

BUILD



A MAGAZINE FROM LECA



HOUSING:

Leca® LWA saves an old defensive fortress → 2

West Side Solna is surrounded by Leca® LWA → 10

INFRASTRUCTURE:

Replacing heavy road construction material with Leca® LWA → 20

Leca® Lightweight Aggregate filling in traffic areas → 22

WATER MANAGEMENT:

Purifying city runoff water → 28

Communication rooftops and green rooftops on garages → 30



CONTENTS

HOUSING

- Leca® LWA saves an old defensive fortress 2
- Leca® LWA show its versatility in new district..... 4
- Leca® LWA helps save a piece of history..... 6
- Leca® LWA in a load compensated foundation 8
- West Side Solna is surrounded by clay pellets 10
- The Leca engineer's stone house..... 12

TECHNICAL ARTICLE

- Leca® Lightweight Fill in Railway Construction 14

INFRASTRUCTURE

- Arlita® allow widening a road in a simple... 18
- Replacing heavy road construction material..... 20
- Leca® LWA provides the water management..... 22

INTERVIEW

- The wellbeing-factor 24

WATER MANAGEMENT

- Purifying city runoff water..... 28
- Communication rooftops and green rooftops on ... 30

OTHERS

- Small notes 32
- Numbers and facts 35



LECA® LIGHTWEIGHT AGGREGATE (LWA) SAVES AN OLD DEFENSIVE FORTRESS

POLAND *Buildings of significant historical importance should always be protected. It is our duty to protect their conditions, so that they can continue to be a source of historical knowledge for future generations.*

The Wisłoujście Fortress is one of last remaining defensive structures in the city of Gdańsk. It was built in the second half of the 16th century. The only basic available construction material of the period was traditional bricks. All the room ceilings were constructed as brick barrel vaults.

Over several subsequent centuries the structure was used mainly for defensive purposes. A section of the structure, which is located directly by the Vistula river, was covered with soil. The structure was maintained and repaired with materials available in consecutive centuries. Unfortunately, at the beginning of the 21st century it was concluded that further partial repairs would not save this historical fortress. The burden of soil proved to be too heavy and it became a structural necessity to replace the heavy damp soil with a lighter material.

Rescue for the fortress

The Technological University of Gdańsk, who are experienced in this type of geotechnical project, especially in terms of building roads on ground conditions with low load carrying capacity, knew the properties of Leca LWA. Through this collaboration it was recommended to replace the ground above the brick vaulting for a lightweight aggregate which would reduce the load over the old ceilings.

During the entire course of works the vaultings were also strengthened with a layer of cement mortar, hydro insula-

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Editor: Morten Müller, communication manager, Leca Norway

Front page:

West Side Solna is located in one of Sweden's fastest-growing urban areas.



tions was implemented and the cropland fill was replaced successfully.

The project was completed over two stages. In 2006 preliminary works were performed, which relieved the load and secured the structure from moisture. Then, partially on the surface of the old brick vaultings, the soil bank was exchanged for a light filling of Leca LWA. For the next 12 years the efficiency of that solution was apparent.

After concluding that the solution was effective in 2018 the light filling on the rest of the vaultings was applied. Additionally, damp-proof insulations were completed and repaired and a new garden soil bank was prepared. Presently the Wisłoujście Fortress has become one of the most visited tourist destinations in Gdańsk – accessible from the ground as well as water.

Leca LWA filling

Leca® facts

Facility: Artillery Bastion of the Wisłoujście Fortress

Location: Gdańsk

Investor: HISTORICAL MUSEUM OF THE CITY OF GDAŃSK

Contractor: "BUDKON" SP. Z O.O.

Geotechnical project, stage I: Ph. D. Eng. Adam Bolt, D.Eng. Grzegorz Horodecki – Gdańsk University of Technology WBWiIŚ

Project, stage II: AQAPROJEKT SP. Z O.O.

Execution date: 2006 and 2018.

Aggregate: Leca® LWA 8-20 R

Amount: 3200 m³





Leca®LWA was delivered by pneumatic delivery truck

LECA® LIGHTWEIGHT AGGREGATE SHOW ITS VERSATILITY IN NEW DISTRICT

DENMARK *The buildings in the Kanalvej area - a new district that combines housing, business and commerce - got off to a good start, partly because of the ability of Leca LWA to be delivered by pneumatic delivery.*

In the center of Lyngby, just outside of Copenhagen, a new district that combines housing, business and commerce is currently under construction. For this project, Leca LWA has been delivered by Leca's innovative pneumatic blowing vehicle, partly specified for drainage in the basement and partly as a light filling material on top of an underground parking facility.

The advantages of selecting the pneumatic delivery method for construc-

tion projects when using Leca LWA, included Leca's ability to be pneumatically blown onto different levels with ease. Furthermore, pneumatic delivery requires minimal space (a huge engineering advantage in urban areas); moreover, there is no material required to be stored at the construction site, meaning that there was no requirements for vehicles needed for internal transport, and only two or three people are required for handling the hose and evenly distributing

the Leca LWA. Through this delivery method; time, human resource and costs for a development project can be saved.

3000 m³ LWA delivered by pneumatic delivery truck

Through the pneumatic delivery method, a Leca blowing truck can park 30-60 meters away from where the Leca LWA needs to be installed. Leca LWA is blown through flexible and agile hoses at a rate of up to 1 m³

per minute - the shorter the distance of the hose, the greater the quantity delivered per minute. For this particular project, as the hose is 20 cm in diameter, not much space is required for them to enter a basement. An access hole of around 30x30 cm is usually sufficient.

In Lyngby, 3000 m³ of Leca 10-20mm was used in two different areas. The first deliveries were used for drainage in the basement under the buildings, because of this the drainage properties and strengths of the product combined effectively with the delivery method. The second round of deliveries was used for landscaping purposes on top of the underground parking facilities. A key engineering part of the decision making process was Leca's lightweight properties and the pneumatic delivery facility, making the specification of Leca LWA an easy choice.

First time

It was the landscape gardener OKNygaard A/S, who was responsible for the installation of Leca 10-20 over

the underground car parking facility. Chairman Klaus Nielsen said that it was the first time OKNygaard worked with Leca LWA. "I was a little skeptical at first, because I did not know if the Leca LWA could hold enough water for the trees that were planted in the material. Moreover, I had difficulty believing that such a porous material had the sufficient strength".

To secure enough water for the trees, the holes in the LWA were lined with a heavy gauze of 500 g/m², to help the material to retain more water. "Due to the very hot summer in 2018, we cannot fully assess the quality of the solution, however, less plants require replacement on Kanalvej compared to other areas."

Easy installation

The delivery of Leca 10-20mm went well. "The driver arrived in the morning and helped lay out the hose and generally made the delivery a smooth experience."

Klaus Nielsen says that he was impressed that one could run a 3,5-ton machine over the Leca LWA and com-

press them without problems, so the material proved its strengths early in the installation process.

"Underneath the tiles of the corridors, a non-woven fabric and a reinforcement mesh were laid to hold the tiles, there are no settlements yet which is impressive. The places where we have built stairs were made of cement-stabilized Leca LWA".

The cement-stabilized Leca LWA was mixed in a mixing bucket on a mini loader, which is fast and simple. Klaus Nielsen concludes: "All in all, it was a positive experience to work with Leca LWA on this project".

Leca® facts

Architect: Henning Larsen Architects

Consultant: Sweco Danmark

Contractor: KPC

Landscape: OKNygaard A/S

Leca: 3000 m³ Leca® LWA 10-20



LWA was used for drainage in the basement and on top of a parking garage.



The Victorian wall has stood in place for over 100 years and runs for over 144m.

LECA® LIGHTWEIGHT AGGREGATE (LWA) SAVES A PIECE OF HISTORY

UNITED KINGDOM *Leca LWA helps to retain and maintain a Victorian wall which has been part of the community for over 100 years in Manchester through its lightweight and robust backfill properties*

An attractive Victorian retaining brick wall has been in place for nearly 100 years in Sparth Bottoms Road. The 144m run of walling varies in height along its length up to a maximum of 5.5m. The wall supports a pavement serving two blocks of terraced houses and accommodates numerous services including gas and water.

Excessive Pressure on Sewage Pipes

The wall is also crossed in two places by sewage pipes. It is thought that over time, the weight of the traditional back fill, mostly sand and gravel, coupled with dysfunctional drainage, resulted in excessive pressure on the

back of the wall, which then caused overturning of the masonry retaining wall. Further movement could have put the properties adjacent to the top of the wall at risk.

Replacing backfill

Remedial work was required by the Impact Partnership, an innovative joint venture company between Mouchel Group, Agilisys and Rochdale Metropolitan Borough Council, who specified the use of lightweight Leca LWA 10-20mm aggregate as the ideal material to replace the traditional backfill. Impact Partnership delivers highways, property and ICT

services to support the regeneration of the Borough.

The principal contractor, A.E. Yates Limited, of Bolton, excavated to a depth of two metres behind the retaining wall into the existing backfill which was then replaced along the entire length of the wall with 650m³ of Leca LWA. The retaining wall also had a reinforced concrete toe constructed to the front and was extensively cleared and pointed before being finished off with a new pedestrian guard rail to the top of the structure.

Leca LWA is an expanded clay formed by heating and firing natural glacial clay up to 1150°C. This process transforms the clay into lightweight ceramic granules that have a hard-shell and porous core. The material is extremely light with a bulk density of just 0.3 tonnes per cubic metre. It was delivered to site on 60m³ tippers and stored during the construction process to enable continuity of work.

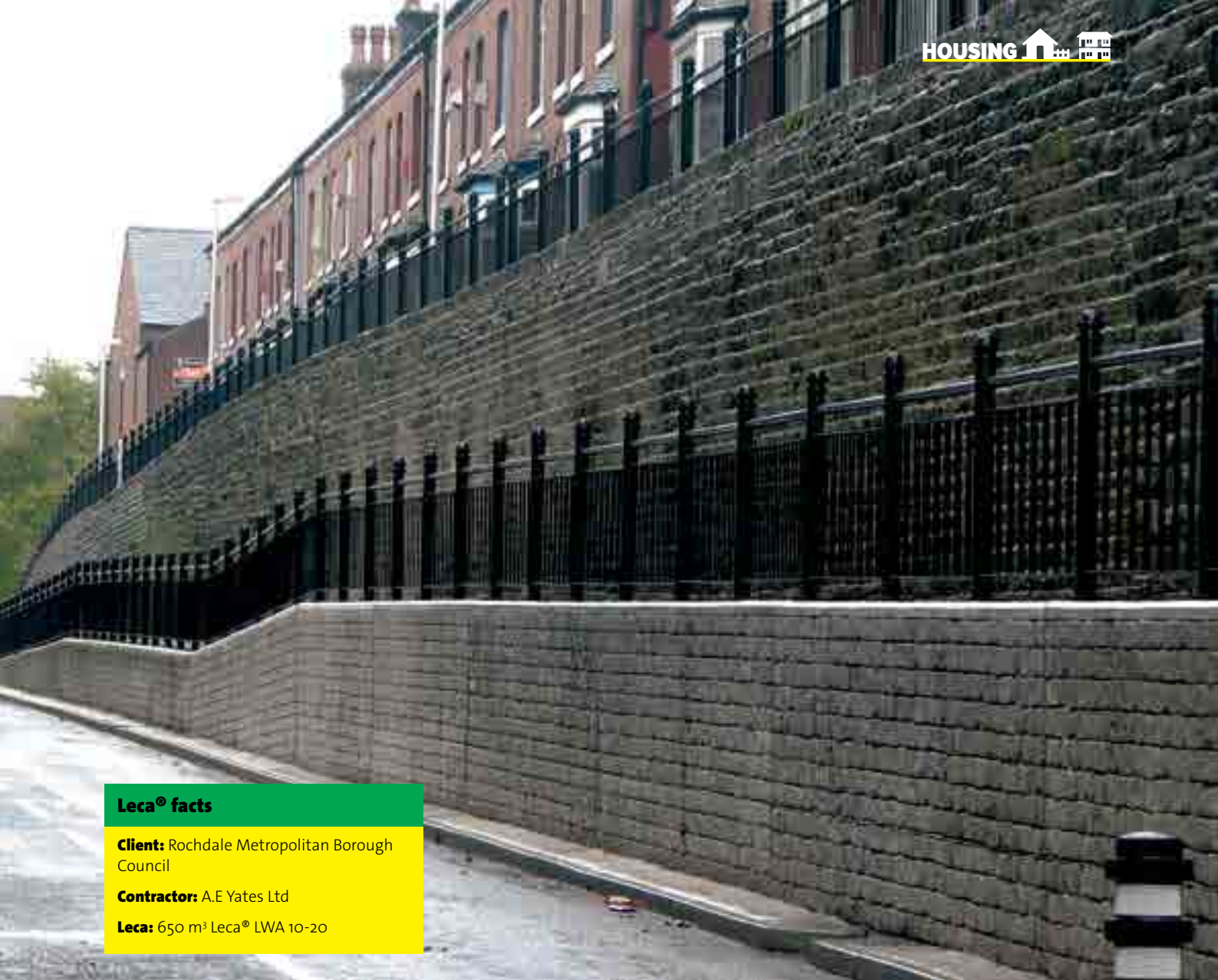
Positive Feedback

Jonathan Parker, of A.E. Yates Limited, said: "I'm impressed. This product is easy and clean to use and has allowed us to work to the 16-week programme which would have taken far longer had we replaced the original backfill material like for like and of course we would have incurred com-



Leca LWA was found to be the ideal material to replace the traditional backfill





Leca® facts

Client: Rochdale Metropolitan Borough Council

Contractor: A.E Yates Ltd

Leca: 650 m³ Leca® LWA 10-20

paction issues. Leca LWA overcomes settlement periods and reduces the number of site deliveries of the material which makes this a very environmentally friendly solution. We have covered the material with a basic geotextile membrane and type 1 subbase ready for finishing. There has been minimal disruption for the residents of Sparth Bottoms Road and this Victorian edifice is now safe, sound and in good condition.”

Alan Lowe, senior engineer, Impact Partnership, said: “I am very satisfied with the performance of this material because of its quick and easy placement, particularly when working around existing services and in the confined working space we have on this scheme.”



Leca LWA provided the perfect solution to reduce exerted pressure and to create a safe walking platform for the local residents.



LECA[®] LIGHTWEIGHT AGGREGATE (LWA) IN A LOAD COMPENSATED FOUNDATION

FINLAND *On clayey detached house plots, lightweight filling to prevent settlements is beginning to be the rule rather than the exception. Using Leca LWA as lightweight filling is not only cost effective, but also very quick to install.*

By the beginning of next summer, a stylish ensemble of homes are being assembled, comprising of five homes called Asunto-osakeyhtiö Espoon Porttitie 13, will be completed in Mankkaa Espoo.

Espoon Porttitie 13 is being developed by Espoon Talokolmio Ltd., established in 2000, which specialises in the construction and development of multi-storey buildings and terraced and detached houses in the capital region.

The two-storey buildings are located on a long plot along a quiet street. Each dwelling will house a sunny fenced garden and a private garage.

The location is ideal, but the tough foundation conditions of the land are challenging, to say the least. This situation is not, however, exceptional in this region of Finland. There is a shortage of suitable plots, and good foundation conditions are hard to find.

The residential buildings of Espoon Porttitie 13 have been founded on steel pipe pile feet. "We had luck, since there was rock already at a depth of 2–6 meters", says Site Supervisor Kari Alhoranta.

Leca[®] LWA filling is a necessity

Lightweight filling needed to be placed under the garages measuring 7x3m located between the houses, in order to prevent the pipelines running under the driveway from rising, as the clay base was not just soft, but also sodden.

Alhoranta says that, in addition to being an easy way of producing a lightweight filling, using Leca LWA was also the most cost-effective solution. An approximate 700mm layer of Leca LWA was pneumatically blown

onto the foundation of each garage. The work was completed very quickly and a total of 60m³ of Leca LWA was blown into place within two hours, states Alhoranta.

Pneumatic delivery is an easy way to install Leca LWA filling even on project sites with logistical challenges. The basic hose on the vehicles is 30m long, but vehicles equipped with longer hoses are also available.

Also excellent for insulation

Leca LWA is also effectively suited for thermal and frost insulation, this is in addition to the load compensation and filling. Furthermore, the foundation of the garages at the Espoon Porttitie 13 site also required Leca LWA to be installed around the garages for increased insulation support.

According to Alhoranta, at the sites of Espoon Talokolmio, Leca LWA is also used next to plinths in order to avoid the trouble of insulation.

For the completion of the garages of Espoon Porttitie 13, a 300mm layer of crushed aggregate and the actual surface layer, most likely pavement, will be laid on top of the Leca LWA.



Leca LWA layers were compacted with a vibratory plate.



An approximate 700-mm layer of Leca LWA was blown pneumatically onto the foundation of each car port.

Pneumatic delivery was a fast and easy solution.

Leca® facts

Site: Asunto Oy Espoon Porttitie 13

Location: Mankkaa in Espoo, Finland

Developer: Espoon Talokolmio Oy

Design: Arkkitehdit Sankari/Jarkko Niiranen

Structural engineering: Uudenmaan Pohjatutkimus/Mikko Kouri

Leca products: Leca® LWA pneumatic 4–20 mm





WEST SIDE SOLNA IS SURROUNDED BY CLAY PELLETS

SWEDEN Where Solna and Sundbyberg meet, the new quarter West Side Solna emerges. To isolate and drain the construction, it was necessary to refill the volume between the pile and the house wall around the entire building. Leca lightweight aggregate (LWA) was selected as the fill material as both of these functions could be comfortably satisfied whilst being extremely easy to install.

The 252 apartments will be ready by the end of 2019 and the residents will, amongst other things, get a communal pool in the courtyard and a terrace on the roof. The building will have six to eight floors and will be at its highest point on the wide main streets and lower towards the narrower local streets.

No insulation or drainage plates were required

Easy handling was one of the main reasons for choosing Leca LWA for the refill around the building, but it also offered further economic advantages. Since they were using Leca LWA which has insulating and drainage properties it was not necessary to use any insulation or drainage plates between the pile and house wall. This solution

could thus reduce costs and generate a faster execution. The Leca LWA was applied directly to the concrete, which was then sealed in the joints between the prefabricated elements.

Effective logistics

Around 2800 m³ of Leca LWA was delivered to this project and the chosen delivery method was to blow the material out by using a pneumatic blowing vehicle. In this type of project, which is amongst a developed city landscape with limited space, it is often difficult to get access to the construction site. By having the opportunity to pneumatically blow out the material directly in place, the delivery and installation could smoothly move forward without delays.

Leca® facts

Project: West Side Solna, residential quarter

Property Developers: SSM AB

Subcontractor: JV AB

Leca-product: Leca® LWA 12/20







THE Leca ENGINEER'S STONE HOUSE

NORWAY When Leca engineer Helge Huser and his family planned to build a new house, there was no doubt: It had to be a stone house. A Leca house. More importantly for him and his family was keeping the levels of maintenance at an absolute minimum in the foreseeable future. The house is located near the city of Tønsberg in Norway.

– Both my wife and I have busy jobs and we also have two young children. That’s why we only wanted to do this once. When the house is built it will stand there forever, and if we ever change anything, it will probably just be the colour,” explains Helge. Of course, as a Leca employee and product manager for Leca blocks, he had strong allegiances to Leca and believed in the fundamental properties provided by the Leca LWA.

Therefore, all material choices were made with the first priority being around the thought process of maintenance. The plastered Leca wall, Kebony and aluminum windows are among Helge’s choices because it requires minimal maintenance.

- When it comes to maintenance, it is only a matter of washing, he says, and outside we only need to flush the facades.

Most affordable over time

- Although the initial costs may be somewhat higher than building with wood, I am convinced that over time we will save a lot of money and not least time, says Helge.

Self-construction and professional assistance

The plaster that is used on the outside is called Rivepuss, and it gives the wall a thick and solid finish that lasts for decades.

- Rendering is not for amateurs, says Helge. You need professionals.

Simple design

- The house has a relatively simple design. It’s very easy to get things right. The Leca blocks are fully insulated, and when using solid walls you don’t need all of the plastic, tape, vapor barriers, gluing, clamping etc. Once the blocks are in place, they only need rendering and you are done. Also, you don’t need steam and wind barriers since all the nooks and cranies are sealed with the render.

Insulation and density

- Stone houses are easy to secure against air leaks, but it is extremely important to treat the wall, both with plaster and possibly paint made for masonry, Huser emphasizes. Temperature wise, a stone house is perfect all



Leca® facts

Architect: KB Arkitekter AS / Ingrid Sporseem

Landscape architect: Heart Tree AS

Consulting engineer: Helge Huser

Contractor: Helge Huser (incl. masonry)

Plasterwork: Thorendahl AS

Leca products: Leca® Blocks, Leca® Chimney, Leca® Slabs

year round. On cold winter days, the heat is kept inside the house and on hot summer days you have a cool and comfortable indoor temperature.

The key word is thermal mass, which a stone house has a lot of, and this contributes to far more even temperature than a wooden house.

– In winter you might ventilate vigorously for an hour, still the temperature is restored almost immediately after you close the windows. You can either cool or warm the house quickly, because it takes a lot of time before the materials change temperature. In other words, a lot of heat is stored in the materials, which gives a much smoother temperature, Huser explains.

Planning is important

- The hard wall surface can make it difficult to make holes, but fortunately there are many good screw and suspension solutions. Above all, it is important to thoroughly plan all of the technical guidelines, such as ventilation, water, drainage and electrical installations, says Helge. This is to avoid too many physical interventions in the wall as it will weaken the bearing capacity of the blocks.

– When the walls are in place, you cannot simply mount sockets and light switches everywhere. This should be planned properly. We have mostly used wireless switches for lighting. We have also wired the supply to the sockets in the floors while electrical

guides go into the floor and ceiling. This way, we avoid doing anything to the wall itself.

Bold colour scheme

- Initially we wanted a light neutral colour, says Helge, but the architect challenged us on colour choices, and we came up with some exciting alternatives. The house was already unconventional so we ventured towards a more exciting colour. We're really happy with the result.

Helge Huser has worked in Leca for about 10 years, but now works as a project leader in a contracting company.

LECA[®] LIGHTWEIGHT FILL IN RAILWAY CONSTRUCTION



A high-speed railway between Kerava and Lahti is partly constructed in low-lying areas with thick soft soil layers



Saira Pahkakangas and Taavi Dettenborn, Geotechnical designers in Ramboll Finland



Railway rehabilitation and construction projects are associated with a significant volume of earthwork and ground improvement providing a huge potential for smart and contemporary engineering. Widespread occurrence of clay soils in the area favors cost-efficient geotechnical solutions. Leca® lightweight aggregate is a versatile material offering multiple solutions to railway construction.

Railway construction is generally more challenging in comparison to other infrastructure projects. Successful project implementation is often complicated by strict safety requirements, demanding soil conditions, and ambitious time schedules. Because an answer to a variety of geotechnical challenges can be found in load reduction, Leca lightweight aggregate (LWA), is a suitable material which can be applied in renovation of existing railway embankments and foundation of new fill structures.

Basics of railway geotechnical design

According to the current project technical gradation, a railway (as a design subject) belongs to the category of difficult to very difficult design. Typical problems in the foundation of the railway embankment are slope stability (risk of movement or collapse), settlement, displacement, and other specific issues related to rail transport such as vibrations and considerably larger loads when compared to road transport.

The geotechnical design of a railway fill shall require development of an optimum foundation method for the prevailing soil conditions and the loads produced by trains, balanced with the financial and time limits set to the project. The design shall correspond to the requirements of the Finnish Transport and Communications Agency, EuroCode and the Finnish national annex, and requirements of the Finnish Transport Infrastructure Agency. Differing design methods are specified depending on project type, including for new construction and for renovations of existing railways. The required lifetime of a subgrade and foundation is 100 years.

Bearing Capacity and Stability Calculations

Safety factors describing stability of

a structure and maximum allowable settlement are prescribed parameters to be applied in the calculations. Initial data for design includes determination of geotechnical conditions, stratification and strength characteristics, and is established by subsurface soil investigations. Soil conditions shall be determined within the project area, which includes the railway and associated, separate structures. The soil investigations performed to the extent and quality required will ensure the reliability of the calculation results.

In Finland, a sliding surface analysis is the most common slope stability calculation method. It assumes that the failure occurs along the established sliding surface of the structure (Figure 1). The calculations are performed to determine the most critical sliding surface defining the slope and/or subgrade stability. The critical sliding surface is usually allocated to the soil layer with the lowest shear strength value.

THE REQUIRED LIFETIME of a subgrade and foundation is 100 years.

There are two common calculation methods applied in Finland which are based on the sliding surface analysis: these are the total safety factor and partial safety factor methods. The total safety factor method is so called conventional calculation method where specific values of parameters are applied. The calculated total safety factor (F_{tot}) defines the strength (resistance) of the structure against the magnitude of the driving force. The F value required for the railway embankment shall be $\geq 1.5 - 1.8$ depending on the case analyses. In the partial safety factor method stated by Eurocode 7, parameters are reduced by the partial safety factor to produce design values, and the cal-

culations are performed with these assigned design values. The Eurocode method enables study of alternative safety factors for each parameter. The outcome of the calculation is an over design factor (ODF), which required value shall be ≥ 1.0 .

There is no significant difference between the design of a lightweight fill structure and a natural stone aggregate fill structure in terms of calculation or analysis approach. By its technical characteristics, Leca LWA behaves as a non-cohesive (granular) soil. The calculations are performed using the design parameters set forth in the instructions for lightweight fill applications, prepared by the Finnish Transport Infrastructure Agency. If water may rise into the Leca LWA structure, buoyancy impact shall be considered. According to the Eurocode requirements, the fill structure shall be dimensioned to the highest possible groundwater level.

Railway Foundation

A pile supported foundation is a common foundation method applied for railway embankments. The method is adequate for many cases, and usually is the most expensive option. Inexpensive berms are applied to increase the stability and particularly to prevent risk of internal stability failure of the structure. The embankment stability can be improved using various deep stabilization solutions and load reducing fill structures.



Design of railways requires special geotechnical knowledge.

cost-efficiency, usability and variability are the most important benefits of Leca LWA structure.

Use of Leca® LWA in Railway Construction

Approximately 2,500 m³ of Leca LWA was used to reduce loads in soil replacement within the renovation of a railway section between Kokemäki and Rauma. Over 100,000 m³ of Leca LWA was applied in construction of the high-speed railway connection between Kerava and Lahti, in related road and bridge structures. The material was used to build about 1 km long embankment on a former agricultural land. Soft soil in the area extends to the average depth of 45 m, top soil is underlaid by a soft clay. Shear strength of clayey and silty soil

substantial cost. Column stabilization was extended to the bottom of the soft clay layer. The lightweight fill structure was additionally enveloped by geotextile, and a loading embankment was placed over it to speed up the settlements. Berms were used as a subgrade for maintenance roads and to increase the embankment stability.

Substantial savings were achieved due to applied Leca LWA solutions. Since commissioning in 2006, the high-speed railway connecting Kerava and Lahti has operated as expected with satisfactory performance results.

Current possibilities

Technical requirements for railway design and construction have been updated after the design phase of Kerava-Lahti high-speed railway section. Current costs and implementation of the project were analyzed by dimensioning the performed lightweight structure in accordance with the updated requirements for such structures (Figure 2). The costs of the lightweight structure developed according to the new method were compared with the costs of a pile supported slab structure in corresponding soil conditions. Geotechnical calculations were performed in accordance with Eurocode 7 using partial factor method applied in DA3.

RAILWAY CONSTRUCTION is generally more challenging in comparison to other infrastructure projects.

More often foundations shall be constructed on a subsoil with a poor bearing capacity, which increases the need for the lightweight fill structures. Loads generated by the lightweight fill structure are smaller than the loads of the natural stone fill material, and therefore the construction of large-scale and expensive foundations may be avoided. Thus,

varies from 9 to 40 kPa, and water content from 40 to 90 % (Figure 2).

A lightweight fill structure and column stabilization provided a good alternative to a pile supported slab. This solution eliminated 30 m long piles that would have been needed due to the thick soft soil layer; such a solution would have carried sub-

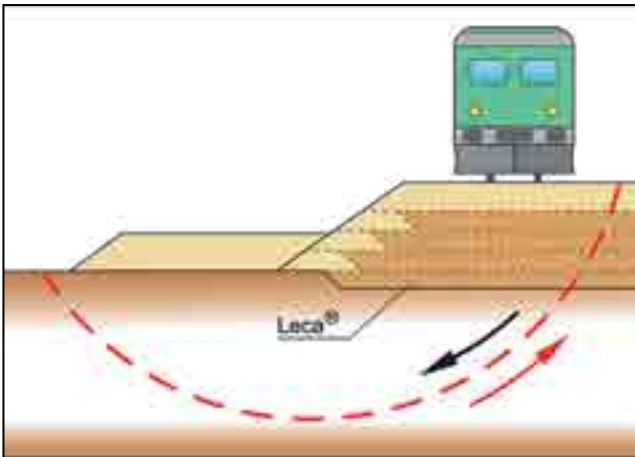


FIGURE 1. Landslide in a railway subgrade occurred along the sliding surface

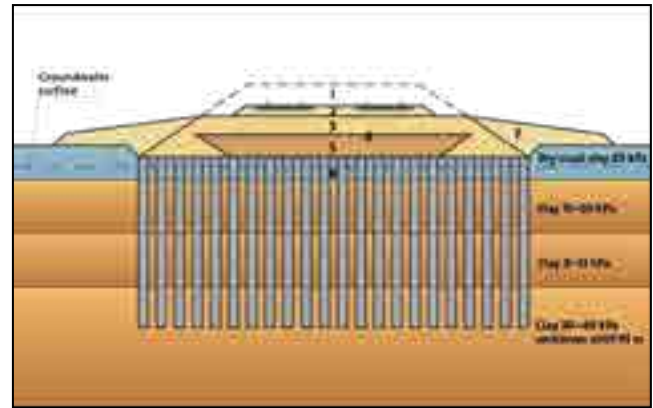


FIGURE 2.

- | | |
|--------------------------------------|------------------------------|
| 1. Loading embankment | 4. Geotextile |
| 2. Ballast layer | 5. Leca lightweight fill |
| 3. Capping layer and structural fill | 6. Column stabilized subsoil |
| | 7. Berm |

Regarding loads and track geometry parameters, the requirements issued by the Finnish Transport Infrastructure Agency were followed (RATO3). In column stabilization calculations, the newest guidelines for deep stabilization published in 2018 were applied. The most significant changes in the guidelines are related to the update of design principles and standards according to Eurocode 7.

The updated design of the railway embankment closely corresponded to the original design. Considering that the railway stability was adequate without ground reinforcement actions, calculations were focused on

maximum allowable settlements. A combination of a loading embankment (for at least 6-month period) with a lightweight fill and column stabilized structure, resulted in the total long-term settlement within the allowed limits (100 mm / 100 years).

As opposed to the pile supported slab, the combined structure provides possibilities for considerable cost savings. The cost modeling results demonstrated that costs of the foundation for the lightweight fill structure were approximately one-third (35 %) of those associated with the pile supported slab founda-

tion. The savings can be estimated to be € 540,000 on a 100 m long railway. The cost comparison analysis included the following elements and structures presented in the cross-section of the railway embankment: fill material, loading embankment, berm, and foundations. Cost calculation was based on current unit prices and normal Leca costs (35–40 €/m³).

Construction of new railway connections continues in Southern Finland. One of the largest projects being designed is a high-speed rail connection between Helsinki and Turku. Applicability of the lightweight fill structures for this track may be significant.

Opportunities offered by railway rehabilitation projects shall also be identified on an ongoing basis. Special arrangements are required to repair an existing fill structure, and challenges are significant compared to a road renovation. Leca LWA is easy to handle and stockpile, giving benefit for a project with an ambitious and challenging time schedule. Simplicity in Leca LWA handling and stockpiling benefits the projects with critical time schedules.



The railway track between Kokemäki and Rauma in Finland was repaired using Leca Lightweight Aggregate filling.



ARLITA® ALLOW WIDENING A ROAD IN A SIMPLE AND FAST WAY

SPAIN *The capacity enlargement in the highway of the Morrazo Road (Galicia) had become a necessity for improving the road safety of the old road. Arlita® facilitated the execution in different points of the road in a fast and simple way compared to other conventional reinforcement solutions.*



Polypropylene Geotextile installation (250 gr/m²).

Faced with a wave of fatal accidents that existed on the old road, in 2010 the Xunta de Galicia began drafting the construction of two additional lanes for this important infrastructure project. This design considered the issues with the sub-structure of the road, incorporating two additional lanes - transforming the dual carriageway, where two additional lanes were added in each direction.

Originally at several points along the route, a common problem appeared and this included the existence of a poor defense system at the ends of the transversal drainage structures. For the extension of the road, it was crucial to increase the length of the defense system. Developing the upper level of the road upon the existing structure to support the increased load, this required strengthening or reducing the applied load.

Arlita® reduced the loads on three transversal drainage structures

Arlita proposed lightening the fill within three of the points where this



Installation of Arlita® on the structure.

problem appeared throughout the route, delivering a total of 2500 m³ of Arlita L which reduced the load by five times in comparison to filling with a more traditional material. The filling process was executed in less than two days (800 m³/day), and this included the delivery, compaction and the geotextile placement.

Another important characteristic, together with the low density and rapid execution, was the drainage capacity of this solution. This contributed an important element to the new highway development - increasing the drainage capacity of the road

and furthermore providing additional protection to the surrounding environment.

The light filler was executed in layers of 600 mm. It was encapsulated with geotextile of 200 gr / m² and firm package > 0.4 m.

The quality control was executed with a 600 mm oversized load plate with values for the first and second load cycle of the following $E_{v1} = 66.18$ and $E_{v2} = 275.51$ MN/m² and a ratio between modules of $E_{v2} / E_{v1} = 4.16$. Resulting in more than what was required by the Specifications of Gen-

eral Technical Requirements for Road and Bridges of Spain.

Once again Arlita allows you to complete engineering projects with an innovative solution, completing highway projects in a simpler, faster and more sustainable way.

Leca® facts

First name: MORRAZO CORRIDOR CG 4.1

Construction: Copasa , Covsa , Taboada and Ramos

Client: Xunta de Galicia

Engineering: ICEASA and AIN Active

Product: Arlita® L



Leca LWA was used to replace heavy road construction material.

REPLACING HEAVY ROAD CONSTRUCTION MATERIAL WITH LECA[®] LIGHTWEIGHT AGGREGATE (LWA)

REPUBLIC OF IRELAND *Leca provided a quick and lightweight solution to repair a busy highway bypass in Ireland.*

The N18 was constructed in 1990 over soft subsoils which were thought to be where the local river used to flow. The west bound section of the dual carriageway had settled quite substantially in five areas along the stretch adjacent to Bunratty Castle. Leca LWA 10-20mm was used to

replace the heavy road construction materials originally installed to the underside of sub-base.

Delivered directly to Port

The Leca LWA was delivered by a 5000m³ capacity ship directly into the port of Foynes, not far from the site,

and then transported over a period of two days in 60m³ high sided articulated tipper vehicles and loose tipped into a storage bund local to site.

Installation time restrictions

Whilst the repairs were taking place, the westbound N18 traffic was tem-

porarily moved onto the east bound carriageway reducing the N18 into a single carriageway. For this reason, time was limited and speed of installation was essential.

Simple Excavation

Once Clare County Council had excavated the first of the five areas that needed to be re-levelled, the Leca LWA was transported from the storage bund and tipped directly into the void. The Leca LWA was then compacted in one metre layers using a 360° excavator, the same equipment that was being used to distribute and level the Leca LWA across the sub-formation. The use of Leca LWA provided a simple lightweight solution. The design is expected to achieve a minimum 20 year design life.

The installation was very quick and simple and the contractor, Clare County Council Works Department, was happy with the speed in which they were able to carry out the works and re-open the busy N18 to traffic.



Over 5000m³ of Leca LWA was used to complete this ambitious project.



The strength and compaction properties of Leca LWA provided an opportunity for heavy vehicles to continue the installation process.



Leca LWA provided a fundamental design component to the reconstruction of the existing 1.6km dual carriageway.

Leca® facts

Client: Clare County Council

Consultant: Arup

Contractor: Road Bridge

Leca: 5000 m³ Leca® LWA 10-20



LECA[®] LIGHTWEIGHT AGGREGATE (LWA) PROVIDES THE WATER MANAGEMENT PROPERTIES TO MAINTAIN A DRY PITCH



Lunner Football Club play in 5th Division.



The artificial turf pitch at Frøystad will be ready for the next season.



With Leca LWA underneath the artificial turf there is no danger of standing water on the track or of frost heaves during winter.

NORWAY *Lunner Football Club will play their home games on 30cm of Leca LWA, providing effective water management created by using the innovative lightweight aggregate, says landscape architect Arvid Moger.*

– Arvid Moger is the guru of artificial turf pitches, says CEO Christian Bruun at Åsmund Pettersen & Son. Pettersen completed the job, but it was Moger who developed the new Frøystad artificial turf pitch at Roa in Hadeland.

The ability to drain was crucial

Arvid Moger has developed over 300 artificial turf pitches all over southern Norway. From Stavanger in the south to Trysil and Ringebu in the north. He specified Leca LWA for installation under the pitch at Frøystad.

– The soil mass in the ground was susceptible to frost heave, so we had to tackle this long term issue. Two options were decided as the most suitable: Leca Lightweight Aggregate (LWA) or extruded polystyrene (XPS). Each offering different qualities and properties, but the advantage of using Leca LWA is that it also provided the pitch with very good drainage, explains Moger.

The sheets of XPS would have elevated the field by only 8 cm, while Leca LWA would raise the field by 30cm. For this project, the pitch allowed for plenty of space for creating additional depth, so Leca LWA was a perfect choice.

Water reservoir

– 30 cm of Leca LWA provides a very good drainage layer. This means that you can create a very large water reservoir. There can be a lot of water in the ground construction, but there will never be pool of water on the pitch, says Arvid Moger.

Åsmund Pettersen & Son at Jevnaker is delighted to work with local pro-

jects in the region at Hadeland and Ringerike.

– We have built most of the sports facilities at Hadeland in recent years, says Christian Bruun. He lists many projects which includes the artificial ice rink at Jevnaker; the track and field facilities at Brandbu; two artificial turf pitches at Ringerike; an artificial turf pitch at Brandbu and the track and field facilities in the Nittedal municipality. Many of these completed projects have incorporated Leca LWA into their design.

Even load

– We need suitable equipment to deliver and position the Leca LWA into place. For this project we used bulldozers and this must be performed properly. Leca LWA is a material which flows easily into place when delivered and it has to be evenly loaded, so it is crucial that we do not use large machines which produce excessive ground pressure, he explains.

– Leca LWA is frequently used on artificial turf fields. Our experience is that this type of solution is great, as it provides both good insulation and because it can store water and offers permeability properties, says Christian Bruun.

Terje Engelkor, key account manager at Leca, is delighted with the artificial turf for Lunner FC:

– It has been a very smooth experience. Approximately 1,300m³ of Leca LWA has been used and my impression of both delivery and when used for the project is that it has worked very well, says Engelkor.

Leca® facts

Project: Frøystad artificial turf

Client: Lunner Football club

Landscape architect: Arvid Moger

Machine contractor: Åsmund Pettersen & Son

Products: Leca® LWA 0-32 mm

Berit Time is centre director for the climate adaptation project Klima 2050; a research consortium of many partners, including Leca, that works to reduce the societal risks associated with climate changes.

Photo: Lasse W. Fosshaug



FACTS

Who: Berit Time, chief scientist in SINTEF and Centre director for Klima 2050

Where: Trondheim, Norway

What: Surface water management and rain-resilient buildings for a changing climate

INTERVIEW

The wellbeing-factor

Berit Time is chief scientist in SINTEF and centre director for the Norwegian climate adaptation project Klima 2050. If someone knows how to adapt buildings and infrastructure to climate changes, it is her.

Text: Lasse W. Fosshaug

Photos: Lasse W. Fosshaug and Klima 2050

– The era of big pipelines is in the past. Now, nature based systems are the solution that counts.

Berit Time occupies a small meeting room in the locales of the Klima 2050 centre at SINTEF and the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway. A large screen shows the goal of the centre: Klima 2050 will reduce the societal risks associated with climate changes and enhanced precipitation and flood water exposure within the built environment. The consortium is achieving this through long term research in close cooperation with several industrial partners, and Leca is one of them. The results are applied to various solutions, such as the water-proofing of buildings, blue-green roofs and measures to prevent water-triggered landslides.

The opening of the Ila-creek

The opening of the Ila-creek is one of the most important decisions done in Trondheim. The municipality has for years worked for clean and accessible urban streams that can be enjoyed by the public. During a large roadbuilding project, and after one hundred years in pipes below the asphalt, the stream surfaced again when the municipality chose to let the water run in an open riverbed. Also, amongst several measures to improve the local water quality, the riverbank and the drainage system were cleaned of pollution. The result is a fantastic blue-green district that stretches through the city. It has even become an important spawning area for trout.

– The Ila-creek is an example of one of the most important aspects of urban outdoor areas. It is a decision that provide many advantages apart from better water management. We aim to attain cities where

people thrive and are nice places to live in. And the biological variety increases.

The Danish has a good term for it – “the wellbeing-factor” (in Danish: herlighedsfaktoren).



Leca's light weight aggregates is a particularly applicable material for blue-green roofs.

A willing municipality

– The municipality of Trondheim is participating in the development of solutions. They are an active partner in Klima 2050 and work a lot with these kind of issues.

This includes a test field of green roofs on the municipal wastewater treatment plant Høvringen, and here Leca is involved.

Leca and Klima 2050

Leca is one of the partners in Klima 2050. The motivation is to provide solutions to moisture resilient building, flood-protection of urban environments and the use of lightweight fillings to protect against landslides. Leca's

light weight aggregate is a particularly applicable material for blue-green roofs and is a market leading producer of lightweight material for backfills and embankments.

– Leca has a product well suited in many types of solutions, both as a purification filter and as a water detention medium on roofs and in the ground. For example, is it also well suited in blue-green



Below the top layer of plants and soil is Leca. The Leca maximises the water capacity and provides an added blue-green function to the roof.

Photo: Tore Kvande, NTNU



roofs. The challenges we face demand efforts from multiple actors, and Leca's components will in many applications be a good alternative, says Time.

Action on the right places

– Even with a high wellbeing-factor, the point is not having



Klima 2050 focuses on solutions with high water detention capacity and are able to run extreme test. Here water detention of permeable pavers with a Leca sub-layer is tested. Photo: Tore Kvande, NTNU

blue-green roofs installed everywhere. In a water detention perspective, we have to localize the places where actions have the largest impact. Therefore, we have developed a GIS-based tool that will provide an understanding of where the water is going, and where it should go. This is one of the most important missions of the centre – to provide architects, developers and producers the data and the research they need to deliver the best solutions, Time says. GIS is short for Geographical Information System, and when used at an early stage it will be possible to avoid construction of buildings and infrastructure in the natural pathways of water. It will also make it possible to avoid development on ground that are well-suited for placements of blue-green infrastructure such as rainbeds and floodways.

– Better cities with nature-based solutions

To implement nature based solutions adapted to a climate with large rainfalls and frequent extreme weather depends on cross-professional cooperation. Berit is comfortable with this multidisciplinary platform between several parties.

Various solutions of blue-green and blue-grey roofs for water management are tested and developed in Trondheim through Klima 2050. Photo: Tore Kvande, NTNU

– I am a construction technologist from NTH, that is now NTNU. An exciting aspect of the Klima 2050 project is the cross-professional environment - to work in the cross section between building engineering and water management. Regarding rainwater on buildings, the idea has always been to divert it to the drainage systems as soon as possible, but now the municipality says it is no longer possible to send that much water into the drainage network. Thus, the building itself must contribute to the delay water run-off. I think it is interesting to work with urban areas this way. Additionally, I strongly believe that our cities will be better to live in when the nature-based solutions become more widespread.

Blue-green roofs

Berit Time and Klima 2050 consequently says that blue-green roofs should be prioritized before ordinary, green roofs. The focus of the research is on roofs with water detention effect and the centre wishes to promote this.

– A blue-green roof can also be grey – there are solutions with concrete paving stones or pavers that retains water, and a combination of solutions is often utilized. It is the nature based solution that adds the wellness-factor and provides well-being and diversity, concludes Time.



The challenges we are working with demand efforts from multiple stakeholders, and Leca's components will in many applications be a good alternative.



The crushed Leca-material is hidden below the pavers in the blue-grey water management pilot at Høvringen in Norway.

Photo: Tore Kvande, NTNU



The biofiltration basin was completed during the summer of 2018.



PURIFYING CITY RUNOFF WATER

Text: Dakota Lavento, photographs: Juha Tanhua

FINLAND *Finnish cities with densely-built centers, such as Lahti, have, for a long time now, been looking for ways to purify storm water. It is not easy to find a space for local storm water purification in a city centre.*

When a suitable space for the construction of a storm water filtration basin became available in Hennala, an area previously used by the Finnish Defence Forces, the city started to explore different funding opportunities.

– I'm glad we found a project and interested companies to partner us, says Project Manager Juhani Järveläinen, who works at the Environmental Services of the City of Lahti.

New solutions for storm water management are sought in the Hule S&C project funded by the Helsinki-Uusimaa Regional Council. In addition to the City of Lahti, also Helsinki, Espoo, Vantaa, Finavia, University of Helsinki, Aalto University, and several design organisations, material suppliers, and

solution providers are participating in the project. Leca Finland is the material supplier for the biofiltration basin in Hennala.

Special products in a field test

– Storm water management, both quantitative treatment and qualitative purification, is quickly becoming a urgent issue for the increasingly dense urban development, stresses Area Sales Manager Marko Jelonen from INFRA solutions at Leca Finland.

– Water management is one of the main focus segments for Leca Finland, and it’s great that we were included in this project, Jelonen notes.

Plans have been made to direct the storm water from a large storm water branch at the centre of Lahti to the biofiltration basin that was completed during the summer of 2018.

Three biofiltration basins

The biofiltration basin in Hennala contains three sections, in which the filtration capacity of different material solutions is compared. One section functions as a control, and it contains ordinary filtration sand. The other two sections are used for examining how well the special filtration materials function under the field conditions.

One section contains 100 cubic metres of crushed (grain size 3–8 mm) Leca lightweight aggregate (LWA) transported from the Kuusankoski factory of Leca Finland, and the other contains 114 cubic metres of the more fine-grained (grain size 0.5–4 mm) Filtralite P filtration material that is produced at the Leca factory in Raelingen, Norway.

Excellent laboratory test results

– The materials for the biofiltration basin pilot were selected on the basis of their excellent performance in the laboratory tests conducted by the University of Helsinki. In the actual pilot project, we want to examine the functioning of the materials on a larger scale and over a longer period of time. That is also important for determining the lifecycle costs, Juhani Järveläinen explains.



One section contains more fine-grained Filtralite P filtration material that is produced at the Leca factory in Raelingen, Norway.



The other section contains crushed (grain size 3–8 mm) Leca LWA manufactured in the Kuusankoski factory of Leca Finland.

Waiting for results

A composite sample of the water flowing into the basin is analysed weekly, and the success of the biofiltration is monitored periodically by taking samples from the subsurface drains in each section.

Preliminary results are expected to be ready as soon as next year.

Leca® facts

Site: Biofiltration basin project in Hennala, Lahti (Finland)

Client: City of Lahti, Environmental Services

Contractor: Haka Asfaltointi Oy

Design: Lahti Aqua Oy/ Tuomo Salminen

Leca products: Crushed Leca® LWA (3–8 mm) and Filtralite® P (0.5–4 mm)



Laying of drainage layer with Leca LWA

COMMUNAL ROOFTOPS AND GREEN ROOFTOPS ON GARAGES

POLAND *A green roof is often the only opportunity to create a biologically fertile area within the tight constraints of a developed cityscape. Such a solution ensures that rainwater can provide nutrients to plants and can furthermore prevent the risk associated to intense flash floods. Developing a green roof provides a perfect solution in managing rain water.*

Green roof developments are becoming increasingly prevalent on new residential and public building projects. Historically, creating air tight insulation in a utility ceiling was problematic. To combat this and to provide protection against water leakages, waterproof concrete or professionally made air tight layers of hydro insulation systems were installed. On surfaces secured in such a way it becomes easier to lay a subsequent

layers that fulfil many different functions, such as: thermal insulation, equalization of levels, drainage, retaining rain water, subgrade for pavements and protection from root overgrowth.

Universal material

Leca lightweight aggregate (LWA) is a light, ceramic aggregate that is increasingly installed during the development of greenroofs. As a

frost-resistant material it maintains its durability for many years. The spaces between the Leca granules allows for efficient storage and drainage of rain water - especially important in times of increasing storms.

Moreover the aggregate, which has water absorption rates of around 35%, becomes a storage medium for moisture for plants during the dry seasons. Tests have confirmed thermal trans-



A set of buildings with a commercial section



The construction is completed and soon green vegetation will dominate the buildings surrounding.

Leca® facts

Facility: a set of multi-family buildings with a commercial section

Location: Gdańsk

Investor: ATAL SPÓŁKA AKCYJNA

Contractor: ATAL SPÓŁKA AKCYJNA

Designer: KOZIKOWSKI DESIGN

Execution date: 2018

Aggregate: Leca LWA® 8-20 R

Amount: 530 m³

mittance coefficient for Leca LWA with humidity levels of 30% is 0,145 W/mK, meaning that even a damp Leca is a stronger insulator than fertile soil or sand.

Leca LWA can also be taken into consideration in balancing heat loss - allowing for the reduction in thickness of other materials and insulation layers. Making the specification of Leca LWA, an ideal solution for the

energy efficiency of a new building development.

As a ceramic material, Leca LWA is fire resistant and resilient to humic acids and fertilizers. The bulk density of Leca LWA L with a fraction of 10-20 mm or 8-20 mm is approx. 300 kg/m³. This lightweight property allows it to be laid as an additional filling that evens the levels of other layers on rooftops.

An example worth following

This is a clear example of one of the many recent development projects being executed in Poland. Leca LWA simultaneously provides many crucial properties; drainage, thermo insulation, moisture storage from precipitation for plant growth, and forms light terrain-leveling fillings.



LECA SWEDEN LAUNCHES THE PILOT PROJECT LME – creating a network that will make it easier to find the right construction firm.

The predominant challenge facing many clients can be sourcing the right contractors to bring a design concept to life. However, through the new LME-network scheme in Sweden this will make the process much easier. The new network looks to educate and gather the best qualified and most suitable masons – providing assurances that clients will receive the best level of service and expertise.

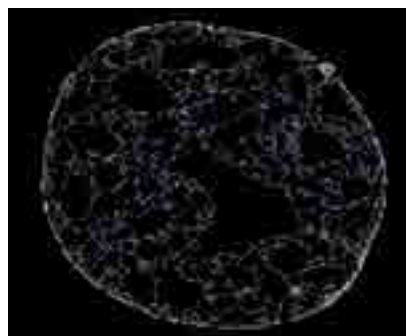
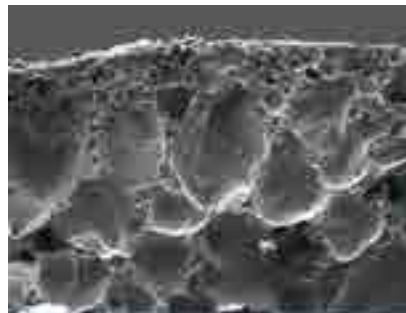
In order to become a member of the network and be an “LME-company” the company must undergo Leca’s intensive training. These training sessions will be carried out periodically over 2019 with the aim of having around thirty companies from all over the country affiliated to this prestigious network at the end of the year.

- The masons who attend our training sessions in order to become a part of the network need, amongst other things, to be established in the market, have professional certificates within the company and a documented quality record system. We only want the best masons to be apart of our network and our ambition is to help them become even better at working with all of our products, says Mathias Odén, Sales and Marketing Manager at Leca Sweden.



BIOWALL

Leca LWA is well-known as an excellent growth medium for plants. Plants can thrive just in Leca LWA alone, or in an aerated mix when combining mulch or compost with the expanded clay. Leca is currently tested as a growth medium for plants in an indoor train station in Oslo. The aim is to improve the air quality, as the air in tunnels contains dust that is harmful to the passengers, and the goal is to let nature’s own processes improve the air quality. The dust contains heavy metals and other contaminants that the green vegetation can catch and collect. The pilot is initiated by Bane Nord, a company responsible for the Norwegian national railway infrastructure, and the Norwegian company Biowall, that specializes in living green walls. The focus is on the removal of airborne dust from brakes and rails. Variations of plants with Leca LWA as growth medium are cultivated in elevated boxes that are placed by the tunnel exits inside the National Theatre train station in Oslo. Similar trails have been done in Finland and England with promising results.



SEM

Leca has an enormous surface area. A new study by SINTEF in Norway show that Leca products can have a specific surface area up to 23 m² per gram of material. This means that a cubic meter of Leca LWA will have a total surface approximately equivalent to the total area of 1700 football fields. This is quite astounding. The BET-method was used for the measurements, a method that can measure pores with diameters down to a nanometer scale. The huge number of microscopic pores is responsible for the enormous surface. Leca is produced from clay that are expanded at high temperatures, and the process results in a strong, porous, ceramic product that are very suitable for water management and geotechnical applications.



LECA® LIGHTWEIGHT AGGREGATE (LWA) AMONGST FLOWERS

Leca LWA supports hydroponic growth in flowers such as gerberas and anthurium. Leca and inter-grain spaces facilitates root growth and access to appropriate nutrients for rapid plant growth. This type of cultivation was used, amongst many others, in Polish horticultural farms in Walcz and Tarnowo Podgórne.



LECA® LIGHTWEIGHT AGGREGATE (LWA) FOR STORMWATER FILTRATION

The University of Helsinki and the city of Lahti in Finland collaborates to establish a series of pilot projects to test filter materials for their capacity to remove nutrients and metals from stormwater. The conventional way to manage urban runoff is to evacuate it untreated directly to adjacent surface waters via a underground sewage system. The increasing awareness of contaminants carried by stormwater together with official initiatives have resulted in much interest and new research on the subject. Leca and Filtralite are participating in the project in Lahti, and the Leca-materials are tested as an on-site biofilter and growth medium for plants. Based on a laboratory experiment in 2018, Leca and Filtralite are now being considered as a possible solution by the city. These materials have been used in a large-scale field biofilter capable of treating huge volumes of runoff originating from the center of Lahti and the performance of this system will be monitored in the future.



LECA® UNO MOBILE TRAINING

Leca Uno is an innovative product, comprising of Leca lightweight aggregates, cement and additives and developed by Leca Portugal, this unique product represents an upgrade in the execution of shape layers on the floors of buildings.

In order to educate users of the product and to communicate its added value as a material, Leca Portugal have developed the Leca Uno Mobile Training.

The Leca Uno Mobile Training is a digital platform, which means that it can be accessed through smartphones, tablets or desktops, allowing for a more interactive platform for knowledge. Through utilising images and videos, it is an aesthetically pleasing training program with added flexibility, since it can be viewed at the most convenient time for the trainee.

This training platform was tested at the end of 2018 by the Weber team in Portugal and because of the verified success of this learning method, this method of training will be extended to other Leca products and solutions.



DRY FLOORS ON WET GROUND

In order to protect the building in Krosno from moisture, within an area of wetlands exposed to frequent changes in the level of groundwater - effective drainage systems were required underneath the floors. After unfolding the geotextiles, drainage pipes with slopes and an insulating layer of Leca lightweight aggregate (LWA) with a grain size of 10-20 mm were laid. Geotextiles provided support for drainage against contamination with fine sand and clay particles. The drainage pipe system led the water out of the building, and Leca LWA allowed water to be removed from all surfaces under the floor. In addition, Leca LWA thermally insulates and forms a solid base for the floor screeds.

SAFE NEST FOR OYSTERCATCHER WITH THE HELP OF LECA® LIGHTWEIGHT AGGREGATE (LWA)

A Finnish bird enthusiast invented a clever way to protect Oystercatcher's nesting habitat. Oystercatcher's do not actually make nests, instead the bird settles on the rock recess from where the predators can easily snatch the bird's eggs. Raccoons can easily find the nest with a good sense of smell, and this situation started to trouble the owner of the cottage. He decided to take action and built a bordered nest platform, inside which came a 4–5 cm layer of Leca LWA. The nest is on top of a high post, so raccoons are prevented in stealing the bird's eggs. The birds found a home in the nest immediately, and Leca LWA's good thermal insulation and ability to stay dry contributed to the nesting even more during the cold Finnish spring weather.



190 SQUARE METERS OF GREEN SPACE

Four new, large plant walls have been completed at the Kannelmäki Shopping Center in Helsinki in connection with the renewal of the center. There are over 7,500 plants within an area of 190m². With the renovation of Kaari, the designers wanted to bring comfort and sanctuary to the shopping centre and the large plant walls were the perfect choice in achieving this.

Plants were specifically chosen in accordance to the customer's wishes, but environmental factors were also taken into account. There were lots of vines and ferns positioned into the wall so that the micro-climate is as favorable as possible for each plant.

Inside the flowerpots for this development is Leca lightweight aggregate (LWA) - keeping the optimal moisture balanced. Leca LWA can be effectively applied for hydroponic growth without the need for soil and provides valuable benefits to gardeners through being lightweight and a powerful medium for plant growth.





250 tonnes

This was the weight of an old concrete chimney that was removed on our plant in Denmark. The chimney was taken down in 5 pieces of approx. 8,5 meter.

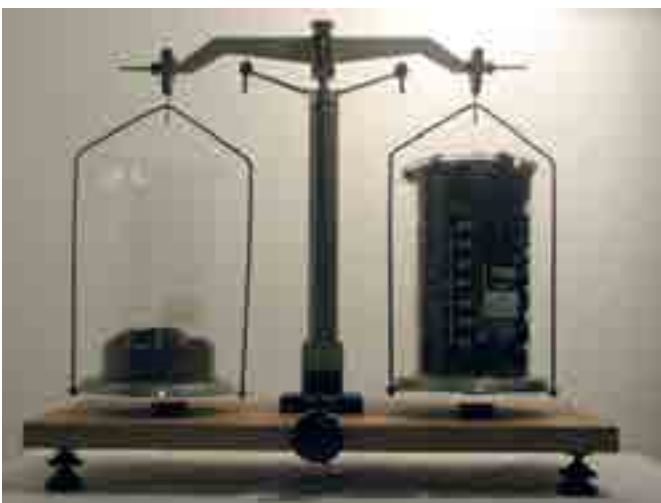
2 400 000

This is the number of cubic meters of Leca LWA produced by the Leca International companies in 2018.



100%

Leca as a ceramic aggregate is 100% resistant to rodents, mice, rats and moles. These creatures don't go into insulation made of expanded clay, because of the abrasive outer structure of Leca clay balls. These small animals prefer other insulation materials!



5

Leca is an aggregate that, on average, weighs five times less than sand. This significantly contributes to the protection of the environment since the number of vehicles required for transport is significantly reduced. Most often, the space for loading in the car allows for carrying twice as much aggregate and twice as many blocks.

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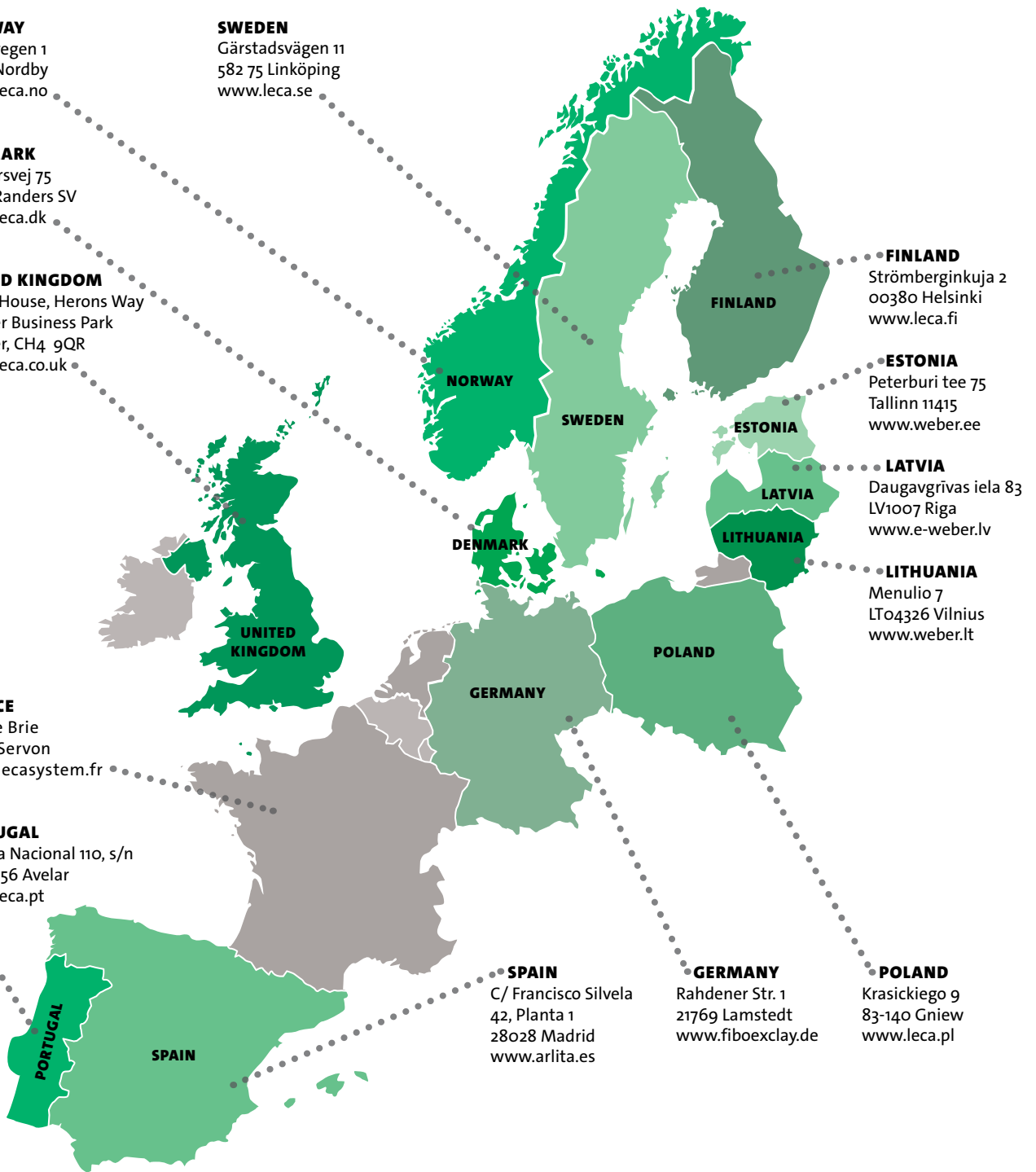
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