

BUILD



A MAGAZINE FROM LECA

The US Embassy in London

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HEAVY RAINFALL AND STORM WATER

Tackling the impact of climate change is one of the greatest challenges for the world today. As major cities become more densely populated - a major urban challenge includes the increased risk of flash flooding from storm-water, placing excessive strain on existing sewage and drainage systems in cities throughout the world.

Here at Leca we invest our time and effort in research and innovation in how to tackle water management. This includes our research involving Green Roofs (See page 36-37), which is already a great alternative to expensive and complex water systems against flooding in the city, providing storm-water protection and a shield in the fight against surface water problems. One of the key advantages of using Leca for Green Roofs is that it provides an effective run off drainage system facility for rain water and reduces the likelihood of flooding.

As you will see in this issue of Build, we have many examples of Green Roof projects from Sweden, Finland, Poland and Norway. As well as offering practical and innovative solutions such as cooling down the surroundings, and reducing the energy required for cooling and warming buildings. Leca Green Roofs supplies aesthetic qualities, creating urban gardens, parks and natural green oases in concrete cities. We hope you enjoy the latest issue and enjoy the work we do.

Torben Dyrberg
Managing Director Leca International

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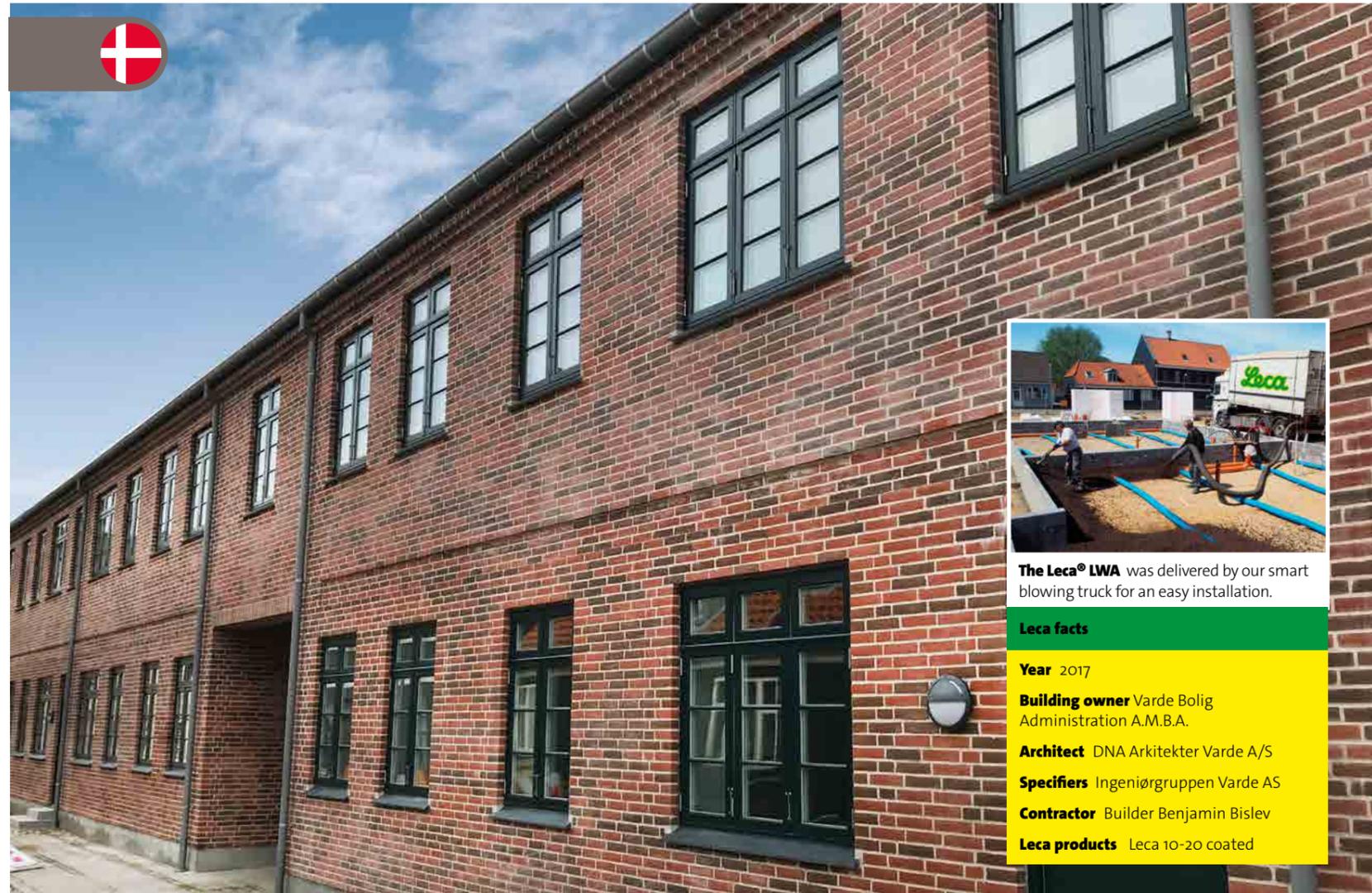
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VENTILATION DRAIN UNDER HOUSING ON CONTAMINATED SOIL

DENMARK A ventilation drain made of Leca® 10-20 coated was chosen as a mitigating measure for the construction of 12 social home-units on a contaminated site in Varde, Southern Jutland.

Text: Allan Dahl and Knud Mortensen
Photos: Ingeniørgruppen Varde AS



The Leca® LWA was delivered by our smart blowing truck for an easy installation.

Leca facts

- Year** 2017
- Building owner** Varde Bolig Administration A.M.B.A.
- Architect** DNA Arkitekter Varde A/S
- Specifiers** Ingeniørgruppen Varde AS
- Contractor** Builder Benjamin Bislev
- Leca products** Leca 10-20 coated

The finished construction - 12 social home-units in red/brown bricks.

Storegade 44-46 previously housed a dry cleaner. During the demolition, a screening showed that the soil was partially contaminated. A plan for the removal of the soil and the drainage of the remaining harmful fumes was a necessity before the new construction could take place.

One possible solution was to replace all the contaminated soil but since this would have been a comprehensive process, the simplest solution was to install an airtight membrane and a ventilation drain made of Leca lightweight aggregate 10-20 coated.

Removal by means of passive ventilation

The building owner, the Varde Bolig Administration, initially sought permission from Varde Municipality to change the land use in a mapped area according to the Danish soil contamination law. Permission was granted in 2017 and the construction of 12 new home-units designed by DNA Arkitekter Varde A/S began on the site.

The specifier on the project, Ingeniørgruppen Varde AS, in co-operation with DGE Miljø- og Ingeniørfirma Vejen have tried to find the best possible solution to the problem.

When selecting Leca lightweight aggregate as a ventilation drain, Thomas Hansen from Ingeniørgruppen Varde AS explains: "We have previously used Leca in projects both under buildings and as lightweight filling but this is our first experience with a Leca layer as a ventilation drain." Through the previous experience of using Leca lightweight aggregate and the properties of the material, Ingeniørgruppen Varde AS was open to testing whether the harmful fumes from subsoil could be removed by means of passive ventilation between the Leca grains.

Therefore, an inlet for the polluted air in the Leca ventilation layer and an outlet leading above the roof were installed. In addition to its drainage properties, Leca 10-20 coated contributes to the functional design by being an insulation material and a capillary-breaking layer and by meeting the DS 430 requirements for side support/surround filling of plastic sewage and drainage pipes.

Testing of ventilation drain over the next two years

Specific measurement points were laid out in the layer of Leca lightweight aggregate under the building in order to assess the effectiveness of the passive ventilation. The plan is for DGE Miljø- og Ingeniørfirma to make this check every three months over the next two years. The ventilation system has also been prepared for future mechanical ventilation, in case the passive ventilation proves inadequate.

However, Ingeniørgruppen Varde AS's faith in the system is so strong that the next building project also incorporates a ventilation drain based system utilising Leca lightweight aggregate with the design in Varde. – It is really exciting, Thomas Hansen concludes.



A LIGHT AND SOLID FOUNDATION FOR OBS BYGG MJØNDALEN



Tormod Hem and Skanska managed this ambitious project but could barely escape the spring flooding.

NORWAY – We needed a compensated foundation, explains project manager Tormod Hem. When Skanska began the initial planning of a new commercial outlet for Coop Norge Eiendom, they discovered that the current ground conditions could not withstand the significant load from the proposed new building development.

Weight reduction

– The project required a system to relieve the terrain. We excavated and replaced the existing load with a much lighter load mass to create reduced weight that corresponded to the weight of the building, explains Hem.

Skanska considered using an alternative material for this project.

– We concluded that the volumes required for this project would be substantial and we required a material that could be handled easily and in bulk. Leca LWA was both the best option and the most cost effective.

Coop has big plans for its chain of commercial outlets. In some stores existing structures will be redesigned, and elsewhere new buildings will begin to rise. The Drammen area will get its first shop in Mjøndalen.

Marius Vårdal Alvheim compresses Leca beneath what is going to be a huge commercial outlet for building supplies and materials in Mjøndalen.

7,500 square meters

– The building will be around 7,500 square meters. More than half of which will accommodate the drive-in store which sells wooden materials and larger things. The remainder will be a traditional store, says Tormod Hem. Skanska is the construction team responsible for this project and has stated that the project will cost approximately NOK 100 million to complete.

Kongsberg Entreprenør, who is the subcontractor for this project states that.

– Around 11,000 cubic meters of Leca LWA will be installed over two rounds, explains Hem.

Casting of foundation

Foundations will be cast on top of around 3,000 cubic meters of Leca LWA. When the foundations are cast, the building will be erected. Afterwards the floor will be overlaid with more Leca.

– We have to get into the building with a crane to mount it, which is

why we're doing it in that order. The crane can't stand directly on the Leca LWA, explains Tormod Hem.

Avoided flooding

This project isn't especially complicated, but like any other project there are some local challenges that need to be taken into consideration. Demolition work and excavation around an existing and fully operational building on the land meant that there was limited space. Furthermore, they had to prepare for flooding as the river Drammenelva began to rise in the spring.

– We have just experienced a winter with a lot of snow, and the area is prone to flooding. We were very concerned about whether the groundwater was going to rise to the point where it flooded the surrounding ditches. It doesn't require much water before the Leca floats, says the project leader. As the project progressed the concerns were unfounded and the winter just created a damp ditch at the bottom, but the construction site did not flood and the contingency plan was not required.



Leca facts

- Project** Obs Bygg in Mjøndalen
- Client** Coop Norge Eiendom through their own real estate company.
- Contractor:** Skanska
- Ground works and outdoor works:** Kongsberg Entreprenør.
- Leca products** Leca LWA 0-32 mm

HORIZONTAL CEILING SLABS IN THE HOTEL

POLAND Leca® KERAMZYT (LWA) was used to build the Nowa Holandia hotel. The main task of this lightweight aggregate was to balance the different ceiling slab levels above the ground floor.



Leca KERAMZYT was transported to the ceiling using a truck pump.



The Nowa Holandia hotel was built at the Family Amusement Park near Elbląg. The building was built to create comfort and relaxation for entire families who visit this place. One of the materials used at this building site was Leca KERAMZYT (LWA), which incorporated to equalise different ceiling slab levels above the ground floor.

Uniform level of floors thanks to Leca KERAMZYT

When designing the building, it is not always possible to obtain uniform floor levels above the ground floor. In order to provide the same level for all upper floor surfaces, and to avoid any additional steps or stairs, all surfaces

have been levelled using lightweight Leca KERAMZYT.

Levelling surfaces and hiding installations

Wooden support constructions of hotel rooms' partition walls were installed upon reinforced concrete ceiling slabs. In order for floor surfaces to be flat and even, Leca KERAMZYT layers were placed with different thicknesses on the entire area of the ceiling slab.

Most technical installations routed into hotel rooms, such as: water, sewage, and central heating systems, were laid inside the lightweight

expanded clay aggregate layer. Furthermore, the expanded clay aggregate at the ceiling slab significantly improved hotel rooms' acoustic isolation performance. This is especially important when there is a restaurant at the ground floor.

Fast and without any problems

Leca KERAMZYT was transported to the ceiling using a truck pump. As soon as the entire expanded clay aggregate was spread out, it was possible to start building the concrete groundwork for the floors immediately after that. Families can already enjoy a great holiday both in the Family Amusement Park and in the new hotel.

The Nowa Holandia hotel was built for the comfort and convenience of entire families visiting the Family Amusement Park.

Leca facts

Facility Leisure and services building

Location Nowe Pole near Elbląg, Poland

Investor REA GROUP sp. z o.o. from Elbląg

Contractor FILJAN Karol Mazur from Stara Kiszewa

Leca products Leca KERAMZYT 4-10 and 10-20

Volume of material used: 140 m³



Weather shelters are becoming a standard solution.

Hyvinkää's Arcturus will be completed at the turn of the year.



Leca facts

Developer YIT Rakennus Ltd

Architectural design
Aihio Arkkitehdit Ltd

Structural engineering Vahanen
Suunnittelupalvelut Ltd

Leca products Leca LWA 8–20 mm

INSTALLATION OF LECA® LIGHTWEIGHT AGGREGATE (LWA) ON A WEATHER SHELTERED ROOF



Construction Manager Kaisa Mäkitalo says that using a lifting box with a discharge pipe provided good results.

FINLAND *The Leca lifting box with a discharge pipe is the perfect solution for Leca LWA installation on sites requiring a weather shelter.*

Text: Dakota Lavento, Photographs: Dakota Lavento and Timo Kauppila/Indav Ltd

YIT Rakennus Ltd is constructing a residential block of seven buildings in the Hangonsilta area in Hyvinkää, Finland. The first building, Hyvinkään Aallotar, will be completed in the autumn of 2018, and the second building, Hyvinkään Arcturus, will be completed at the end of the year.

Two roofs, two solutions

The architecturally modern urban high-rise buildings contain an inward-sloping roof solution. The dual-layered roof of the Arcturus building has a hybrid thermal insulation structure: this contains 200mm of EPS board and, on average, a 500mm layer of Leca LWA; whereas the insulation structure of the roof of the Aallotar building only contains, on average, a 1,030-mm layer of Leca LWA.

Leca LWA under a weather shelter with a lifting box

In the case of both the Aallotar and Arcturus buildings, the roof construction work was carried out under a weather shelter. – We couldn't afford to take a risk in that respect, Construction Manager Kaisa Mäkitalo

from YIT Rakennus Ltd points out. The weather shelters provided a significant challenge for the installation of Leca LWA with a traditional lifting box. Controlling the box from the ground was arduous, and the practicalities of transporting this through the support structures without damaging the weather shelter was a significant concern.

– We have also tried using a lifting box that is narrower than usual and easier to get in by the support structure, but even that has not solved the controlling problem, says Jouko Partanen, Area Sales Manager from Leca Finland Ltd, who specialises in applying Leca LWA solutions for roof construction.

A simple yet functional method

This unique delivery method of a Leca lifting box with a discharge pipe has been used successfully in many successful projects for a year and has proven to be a simple and extremely functional method.

As the name suggests, the Leca lifting box with a discharge pipe con-

sists of a lifting box and 5–10-metre discharge pipe equipped with a closing mechanism. Through using this unique installation tool, only two people are required for the whole operation: one on the ground to control the box and one on the roof.

Kaisa Mäkitalo states that Aallotar was the first site where the method was used, and the installation was very quick and efficient.

Construction under a weather shelter is becoming more popular

Project manager Janne Lyömilä from Vahanen Suunnittelupalvelut Ltd, who was responsible for the structural design, closely monitored the Leca LWA installation on site. 'If the installation had been carried out in some other way, it would have been rather difficult. I must say that the box is a great innovation!'

Where a weather shelter becomes a standard requirement for a structural engineering project, it may become an increasingly familiar sight to see the Leca lifting box providing the installation solution.



GEO LECA® HELPS TO RECONSTRUCT A SUPPORT WALL IN SHOPPING AREA

PORTUGAL Leca® Lightweight aggregate provided a fundamental solution in stabilising a supporting wall at the Bricomarché store car park in Penafiel, Northern Portugal.

The project included the reinforcement of the wall at points that were subject to greater pressure and the constructing an embankment using lightweight Geo Leca® in order to reduce horizontal pressure on the walls.

The retaining wall of the car park at Penafiel's Bricomarché store became destabilised, needing urgent intervention for its reconstruction and reinforcement. Geo Leca was used to create a lightweight embankment, aimed at reducing horizontal loads on the wall.

The team at Tisem, the project management company for this job, believed that the lateral (on the cantilever wall base slab) and longitudinal alterations observed in the wall indicated that there were several problems to be addressed.

One wall, several challenges

One major issue for this project was that the wall was originally confined to a large embankment, it was

suspected that a sliding or rotation of the foundation slab could cause longitudinal deformation.

Another major concern related to the deformation of the wall which may have led to decompression of the embankment fill, with significant settlement, without ruling out the possibility of displaced fines in the wall drainage system, explains Emanuel Lopes, the Tisem engineer in charge of the construction project.

– Furthermore, following an analysis of the existing project, we observed that the existing cantilever wall reinforcement was insufficient to cope with the pressure generated by the loads applied, he adds.

Anchoring or lightweight embankment?

Faced with the significant challenge at hand, the company looked at two potential solutions: to anchor the wall to the land, or to create a lightweight embankment and build buttresses on the highest areas of the wall.

– The option of anchoring the wall was ruled out in the preliminary study phase, said Emanuel Lopes. Apart from being a more expensive option, we realised that the anchoring solution would increase tension on the ground. – In using this solution, even if there were less subsoil movement, we would have to repair part of the decompressed embankment fill, he concluded.



The execution deadline was an essential factor in this project and Geo Leca® allowed the work to be completed within the established timeframe.

The project management team identified a number of key advantages to be gained by implementing a lightweight embankment system and creating specific wall reinforcements. The complete excavation that would be necessary for building the embankment would allow for – a visual analysis of the wall's interior and of the foundation slab, as well as checking the appropriate structural pathologies required, stated the project planner.

In addition, building a lightweight embankment would also enable us to –implement an efficient drainage solution and effectively reduce pressure on the wall, reducing the bending forces, the transversal pressure applied and the tension on the ground, he confirmed.

From the client's perspective, IMMO Mosqueteiros, the lightweight embankment option also proved to be the most attractive, as it offered a safe balance between cost and speed of installation. –The execution deadline was an essential factor in this project, Eurico Justo, engineering at IMMO Mosqueteiros, explains. – By choosing the less invasive solution, which required less equipment and skilled labour resource, we felt reassured that the work would be com-

pleted within the established timeframe, he concluded.

Pressure on the wall reduced by 60%

Once the decision to opt for a lightweight embankment had been made, the project was accomplished by reinforcing the wall at points that were subject to greater pressure, in order to guarantee its stability, and by constructing an embankment using lightweight Geo Leca with the aim of reducing horizontal pressure on the walls.

– Through adopting a lightweight embankment solution and disregarding the additional structural reinforcement, we managed to achieve a 60 percent reduction in active pressures (until now around 380 kN/m and transversal pressure of around 100 kN/m), the pressure on the subsoil falling within the normal range (~150 kPa) Emanuel Lopes affirms.

Leca makes the job easier

Tisem's decision to use Geo Leca in this project was facilitated by the technical information available, and also by the support received from Leca Portugal, which enabled them to carefully assess the adequacy of the solution for the job at hand. An opinion shared by Eurico Justo of the IMMO Mosqueteiros Group.

–The guidance we received from Leca was a key factor in our selection, and for the project's success, he said.

During the project phase, Geo Leca always performed positively in relation to the technical requirements. – We were already familiar with Leca, but this was the first time we had used Geo Leca in the construction of an embankment wall and it was pleasantly surprising, reveals Ricardo Ramos, engineer at contractor, Os Novos Construtores.

– The implementation process was very simple and exceeded our expectations in terms of work speed, he concluded.

Leca facts

Project Stabilise the car park wall at the Bricomarché store

Project Owner IMMO Mosqueteiros (Eng. Eurico Justo)

Location Penafiel, Portugal

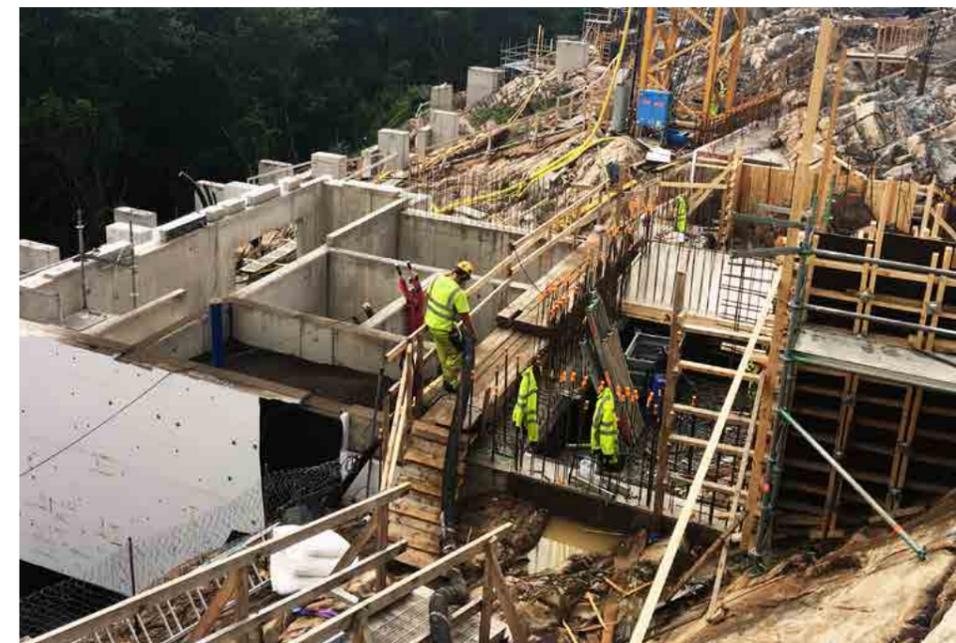
Project Management Tisem (Engineer Emanuel Lopes)

Contractor Os Novos Construtores (Engineer Ricardo Ramos)

Products 2,000 m³ Geo Leca



A spectacular view with green surroundings. Photo: Riksbyggen.



Leca LWA is being delivered at the building site.

PROBLEMATIC CONSTRUCTION SITE WAS NO MATCH FOR LECA® LIGHTWEIGHT AGGREGATE (LWA)

The view and location is remarkable but there's more to this project than meets the eye. The new block is actually part of a collaborative project called 'Positive Footprint Housing'. Positive Footprint Housing is a collaboration between Chalmers Technical University, Riksbyggen, Gothenburg University and Johanneberg Science Park. The goal is to promote sustainable housing and urban development. Brf Viva is the first develop-

ment within this innovative project. The location of Brf Viva made the engineering project much more difficult than usual, this is because of the construction development standing in the middle of a slope. Through incorporating Leca Lightweight Aggregate (LWA) into the design, many of the difficulties of the uneven ground in the development were overcome.

Blowing Leca LWA was the most effective and easiest solution

When subcontractors HTE Produktion, were constructing the foundation they needed to refill certain sections. They chose to use Leca LWA for several reasons and this included the low weight properties of Leca, but even more importantly, the practical delivery method available. Since the construction site wasn't easily accessible they needed a solution that was

SWEDEN *One of the new residential developments in Gothenburg has developed into something special. To build a whole residential block in the middle of a slope is not the easiest task – but the results have been truly spectacular.*

Photo: Caroline Hanner & Riksbyggen

quick and simple - this was solved through using the Leca pneumatic blowing facility. With the Leca blowing truck parked at the top of the site and a long hose going down the slope, the delivery of the lightweight material was installed with ease. With many other alternative materials the only option would have been to tip the material at the top and for this to be swept down the slope little by little, which would have required

more time and resource.

Benefit to the planet, benefit to the residents

Residents at the development will save money and provide a positive footprint on the environment since the houses have solar panels generating self-produced electricity with energy efficient ventilation and smart waste systems. There are also plenty of facilities and places (for example

the idyllic orangery) to socialise with your friends and neighbors. And who wouldn't want that just around the corner?

Leca facts

Project Brf Viva, Gothenburg, Sweden

Year 2017/2018

Construction client Riksbyggen

Sub contractor HTE Produktion

Architect Malmström Edström

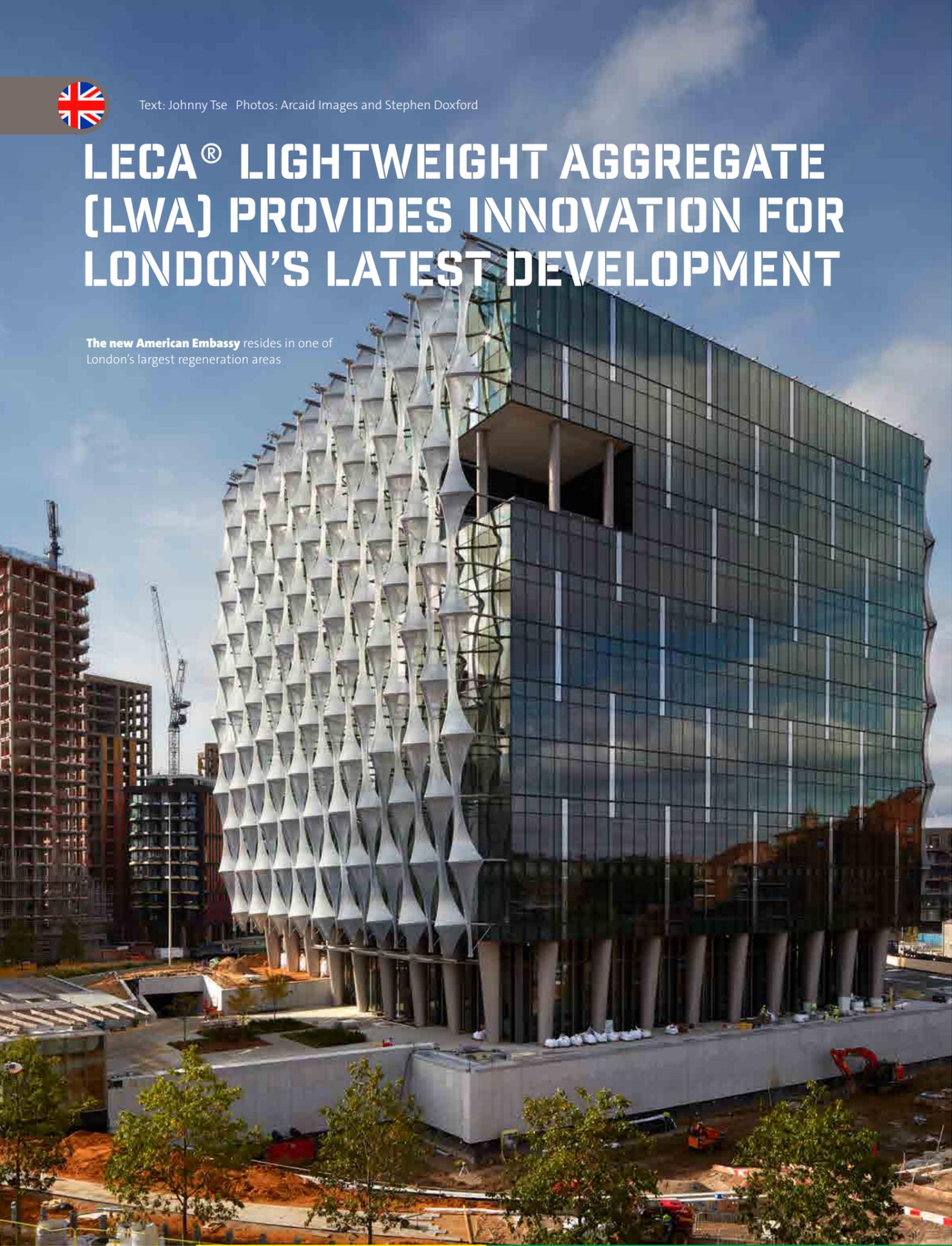
Leca products Leca LWA 12/20



Text: Johnny Tse Photos: Arcaid Images and Stephen Doxford

LECA® LIGHTWEIGHT AGGREGATE (LWA) PROVIDES INNOVATION FOR LONDON'S LATEST DEVELOPMENT

The new American Embassy resides in one of London's largest regeneration areas



Over 4000m³ (10 – 20mm) of Leca lightweight expanded clay aggregate (10 – 20mm) was used for this prestigious project

UNITED KINGDOM Leca® lightweight aggregate (LWA) (10-20 mm) was selected as one of the core materials employed in the development of the new American Embassy in London. This state of the art 12-glass cube rises to 213 feet and contains more than 500,000 square feet of space in London and was design by Philadelphia-based Kieran Timberlake.

Innovation in Design

This state of the art 12-glass cube rises to 213 feet and contains more than 500,000 square feet of space in London and was design by Philadelphia-based Kieran Timberlake. The embassy which has been a long time in the planning is now set to open.

The new American Embassy resides in one of London's largest regeneration areas, Nine Elms, and is the near the iconic Battersea Power Station. The new embassy is a mile and a half south of the UK government's Palace of Westminster and on the opposite bank of the Thames. A prime location for the City of London.

Providing Stability Against Frost

Over 4000m³ of Leca LWA (10 – 20 mm) was successfully installed by P J Carey Contractors Ltd for this project. Leca LWA was used for this prestigious project and was selected because of Leca LWA's core properties, which has made it a key material for geotechni-

cal and structural engineering. – The frost resistant properties of the material was important as the Leca LWA was proposed to be installed around piping below the ground where frost susceptibility was high. explains Project Engineer, Rajatheepan Balachandran of P J Carey Contractors LTD. This was alongside other core properties including speed of delivery, reduced earth pressure, limited compaction, low density and ease of handling.

Positive feedback

Rajatheepan Balachandran goes on to explain – Leca LWA (10-20 mm) was specified for its lightweight properties for a delicate landscaped area. It was essential for the material to be easily spread across the ground to create a smooth installation. It was utilised in an area where there would be a lot of foot traffic - so it was critical for the material to have limited compaction.

He continues –The ability for the Leca

LWA to be delivered on 8-wheel tip-pers and in 2.2m³ bags was a major benefit - as access to the site was extremely restricted and limited.

The Leca LWA was specifically utilized for the area of the development where there will be a huge foot fall – with the purpose of minimizing the weight above the basement structure – providing additional strength and stability. Project Engineer, Rajatheepan Balachandran of P J Carey Contractors LTD concludes – The speed of delivery ensured that we could uphold our tight project deadlines.

Leca facts

Construction P J Carey Contractors LTD

Main Client US Government

Leca products 10-20mmR – Leca LWA

Volume - 4000m³



Text: Dakota Lavento
Photos: Janne Pappila/JTP Media

LECA® LIGHTWEIGHT AGGREGATE (LWA) SIGNIFICANTLY REDUCED THE WEIGHT OF A SUB GRADE RAILWAY TRACK STRUCTURE

FINLAND During the midsummer weekend in June 2018, the section of railway between the cities of Kokemäki and Rauma underwent significant engineering work within an extremely tight schedule to make the settled loose soil areas lighter.

– The railway track between Kokemäki and Rauma was originally built towards the end of the nineteenth century, and urgent repairs were required on a particular section of the track where the culverts were constructed using wooden piles as a foundation. However, the old track structure was showing signs of sig-

nificant settlement on the soft sub-grade, while the piled culverts were not safely settling. The track has had to undergo lifting from behind the culverts on an annual basis whenever defects with the track inspection carriage have been found to be too severe, says the site's main engineer for the project, Seppo Hakala,

construction engineer at Insinööritoimisto Arcus.

Permanent solution

This year, however, instead of lifting the track which has provided a short term solution over the last few years, the decision was made to completely lighten the track structure

behind the culverts over three sites that are located on soft soil areas. This is hoped to provide a permanent resolve to the structural issue.

Tight schedule

The time allocated for repair was during the midsummer weekend and equated to 51 hours. – The track was

closed on Friday afternoon for the repair work and it needed to be open for traffic again on Sunday afternoon, says Ronny Östman, supervisor at Sundström Ltd, the site's contractor from Pedersöre, a company which specialises in both ground and railway construction.

Multifunctional Leca LWA

In two of the repair sites at Kahalansuo, the task of lightening the structure was implemented using Leca LWA – On one of these sites, the two-meter-deep replacement of soil mass was completed over a 100m stretch, while on the other site, a length of just under four hundred meters of soil was relaid. The depth of the replaced soil varied between one and two meters, Östman says.

Due to its durability and lightness, Leca LWA is an excellent material for such structural repair projects. Approximately 2,500 m³ Leca LWA was utilised for the site.

Efficient logistics

A storage area was prepared on site for the Leca LWA which was delivered directly from Leca Finland's factory in Kuusankoski, with the site being in close proximity to the work sites. This meant that deliveries did not need to be scheduled around the midsummer holidays.

The experienced team managed to get the engineering project completed during the midsummer weekend, and the work was even finished five hours ahead of schedule.

Hakala says that the lightened structural sections and the setting of the track structure will take a few years, but after that, there should be no further settlement.

The experienced team managed to get the repair contract completed during the midsummer weekend.



All in all, a total of approximately 2,500 m³ Leca LWA was used for the site.



Due to its durability and lightness, Leca LWA is an excellent material for such repair purposes.



LECA® LIGHTWEIGHT AGGREGATE (LWA) PROVIDES LOAD COMPENSATION

DENMARK In a bog area in Jutland soft subsoil had been causing settlements on a crossing road for some time. The problem was solved by using Leca® lightweight aggregate as load compensation underneath the road.

Text: Allan Dahl and Knud Mortensen
Photos: René Jespersen

The crossing road, Korupskovvej, which is located in Djursland near Kolind runs through a 450-metre stretch of bog area with very soft subsoil causing settlements. Through the years, the road has subsided by up to 1.5 metres and during wet periods, it has been flooded to such an extent that closure has been necessary.



The completed road running through the bog area

In 2017, Syddjurs Municipality decided to repair the stretch through the bog area and therefore joined forces with the engineering company Viggo Madsen A/S as specifier and the contracting company Gert Møller ApS as contractor.

Viggo Madsen A/S initially suggested installing load compensation under the entire road as the problem with settlements was not merely centred locally in the bog area. This solution, however, turned out to be too expensive, so to start with only a 100-metre stretch in the bog area has been repaired. At the same time, a new bicycle track has been constructed, also with load compensation, on the 450-metre long particularly challenging stretch.

Leca lightweight aggregate for load compensation

Leca lightweight aggregate was the

product chosen for load compensation under the road as well as the bicycle track because gravel proved too heavy and thus liable to cause settlements.

Morten Lynghus from Viggo Madsen A/S explains the choice of material: – This is not our first experience with Leca LWA. 12-15 years ago we applied the principle for some vehicle inspection facilities in Lystrup, and they are still fine. That project is the basis for choosing Leca lightweight aggregate for this task as well.

Geotechnical studies under the stretch of road have shown that over time, without the load compensation the road would have subsided

by 35-50 cm on the 100-metre stretch and by 25-30 cm on the remaining stretch.

Two different solutions

When incorporating the Leca LWA under the road they excavated part of the softest stretch, installed geotextile and then applied 1,075 m³ of Leca 10-20, which was distributed in a layer of up to 80 cm. Finally, the geotextile was wrapped around the lightweight aggregate and the road was built on top. With this solution the maximum settlements has been limited to approximately 25 cm for the entire stretch of road through the bog area.

Under the bicycle track, they did not excavate the bog bottom, but instead rolled out geotextile directly on top. Subsequently, 2,362 m³ of Leca trans 2 was installed in a thickness of 1 metre and finally the bicycle track was built.

Easy installation and distribution

Christian Pannerup Jensen from Gert Møller ApS explains: – The trucks drove to the road construction site and tipped the lightweight aggregate directly down into the excavation. This took place above groundwater level. The work at the bicycle track, on the other hand, took place below groundwater and required the use of the somewhat heavier Leca trans 2. “The fantastic load capacity of Leca trans 2 enabled us to drive out on the installed layer and tip off again and again,” Christian continues.

The distribution was carried out by means of small Bobcat® machines on

caterpillars. However, since bottom fractures occurred in the process the installation method had to be changed. The lightweight aggregate was consequently grabbed out.

This was Christian Pannerup Jensen’s first experience with Leca LWA, but not necessarily the last. – It went really well, he states.

Satisfied with the solutions

Some six months after project completion engineer Morten Lynghus inspected the road and found that – there are no problems in terms of the load compensation other than a small bump where new and old road meet, so the road is quite fine.

Lars Bonde from Syddjurs Municipality is also very pleased with the solution and states that – there have been no problems after the restoration and the road is fine now.

The high load capacity of Leca® trans 2 enabling the Bobcat® machines to drive out on the installed layer and tip off again and again



Leca facts

Building owner Syddjurs Municipality

Specifier Viggo Madsen A/S

Contractor Gert Møller ApS

Leca products Leca 10-20 and Leca® trans 2

Quantity 1,075 m³ Leca 10-20 and 2,362 m³ Leca trans 2



BUILDING A ROAD WITH A STRUCTURAL SURPRISE



Voivodship road No. 196 after rebuilding.

POLAND While performing earth works as part of rebuilding of the voivodship road No. 196, it turned out that under the embankment of the existing road, non-load bearing organic soils was found in the ground at a depth of more than ten metres.

The modernisation and redevelopment project of the voivodship road No. 196 from Murowana Goślina to Wągrowiec was carried out in the “Design and Build” system. At its design stage, geological documentation was prepared. A railway line, running along the road that was planned to be modernised, posed no technical difficulties and - in fact - was

used successfully and posed no issue to settlements.

Surprise during the road rebuilding works

However, while performing earth works in the Brzeźno area, it was discovered that organic soils (peat and mud) could be found within a depth of more than ten metres under the

All the works were divided into 4 stages to ensure uninterrupted traffic flow.

embankment of the existing road. The road redevelopment project planned to raise the grade line by approx. 1.50 m (which would have included an additional load on the peat!), and to widen embankments.

Alternative action was required when it was decided that continued work in accordance to the original plans would have posed a significant risk resulting in differentiated settlements of the road surface as deep as even 30 cm.

How to solve the problem?

Two ways were considered to solve this problem. One way was to drive into the soil with several metres of long piles, topped with a transmission layer, upon which work on the road could continue. Another method proposed was to build a load-reducing embankment using the lightweight Leca KERAMZYT (LWA) material.

Taking into account the financial pressures and health and safety issues (including the safety of work within active road traffic conditions), a load-reducing embankment was finally designed, built with geotechnical lightweight expanded clay



aggregate that was wrapped with a polyester geotextile, and a reinforced embankment construction (0/63 mm crushed-stone aggregate + polyvinyl alcohol geonet).

It was also decided by the engineers that it was necessary to build a load-bearing embankment on part of the subsoil which had so far been unloaded. All the works were carried out in a continuous manner, and works were divided into 4 stages to make it possible to maintain the flow of traffic.

Leca facts	
Facility	Redevelopment of the voivodship road No. 196
Location	Gmina Skoki
Investor	Wielkopolska Voivodship Roads Authority from Poznań
Designer	Biuro Projektów TRASA from Poznań
Geotechnical design	dr inż. Jerzy Rzeźniczak
Contractor	EURIVITA Oddział Poznań
Leca products	Leca KERAMZYT 8/10-20 mm
Volume of material used:	8,200 m ³



There are rough conditions inside the tunnel, and the workers must bring everything with them, including power. Because of that, it is very nice to work with an easy to use material.

FIREPROOF TUNNELS USING LECA®

Text & Photo: Inger Anita Merkesdal

NORWAY One of Norway's largest ongoing road projects is the E39, situated in the south of Bergen. There will be a new arterial road between Flesland Airport and Bergen city center, as well as significantly better and shorter roads between Os and Bergen. Implenias is responsible for the tunnels and foundations, including concrete work and bridges. In the escape routes between the tunnels they're building fireproof, gas and smoke tight "houses" that need to endure damp surroundings. This is where Leca® enters the stage.

Leca makes the escape routes fireproof

Close to the shopping centre in Lagunen, they're developing two tunnels, each with two lanes. Traffic is increasingly problematic, and long tunnels offer additional security challenges. If an accident were to lead to an eventual fire, there may be only minutes to escape. Therefore, there are escape routes between the tunnels. These are escape routes with fireproof, gas

and air tight «houses» where road users are protected.

Leca has all the key properties needed to create a safe haven in the mountains in the case of fire. The Leca blocks are fire resistant, easy to adapt and easy to work with.

Construction company Per Hovden Lynghaug, Murmester Entreprenør AS has the contract with Implenias

on the utilisation of Leca within the escape routes. The company was established in 1997, is registered in Bergen and has constructed similar fire resistant shelters by Leca in Knapetunnelen, the Nesttunn tunnel, the Hopstunnelen, the Bogatunnel, the Helletunnel and the Dalevåg tunnel, as well as some small tunnels.

Simplifies work

– The advantage of Leca, amongst

other things, is that the material is fire resistant and completely inert. As an alternative solution the houses could have been built in cast concrete, but it would have been far more complicated, says chief building engineer Per Hovden Lynghaug.

– It's also easy to incorporate changes to Leca, which make it a highly flexible material, adds Implenias's construction manager Ingvar Haukelid. For example, it's easy to make an extra recess using Leca. We could do the same with cast concrete through core drilling, but the concrete cutting is a resource intensive task in comparison to cutting into Leca, he says. The chief developer agrees. Leca is not only easy to adapt and to change, but to also lift thanks to the light-weight properties – which is a huge advantage when developing within confined tunnels, where there is no such thing as easy tasks and the lack of electricity is common place.

A well-proven product

Roadworks started in the autumn of 2015 and is expected to open in 2022. They are going to build 16 houses which they began in May of 2018. The fire shelters are 3 x 5 meters and gas-tight. Some houses are higher than others, and they must put together at least 1,100 square meters of Leca walls during this project. Implenias molds the bottom plate. The builders only need the sole before they begin. It takes about one week per house. – We are pleased with that, Ingvar Haukelid adds.

The two tunnels are of different heights. The escape route is via stairs, and there will be designated areas for wheelchair users and prams.

– Are there any challenges?

– No. Per knows what he's doing, so it's convenient for me to have him here. There are few questions. More or less everything has been clarified, says Haukelid.

– So you are specialized in constructing tunnels?

– No, it's more correct to say that we specialize in building with Leca, replies the builder.

– Why?

Per Hovden Lynghaug looks up and smiles.

– Leca does not absorb water, doesn't rust, it is easy to work with and to shape. Besides, Leca is a well-proven product. Then we, as builders, can confidently say something about how this will hold up in 10, 20 and 50 years. This is Leca. That's why.

Leca facts

Project Fire-resistant escape routes in tunnels on the new E39 south of Bergen

Developer Statens vegvesen

Main contractor concrete work Implenias AS

Masonry Murmesterbedrift Per Hovden Lynghaug, Murmester Entreprenør AS

Leca Product Leca Basic Block LSX 20 cm, Leca Basic U-Block 20 cm LSX, Leca Grout reinforcements

In front of the entrance to one of the escape routes where houses made of Leca form gas-tight spaces between the tunnels. Leca's representative in Bergen Sturle Stenhjem, Per Hovden Lynghaug and Implenias's construction manager Ingvar Haukelid.





LECA® LIGHTWEIGHT AGGREGATE (LWA) REPLACES EXPANDED POLYSTYRENE FOR BRIDGE DEVELOPMENT

UNITED KINGDOM *The Farningley and Rossington Regeneration Route Scheme (FARRRS) was carried out by Doncaster Council in a £32million project to provide a highway from the M18 at junction 3 to the Robin Hood Airport with additional links into Rossington and Farningley villages and the new iPort inland freight terminal.*

Issues with the design

Mott MacDonald, global engineering and development consultants, prepared the overall project concept for Doncaster Council and it quickly became clear that this was one of the biggest civil engineering projects in the region.

The original design proposed use of expanded polystyrene to deliver a low weight of high volume infill against the abutments but the limited experience of this design, coupled with the evident limited capacity of supply, forced the developers to seek a suitable, proven and available alternative.

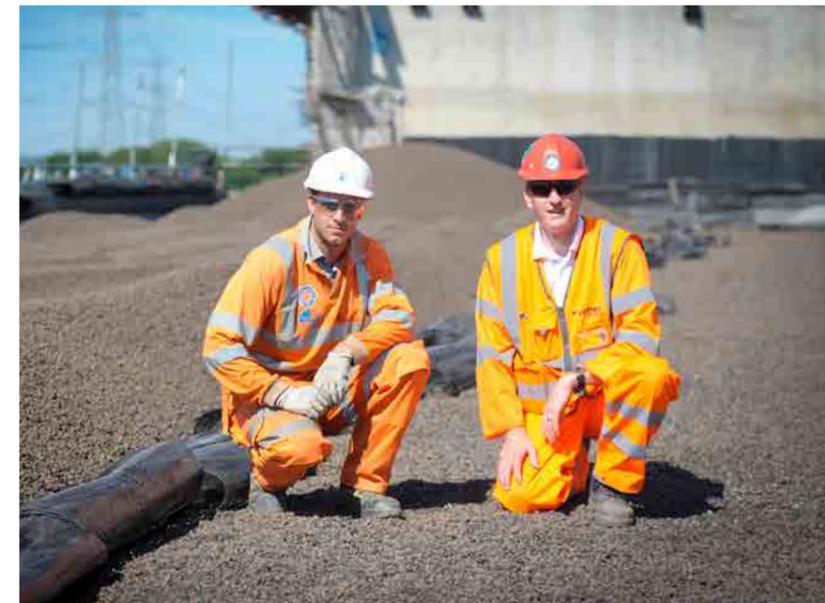
Leca LWA was the product of choice to meet these exacting technical and construction criteria.

Delivering Leca in bulk

A total of 26,000m³ of Leca LWA was brought to site in bulk, walking floor trucks. No tippers are

The main bridge structure has exceptionally high abutments to carry the bridge high above the five rail lines and the high-power cable stations.

allowed on Carillion sites to maintain high safety standards. – The delivery system worked perfectly, reports Carlton Gray, Carillion’s Structures Agent for the FARRRS project. – We had the fullest co-operation from Leca UK on timings, stock and deliveries. The drivers did their best to



A total of 26,000m³ of Leca LWA was brought to site in bulk, walking floor trucks.

stock pile the Leca LWA as close to the point of application as possible so we could minimise site handling. Moving the Leca LWA with ADT dumpers and then placing it and tracking in down proved a smooth operation. We had to put it down in 450mm layers to link in with the Tensar grid system which hooks the grid mesh into the wall blocks which meant eight truck loads per layer which was 60 meters in length.

Together We Build For The Future

– Leca LWA played a key part in this construction project, says Mike Widdicks, Carillion’s Project Manager. – A project of this size and complexity requires close co-ordination between the main contractor, the designers, the supply chain and Network Rail. There was concern on the cost, the supply and risks of the initial product specification but the Leca LWA material enabled us to maintain the original envelop of the bridge

design, saving time delays for the whole project.

Dave Finn, one of Carillion’s site team who lives locally, is proud of his work on the project. – My kids believe I’ve built the new bridges single handed of course! But in years to come I’ll look back on this job with pride. This Leca LWA is very good indeed and really easy to handle. Nothing else would give you 450mm layers as fast as this.

Project details

- Main Client** Doncaster Council
- Consultants** Mott Macdonald
- Construction** Carillion Civil Engineering
- Others** Tensar International
- Leca products** 10-20mmR – Leca LWA
- Volume** 27000m³



Text: Jesper Ketelsen. Photos: Christian Vestergaard

CREATING AN URBAN SQUARE WITH LECA® LWA

DENMARK When constructing a new underground car park in Bindslevs Plads square in Silkeborg, the municipality decided to rethink the entire layout and the use of the square in order to create cohesion between the institutions in the area. Leca® lightweight aggregate has contributed to the new landscape architecture of the square.



One of the goals with the project is to make Silkeborg known for other features than its beautiful surroundings – the city itself, including the new urban square, is worth a visit.



Loose Leca® LWA was used to create the shape of the hills. On top of this a layer of Leca® Beton was applied and finally asphalt was installed.



CampusHuset is one of the educational institutions located on the square, which will benefit from the project.

As part of the construction of a new underground car park in Bindslevs Plads in Silkeborg, Silkeborg Municipality in co-operation with the educational institutions in the area decided to rethink and re-shape the landscape architecture of the square.

In the initial concept it says: "Bindslevs Plads should be an urban space for culture, learning and creativity, an urban space that is capable of changing its character and accommodating temporary installations, arrangements and exhibitions. The place should encourage play, chill out and activity and at the same time be the entrance to various institutions".

New urban space in Silkeborg

– Bindslevs Plads is the new urban space in Silkeborg, says Carina Nørlund from Silkeborg Municipality. – One of the goals is to make Silkeborg known for other features other than its beautiful surroundings.

Landscape architects LABLAND architects made the sketches for the new design of the square in co-operation with Silkeborg Municipality, the main focus of the design was to ensure that the cars were situated away in a basement car park - to renew the focus on the urban life which historically has always been a focal point in the square.

As the urban space is constructed on top of an underground car park and a naturally shaped landscape was desired, it was imperative that the aggregate material used for the landscape did not weigh too much. – It is no use designing something which cannot be executed in terms of structural stability, explains founding partner Line Toft from LABLAND architects.

Landscape architecture with Leca lightweight aggregate

After a close dialogue with COWI, who were the architects and advisors on the project, Leca lightweight aggregate was selected to create the shape of the hills. On top of this a layer of Leca concrete was applied in order to make the hills dimensionally stable. Finally, asphalt was installed. Casper Gravlev Christensen from COWI commented on the choice of material for the shaping of the hills in the square: "Leca lightweight aggregate was chosen because the product met the two main requirements for fill material: low density and formability – and was available at a competitive price".

Casper adds that the close co-operation with technical consultant Knud Mortensen from Leca Danmark contributed to the choice of solution. Among other things Knud Mortensen proposed utilising Leca lightweight

aggregate/ Leca concrete for the construction of the hills and was present when the contractor Gustav H. Christensen received the first deliveries.

– A few months before start-up, we had a meeting with Knud Mortensen from Leca Danmark A/S. It was really good to talk things through early on, says Knud Rasmussen from Gustav H. Christensen.

Easy delivery and installation

The Leca 10-20 was delivered through pneumatic blowing which was the easiest step in the process. The Leca concrete, was delivered from a concrete plant, and was subsequently pushed into place by asphalt rakers. The original plan was to apply a layer of geotextile on top of the loose Leca layer but the geotextile turned out to be unnecessary. Finally, asphalt was installed on top of the Leca concrete.

The result is a functional square with a landscape architecture that meets the wishes of all parties.

Leca facts

- Building owner** Silkeborg Kommune
- Specifier/architect** Cowi A/S
- Sketch project** LABLAND architects ApS
- Contractor** Contracting company Gustav H. Christensen
- Leca Product** Leca 10-20 mm



ARTIFICIAL TURF FIELD EXPERTS

NORWAY Bjørn and Øyvind Tveter have built 26 artificial turf sports fields. In Skien they are using Leca® LWA to sit underneath the turf. All in all there are about 1,000 artificial sports fields in Norway. 150 of which were constructed through using Leca®.

-All courses have their own challenges and technical specifications. There are different types of drainage, different structure, different bearing layers and different insulation, explains site supervisor Line Haugene.

Gjerpen Sport Park in Skien is her first artificial turf field project as a site manager, but this is not the first project she has worked on.

– I have installed artificial turf on three fields, she explains.

Work during winter

At Gjerpen Idrettspark, it is the first time she uses Leca beneath turf.

– We had to form the terrain without increasing the load too much, and we were concerned about storm water. At the same time, there is a stream right below, and we have to make sure that we do not push any mass down into the stream, she explains.

Preparations began a week before Christmas, and the work itself started in January. An important part of building artificial turf in winter is maintaining control over ground frost. In the early winter, machine contractor Bjørn og Øyvind Tveter removed the snow on the strips surrounding the field to make it possible to drive the trucks carrying LWA onto the field. On the field itself, on the other hand, the snow remained until it was time for

digging. Then it was removed with front mounted snow blowers.

– I’ve been reading the weather forecast every day, laughs Line Haugene.

Athletics and handball

There has been a gravel pitch from the sixties on the premises. Now there will be football pitches, open areas, track facilities for athletics, children’s climbing park, a fitness park, three volleyball courts and an activity area with asphalt.

– It’s a gift to ourselves. We are celebrating our 100th anniversary this year, says Lars Tormodsgard. He is the leader of the construction team in Gjerpen Idrettsforening. The club is doing the development itself, using savings, sports funding and Government grants. The development is budgeted at NOK 20 million.

– We have approximately 800 kids playing football, handball, skiing and athletics, says Tormodsgard. There is also primary and secondary schools nearby.

11,300 square meters

– The area is 11,300 square meters. It is important that the entire area has a familiar overall feel, regardless of whether it is a football field, road or a place for athletics. That’s why

we build everything with the same material, says Line Haugene.

All in all, there are about 3,800 cubic meters of Leca LWA.

– This is the first time I’ve been using Leca in a project. It’s exciting, says Jan-Petter Enger in Naturpartner. Gjerpen IF has hired him as site engineer at the new facility.

– We started the planning in the autumn of 2016. We haven’t received the sports funding just yet, and in between funding cost quite a bit for the club, says Lars Tormodsgard.

Frost protection, drainage and water detention

Jon Hauge is Sales Manager for Leca LWA in Leca Norway and has been responsible for many of the newly developed artificial sports grounds, where Leca Norway has supplied lightweight aggregate. He says that it is primarily the key engineering properties of the Leca lightweight aggregate including frost protection and drainage, which make it a key component for the design of artificial turf sports areas. In addition, the Leca layer beneath the fields relieves settlements with poor ground conditions and creates water detention, thus preventing the risk of flooding from intense rainfall on the field.



This is the team behind the project which is to be completed for the end of May. From left to right: machine operator Marius Hvaal, construction manager Jan-Petter Enger, Gjerpen IF’s Lars Tormodsgard and site manager Line Haugene

Leca Facts

Gjerpen Idrettspark in Skien - artificial turf for football and facilities for athletics and beach handball, totalling 11,300 square meters.

Client Gjerpen Idrettsforening

Machine contractor Bjørn & Øyvind Tveter, Larvik

Artificial turf Unisport

Lighting Multilux / Midt-Telemark Elektro

Apparatus Uniqa

Leca product Leca LWA 0-32 mm



GREEN ROOF GARDEN SOLUTIONS FOR CITY DWELLERS WITH LECA® LWA

Text and photos: Caroline Hanner and Ola Andersson

SWEDEN When building a new neighborhood in Mölndal, Sweden, the building firm Peab was challenged to construct their first ever Leca® Green Roof.



Illustration: Fredbad Arkitekter

In scenic Mölndal a new neighborhood is being built in the middle of the city center. The whole area has undergone major changes to make the city center a more attractive and vibrant place.

The new buildings in the neighborhood are interconnected in the middle of two green roofs. The roof gardens also serve as a communal courtyard for the residents living there.

It's the public utility housing company Mölndalsbostäder which has given Peab the task of building the new block. The building consists of both rental apartments and office spaces. They are just about to finish the second green roof when we visit the project to see how the project has progressed.

More benefits than just aesthetics

Mikael Rönngård works as a construction manager at Peab and is the one meeting us outside the building to take us a couple of floors up to the courtyard.

– This is the first time we've used Leca LWA. Before the work started I was actually a bit worried about the stability but there hasn't been any problems at all, says Mikael.

A green roof is not only beautiful but also has many technical and environmental benefits. It dampens noise, delays the risk of flooding from storm water and furthermore

reduces the need for an expensive and complex water system. The energy required for cooling and warming buildings will also decrease because a Leca green roof also provides major insulating properties.

A whole new Leca experience

The material has been delivered through the pneumatic blowing system, where approximately 1000 m³ of Leca LWA was delivered at different stages of the project. The first roof garden took slightly longer than the second phase as this was the first time they utilised Leca LWA for this kind of job, previous experience of using the material had been mainly within infrastructure.

A thin layer of gravel and a geotextile cloth has been laid between the casting and the Leca LWA. They also mixed in some lightweight aggregate in the plantation soil as well.

– When the material came to the workplace and I walked around in it and felt my feet sinking I thought to myself: this will never work. But as soon as we had packed the material I realized that I had nothing to worry about.

Leca facts

Project Kvarteret Hajen, Mölndal, Sweden

Construction client Mölndalsbostäder

Contractor Peab

Architect Fredblad Arkitekter

Leca-product Leca LWA 12/20



URBAN PARADISE ABOVE A SHOPPING CENTER

FINLAND In the Kalasatama area of Helsinki, a large green zone is being constructed over SRV's REDI shopping centre and the Itäväylä motorway. In the construction of the green roof, crushed Leca® lightweight aggregate (LWA) was installed to lighten the structure and to improve the horticultural conditions of the vegetation.

In the autumn, when REDI, the largest shopping centre in the Helsinki central city area, opens in Kalasatama, the city dwellers will be able to enjoy a completely new type of outdoor park with versatile vegetation on the green roof above the shopping centre and the Itäväylä motorway.

A sustainable outdoor park with rain-water management

– The aim of this ambitious project is to create a high-quality urban landscape, an outdoor environment with a strong and distinctive identity that withstands the demanding coastal conditions, says landscape architect Krista Muurinen from the Helsinki-based landscape architecture office Maanlumo Ltd.

When constructing a high-quality green roof with diverse vegetation, it is, according to Muurinen, important to ensure that the rainwater is utilised as effectively as possible and that the substrate binds moisture and balances the environmental conditions. The structural layers must also be lightened, as the strain on the load-bearing

structures would otherwise become too heavy.

Versatility with Leca LWA

– Green roof soil with crushed Leca LWA will be utilised as the substrate. In addition, a 50–350 mm lightening layer made of crushed Leca LWA will be added under the soil layer. In the park, the lightening layer is the thickest at the gently-sloping mounds, which are approximately 1.2 metres high at their highest point, says Muurinen. Terrawise Ltd.'s department of environmental construction and landscaping is responsible for REDI's green roof project. Site manager Jouni Uusipuro from Terrawise considers the location exceptionally interesting and challenging.

An ambitious design solution

– The design solution and materials incorporated into the green roof are very innovative and of the highest quality. The Leca LWA's ability to bind moisture and to release it over a prolonged period of time helps, for its part, to maintain balance within the growth conditions, since this prevents moisture seeping through the layers of soil

too quickly. This is an important quality in a green roof structure, says Uusipuro.

– The lightened structures made of crushed Leca LWA and the green roof soil reduce unnecessary loading of structures on the large park deck. Soil that is lightened with Leca LWA weighs approximately 600 kg/m³, whereas normal sand-soil blend weighs approximately 1,000 kg/m³. Weather factors such as the sun and wind are prone to dry the soil on a deck such as this, so that's why Leca LWA's ability to bind moisture, together with irrigation, helps the vegetation in the park stay verdant, says supervisor Olli Saarinen from SRV.



The green deck has a diverse vegetation.

The green deck is situated above a shopping centre and a motorway.

The retention grid helps to store and slowly drain storm water.



Leca facts	
Project	REDI shopping centre, green deck
Location	Helsinki, Finland
Design	Landscape architecture office Maanlumo Ltd
Developer	SRV Rakennus Ltd
Contractor	Terrawise Ltd
Product	Crushed Leca LWA 3–8 mm, Leca LWA 4–10 mm



Text and photos: Johnny Tse



Leca LWA provided a protective layer to keep the nutrients generated by the farm within the slurry



LODGE FARM BIO-GAS LAGOON COVER

UNITED KINGDOM Over 44m³ of Leca Lightweight Aggregate was pneumatically delivered to cover a Bio-Gas Digestate Lagoon in Wrexham for Fre-energy. Leca LWA is recommended in its official guide for waste management by DEFRA (Department for Environment, Food & Rural Affairs) to be a solution to provide harmful gas abatement into the local environment, including Ammonia, which poses a significant threat in areas of valuable habitats.

Biogas Food Waste Management Systems

Fre-energy in Wrexham is a major innovator in waste management in the UK and one of its major features is Lodge Farm Biogas Ltds Anaerobic Digester. Operating as an efficient slurry and food waste management system, their patented combined de-gritting and gas actuated mixing technology is designed to manage grit laden, high-strength wastes and slurries. The main aim of Lodge Farm Biogas AD is to assist local food manufacturers deal with process waste in an eco-friendly way. The lagoon was constructed to handle the digestate produced after the AD process. A valuable, natural fertiliser, digestate is by process virtually inert (most of gases converted to biogas by anaerobic digestion) and odourless. The application of Leca LWA serves to meet regulatory compliance by handling the residual ammonia that would otherwise be released to atmosphere.

DEFRA Suggests Lightweight Aggregate

Environmental regulations set by DEFRA ensures that the levels of harmful gas released from waste management processes must be reduced to a minimum – Leca LWAs unique properties prevents harmful gases into the surrounding countryside – potentially causing damage and pollution to the local area. These initiatives, and targets set by government to reduce gas emissions (including ammonia) and the removal of foul odours of slurry tanks is a major challenge for many farmers.

Quick Delivery and Solution

A quick and simple solution is to pour Leca Agri directly on top of the slurry,

A quick and simple solution is to pour Leca[®] Agri directly on top of the slurry

which acts as an effective floating protective cover for a slurry tank or lagoon. A 10cm layer of Leca Agri poured over slurry limits the emission of harmful gases and foul odours by up to 85%. The Leca Agri floating cover solution is designed for reducing gas emissions (mostly ammonia) from liquid animal waste and complies with EU standards and BAT guidelines (Best Available Techniques) and may be used on a par with closed tanks. Conversely the Leca LWA provided a protective layer to keep the nutrients generated by the farm within the slurry.

Satisfying Results

Lodge Farm Biogas Site Manager, Tom said that.... – The material did exactly what we required and this was to provide an effective cover for our lagoon with the aim of reducing the amount of ammonia released into the surrounding area. The material was quickly blown onto site with the Leca blowing machine with no issues and quickly covered the lagoon which is over 1200m² in size. This operation took only a few hours to complete. The floating nature of the material quickly provided a floating cover for the slurry pit.

– The time saving solution provided by Leca LWA was key performance indicator for us, we needed to find a product which would effectively reduce emissions of Ammonia and provide a protective layer for keeping the nutrients within the slurry in our farms.

Leca facts

Main Client Lodge Farm Biogas

Volume - 44m³

Leca products 10-20mmR – Leca[®] LWA



GREEN ROOFS: STORMWATER MANAGEMENT WITH GREEN SIDE EFFECTS



NORWAY *Green roofs can be decorative, natural oases in grey cityscapes, but they are much more than just plants on rooftops. They are modern and environmentally-friendly solutions for local stormwater management, and according to an expert, Leca-based green roofs possess an even greater potential to protect our cities from floods.*

In recent years, heavy rainfall, cloud-bursts and stormwater have become more common. In Europe alone, we have experienced an increased frequency of these phenomena, and especially the stormwater runoff, which comes from intensive rainfall, puts a strain on sewers and drainage systems. This in turn has devastating effects on people living in large, dense cities.

Therefore, as part of a growing effort to meet the challenges with stormwater runoff, green roofs are becoming a popular solution. In short, a green roof is a roof of a building, which is covered with vegetation. And according to an expert, there is a good reason for this popularity:

Healthier cityscapes

– A green roof is not just a roof with plants on it. It is an excellent, modern and environmentally-friendly way of creating healthier and more resistant cityscapes, says Jaran Raymond Wood, who is Research & Development Manager at Leca International.

Green roof Bjørvika Oslo

Solving the problem, where the rain hits first

– Rooftops are where the water hits the cityscapes first and, therefore, are a logical barrier in the fight against surface water problems, such as stormwater runoff, says Jaran Raymond Wood and points out the primary purpose of a roof covered in plants is: to provide local stormwater management.

Delaying rainwater

– In modern times, the primary purpose of green roofs is their potential for retaining and delaying rainwater during storms, he says and continues, – because with a green roof, a large amount of the rain that hits the roof's surface will get soaked up in the soil, and thus never reach the ground and sewerage.

Furthermore, Jaran Wood Raymond explains that by applying Leca lightweight aggregate in the substrate below the plants and soil mix, in the construction of green roofs, the advantages will be even greater:

Improved water retention

– By adding Leca to the construction of a green roof for stormwater management, you will increase the potential of the roof. Instead of building a roof, where the rain is 'only' retained by the plants and soil, with Leca as part of the soil mix the water retention will improve because the Leca-material can detain up to half its volume in water for 1.5 hours. Therefore, Leca-based green roofs are excellent for detention and delay of water discharge, he says.

Leca-based green roofs are already a popular way of building green roofs. For instance, when building a green roof garden on top of a parking lot in Copenhagen in 2011,



Overflown city streets

Leca was added to the construction, in order to improve the drainage effect. Also, as part of the regeneration of the Liverpool waterfront in 2007 and 2008, a multi-storey car park and high street stores were constructed beneath an existing green scape. To maintain the green scape and to improve the stormwater management, a Leca-based green roof was the chosen solution.

Green side effects

Besides being an excellent solution for stormwater management, green roofs have other great advantages. One of the 'green side effects' is their ability to provide an attractive cityscape with green spaces, preferably available to the inhabitants. A green roof can be a way of bringing nature and, therefore, an increased biodiversity into the city, because more plants create better circumstances for animals and bugs. And that is very important for both our environment and the ecosystem we are part of.

Reduces temperature

The roofs also have a positive impact on the so-called heat island effect, which causes bigger cities to reach a higher average temperature than the countryside surrounding them,

due to the population density and large amount of stone and asphalt. As a result, the cost and energy consumption in connection to air conditioning goes up and many citizens feel uncomfortable. All of which are problems that can be solved by building green roofs, because the living plants give shade, and stop the hard surfaces from absorbing so much heat.

These are just some of the many benefits of building Leca-based green roofs, which are, therefore, a suitable, sustainable solution for many types of constructions. Read more about Leca-based green roofs and see examples on how easy it is to apply Leca on our website.

Green roofs

A green roof is a living surface of plants growing in a substrate layer on the roof of a building. There is a distinction between **extensive** and **intensive** green roofs.

An **extensive roof**, which is the most common solution, has very thin soil layers, draught tolerant plants and requires little or almost no maintenance.

An **intensive roof** has much thicker soil layers, and looks like an ordinary garden with trees and shrubs.



GREEN ROOF DEVELOPMENT IN A CONGESTED CITYSCAPE

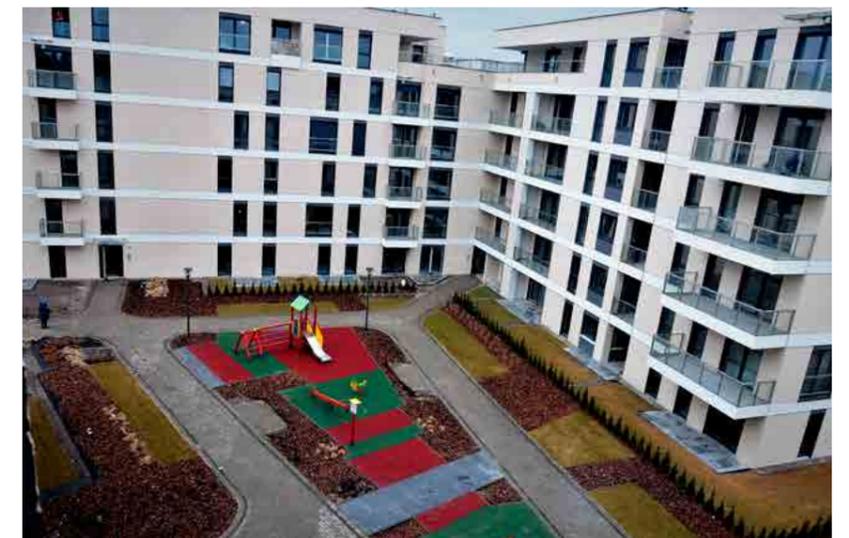
POLAND At one of the newly-built housing developments in Bydgoszcz, residential car parking problems have been finally resolved through the development of an underground garage.

Multipurpose Leca lightweight ceramic aggregate can perform drainage, retention and filling functions on green roofs, simultaneously.



Leca KERAMZYT aggregate was delivered in 2.0 m³ bags.

A green roof over the underground garage at the Platan Park development.



Creating a green roof above an underground garage ceiling has in recent times become a popular solution in Poland. Due to the lack of space available within developed cities, investors and designers are forced to build parking spaces within underground multi-level garages. Green roofs are constructed upon the garage flat roofs, where they are used as leisure areas for residents and playgrounds for children.

Problems and ways to solve them

Some of the main technical problems faced when developing green roofs include: limiting the weight of layers at the ceiling slab, and developing effective drainage systems, especially to efficiently drain water after heavy rainfalls.

In order to fulfil these conditions, designers tend to use Leca KERAMZYT

(LWA) more and more often. This lightweight ceramic aggregate can perform a number of functions at the same time, such as:

- the drainage function designed to drain the rainwater fast,
- the retention function designed to keep part of the water volume within spaces in between aggregate grains,
- the filling function, as a levelling layer that makes it possible to obtain

proper levels of pavements and entries to buildings.

Several green roofs at a single housing estate

A large residential block housing estate called Platan Park is being erected within an area of almost 10 hectares in Bydgoszcz. More and more new buildings are now incorporating green roofs each year. As a material that constitutes

part of the green roof construction, Leca KERAMZYT was used at one of the initial stages of building this housing estate. Because the roof was planned to be built in between buildings, it was decided to use the aggregate packed into 2.0 m³ big-bags. At the housing estate, more and more buildings are erected, between which green roofs are designed, which are also built using the Leca KERAMZYT material.

Leca facts

Facility Platan Park multi-family housing building with underground garages

Location Bydgoszcz, Poland

Architect CDF Architekci from Poznań

Contractor CDI Konsultanci Budowlani from Bydgoszcz

Leca Product Leca KERAMZYT 10-20 R

Volume of material used 650 m³

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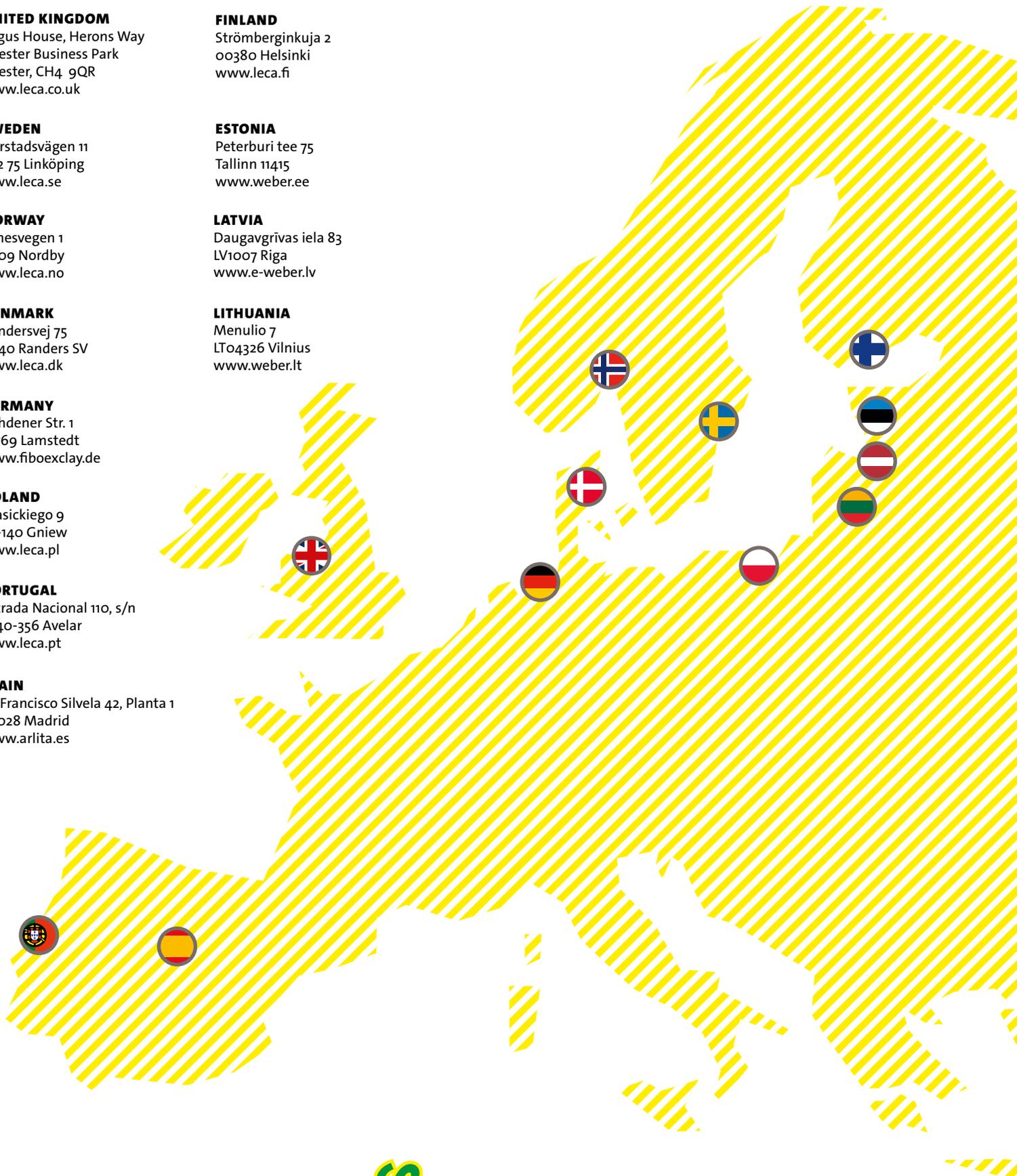
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