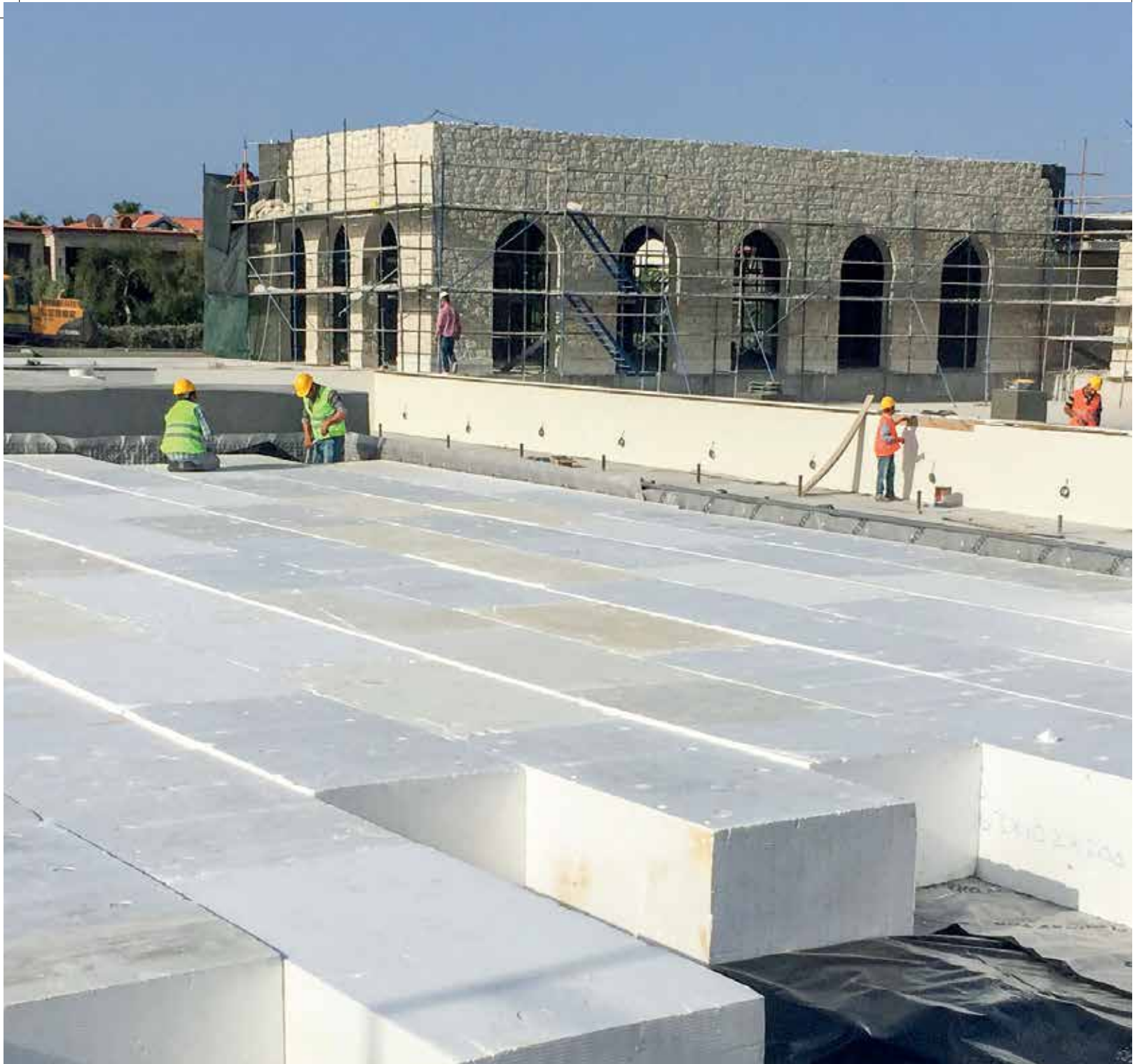
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BIBLOS RESORT HOTEL, İZMİR

WALKWAY, FLAT ROOF, LANDSCAPE LIGHTWEIGHT FILL APPLICATION

The very first lightweight fill application in Turkey



Fast and economical solutions were obtained by utilization of Austrotherm geoBLOCKS® for many applications at the Alaçatı Biblos Hotel Resort & SPA being built in İzmir-Cesme.

In this project, 2000 m³ of Austrotherm geoBLOCKS®, 20 kg/m³ in density, were used in many applications such as reducing the design loads on the rooftop of the SPA center, construction of walkway aisles connecting to the main patio as well as arrangement of many vegetated areas and landscapes.

Design loads reduced by 100 times

With the utilization of Austrotherm geoBLOCKS® for raising the rooftop elevation of the under ground SPA structure, the design loads were reduced by almost 100 times. Therefore, a much safer design was obtained in terms of the load-bearing capacity of the structural frame of SPA.

Utilization of Austrotherm geoBLOCKS® in the arrangement of green areas and landscapes also allowed for an easier and faster construction. The Austrotherm geoBLOCKS® custom-produced with special cutting process were easily applied around curvilinear forms such as pools, tree pots, etc. Raising of the elevation, formation of hills and construction of walkway aisles connecting to the main patio were completed in a much shorter time when compared to that of traditional methods (earth fill, concrete fill).

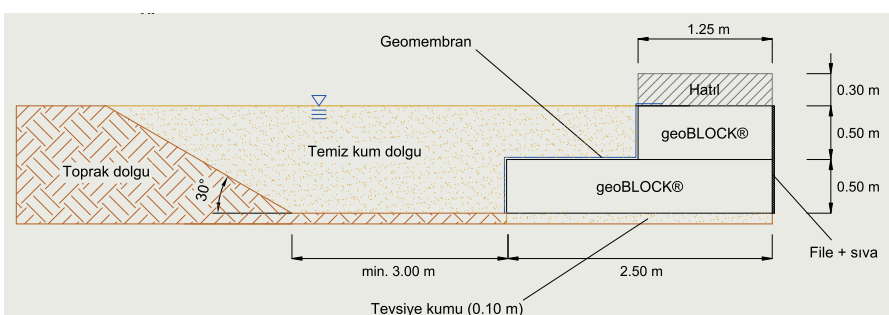
No need for a retaining structure

Utilization of Austrotherm geoBLOCKS® also enabled construction of a 150-meter long

Project Highlights

Application: Lightweight backfill for green areas and landscapes, raising the rooftop elevation of existing underground SPA structure, reduction in the service loads
Material used: Austrotherm geoBLOCK®
Density: 18 kg/m³ and 20 kg/m³
Dimensions: 1.03 m x 2.5 m x 0.63 m, 1.03 m x 2 m x 0.63 m and 1.03 m x 1.25 m x 0.63 m
Embankment height: Miscellaneous dimensions with on-site cutting process

and 1-meter high garden embankment without the prerequisite for a retaining structure. According to the block layout plan designed as per the “overburden pressure concept” prepared by (Ozer vd. 2014), a stepped backfill was built, in the first place, on the border of the garden using Austrotherm geoBLOCKS®. Prior to the construction of the backfill, a reinforced concrete capping beam was built that will serve as a walkway and to create a platform for assembling garden railing. After applying geomembrane on the backfill side for protection against solvents and petroleum-based fluids, the backfill was compacted in lifts. This application ensured an increase in the safety factor against the horizontal sliding through the vertical stress acting on the portion of Austrotherm geoBLOCKS® that fall within the slope.



5TH INTERNATIONAL CONFERENCE ON THE USE OF EPS GEOFOAM BLOCKS IN CONSTRUCTION APPLICATIONS

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WALKWAY, ON THE ROOFTOP, LANDSCAPE LIGHTWEIGHT FILL APPLICATION

The right choice in the lightweight fill application



NESLIHAN ÜK
HDS Engineering,
Construction
and Consultancy
General Manager



It is obvious that we have made the right decision by reposing our confidence in this solution for such a challenging project. The fact that we utilize it in other projects indicates that it has already earned our trust.

Could you please tell us about your company?

Founded in 2014, HDS Engineering is specialized in supplying of geosynthetic materials, engineering, consultancy and contracting. HDS Engineering is driven to provide its customers with reliable and smooth services utilizing state of the art technological products and modern engineering solutions with its specialized administrative and technical staff. Committed to team spirit and working devotedly, our employees are the foundation of our quality of services. Our meticulous work and services warrant the sustainability of our quality.

What made you prefer a lightweight backfill material for the application?

The fact that it allows for an extremely fast construction process due to its high installation speed and its well proven track record in terms of engineering motivated us to prefer the Austrotherm geoBLOCK® solution. In addition, the significant decrease in labor time, the decrease in indirect costs that derive from waiting for settlement to complete and the reduction in the amount of traditional backfill material are other important factors that made us decide to use this material instead of other alternatives.

Could you elaborate on the advantages of the field technical support provided by Austrotherm during the application phase?

Austrotherm was at the construction site throughout the application providing technical support when necessary. The precision in transportation of the products was another important contribution.

What would you like to say about this innovative solution?

It is obvious that we have made the right decision by reposing our confidence in this solution for such a challenging project. The fact that we utilize it in other projects indicates that it has already earned our trust. We will continue to include this solution in our upcoming projects.





Austrotherm is the official sponsor of the 7th National Geotechnical Symposium with International Participation

Austrotherm Turkey was among the official sponsors of the International Geotechnical Symposium held for the seventh time this year.

The event took place between 22-24 November 2017 in İstanbul Technical University and the delegates were included prominent geotechnical engineers, academicians and professionals from the public and private sectors. The design details of the very first roadway embankment built in Turkey utilizing Austrotherm geoBLOCKs® and evaluations of field measurements from the monitoring program were presented in the conference and it was well received by the delegates. Professionals interested in the Austrotherm geoBLOCK® technology were briefed at numerous meetings that took place at the Austrotherm Turkey booth.



Online seminar series Austrotalk has drawn huge interest

Austrotherm Turkey's new medium of communication, the live webinar AustroTalk series has started. The title of the first series of online seminars which drew huge interest were: The Perfect Engineering Solution, Austrotherm geoBLOCK® Applications and Economical and Time Saving Solution for Highway Construction, EPS Block Applications.

AustroTalk series were continued with CE Reporting and Certification in EPS Thermal Insulation Products seminar. AustroTalk has been put into practice with the objective of promoting Austrotherm products and to inform the public about important topics such as thermal



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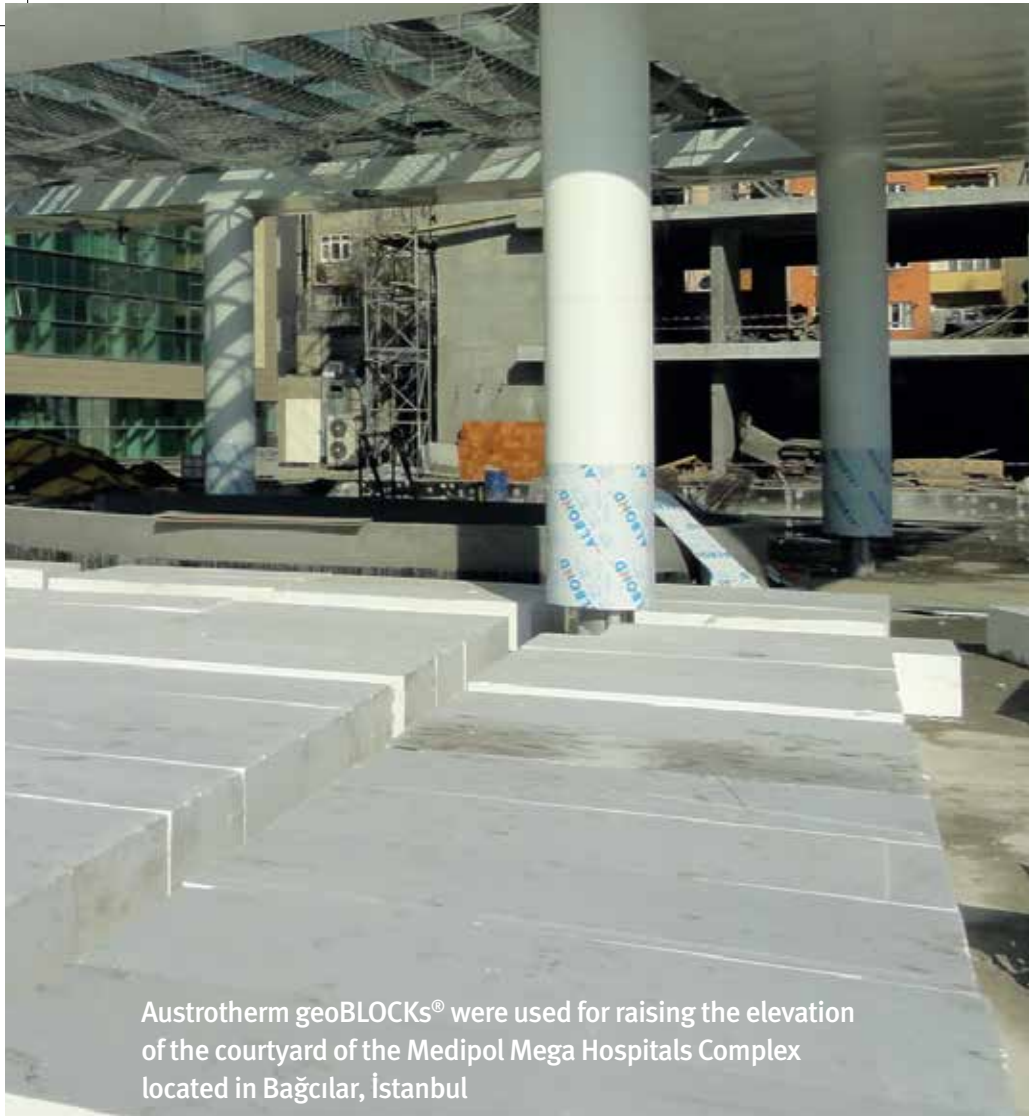
MEDIPOL HOSPITAL, BAĞCILAR-İSTANBUL

LIGHTWEIGHT BACKFILL APPLICATION ON THE ROOFTOP OF UNDERGROUND PARKING STRUCTURE

in lightweight
backfill on
the rooftop of
parking structure

A first





Austrotherm geoBLOCKs® were used for raising the elevation of the courtyard of the Medipol Mega Hospitals Complex located in Bağcılar, İstanbul

Applied on the rooftop of the underground parking structure, this application is known to be the first EPS Block application recorded in Turkey.

Innovative lightweight fill technology was utilized

After the construction of the car park was completed, it was decided to build a courtyard on the rooftop of the car park structure so as to create an entrance to the hospital without stairs. This required alignment of elevations of the rooftop of parking structure and entrance of the hospital. The decision to eliminate the elevation difference at a later phase (after the construction of the reinforced concrete frame of parking structure was completed) meant that the backfill load had not been included and calculated in the project design phase. Therefore, it was obvious that elimination of the elevation difference using traditional fill materials would put the safety of the reinforced concrete frame at risk because of the additional loads which were not considered during the original design phase. The decision makers were faced with two alternatives. The first one was to reinforce the existing structure to secure a safer structure against the additional loads. The second alternative was elimination of the elevation difference by utilizing the innovative lightweight fill technology instead of traditional

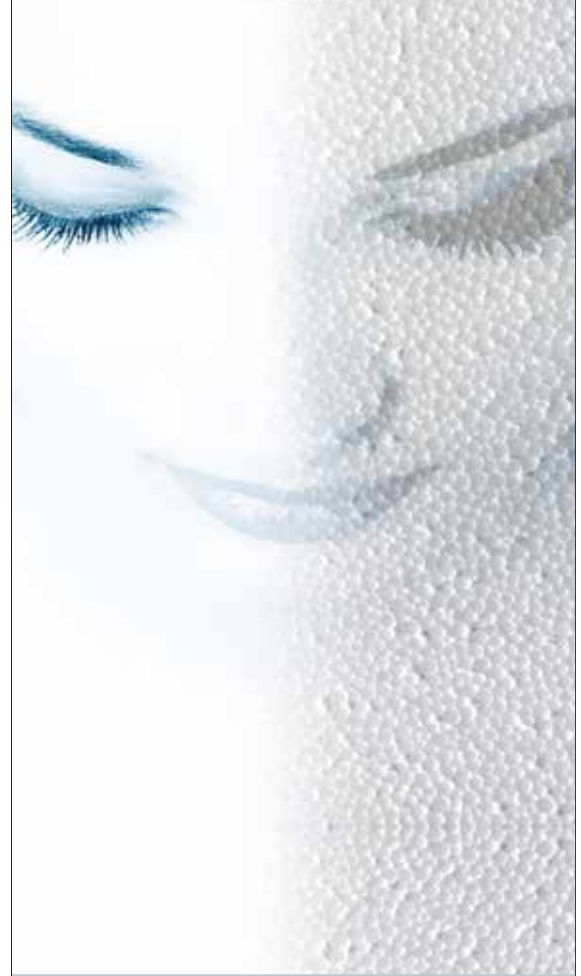
fill materials without the need for structural rehabilitation.

The safety of the reinforced concrete frame was enhanced with the Austrotherm geoBLOCK® solution

The Austrotherm geoBLOCK® solution was preferred in order to eliminate the additional stress increase on the existing parking structure if traditional fill materials were selected. The elevation difference was filled by utilizing approximately 1700 Austrotherm geoBLOCKs®, 20-22 kg/m³ in density. If the application has been completed using traditional fill materials, the rehabilitation of the structural frame would have resulted in additional costs and a significant delay in construction completion time. By utilizing the Austrotherm geoBLOCK® solution, both the structural safety of the structural frame was satisfied and the construction was completed in a very short period time.

Following the completion of the Austrotherm geoBLOCK® application, elevation was measured on 6 different sections of the courtyard for a period of 3 years. At the end of the third year, the maximum amount of settlement measured on the courtyard was only 6 mm. The courtyard has been performing under the service loads of about 3500 vehicles per day for the last 5 years.

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MEDIPOL HOSPITAL, BAĞCILAR-İSTANBUL LIGHTWEIGHT BACKFILL APPLICATION ON THE ROOFTOP OF PARKING STRUCTUR

No indications of damages arising from cracking or settlement



HASAN ALI YAZICIOĞLU
Medipol Education and Health Services Inc. Civil Engineer, M.Sc., Construction Coordinator



The Geofoam blocks ensured completion of the project without delay with the ease of field application and acceleration of construction.

Could you please tell us about your company?

Incorporating four hospitals, the Medipol Mega Hospitals Complex located in Bağcılar, İstanbul is the first private health complex in Turkey. With its General, Cardiovascular Surgery, Oncology and Dental hospitals, the Medipol Mega Hospitals Complex is the hospital with the highest number of specialties. It has a 500-bed patient capacity with 100,000 m2 indoor area.

What made you prefer a lightweight backfill material for the application?

After the completion of the reinforced concrete frame of the hospital underground car park, it was decided to fill the reinforced con-

crete slab, which was initially designed by calculating vehicle loads for the live load and pavement loads for the dead load, in varying heights (0.30 and 1.5 m) for the main entrance courtyard. The best solution at that point was to use the most lightweight material available and thus not impose any additional stresses on the structure other than the initial design loads.

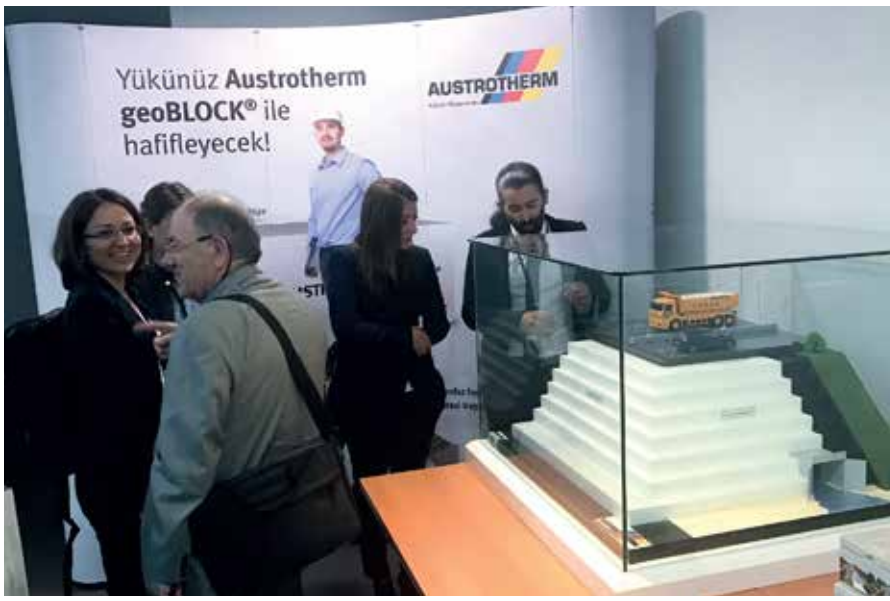
How were you informed about the Austrotherm geoBLOCK® that you used in the project?

We heard about this application through online research. And we reviewed examples from abroad where it was used for highway embankment.

What would you like to say about this innovative solution?

In addition to its lightweight backfill quality, the geofoam application for the multi-functional flat roof above the existing car park has prevented potential structural rehabilitation that would occur from using traditional fill materials. The Geofoam blocks ensured completion of the project without delay with the ease of field application and acceleration of construction. The post-construction survey measurements taken as of the time the flat roof was opened to traffic reveal that a settlement of 0.44%-0.48%, which is smaller than the upper limit of 1% elastic limit strain for the geofoam blocks. No indications of damages on the driveway or the sidewalks arising from cracking or settlement have been found since the opening of the flat roof to service.





Austrotherm is the main sponsor of the 7th National Geosynthetics Conference

Austrotherm was among the main sponsors of the 7th National Geosynthetics Conference organized by the Turkish Chapter of International Geosynthetics Society.

The conference was held at the Bogazici University on 11-12 May 2017 brought together the manufacturers, practitioners and scientists working in the field of geosynthetics - consisting of geotextiles, geogrids, geomembranes and geocomposites – who shared their knowledge and experience while discussing problems encountered and alternative solutions.

The construction details of the very first roadway embankment built in Turkey utilizing Austrotherm geoBLOCKs® were presented to the delegates of the conference. Professionals interested in the Austrotherm geoBLOCK® technology were briefed at numerous meetings that took place at the Austrotherm Turkey's booth.

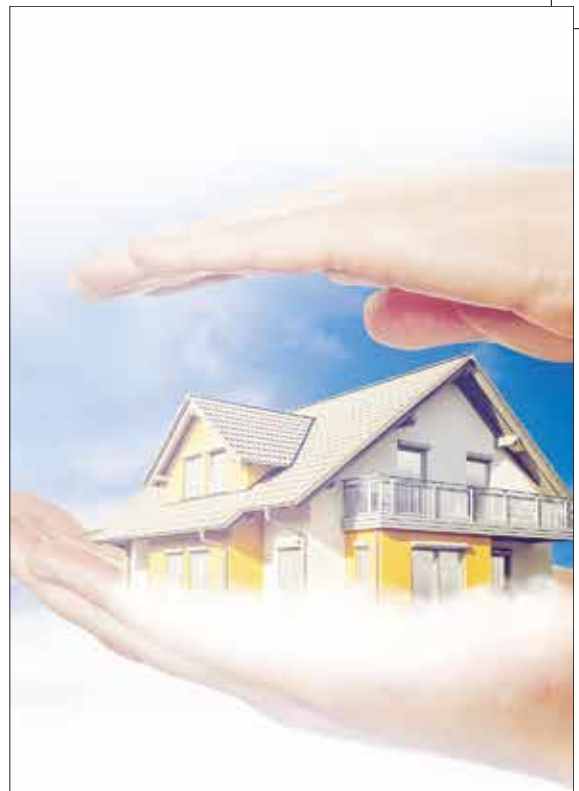
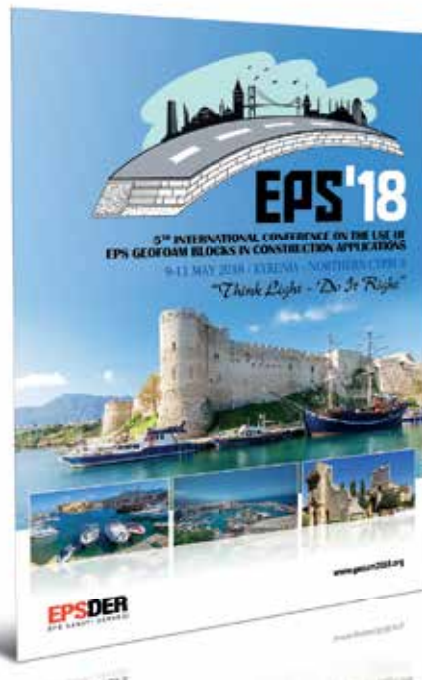
Austrotherm is the main sponsor of the biggest meeting of the EPS sector

5th International Conference on Geofoam Blocks in Construction Applications (EPS'18) will be held on 9-11 May 2018 in Northern Cyprus under the sponsorship of Austrotherm Turkey.

Geofoam researchers, consultants, molders, contractors and practitioners from all around the world will be meeting in Kyrenia to discuss the recent developments and future trends of the expanded polystyrene (EPS) block geofoam technology and its construction applications. EPS'18 will continue to contribute to the development of the geofoam applications after successful Oslo (1985, 2011), Tokyo (1996) and Salt Lake City (2001) conferences.

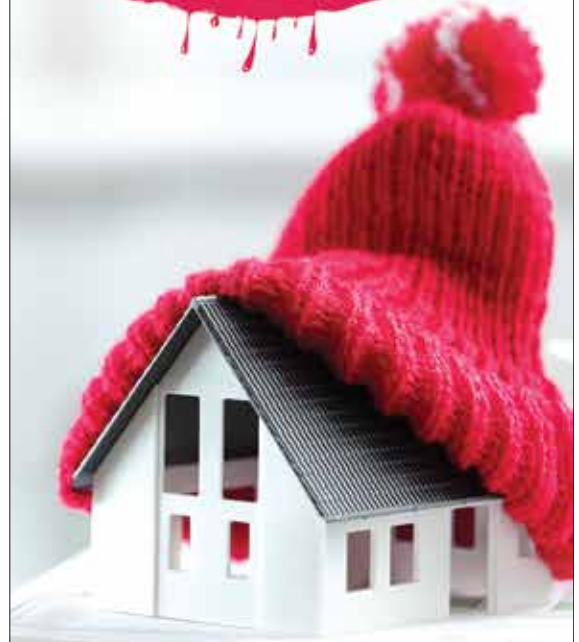
The conference program will be a combination of technical papers and group discussions regarding the use, new development and implementation of geofoam technology. The conference theme will cover the present use of geofoam, design specifications, applications, new concepts, material properties, modeling and special topics of geofoam blocks in construction applications. We highly recommend that you register at the conference where Dr. Emre Akinay will make a presentation on the product line which became popular and start-

ed to be included in tender specifications right after its first utilization in Turkey in 2017. Please visit <http://geofoam2018.org/en/> for detailed information.



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BAHARİYE STATION AT THE İKİTELLİ-ATAKÖY SUBWAY, İSTANBUL

LIGHTWEIGHT FILL APPLICATION IN BETWEEN WALER BEAMS OF DRILLED SHAFTS



Austrotherm geoBLOCK® preferred for the İstanbul metro construction

Ever offering innovative and lightweight solutions for road constructions, Austrotherm geoBLOCK® is now lightening the load in metro constructions. The low-density Austrotherm geoBLOCKs® were preferred for filling the spaces in between the waler beams within the scope of the Ataköy-İkitelli Metro Line/Bahariye Station construction project contracted by İstanbul Ulaşım Inc.

In the project carried out by Aga Energy, an affiliation of Bayburt Group Inc., approximately

1200 m³ Austrotherm geoBLOCKs®, 10 kg/m³ in density, were used to fill the space between the temporary waler beams and generate a flat surface for insulation application prior to waterproofing. The Austrotherm geoBLOCK® solution ensured a fast and easy installation in this project.

The Aga Energy executives stated that they have chosen the Austrotherm geoBLOCK® solution for its ease of construction and economy on the project construction time.

Project Highlights

Application: Lightweight fill between waler beams, creating a flat surface for waterproofing application

Material used: Austrotherm geoBLOCK®

Density: 10 kg/m³

Dimensions: 0.4 m x 1 m x 0.2 m





The Austrotherm booth has drawn huge interest

The 2nd Highways, Bridges and Tunnels Special Fair held on 24-26 May 2017 at Ankara Congressium brought together professionals from the public and private sector. Austrotherm Turkey attended the fair to create awareness of EPS block utilization for the construction of highways and to promote the Austrotherm geoBLOCK® launched as an engineering solution for such projects.

The knowledge and experience accumulated from the Austrotherm geoBLOCK® applications in Turkey and around the world were shared with visitors at the 56 m² Austrotherm Turkey stand located next to the contractors' lodge. The stand was visited by officials from the General Directorate of Highways, Regional Directorates of Highways, other public enterprises and executives from the leading construction companies such as ASTALDI, İÇTAŞ, MKC OR-

TAKLIĞI, YÜKSEL PROJE, TEMELSU and SARGIN which are engaged in construction of mega structures like highways, bridges and tunnels. Professionals from the public and private sector and academicians were given a presentation by Austrotherm Turkey Civil Engineering Applications Representative Dr. Emre Akinay where Austrotherm Turkey's knowhow and experience in EPS block utilization for the construction of highways were presented. The details of the Austrotherm geoBLOCK® design for a bridge approach ramp to be constructed on poor bearing soil conditions located within the jurisdiction of the 6th Regional Directorate of Highways were presented to and mutually consulted with the officials from the 6th Regional Directorate of Highway.

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The Development of Geof foam Technology in Turkey and Current Applications

Expanded polystyrene (EPS) block (geof foam block) is a geosynthetic product used in geotechnical applications (ASTM D4439). Lightweight geof foam blocks are manufactured in densities ranging from 11.2 kg/m³ (EPS12) and 45.7 kg/m³ (EPS46) and have a high strength to density ratio (ASTM D6817). Geof foam technology was first used by Norwegian Public Roads Administration (NPRA) in 1972 to construct a lightweight roadway embankment on highly compressible subsurface condition (Aabøe, 2011). The geof foam technology has proven itself in last 45 years for constructing highway embankments on soft soil sites since the first geof foam application in Norway.

Nowadays, geof foam technology is implemented by many different European countries such as; Norway, Holland, Germany, France, England, Greece, Czech Republic, Serbia, Poland, Sweden, Ireland and Finland. In addition, geof foam technology is preferred to construct highway embankments and bridge approach embankments construction over soft soil sites in United States of America and Japan. Furthermore, it is known that the technology was implemented in Russia, China, South Korea and Taiwan. Upon following the wide spread use of geof foam applications, the infrastructure of the technology was supported by the design and construction specifications (NRL, 1995; Stark vd., 2004; EUMEPS, 2014).

Geof foam technology awareness and educational activities in Turkey was initiated in 2009

Regardless of the long-proven track record of the technology around the world, the first geof foam technology awareness and educational activities in Turkey was initiated by the Turkish EPS Industry Association (EPSDER) in 2009. Civil Engineering Applications of geof foam blocks were introduced to design offices, consulting engineers, department of transportation representatives and civil engineering societies via seminars and meetings. As a part of these activities, EPSDER delegation has attended two-day Master Class “EPS in Civil Engineering Applications” organized by European Manufacturers of Expanded Polystyrene (EUMEPS) in Amsterdam on November 2010. In addition, EPSDER delegation has also attended “4th International Conference on Geof foam Blocks in Construction Applications – EPS 2011” in Lillestrøm, Norway on June 2011.



Following this technology awareness and educational activities, the first known geof foam application of Turkey has been realized in the construction of Medipol Mega Hospital Complex, Bağcılar, Istanbul, in 2012 (Aliyazıcıoğlu and Özer, 2015; 2016, Aliyazıcıoğlu, 2016). In this project, geof foam blocks were used to create 0.6 to 1.5 m thick lightweight fill to create a flat roof on the rooftop of existing underground parking structure without imposing significant stress increase to the structural frame. Flat roof constructed using geof foam blocks were not only eliminate the elevation difference in between the entrance of the hospital block and rooftop of the parking structure, but also created a driveway for approximately 3500 daily car traffic for the patients and visitors. In addition, this flat roof was also designed as a green roof with the reflection pool and green areas (Aliyazıcıoğlu, 2016). Deformation measurements after three years of service under the traffic loading in the driveway portion of the geof foam flat roof indicated that the performance of the geof foam block fill is confirming the design (Aliyazıcıoğlu and Özer, 2016).

Two educational seminars, one in Ankara and another in Istanbul, were organized by EPSDER and Okan University Civil Engineering Depart-

ment with the contribution of Associate Professor Steven Bartlett with the University of Utah, Department of Civil Engineering. In these seminars, Dr. Bartlett has shared his geof foam experience from the reconstruction of I-15 highway project which was constructed over highly compressible soft soil site.

EPSDER has awarded the organization of the 5th International Geof foam Conference (The 5th International Conference on Geof foam Blocks in Construction Applications, EPS 2018) in September 2014. EPS 2018, which will be held in The Turkish Republic of North Cyprus in 9-11 May 2018, will create a technology discussion platform about the current situation of the geof foam technology for both national and international delegates (<http://www.geof foam2018.org>).

Geof foam blocks were used as lightweight fills in various projects such as; elevation raise in slabs of various structures, flat roofs and green roofs in Turkey in between 2014 and 2017. Upon the initiation of these flat roof applications in Turkey, EPS delegation has attended two day Master Class “Application of EPS in Flat Roofs” in Czech Republic on September 2015.

Austrotherm Turkey has established “Civil Engineering Applications Department” in 2016 to execute geof foam applications under the cooperate structure, to oversee every step of geof foam applications; from the design to field application, from block molding to quality control, and to develop the geof foam technology in our country with a systematic approach.





2017 was a milestone for geofam applications in Turkey

All of these education and technology awareness activities have panned out the first results and 2017 was a milestone for geofam applications in Turkey. First geofam roadway embankment of Turkey has opened to traffic in April 2017 (Özer et al., 2017; Özer and Akınay, 2017) and the first geofam retaining wall backfill application has been completed in November 2017.

First geofam roadway embankment of Turkey has been constructed as a part of a roadway designed to divert a portion of the traffic in the Harem direction of the Uzuncayir Exit of the Istanbul Motorway to the Acibadem district and Akasya Shopping Mall (Özer et al., 2017; Özer and Akınay, 2017). While geofam technology is traditionally used to construct highway embankments on the highly compressible soft soil sites, it is also a well proven technology for constructing the embankments on buried infrastructures. The first geofam roadway embankment of Turkey was constructed on buried infrastructure. Two 2.2 m diameter water mains are located approximately 3.8 to 5.6 m below the ground surface. Therefore, constructing the embankment with traditional compacted fill would potentially damage the water mains that could create a service loss. Possible structural damages to these buried infrastructures were prevented by selecting the geofam blocks to construct the embankment and project has completed without a service loss. An instrumentation program to monitor the performance of the embankment not only during the construction but also for the post construction period under service loads has been prepared. For this reason, an instrumentation array consisting of magnet settlement plates were installed in the geofam embankment and deformation readings were taken. The settlement occur at the end of construction was lower than the allowable elastic limit strain (1%) of the geofam embankment (Özer and Akınay, 2017). In addition, projected long term settlement value, estimated based on the last seven months settlement recordings since opening of the roadway to traffic, indicated the expected total settlement (post construction settlement plus long term creep deformation) will be below the allowable limit (2%) (Özer and Akınay, 2017).

The first retaining wall lightweight backfill application

Following this geofam roadway embankment project, the second geofam application of Turkey has been completed as a backfill behind a retaining wall constructed over capping beam of drilled shafts in Kayasehir, Istanbul. Upon completion of the drilled shaft construction as a part of deep excavation project, a 3 m high embankment on the capping beam of the drilled shafts needed to be constructed. In order to construct this embankment, which initially thought to be comprised of compacted traditional earth fill, the contractor constructed a retaining wall over the capping beam of drilled shafts. At this stage, the project design team indicated that the drilled shafts were designed against horizontal stresses therefore additional vertical stress increase due to the traditional earth fill will adversely affect the performance of drilled shafts since this vertical stress was not considered in the initial design.

Consequently, it was decided to use geofam blocks to construct the backfill. Field instrumentation was installed in this project which was completed in November 2017. A total of two total pressure cells, one of them was installed at the interface between geofam blocks and the retaining wall to monitor the horizontal stresses acting on the retaining wall and the other was installed in the basal sand layer to monitor the total stress on the bottom of the geofam backfill and a magnet settlement plate was installed at the interface between top of the geofam embankment and load distribution slab to monitor the total settlement of the geofam backfill. Similar to that of first geofam roadway embankment field performance, the settlement occur at the end of construction was lower than the allowable elastic limit strain (1%) of the geofam backfill.

Field instrumentation and monitoring program was implemented

In addition to these first field geofam applications, geofam research activities have also gained momentum in Turkey. These research activities can be listed as; the use of geofam blocks in slopes subjected to seepage flow (Akay et al., 2012; Akay et al., 2013; Özer et

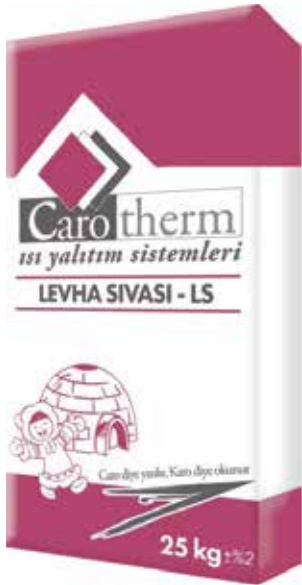
al., 2014; Akay et al., 2014; Koç, 2015; Akay, 2016; Özer and Akay, 2016), the determination of mechanical properties of EPS beads and sad mixtures (Edinçliler and Özer, 2014), interface shear strength properties of the interfaces within the geofam block embankments (Özer and Akay, 2014; Özer et al., 2015; Özer et al., 2016; Özer and Akay, 2016; Ateş, 2016; Usturbelli, 2017; Özer et al., 2017), use of geofam blocks in flat roof applications (Aliyazıcıoğlu and Özer, 2016; Aliyazıcıoğlu, 2016), the behavior of geofam embankment widening subjected to seepage (Özer, 2016) and the use of geofam blocks as compressible inclusion to prevent the structural damages of the buried pipelines (Akınay, 2017). In addition, in-situ instrumentation programs were implemented to monitor the performances of the first geofam applications in Turkey (Özer et al., 2017; Özer and Akınay, 2017). It is clearly seen that the many new research and development activities on the material behavior and innovative applications will be conducted as the application of the geofam become widespread technology in Turkey.

A new geotechnology has been introduced to toolboxes of our colleagues

The first geofam roadway of our country has been opened to traffic in 2017. In other words, a new geotechnology has been introduced to toolboxes of Civil and Geotechnical Engineers in Turkey. The adaptation of the technology in our country has been made and field performance of the mature geofam technology has been observed by the local Civil Engineering society. Geofam technology can be considered as an alternative to traditional methods not only in the construction of the roadway embankments on the buried infrastructure corridors and retaining wall back fill applications as in the case of first two applications in our country but also can be utilized in embankments and bridge approach ramps to be constructed on the highly compressible sites, embankment widening projects, airport and railway embankments. The know how gained from both construction and field monitoring data of the first examples of the geofam technology will shed a light on designing of geofam highway and bridge approach embankments will be constructed in Turkey.

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