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BUILD

Leca®

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Blackpool Seaside: Paul Daniels/Shutterstock.com

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Text: Sampsa Heilä
Images:
Mikko Voutilainen

Project information

Facility: A semi-detached house for two families

Location: Raisio, Finland

Client: Mikko Voutilainen

Architect: Arkkitehtitoimisto Tommy Gustafsson / Architect Tommy Gustafsson

Contractor: Mivox Oy

Leca products: Leca® Design Sandwich Block 380 mm, Leca® EasyLex partition wall block

Light gray and vivid walls and Weber's light Design Plaano floor create a great backdrop and contrast to Italian kitchen and hardwood furniture.

The walls have a naturally colored concrete screed.

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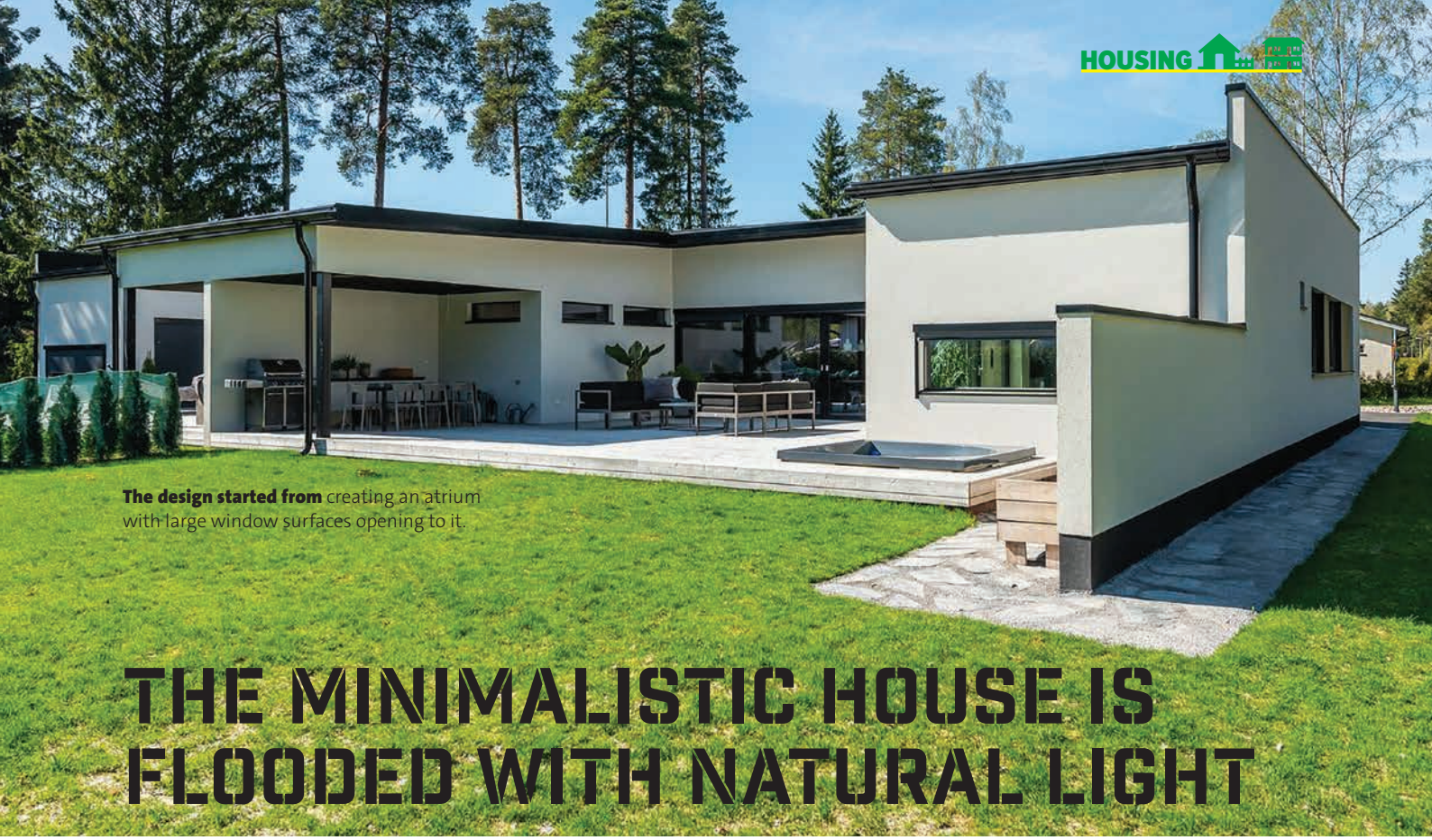
Front page:
Blackpool Seaside has been transformed for £80million.
Photo Paul Daniels/Shutterstock.com



The design started from creating an atrium with large window surfaces opening to it.

THE MINIMALISTIC HOUSE IS FLOODED WITH NATURAL LIGHT

FINLAND ***Leca® Design Sandwich Blocks were a natural choice for a semi-detached house built in Raisio, Finland, with the clear and minimalistic shapes of the light rendered facade and the concrete interior walls and floor – creating an impressive yet elegant home.***

In 2015, construction entrepreneur Mikko Voutilainen began building a semi-detached house for one of his customers — and for himself — with the best material he could think of: Leca Design Sandwich Blocks.

– We wanted a stone house in which all the building materials and furniture would be top-quality and durable, he says.

Voutilainen and his wife chose architect Tommy Gustafsson from Arkkitehtitoimisto Tommy Gustafsson as the principal designer.

A success in every way

The architect and the residents both agree that the goals for the design were met in an excellent fashion. The floor plans of the apartments are identical to each other. The net floor area in both apartments is 147 m^2.

According to the architect, the design started from creating an atrium with large window surfaces. The big windows that reach the floor create a spatial continuity between the interior and the exterior. Both ends of the atrium are flanked by two wings, one housing the bedrooms and the other housing the back door, wardrobes, a utility room and a sauna with a shower room.

Durable and energy efficient

According to the architect, the light rendered facades give the house a modern and contemporary look. Applying a render finish to stone houses is quick and effortless task. Gustafsson says that stone houses have a superior moisture resistance to that of wooden houses, and they require less effort to maintain.

Energy efficiency with Leca Blocks

The facades of the house are made of 380 mm thick Leca Design Sandwich Blocks.

– Leca Sandwich Blocks have the best U-value in the market, which makes the house extremely energy efficient, Voutilainen comments. Of course, a Leca block house that is smoothed out and rendered on both sides is extremely airtight.

The partition walls are made of 88 mm thick Leca EasyLex partition wall blocks. The same block is suitable for non-load-bearing walls in both dry and wet spaces.

Successful project

Leca blocks are laid using a thin-joint method that accelerates and streamlines the masonry work. With large blocks, the frame is quick to build.

Voutilainen's company Mivox Oy carried out the construction work on the semi-detached house from the Leca-block frame to the finishing touches.

All in all, the project was a great success all the way through. The Voutilainen family has been very content with their new home, and the architect describes it as one of his favourite designs.

Renovation of a historic tenement building in which a Music School functions

SOUND-INSULATED CEILINGS IN A MUSIC SCHOOL

POLAND ***Rehearsal rooms in the Music School require high acoustic comfort to prevent students from interfering with each other when they practice. Thanks to Leca® Lightweight Aggregate (LWA) we managed to fulfill this condition in an old, historic building.***

Wroclaw, city in the southwestern part of Poland, was the European Capital of Culture in 2016. To obtain such a prestigious prize, a city has to exhibit many institutions that influence the development of culture. There are many academies and high schools in Wroclaw helping young people develop artistic talents.
One of such schools is the Secondary Music School located at Podwale street. The school building was constructed in the 19th century. The building's structure was traditional. Walls made of brick, mainly wooden ceilings with brick ones on the lowest floor. Almost two centuries of using the building caused most of the ceilings to deteriorate – causing significant health and safety issues.

Ceiling renovation

Based on a thorough expertise of the building's technical condition, it was decided to replace all ceilings with new ones. Where old ceilings were disassembled, new I-sections - steel beams were laid, and 90-120 cm long reinforced concrete slabs were placed on the bottom shelves of these beams. Such a construction is known

Leca LWA in the ceiling between the beams

Project information

Facility: Music School

Location: Wroclaw

Investor: Wroclaw City Hall

Contractor: Haras Budownictwo Sp. z o.o. Sp.k.

Date of completion: 2016 - 2019

Aggregate: Leca lightweight aggregate (KERAMZYT) insulating 10-20 R.

Amount: 240 m³

as a WPS ceiling in Poland. This solution restores required condition of the building and allows the rooms to be used even with higher payloads.

Acoustic comfort

A music school is a specific type of facility. In the music school, there are many rehearsal rooms in which young people practice playing instruments and develop their vocal talent individually or in small groups. Everything usually takes place simultaneously. That's why each room must be effectively sound-insulated so that learning isn't affected by the sounds coming from neighbouring rooms. Old, heavy brick walls meet this condition. Windows and doors equipped with good seals also reduce acoustic transmission.

Therefore, only an effective sound insulation remains. In this case Leca LWA 10-20 mm was laid on reinforced concrete slabs of the WPS ceiling. The lightweight aggregate doesn't overload the ceiling and in addition, the porous internal structure and the free spaces between the granules cause repeated reflections of sound waves, partially suppressing them. A layer of mineral wool was laid on the expanded clay as an insulation from impact sounds, and then a typical concrete floor (cement screed) was laid on it. From the bottom of the ceiling, a special Ecophon suspended ceiling has been installed, which limits the occurrence of reverberation, i.e. waves reflecting off the partition inside the room. In addition, a layer of Isover wool has been laid on this suspended ceiling. The entire ceiling prepared in this way was subjected to acoustic tests. Despite the lack of the floor coverings on the floor during the tests, an acoustic insulation from airborne sounds of R'w = 58 dB and insulation from impact sounds of L'nw = 41 dB was obtained. These results provide effective acoustic comfort of the rehearsal room. And after laying the floor coverings and completing the furnishing, this comfort will improve even more.

Through this, Leca LWA contributed to the development of science and culture in Poland.

WPS ceiling from below

FAST AND EASY DELIVERY TO KARLATORNET – THE TALLEST BUILDING IN SCANDINAVIA

SWEDEN ***With its 73 floors, Karlatornet will be the tallest building in the Nordic region. In the heart of the foundation, Leca® Lightweight Aggregate (LWA) was used to refill sections in the foundation around the elevators.***

The new district in Gothenburg that is being developed and built by Serneke will consist of a total of eight blocks. But what makes this new neighborhood unique is the (not so small) detail called Karlatornet. Karlatornet will be 245 meters high, which will make it the tallest building in the Nordic region. The skyscraper will mostly consist of apartments but the block will also have schools, shops, restaurants, green areas and a hotel.

Karlatornet will be 245 meters high and have 73 floors
Illustration: Serneke

The architects behind the skyscraper is Skidmore, Owings & Merill. A US based firm that has designed some of the largest buildings in the world such as Burj Khalifa in Dubai.

Unique foundation

It's no secret that it can be challenging to build things in the Gothenburg region due to its infamous soft clay. The tower was therefore anchored with 58 piles that goes 45-75 meters deep into the ground. In fact, no similar foundation has ever been done before in Sweden and there is great interest from both local citizens and the industry.
The inauguration of the skyscraper is planned to happen in 2022.

Challenging construction site

It's in the core of skyscraper that Leca LWA comes into the picture. In the phase of constructing the foundation, some parts of the section around the elevators in the center of the tower needed to be refilled.

One of the reasons for choosing Leca LWA was accessibility. Many construction sites are difficult to access and Karlatornet was definitely no exception. Especially since they needed the material installed at the very center of the gigantic construction pit.

Karlatornet is both developed and built by Serneke Group. A challenging project that never have been done before in Sweden
Illustration: Serneke

Project information

Project: Karlatornet, skyscraper

Where: Gothenburg, Sweden

Developer: Karlastaden Utveckling AB (part of Serneke Group)

Contractor: Serneke AB

Architect: Skidmore, Ownings and Merrill

Leca-product: Leca® Infra 10/20

Delivery direct to final destination

Since Leca LWA can be blown out with a long hose, you can get the material exactly where you want it from start. This makes delivery and installation a quick and smooth process for everyone involved. The truck has a hose of 30 meters by default, but it can easily by extended to up to 100 meters if needed.

The truck loaded with Leca LWA parked next to the construction pit and the hose was connected and was pneumatically delivered to the final destination. With the help of compressed air from the truck, the material could be blown directly down into the shaft in the foundation. All managed by only two people.

Since they could get the material installed right away they didn't need to stock pile it at or nearby the construction site at any stage. All in all, this procedure saved the contractor Serneke both time, money and workforce.

The construction site for the skyscraper seen from above

Leca LWA being delivered by blowing truck to the center of the tower foundation

COMPANY PROFILE

Basso Building Systems Oy

Whether it concerns a unique detached house or a small block of flats, Basso-Kivitalo does not compromise on the high quality that it provides. In a highly competitive market, the company has found its own niche, where it is focusing on its expertise.

Text: Dakota Lavento

In recent years, Finland has enjoyed an excellent time for construction and renovations. Although these initiatives, in the housing construction area in particular, have already declined, the situation does not seem to be especially worrying to Basso-Kivitalo's entrepreneurs Markus Wirtanen and Jukka Lehtonen.

There is sufficient demand for the housing built by Basso. The company is building as many Leca® Block low-rise blocks of flats as they can. Quality is easy to sell.

From basic packages to detached homes

Operating mainly in the Helsinki metropolitan area, Basso Building Systems Oy was founded in 2008 to continue the activities of Maxit-Kivitalo. The company quickly moved from foundation and supply package deliveries to the contract building of Leca detached homes. The entrepreneurs realized that home builders no longer had the required skills and did not want to build their own homes, or even have them built. - As requirements became tighter, it became neither sensible nor feasible. Customer families appreciate the effortless home procurement process and the high quality end result. That's what we've been able to offer, Markus Wirtanen emphasizes.

Quality is the be all and end all. In Basso stone houses, geothermal heating, underfloor water circulating heating, tiled floors, individual kitchens, room specific ventilation and heat recovery have always been self-evident, Markus Wirtanen continues. - We haven't implemented any radiator heated building.

Customer families appreciate the effortless home procurement process and the high quality end result. That's what we've been able to offer.

When quality is the backbone for builders, it also naturally moves on to larger targets. Basso began carrying out contracts for low-rise block of flats in 2014. Work is currently under way on 350 apartments, including (in Helsinki) 106 in Kivikko, and 71 in Vuosaari, Markus Wirtanen says.

Most of the production already concerns small blocks of flats.

The demand for complementary construction is sufficient

The move to the contract construction of terrace houses and low-rise blocks of flats was a natural step, as the company found that there was a clear and growing demand for high quality projects.

–The plots for complementary constructions are often too small to attract large construction companies and, on the other hand, they are also too large for groups building separate terrace houses. For us, they are just right, Jukka Lehtonen points out.

The entrepreneurs were quite right. Basso hit upon an excellent niche market, and of course, their high quality homes sell like hot cakes, the company builds them to sell or even as contracted for the customer.

Blocks are suitable for low-rise blocks of flats

There will be plenty of projects in the future, because complementary construction is not coming to an end soon in a congested Finland.

Basso Stone House entrepreneurs Markus Wirtanen (left) and Jukka Lehtonen (right).

Low-rise blocks of flats in Sipoo, Finland.

Advantages of Leca® Blocks in building low-rise blocks of flats:

- **Versatile block system**
- **Products with excellent heat economy, sound and fire resistance**
- **Dry construction process, quick plastering to masonry insulation blocks**
- **Rapidly developing masonry and site processes (telehandlers)**
- **Advantages of local construction, flexible design and building**
- **Functional logistics, warehouse product, advantage in a small plot with little space for storage**
- **The price of the blocks is stable**

Up to 40% of the new building activities taking placing in Helsinki are these kinds of lower and smaller complementary constructions, where Basso shines bright.

Jukka Lehtonen says that years of experience have taught him that Leca Blocks are supreme when building small blocks of flats of 3 to 5-floors. The company has also refined its building process and logistics to the top in small complementary construction projects. - We are certainly the leading expert in the construction of small blocks of flats using Leca Blocks!

After years of well realised locations, their reference list is impressive. It distinguishes us from many competitors at a time when many are experiencing problems concerning construction quality, humidity and mould.

Markus Wirtanen and Jukka Lehtonen say that they have never considered quality to be a mere marketing term. - Quality already comes from the culture of Leca Block construction. Stone construction with on the spot masonry produces quality. It is very difficult from elements with their insulation getting wet on the construction site!

Quality already comes from the culture of Leca Block construction. Stone construction with on the spot masonry produces quality.

Colorful small apartment buildings in Espoo, Finland.

Nowadays, even, seamless plaster is an important part of the quality of construction and an important aspect of the city. In many places visible elemental joints are no longer accepted in Helsinki. The smooth plaster base provided by a Leca Block structure is a very good competitive advantage.

Quality can only be produced when the professionals have expertise. Basso boasts good, dedicated partners. Although there are only 12 employees in the company, a long-term subcontracting relationship network involves about 300 professionals.

- We have enjoyed long-term partnerships from the beginning. This is an advantage for all parties. Committed professionals can also grow their own businesses while Basso also grows theirs, Markus Wirtanen points out.

One should focus on their own expertise

Basso have their eyes towards the future and the entrepreneurs say that the current size and niche market feels good. It is good to remain in place and not stretch out too far. Even though the company that enjoys a good reputation is constantly being asked for offers concerning renovations and hall constructions, Markus Wirtanen says that they do not contemplate such. - It's just not our field.

– Our area is the building of customized and high quality Leca stone homes for our customers.

Detached houses in Espoo, Finland.

Leca LWA accelerated the £80million transformation of Blackpool's seafront

BLACKPOOL SEASIDE TRANSFORMATION

UNITED KINGDOM ***Leca® Lightweight Aggregate (LWA) provides the lightweight structural solution to re-develop and transform the Blackpool Seafront.***

Leca LWA geotechnical fill from Leca UK helped the £80million transformation of Blackpool's seafront ... and saved the council hundreds of thousands of pounds.

Developing Blackpool's Sea Defence

Some 4,000m³ of Leca LWA was used, for the first time by Birse Coastal, to fill the void between the existing sea defences and a new sea defence wall. The new 7m high sea wall of precast concrete units was constructed immediately in front of the existing defences, limiting the space for foundations. The only way around this would have been to break out the old wall which would have added serious costs to both temporary and permanent works.

Through value engineering workshops held with Birse Coastal, consultants Halcrow Group discovered Leca LWA was 66% lighter than its closest rival and considerably more cost effective. Anthony Burgess, regional engineering manager with

4,000m³ of Leca LWA was used to fill the void between the existing sea defences and a new sea defence wall

Leca LWA is 66% lighter than its closest competitor and considerably more cost effective.

Birse Coastal, estimates that not having to break out the existing sea defences saved Blackpool Council some £250,000.

"We hadn't used a lightweight fill before but the Leca LWA product performed very well. We were a little concerned at first about using lightweight material because of the exposed environment. We thought it might blow away in the wind or float away on the tide.
"But we got a lot of support from Leca LWA and when we trialled it slowly on the Blackpool project, it proved very effective and simple."

Delivering Leca LWA to site

To assist with minimising costs a dedicated shipment of 10-20mm Leca LWA was received into Goole docks and trucked across the Pennines to Blackpool on walking floor vehicles carrying average loads of 86m³. More economies of scale were realised with the walking floor vehicles which negated Birse having to work around its ban on articulated tipper trucks.

Gareth Robertshaw, principal coastal engineer with consultants Halcrow Group, said: "We had a real design challenge with the Section 7 works. The new wall was to be built immediately in front of the existing sea defences, limiting the space for foundations.

Positive Feedback

"Without adding serious additional temporary works costs associated with breaking out the existing defences, we couldn't get a design to work using standard materials.
Using Leca LWA meant we were able to reduce the weight of the new construction by up to 40% and support the weight of the new wall which remained within the footprint of the original design.

"Overall, this has allowed the delivery of this critical element within programme and budget which is a real success given the initial challenges."
No settlement period was required before a concrete cap was then cast and the new promenade finished off with a decorative concrete.

Birse Civils is one of six contractors working on the final phase of the six-year redevelopment of Blackpool's seafront into the "best seafront and promenade in the UK".

Fundamental Properties of Leca LWA

Leca LWA is a lightweight expanded clay aggregate formed by heating and firing natural marne clay in a rotary kiln at temperatures up to 1150º centigrade to create a ceramic granule. With an average density after compaction of just 300kg/m³, Leca LWA is free-draining, chemically inert and resistant to extreme temperatures.

Leca LWA is used in many civil engineering and geotechnical fill scenarios helping to reduce weight loadings by up to 75% on retaining structures and wiping out lengthy settlement periods in bulk fill applications. With site production up to 16 times faster than traditional fills, Leca LWA proves itself an economical alternative.

Project information

Client: Blackpool Council

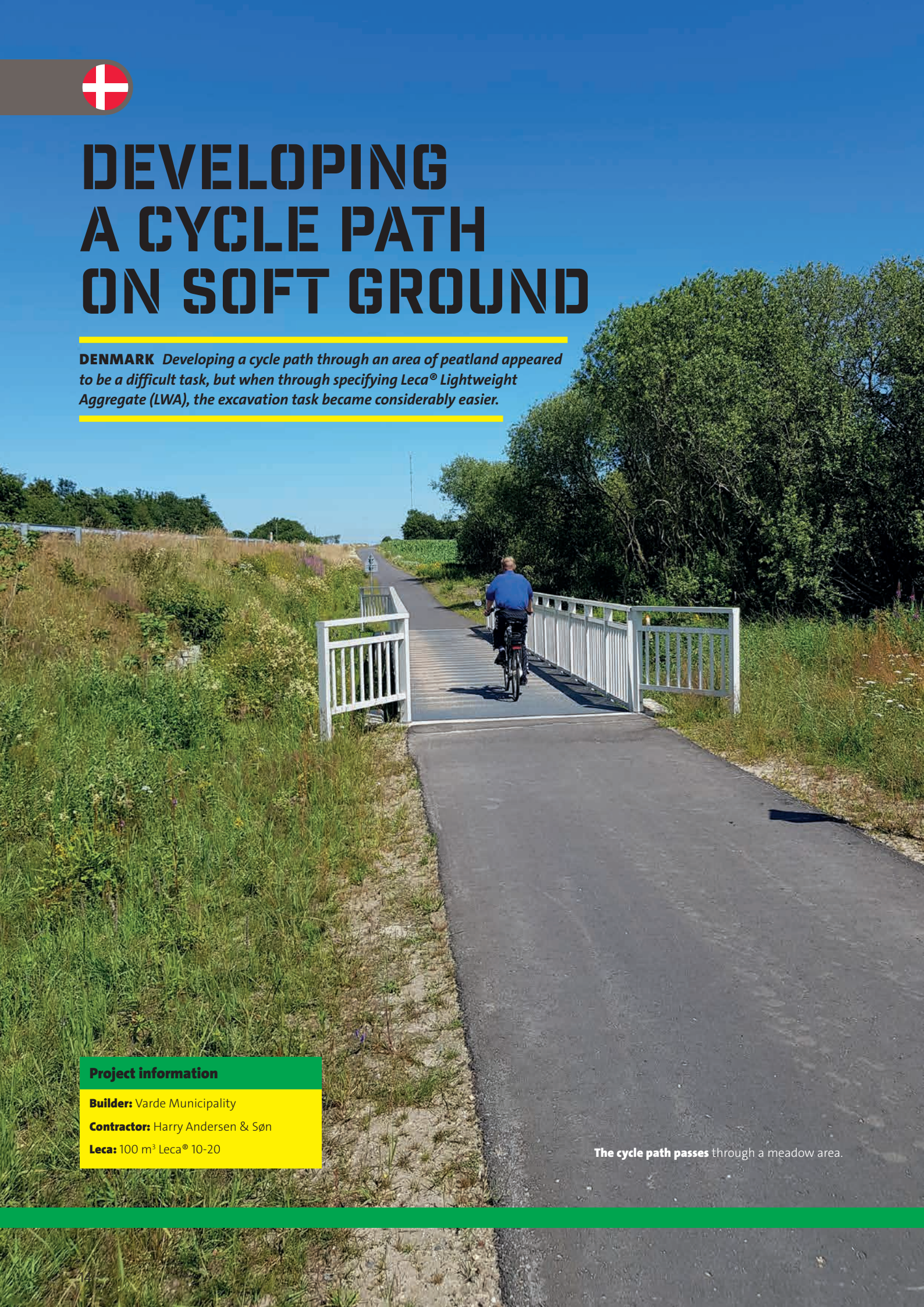
Consultant: Halcrow Group

Contractor: Birse Civils

Leca: 4000 m³ Leca® 10-20

DEVELOPING A CYCLE PATH ON SOFT GROUND

DENMARK *Developing a cycle path through an area of peatland appeared to be a difficult task, but when through specifying Leca® Lightweight Aggregate (LWA), the excavation task became considerably easier.*



Project information

Builder: Varde Municipality

Contractor: Harry Andersen & Søn

Leca: 100 m^3 Leca® 10-20

The cycle path passes through a meadow area.

The Committee on Planning and Technology in Varde Municipality decided to create a child friendly school road along the busy Vardevej. This resulted in the development of a new cycle path, which opened in December 2018.

Challenges were encountered as the cycle path crosses a watercourse including a surrounding meadow and marsh area. The geotechnical survey showed that from a depth of 0.3 - 1.0 meters, a 2 – 2.5 m layer of thick peat was discovered with a low carrying capacity.

The cycle path is also situated in an area that is protected under the Nature Conservation Act §3. The law protects certain habitats where wild animals and plants reside whose livelihood is threatened from new infrastructural developments. This legal act posed some significant challenges for the development, but the project was fortunate in succeeding to get an exemption, and the cycle path development could continue.

Load compensation with Leca® LWA

Mille Graarup, Engineer at Varde Municipality, designed the cycle path, but had no previous experience of building on soft ground conditions. The bridge, which crosses the watercourse is a pile foundation that is nine meters deep, and this provided a significant challenge for the project. It was Rambøll who suggested Leca LWA. "From there it was pretty easy", says Mille Graarup "I found Leca through an online search and contacted René Jespersen to hear if Leca had experience with cycle paths on peat soils, and they did."

To avoid settlements, a solution was designed where the cycle path was to be at the same level as the terrain, so that no additional load was exerted on the delicate ground - providing additional support for the path. On a stretch of approx. 50 meters before and after the watercourse, 60 cm of the soft, heavy soil was replaced with 40 cm of Leca® 10-20 and 20 cm stable gravel. Through this design method there was no increased load at the bottom of the excavation, and thus no settlements.

In order to stabilize the design and distribute the pressure, there is was a geogrid system under and over the layer of Leca LWA.

Easy delivery through pneumatic installation

Flemming Nørskov, who worked for the project contractor Harry Andersen & Søn and helped to incorporate the Leca LWA, says: "It was easy to work with when it was delivered by the pneumatic blowing truck. We had placed some piles one meter from the center line of the cycle path and then we just had to fill this up until they were covered. It was easy to rectify afterwards."

The contractors chose to provide additional stability through placing gravel on top of the Leca LWA - this was then flattened and compressed to provide additional stability to the construction.

"Compared to an alternative solution, traditional soil would have to be replaced in three meter depths, and 15 m^3 would have to be excavated for every meter of development, the solution discovered with Leca LWA opened so many doors for us and solved many issues" says Flemming Nørskov.

Mille Graarup was pleasantly surprised with the results when using Leca LWA: "When it is first wrapped in geotextile, it is solid to work on, and so far we have no issues with settlement."

The Leca® LWA was delivered by pneumatic blowing truck.

The thickness of the Leca LWA layer varied between 600 and 1,200 mm

LECA® LIGHTWEIGHT AGGREGATE (LWA) FILLING IN TRAFFIC AREAS

FINLAND ***The extensive lightweight filling structures for the outdoor areas surrounding retail park Bredis Laajalahti, recently built in Laajalahti, Espoo, were carried out using Geo Leca 4-32 mm.***

Text: Dakota Lavento
Photos: Janne Pappila

Retail Park Bredis Laajalahti has been opened in Espoo at the intersection of the Sinimäentie and Turveradantie streets, close to the Ikea store. Lehto Tilat ltd, the contractor of the project, was led by the property investor Nordic Real Estate Partners (NREP).

Three commercial buildings with a total surface area of 15,000m^2 were built in the area during the first phase of the project. The first shops were opened before Christmas 2018, and the rest was opened by the spring of 2019. Plans have already been made to further expand shops in the area.

Challenging ground conditions

According to Jarno Tuominen, the Project Manager responsible for the earthworks at the site, the ground conditions on the plot were extremely challenging.

– The ground was marshy, he states.

20 000 m³ of Leca LWA

Lightweight fillings were provided for a total of 20,000m² of land next to the retail park. Service roads and loading areas, as well as over 300 parking spaces between the buildings, were constructed in the area.

The earthworks on the site started in the winter of 2017. Leca LWA 4-32 mm deliveries for the lightweight fillings in the traffic area of Bredis Laajalahti began in May 2018 and continued through to autumn.

– A total of 20,000m³ of Leca LWA 4-32 mm was delivered from our Kuusankoski factory to the project for lightweight fillings and to provide frost insulation, says Area Sales Manager Marko Jelonen from INFRA solutions at Leca Finland.

Leca LWA directly into the structures

The quantities of Leca LWA required at the site was substantial, and the material was consistently installed directly into the structures, meaning that Leca LWA did not require storage on the site. – We were able to prepare the project in advance, Tuominen notes.

The lightweight filling and frost insulation works continued through to the summer and autumn. The thickness of the Leca LWA layer varied between 600 and 1,200 mm. The load-bearing layers and the asphalt were laid on top of it. The project was completed in December 2018.

According to Tuominen, Leca LWA as a lightweight fill material was the best and most cost-effective solution for the site.

– In the case of an area as large as this, using a pile-slab structure would not have been a cost-effective solution, Tuominen points out.

Project information

Facility: Retail Park Bredis Laajalahti, Espoo

Developer: NREP

Contractor: Lehto Tilat Ltd.

Leca product: Leca® LWA (4–32 mm)

Lightweight fillings were provided for a total of 20,000 square metres of land next to the retail park.

Paulo Palha is president of the Portuguese National Association of Green Roofs and vice president of the European Federation of Green Roofs and Walls (EFB). He is an expert on green spaces and ecological design and has coordinated over 100 green roof projects over the last 20 years, both in Portugal and overseas.

Photos: Duarte Silva

INTERVIEW

"Buildings of the future will be obliged to demonstrate social and environmental responsibility"

Paulo Palha has been vice president of the European Federation of Green Roofs and Walls (EFB) since April. In this interview he talks of the importance of green roofs, the latest industry trends and the versatility of Leca® Lightweight Aggregate (LWA) in their construction.

You were recently elected vice president of the European Federation of Green Roofs and Walls (EFB). Tell us a little about the EFB's objectives the work it carries out.

The EFB is the federation of the various national associations in Europe that handle issues relating to green roofs and walls. We encourage these countries to work together and we support the European Community with any open dossiers in this area. We establish a collective strategic plan every year and we share tasks throughout the year with the aim of achieving an organised working process on a European level.

The subject of green roofs has been an increasingly popular topic in recent years. Could they be one of the answers to urban rainwater management problems? If so, how?

This is essentially linked to the perception that green roofs can bring extremely interesting benefits to urban ecosystems, which include rainwater management, and with a highly favourable payback. The roof is the first part of building to have contact with the rain. If we were able to detain this water – and the sector is continually developing systems with large water retain capacities – we could greatly alleviate urban drainage systems. Apart from that, excess water would be channeled into the drainage system at a slower rate, which also facilitates its management. Rainfall peaks are on the increase, meaning that large volumes of water are generated in short spaces of time. In addition, cities are getting increasingly bigger, more built-up and waterproofed. Buildings are therefore being forced to adapt, meaning that green roofs are making a greater appearance.

Rainfall peaks are on the increase, meaning that large volumes of water are generated in short spaces of time.

Green roofs allow for the creation of gardens, urban vegetable gardens, as well as leisure and social areas that could not previously be used. Is the social role of green roofs also an important aspect for the industry?

Absolutely. In times of crisis in the past, people have used the roofs of buildings to produce food and this issue is receiving renewed attention today. If we consider that food travels an average of 2900 km to reach the end consumer in the United States, we soon realise that this leaves a huge ecological footprint. Bearing in mind that the world population grows by almost 240,000 people every day, we have a problem on our hands. Green roofs create an opportunity to produce food locally. In this respect, I believe that future buildings will also include underground gardens for cultivation, with the aid of photovoltaic energy and hydroponics.

Could you give us a brief overview of the green roofs that are being implemented in buildings on a European level? Are some countries way ahead while others are only just beginning?

On a European level, this area is much more developed in northern European countries. *Sod* roofs were already incorporated into Scandinavian constructions as a part of their culture. These were wooden buildings that were finished with a layer of grass made with birch bark for waterproofing. This means that green roofs have been around for centuries.

They were also the first to realise, in the 1960s, how these roofs improved the level of heat insulation, which was one of the first areas they worked on. Environmental aspects later emerged when it became clear that more vegetation in cities meant that more CO2 and other air pollutants could be captured, helping to improve the environment. From the 1960s onwards, some cities began to launch specific programs that fostered, or even insisted on the installation of green roofs, very often starting with local authority buildings. These roofs later started to ex-

tend to Southern European countries. You could say that this is a movement that spread from North to South. The Portuguese National Association of Green Roofs website (greenroofs.pt) shows an interactive world map of policies, where you can see the policies that are currently active in a range of cities.

Could you highlight some of the most important green roof projects in Europe?

This is always a difficult question because the most recent projects are usually the ones that spring to mind. For example, during the last meeting of the world federation, in Oslo, we visited a private building with a very interesting concept. The green roof was an optional feature that was developed to serve as a community area. The size of the balconies had been reduced in order to encourage people to use the roof. They designed a few private areas which were sold and, with this money, they financed the rest of the community area of the green roof. The most interesting aspect of this building was that, in comparison to others built at the same time, it was sold for 20 % more. This is an encouraging sign that the market itself is adapting and that there is an emerging demand for green roofs, without the need for political will or legislation for them to develop.

In terms of legislation, is the necessary legislation already in place or is there still some way to go before green roofs can become more widespread? Is the situation the same across Europe?

The subject of green roofs has been warmly embraced across Europe. There are many working groups and funding is available for research. Portugal is one of the countries that has stood out for its scientific work on the subject. No specific European Community directive exists in relation to this field that says, for example, that green roofs are obligatory. But the subject is certainly being encouraged and this has led the governments of each country, and consequently local authorities, to look into it as part of a decentralisation process. Indeed, if we look at local authorities, there is already a group of European cities that either require or encourage the installation of these roofs. This is the case in some German cities where the "user pays" principle is in force. If a building makes less use of the urban drainage system, then why not reduce the amount of tax it pays towards the maintenance of this system?

In relation to legislative matters, is this an area the EFB aims to get involved with? How?

The European Federation takes great interest in supporting the different national associations and promoting best practice. We also have to try to encourage countries that have similar climate conditions to work together. It's in Portugal's interests, for example, to work together with Spain, Italy, Greece and other Mediterranean countries with the same climatic conditions. But is also important to note that northern European countries are also interested in our know-how, because warmer and drier conditions are on the increase. A recent study suggested that London's climate would be similar to that of Barcelona by 2050.

On a European level, and assuming that the solution has

different implantation levels from country to country, how does the green roof market work in terms of project and construction? Are there already a lot of companies offering solutions and specific services for this area?

There certainly is a mature market in terms of solutions. It's safe to say that there is a group of players and fairly large companies, and that we clearly have a solid infrastructure in place to ensure that things will be done properly. At the same time, there is still some adventurism, a little DIY, which often means that the roofs do not perform as expected. But this is like everything else in the construction industry. If we lay poor foundations we'll have problems, and if we take risks with waterproofing we'll have problems. There are clearly defined rules and if we follow these rules using the products and systems available on the market, we can achieve structures that could last 40 to 50 years without any problems.

Generally, and in economic terms, do green roofs offer more advantages than traditional roofs?

A green roof is always an added feature for a building. In other words, if we add an extra layer it's only natural that this will affect the budget. It is sometimes possible to eliminate something from the system, for instance in terms of heat insulation, in order to save some money. But the fact is, a green roof is an extra cost. Yet we need to start looking at the life-cycle of buildings. We definitely need to abandon the idea of the costs on opening day and think about the long-term costs of running the building. From this point of view, the payback on investing in a green roof is extremely attractive. The energy savings go without saying. We will use less energy to heat and cool the building and thermal comfort is far superior. Being in a room with air conditioning at a temperature of 21° is not the same as being in a room with a natural room temperature of 21°. On the other hand, we will prolong the lifespan of our waterproofing, which instead of changing after 20 years may only need changing after 40 years. And finally, there are many other benefits that are more difficult to measure: less polluted cities, better health, more recreational spaces, increased productivity because we work surrounded by plants. These benefits last for the lifetime of the roof, so we should therefore look at the long-term investment.

The market itself is adapting and there is an emerging demand for green roofs, without the need for political will or legislation for them to develop.

In your opinion, what role could expanded clay have in green roofs?

Expanded clay is a historic material in the area of green roofs. It's excellent because it's extremely light and has characteristics that help to retain water, and can be used for drainage in green roofs or as an ingredient in technical substrates. It's an extremely versatile material and I even think that it could be used in ways we have yet to discover, given its potential for construction and also in the green roofs sector.

Could you give us one or two examples of projects where this material has been used with positive results?

I'm sure that Leca® LWA has been used in countless projects, but what usually happens is that when a green roof has been finished we don't know what's underneath. Even if we have access to the project, they may often have been changes, whether for technical or budget-related issues. But one example, in which I know a great deal of expanded clay was used, is Alcântara's water treatment plant (ETAR). This project is simply iconic in Portugal, and which managed to place a water treatment plant – which isn't usually a very attractive building – in the Alcântara valley with a fabulous design, linking it to urban vegetable gardens that already existed.

How do you foresee the future of green roofs in Europe? One of the main trends in this area?

We are experiencing a time of transition. People are increasingly demanding nature-based materials, and buildings of the future will be obliged to demonstrate social and environmental responsibility. From a social perspective, there is the matter of food production. From an environmental perspective, buildings will be increasingly required to incorporate waste and use natural raw materials. I believe that all industry players involved with green roofs will be focusing on nature-based materials, as well as those that have proven carbon negativity. In fact, some areas of the market are already moving in this direction.

LOAD COMPENSATION UNDER A GREEN ROOF DEVELOPMENT

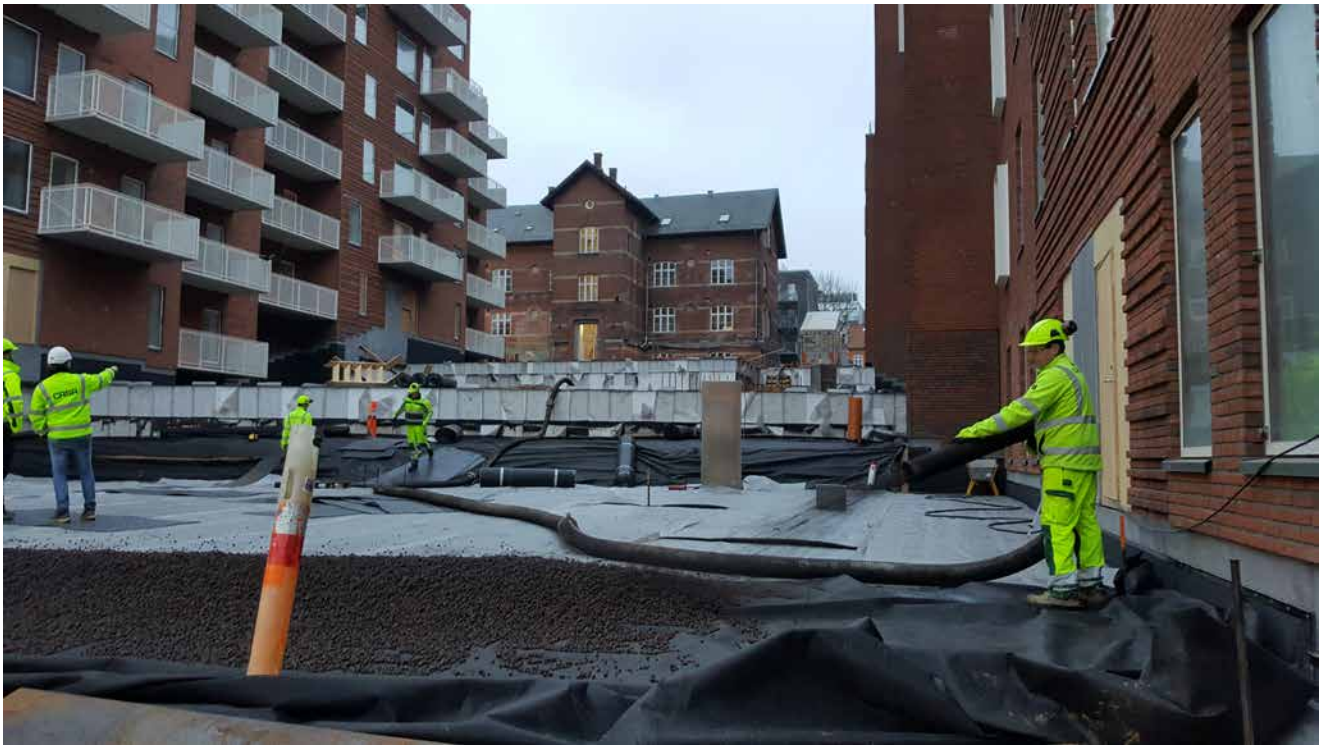
DENMARK ***In the heart of Aarhus, an old municipal building was sold, demolished and replaced by new housing development with a communal green roof courtyard.***

106 new apartments have been built in Valdemarsgade, Aarhus. Three garages were built between two new buildings, and on top of these sits an urban green roof, which also acts as a public access connection to the surrounding area.

OKNygaard was the landscaper on the project and was tasked to build the new courtyard development. A lightweight material was specified as the concrete garage was not be able to withstand the load from ordinary soil. Leca® Lightweight Aggregate (LWA) was chosen, as it was a proven and well established solution for lightweight load bearing compensation.

Sloping terrain

The green roof is around 60 meters in length and reaches as much 11 meters in height - therefore the area had to be divided into stages. Leca LWA was successfully delivered to an otherwise difficult to reach area. The stop-start requirements of the hoses needing to be moved around, took additional time, but the project was still completed within the contractor's timeframe.



The courtyard was build up bit by bit because of the sloping terrain.

Under this nice courtyard you will find three parking garages.

Martin Høj, chairman of OKNygaard A/S, says it was the first time he worked with Leca LWA. Although he had seen videos of people walking around on a layer of LWA, he was still rather skeptical as to whether the material was suitable for the task:

- Our fear was that the pellets, due to the sloping terrain, would roll down like balls in a play room. But it was much easier to work with than expected.

The sloping surface, however, meant that the small clay aggregate would move easily. But as the layers was compressed, the firmer and more comfortable the Leca LWA sat on the sloping angle.

Seamless cooperation

- The collaboration prior and during the project with Leca worked perfectly. Engineer Knud Mortensen was readily available with his technical expertise and the sales department made sure that the Leca LWA was delivered as required. It has gone smoothly, Martin Høj concludes.

Project information

Client: Valdemars Have A/S

Contractor: Casa A/S

Landscaper: OKNygaard A/S

Leca: 2000 m³ Leca® 10-20

Bent C. Braskerud by a pilot green roof on the top of the Oslo Water and Sewage Works offices.

Text: Lasse W. Fosshaug
Photos: Lasse W. Fosshaug and Bent C. Braskerud

THE DANGERS OF FLASH FLOODING ARE LEADING TOWARDS GREENER SOLUTIONS

Intense storm water flooding is becoming increasingly common throughout all our cities. Through this common crisis it is interesting to see the innovative work which is happening in the Municipality of Oslo in Norway, and its plans on how to tackle the influx of storm water.

Chief engineer Bent C. Braskerud is sitting on a chair in his office in Herslebs gate in Oslo. The offices of City of Oslo Water and Sewage Works are not the most modern, but they are functional, and Bent is lucky enough to have a window in his office. And he needs that window to keep a positive outlook when contemplating how the capital of Norway can handle the threat of increasing storm water in the future.

The increase in extreme rainfall

Storm water is the water runoff from roofs, asphalt, walls and other non-permeable surfaces after rain, flash floods or melting snow. This water run-off is usually handled within the established city sewers and has until recently effectively served its purpose in removing the risk of flooding. However, climate change looks set to cause more precipitation in general and generate more intense and heavy rainfalls and the capacity of the existing sewer system in the city is believed to insufficient. The evidence of which is clear when looking at data from 2016, when Oslo received 54,7 millimetres of rain water within two hours. The devastating effects of which saw basements getting flooded, waste water rising up from the toilets and havoc caused on the roads where traffic remained stationary throughout the city centre.

WE WANT THE WATER to hold a more natural place in our environment

– There has been a steady increase in storm water over the last hundred years and the accelerated rate of this increase is glaringly obvious in recent

decades. An example of this was evident in Copenhagen in 2011, where storm water fell at such a rapid rate it created a depth 150 millimetres within only two hours throughout the whole city. That`s extreme! Basements of buildings were flooded and damaged throughout Copenhagen. The effects of this saw one man succumbing to the direct effects of water poisoning after accidently drinking contaminated water containing unfiltered water mixed with sewage waste, says Bent C. Braskerud.

– So it is not unforeseeable that similar rainfalls can occur in Norway as well.

Creating space for water in cities

To effectively manage this change in climate, the Oslo Municipality has made a storm water management strategy for the capital. The strategy sets goals and elaborates on what practical measures are needed to tackle the devastating effects of intense rainfall. Some of these development measures which can be taken include opening closed streams and rivers, installing green roofs and creating green, permeable surfaces instead of non-permeable asphalt and cobblestone.

– We want water to have a more natural place in our environment. The perception that all water should be led through pipes is outdated. If we can rediscover the natural place of water in our near environment, it will not only prepare us for an increase in storm water – it will also make our city aesthetically nicer to live in, says Bent.

WE CAN CHANNEL THE STORM WATER into green areas, or via open ditches and canals to water reservoirs

The three-step strategy

The goal is clear and specific. Oslo is to manage storm water using open and local solutions to meet climate change and to minimize damage and inconvenience for inhabitants, thus protecting property and providing support for local infrastructure. The solutions shall protect the environment and ensure healthy ecological and chemical conditions in all water resources. And last, but not least: the solutions shall use the storm water as a resource. To make this happen, Bent and his colleagues have described something they call the three-step strategy.

– If we use more green spaces, trees, rain beds, green roofs and permeable surfaces we can channel the storm water into green areas, or via open ditches and canals to water reservoirs. In this way we can handle everyday rain in a good way. If it rains more, we need to handle and restrain storm water by detaining the water, though a process called water detention. To achieve this, we need to create dedicated areas and make sure they are fully optimised to handle the storm water. And last, but not least we need to be ready to direct the storm water safely into the fjord when extreme weather occurs. This means establishing safe, surface-based flood ways. If we can manage to do all of this, we are well on our way towards creating a safer and nicer city, says Braskerud.

Chief engineer Bent C. Braskerud in Oslo Water and Sewage Works and his colleagues in the Municipality has worked out a three-step strategy for water management in Oslo.

Excited about green roofs

Bent's office is currently filled with brochures and ring binders containing information and research based on water management. When the conversation turns to green roofs he gets excited and quickly finds documentation and pictures from his own

Crushed Leca 0-6 mm was used to maximize water detention when Bent C. Braskerud installed a green roof on his home in Oslo

test bed at his home in Nordberg, Oslo. He created his first green roofs on a garage to establish research findings into detention and runoff with traditional roofing. But last year he went all in and installed a larger green roof on a house which was built in 1964.

– I have multiple test beds established to see how different subsoils affect vegetation. Under some of the fields there is drainage with plastic systems and felt, and in other places I`ve used Leca® Lightweight Aggregate (LWA) and felt. The soil also has different levels of thickness. This creates terrain on the surface and the increased volume of earth enables a higher assortment of vegetation. But this additional weight also means that the roof must handle the increased weight.

Braskerud wrote his PhD on measures against runoff from farming and he has been employed by NIBIO, earlier called Jordforsk. The name Jordforsk – Earth science - has a bit more flair to it, it is more aligned with nature, just as Bent himself. On our way to the botanical garden to shoot pictures, he shares some of his views on ecological food and biological diversity. His passion is clearly within more than storm water. When we arrive at the garden and passes an insect hotel, he eagerly poses and tells the photographer to snap some pictures.

– Did you know that insects are incredibly important to ecology? They also greatly benefit from developing green roofs too, says Bent Braskerud.

SMALL notes

STUDENT EDUCATION PROGRAM

In Denmark, every year hundreds of students from various youth education programs visit our plant. The students get a guided tour around the factory and are taught about the use of Leca® LWA. We are very happy for their interest in our product and love to share our knowledge.

WATER FILTRATION TUNNEL

The Norwegian Road Authorities is a model organization when it comes pollution-reducing measures from infrastructure. Their handbook N200 describes that water treatment processes are required for washwater that leaves tunnels in Norway. Tunnel washwater contains large amounts of soap, microplastic and heavy metals, and the Technical University of Norway and the Road Authorities have started a project for testing new methods for cleaning this water. Leca has participated in the planning of the project. In the coming year, Leca's innovative solutions for filtering and purifying the water with Filtralite are expected to be tested in the water treatment plant in the new tunnel Bjørnegårdstunellen near Oslo. The tunnel is 2,3 km long and must be washed several times a year to ensure traffic safety.

EVEN A BEE MUST DRINK

Water is an indispensable nutrient for bees. It is just as important as honey and pollen. To ensure a sufficient amount of water during a period of highest demand, one bee family must perform as many as 6,000 flights a day. Therefore, beekeepers place special waterers near the hives so that the bees do not have to take long flights in their quest for water. An innovative solution is to make a drinker in the form of a flat container buried in the ground and filled with 2-3 cm layer of expanded clay on the water surface. The surface of the expanded clay remains moist all the time which provides the bees with simple and safe access to water. Expanded clay is a chemically inert substance that does not react with water and does not rot which allows the water in the drinker to stay fresh for a long time. It is very durable so that you don't have to clean or replace it throughout the season. Additional advantages of this solution includes maintaining a slightly elevated water temperature in the drinker, limiting evaporation and providing easy access for periodic disinfection. Expanded clay is also excellent for filling feeders.

REUSE OF LECA® LWA

When excavating for a new road works, the originally placed Leca lightweight aggregate was also excavated, and when the geotextile was removed, the Leca LWA was found to be of the same quality as when originally laid in 1993. So the material could be reused in the new road construction.
However, it took some caution to remove the overlying layer of asphalt without damaging the geotextile and getting mixed soil, sand and other impurities in the Leca LWA.

THE RE-ESTABLISHMENT OF NATURE AT THE CLAY PIT IN KUUSANKOSKI

At Leca, if for various reasons you are not able to unearth anymore clay from a clay pit, the digging process is shut down and a re-establishment process begins. This process took place at the Kuusankoski plant in Finland.

Nature has taken its course over the former clay pits in Kuusankoski, Finland. The old clay pits were filled with water and now the green oasis attracts birds to nest and rest. The area attracted birds and other wildlife even before the clay was finally depleted and the pits became redundant. The lightweight aggregate plant has been extracting clay from the area for over 70 years, totaling approximately 2.7 million cubic meters. The source of rich clay was depleted about four years ago. Now the pits are owned by the city of Kouvola, which wants to make the area an official nature site – where signboards and bird watching towers are planned in the area. If you are lucky enough, you can spot tufted ducks or a Slavonian grebe in the area.

STRONG PLANT ROOTS

Many studies and experiments related to horticulture have shown that Leca Lightweight Aggregate (LWA) can help both the gardener and the plant. If you put a layer of Leca LWA that is a few centimeters thick at the bottom of a pot with a sapling, the roots of the plant will grow faster and be abundant. A greater root mass allows for faster and better rooting of the plant in its target place. With more roots, the green part of the plant receives its nutrients faster. Through this there is a reduction in plants not rooting and beginning to wither. Having a lot of strong roots right from the start helps the plant when planted in a garden soil of small thickness. And this is often the case with green roofs. Tests carried out on more than 1,000 Emerald Green Arborvitae have shown that after putting a 4-6 cm thick layer of Leca LWA with 4-10 mm in grain size at the bottom of a 10-liter pot, after two years, just before transplanting the plant into the soil, the root mass is over 20 % larger than if the plant had grown in garden soil without Leca LWA.

LECA AND WEREC LAUNCHES STORMCLENS™

Leca has together with WEREC Water Ecosystem Recovery developed a solution, Stormclens™. A solution which provides efficient pollution removal while providing good storage capacity. Stormclens is based on patented technology and is a progress towards solving the challenges of increased water flows and the set requirements for treatment of stormwater.

Water flows are increasing and there is much that indicates that they will continue to do so in response to climate change. Stormclens is the result of a successful collaboration where combining expertise has resulted in a long-life solution where the filters last for at least 10 years.

Municipalities can often find it difficult to find practical solutions for this. Also, the EU Water Framework Directive places clear demands on municipalities and their management of stormwater. Many see the regulations as challenging and previous techniques are costly to build, especially in expanding urban areas where space can be limited and with many hard surfaces covering the ground. Then, open ponds are not always an option that fits or creates enough water detention for the desired purification effect. However, since Stormclens is installed below ground it can be designed quite freely. And it works both economically and construction wise just as well in new construction as in an already built areas.

SMALL notes

REUSING LECA® LWA WAS EASY

In the middle of central Gothenburg in Sweden there is a project going on where 800 meters of the E45 road is being lowered six meters down into the ground.
It was planned all along to use Leca Lightweight Aggregate (LWA) as a filling material and below the existing road there was in fact already Leca LWA in the ground that had been there since the 90s.
You might think that the material would be negatively affected by this. But the material was in good condition even though it had been in the ground for almost 30 years. This is because the natural material, clay, is durable over time and resistant to frost and chemicals. It can endure fluctuating pH-values on surrounding water, is resistant to petroleum based products and can withstand temperatures up to over a thousand degrees without being chemically altered.
For the contractor PEAB, it was not only a good decision to reuse Leca LWA from an environmental and sustainability perspective. It was of course also economically advantageous. When the contractor had utilized all the recycled material they were supplemented with new material where needed, and with a satisfying result.

WINNER OF THE LECA® INTEGRATED DESIGN PROJECT AWARD

We have launched our inaugural geotechnical award in conjunction with the University of Leeds, and we are thrilled to announce the inaugural winner of the LECA® Integrated Design Project Award is George Marchant. His final report on an ambitious redevelopment concept for Craven Cottage football stadium in Fulham demonstrated innovative geotechnical ideas and an intricate understanding on the common issues facing today's structural engineers.
One of the main modules in my 4th year of study was the group design project that involved the redevelopment of Craven Cottage football stadium in Fulham. One of the most challenging requirements was to incorporate a new underground car parking structure that would include 750 new spaces.

SAINT-GOBAIN NORDICS SWITCH TO GREEN POWER

Since January 1st 2018, many Saint-Gobain subsidiaries, including Leca, in the Nordic countries have switched entirely to green electricity. This electricity, considered as CO2 neutral according to Scope 2 of the Greenhouse Gas protocol, is issued by facilities that produces renewable energy, and provides Guarantee of Origin certificates. The transition should result in a reduction of the carbon footprint by 40,000 metric tons of CO2 and supports Saint-Gobain's strategy of reducing its carbon emissions by 20 percent between 2010 and 2025.

7000 m³

In less than 24 hours Leca managed to deliver this amount of Leca lightweight aggregate to an infrastructure project in Sweden. Thanks to careful planning, efficient excavators and deliveries that kept the schedule, the work could be completed in record time.

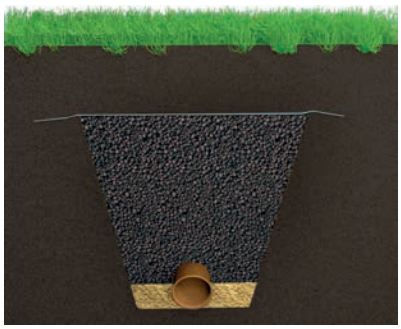
> 1 m

Over 1 m thickness of insulation layer in Leca roofs is not exceptional. Over 50 years of experience has proven that utilising Leca LWA within a roof design is one of the most durable and weather resistant roofing solutions available for residential and office buildings. Leca LWA roofs are distinguishable and furthermore appreciated by designers, contractors and roofers. Moreover, a Leca LWA roof can be made watertight within two days of development.

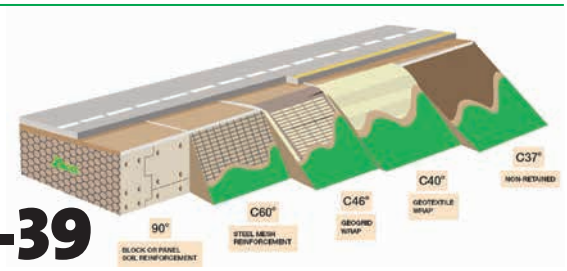
700+

The number of people visiting Leca Denmark on Open Day 2019 – the first ever in Denmark. This is the highest number of visitors to any Leca Open Day and twice as many as expected.

4



times better insulation of pipes in the ground. Leca Lightweight Aggregate is over 4 times better as a thermal insulator than plant soil, clay or gravel. In practice, it means that 10 cm of expanded clay can replace 40 cm of soil. Therefore, it is often used for thermal insulation of pipelines in freezing areas. This lightweight ceramic aggregate can be used in any type of environment, even an aggressive one. It easily transfers traffic loads and is durable and reliable.



35-39

The angle of friction given for Leca® Lightweight Aggregate 10-20mm is 35°-39°. But did you know that in geotechnical structures LECA® LWA is commonly used to reduce subgrade settlement? When reinforced with a steel mesh or geotextile wrap, the angle of shearing resistance can be adjusted to 90° - providing an innovative, diverse and lightweight structural solution.

1200 m²

LECA Lightweight Aggregate provided effective coverage for a 1200m² digestion lagoon in North Wales. Limiting the emission of harmful gases and foul odours such as ammonia from a lagoon by up to 85% - staying in line with DEFRA's requirement in the protection of the environment.

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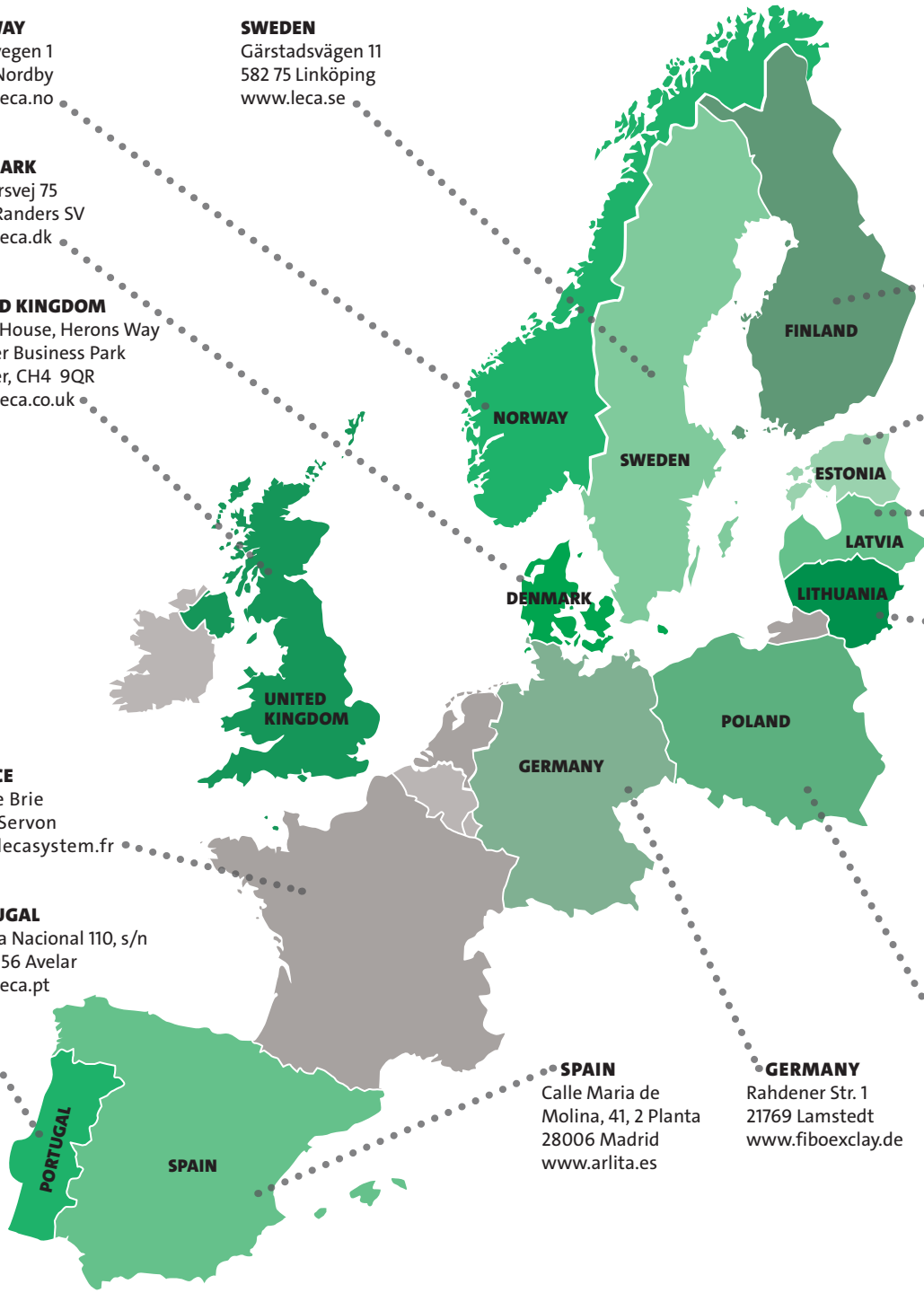

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