Leca® Lightweight Fill within Rail Development

Leca®
SAINT-GOBAIN

Leca® Lightweight Fill within Rail Development

In railway structures Leca® LWA is commonly used as a light fill material to reduce subgrade settlement and to improve stability of structures and areas of weak and unstable ground. It serves the similar targets when used in pedestrian and bicycle

In the re-construction of railways Leca® Lightweight Expanded Clay Aggregate can be applied to repair settlement defects, to increase levelling and to improve bearing capacity. In addition, with the help of Leca® Lightweight Expanded Clay Aggregate road and rail embankments that require widening can be constructed with minimal effect due to increased loading to the existing structure.

Minimise Differential Settlement

Construction of embankments over weak and compressible soil deposits, where the loading of the embankment causes soil consolidation and settlement, is common. Depending on the height of the embankment, the depth of the weak soil deposit and the consolidation properties of the soil strata, total settlements can be very deep and problematic in terms of road evenness, function and durability of the road construction. In the most difficult cases, various combinations of soil strengthening techniques are available, for example, preloading, vertical drainage and deep stabilisation with piles all of which are time consuming and costly to install.

More than 70 years developing innovative projects

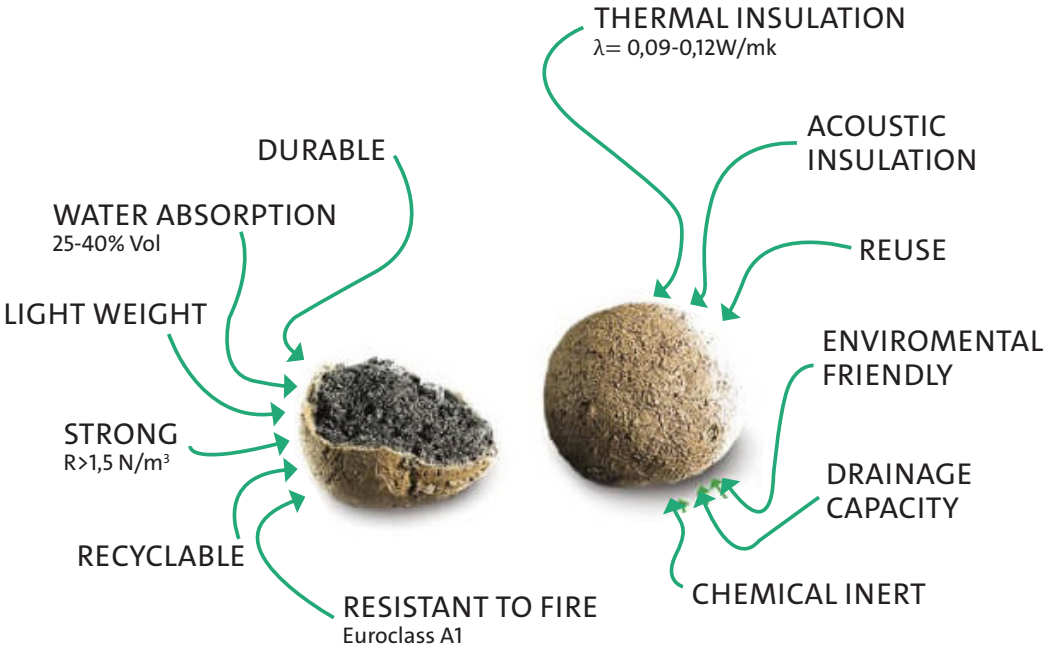
The ‘pull out’ resistance of Leca® LWA makes it an ideal solution for reinforced soil retaining walls. Particularly when constructed over weak sub-soils or voids, this method has been proven to cut overall construction costs considerably.

Leca® LWA is used extensively to reduce vertical loading. Structures such as underground parking, tunnels or roof garden benefit greatly from the reduction in pressure and avoid additional costs of strengthening.

Being light weight and round in nature, Leca® LWA can be transported and placed more easily than that of traditional fill in these difficult to access areas.

Overview

- Stability – reduces the risk of embankment landslide and deformation
- Reduced settlements - less damage to road structures, rail beds, pipelines and other structures
- Reduced earth pressure - in structural backfill against foundations, retaining walls and bridge abutments
- Drainage - on sports grounds, fields, slopes and roads
- Insulation - protection for roads surface, structure, pipelines and service mains
- Frost stability - in road and rail beds
- Limited compaction – Exerted energy during compaction is minimal with a reduction in volume of approximately 10 - 12%.
- Low density and ease of handling, coupled with consistent high quality, make Leca® LWA a highly competitive alternative to other lightweight materials



FINNINGLEY AND ROSSINGTON REGENERATION ROUTE SCHEME (FARRRS)

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

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

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

The original design proposed use of expanded polystyrene to deliver a low weight of high volume infill against the abutments but the limited experience of this design, coupled with the evident limited capacity of supply, forced the developers to seek a suitable, proven and available alternative. LECA® LWA was the product of choice to meet these exacting technical and construction criteria.

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

Carillion sites to maintain high safety standards. "The delivery system worked perfectly," reports Mr Gray. "We had the fullest co-operation from LECA® UK on timings, stock and deliveries. The drivers did their best to stock pile the LECA® LWA as close to the point of application as possible so we could minimise site handling. Moving the LECA® LWA with ADT dumpers and then placing it and tracking in down proved a smooth operation. We had to put it down in 450mm layers to link in with the Tensar grid system which hooks the grid mesh into the wall blocks which meant eight truck loads per layer which was 60 meters in length."

Overview of Project

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

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

Project information

Amount of material: 26,000m3 Leca (10-20mm) LWA

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

Delivery Method: 4-Wheel Tippers

Main Contractor: Mott MacDonald

EDINBURGH TRAMWAY | MURRAYFIELD STADIUM | EDINBURGH

GRAHAM Construction, responsible for the creation of the Murrayfield tram stop as part of the Edinburgh Trams Project, faced challenges on the project not least of all the ability to raise the structure seven metres above the existing ground level.

Rugby fans will alight from the Edinburgh tramway system right outside the hallowed gates of the famous Murrayfield Stadium, home of Scottish Rugby, thanks to the advantageous properties of Leca® LWA. The tram stop is a key part of the new inner city tramway linking Edinburgh airport with the heart of the City.

GRAHAM Construction, responsible for the creation of the Murrayfield tram stop as part of the Edinburgh Trams Project, faced challenges on the project not least of all the ability to raise the structure seven metres above the existing ground level. Normal traditional fill would have imposed severe overburden threatening the stability of the existing Network Rail line and other established buildings.

Consulting engineers to this project, Parsons Brinkerhoff, determined that the replacement of traditional fills with Leca® LWA was the preferred option to overcome bearing and settlement issues associate with the soft ground conditions underlying the site.

Tristan Morgan, Geotechnical Engineer at Parsons Brinkerhoff, said:

“One of our main issues was to get such a large earthworks structure founded within the underlying soft ground conditions without significant ground improvement being undertaken. The light weight attributes of the Leca® LWA satisfied these criteria, with significantly lowering bearing/settlement at formation compared to traditional fills. It also interacted with the Tensar elements of the structure without difficulty.”

Contractor Feedback

A Tensar Geogrid wall system in conjunction with Leca® LWA was designed and subsequently constructed to raise the ground level and form the platform surfaces.

More than 14,000m³ of Leca® LWA was required for the Murrayfield tram stop construction which was shipped directly into the Port of Leith Docks ready to be trucked to the site as and when required.

Andrew Henry, Construction Manager GRAHAM Construction pointed out the advantages of Leca® LWA. “Faced with the complications of the Murrayfield site, especially the potential expense of excavating unsuitable ground, Leca® LWA has proved exactly the right choice of material for this technical project. Access to the platform site was difficult but Leca® LWA is a versatile and easy material to handle and this enabled us to meet the project targets.”

Project information

Amount of material: 14000m3 of LECA ®LWA (10-20mm)

Interesting Fact: A Tensar Geogrid wall system in conjunction with LECA® Lightweight Fill was designed and subsequently constructed to raise the ground level and form the platform surfaces

Main Contractor: GRAHAM Construction,

NEW RAILWAY EMBANKMENT WALKWAY -ST BRIDES

600m3 of Leca® lightweight fill was specified for a new railway platform in St Brides, Newport, South Wales.

600m3 of Leca lightweight fill was specified for a new railway platform in St Brides, Newport, South Wales. The new embankment walkway which is 340m in length and 2m high, was surrounded by agricultural land and interspersed with drainage reens. This embankment carries up to four lines and a signal gantry spanning all four lines. The aim of the embankment was to provide a new and stable walkway for the platform.

Furthermore, a culvert runs through the embankment including two historical overbridge abutments. Whilst specifying a suitable fill material for the earthworks, the material required key properties including lightweight in nature, free draining and contained a suitable compaction rate, which was in compliance with Network Rail's specific specification.

Similar solutions were considered for this project, Paul Hartland, who was the Agent for this project at BAM Nuttall confirmed that 'similar products that complied with the specification were considered.', but Leca Lightweight Fill offered a solution which offered the 'specified fill requirement due to a low load bearing capacity and ease of installation.'

The Leca Lightweight Fill (10-20mm) was delivered loose by Walking

Project information

Amount of material: 600m3 of Leca® lightweight fill was specified for a new railway platform in St Brides, Newport, South Wales

Interesting Fact: The new embankment walkway which is 340m in length and 2m high, was surrounded by agricultural land and interspersed with drainage reens

Delivery Method: Walking Floor

Main Contractor: BAM NUTTALL

Floor trailers at a delivery siding to the station compound in Newport, this was at a rate of around 70m3 per Walking Floor delivery, the material was then taken from the station compound and delivered into place by an excavator. A geotextile backing was used to accommodate the Leca Lightweight Fill and provide the suitable rate of stability for the important rail embankment.

The specification of the Leca Lightweight FIll from the design to delivery was proved to be successful. Paul Hartland, who was the Agent for this project at BAM Nuttall, stated that the ‘product, service and commercial elements of the supply was excellent.’, and the technical support provided by the Leca UK team was ‘extremely helpful’.

DERBY RAIL STATION PLATFORM DEVELOPMENT

Part of the ambitious Midland Main Line Upgrade. Starting south of the station, the project was in operation 24 hours a day and 7 days a week to replace over 2km of track, install 11 sets of points, open a new platform and started on the demolition of platforms in the station.

Sunday 22 July 2018 saw the start of an 11-week partial closure of Derby station, part of the ambitious Midland Main Line Upgrade. Starting south of the station, the project was in operation 24 hours a day and 7 days a week to replace over 2km of track, install 11 sets of points, open a new platform and started on the demolition of platforms in the station.

The purpose of this project was to reduce journey times, improve rail performance, increase the line speed and to segregate services. This remodelling exercise simplified and created compliant track. Furthermore, this provided an opportunity for future electrification development. Achieving those objectives involved a £200 million investment to reconfigure both track and signalling in the Derby station and surrounding area, delivering a more efficient and reliable layout.

Leca LWA was selected in order to provide a lightweight solution for the rail platform. The lightweight fill was used behind the riser walls in order to reduce loads applied. Leca LWA was specified in areas where small foundations were installed to accommodate electrical cabinets on the platforms. The cabinets were installed on top of the Leca LWA.

Over 1700m3 of Leca LWA was delivered to site and was installed through the pneumatic blowing facility which was crucial for the development as time was extremely limited and access points to the project site was highly problematic – due to the station remaining partially open during much of the development. The site required delivery at a distance of 70m and the speed of installation was fast and easy.

Project information

Amount of material: 1700m3 of Leca LWA (10-20mm)

Interesting Fact: Lightweight fill was used behind the riser walls in order to reduce loads applied.

Delivery Method: Pneumatic Delivery

Main Contractor: Galliford Try Infrastructure

STABILITY FOR THE LONDON RAIL EMBANKMENT

Engineers for Transport for London were tasked with providing the structural stability and lightweight solution for one of the busiest rail lines in London.

The use of Leca Lightweight Aggregate provides the solution for a 200m London Rail embankment with limited access on a busy rail line.

Engineers for Transport for London were tasked with providing the structural stability and lightweight solution for one of the busiest rail lines in London. Leca Lightweight Expanded Clay Aggregate was installed as a lightweight backfill which was placed within a RAM WALL system, stabilising the embankment walls along a 200m stretch of the Acton Town to Chiswick Park London Underground.

Phil Richardson of Innovative Support Systems Ltd. explains that "Deterioration of the embankment was compromising the stability of the wall and it was deemed necessary to re-grade the slope to reduce and transfer weight directly above whilst at the same time creating a walk way to access the line-side services.

The problem facing the Transport for London was that the railway embankment was situated directly behind

residential property in a busy area of London and alternative aggregate was proving to be dangerously problematic due to the heavyweight pressure – causing potential major long term structural issues. Leca Lightweight Expanded Clay Aggregate fundamental lightweight properties solved this issue with ease.

"In order to accomplish this in an exceptionally constrained site with very limited access. RAM WALL was used alongside Leca Lightweight Expanded Clay Aggregate which was selected because of its ability to be constructed in difficult locations to a variable geometry." Explains Phil Richardson of Innovative Support Systems UK.

Thanks to Leca Lightweight Expanded Clay Aggregate's free draining and lightweight nature, the facility to be pneumatically delivered, and the ability to also be delivered in small lightweight bags –Leca Lightweight Expanded Clay Aggregate provided the perfect innovation and solution to this rail issue.

Project information

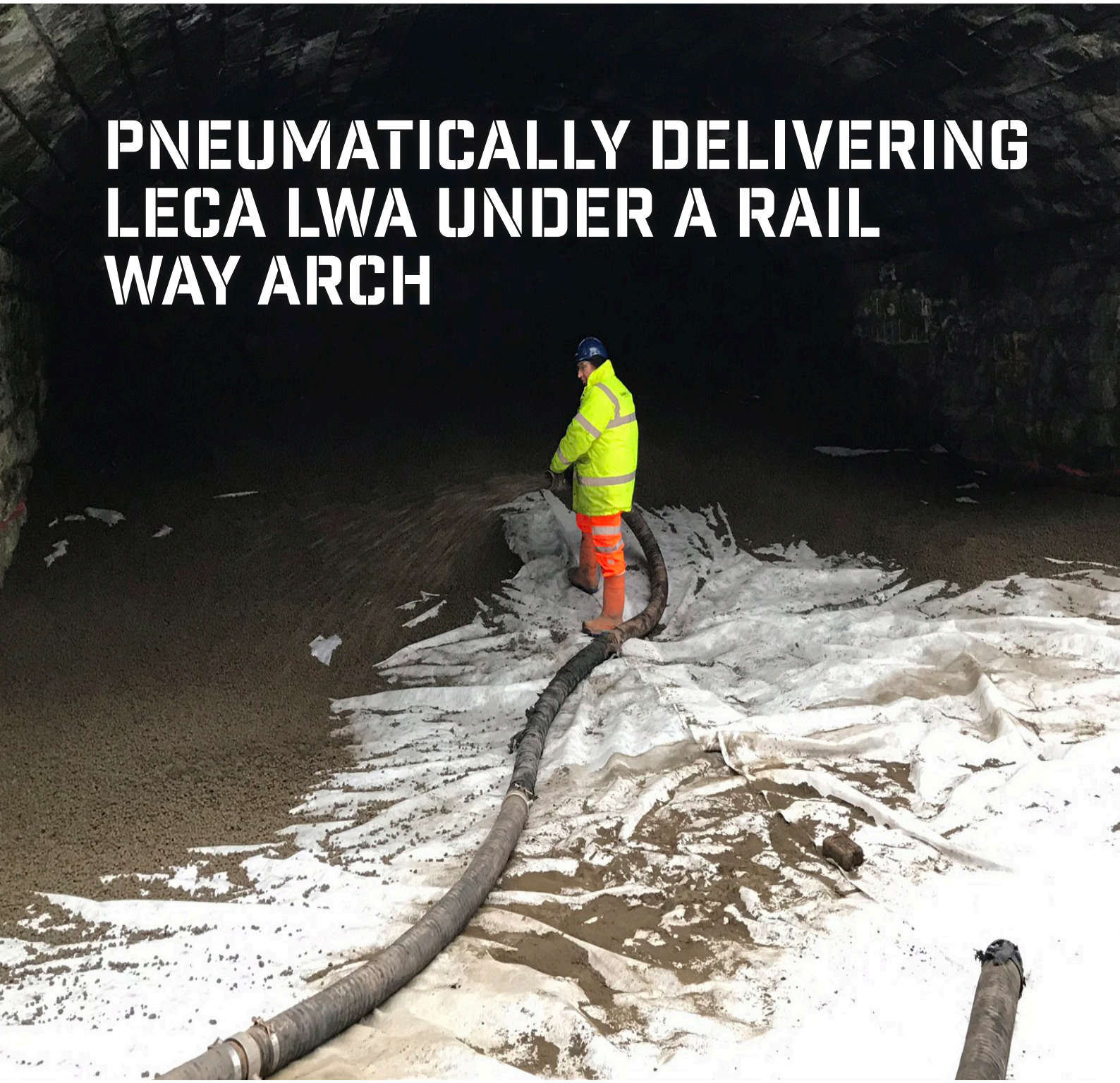
Amount of material: 200m3 of Leca® LWA (10-20mm)

Interesting Fact: The problem facing the Transport for London was that the railway embankment was situated directly behind residential property in a busy area of London

Delivery Method: 2.2m3 Bulk Bags

Main Contractor: Transport of London

PNEUMATICALLY DELIVERING LECA LWA UNDER A RAIL WAY ARCH



LECA® LWA WAS SPECIFIED FOR THE DISUSED RATHO STATION IN EDINBURGH. THIS PROJECT REQUIRED AN URGENT INFILL UNDERNEATH THE RAILWAY ARCH TO MAINTAIN CONTINUED SAFETY.

Leca LWA was specified for the disused Ratho Station in Edinburgh. This project required an urgent infill underneath the railway arch to maintain continued safety.

Selecting an aggregate infill was proving to be difficult for the construction team, with detrimental conditions including poor ground conditions and limited access to the railway arch. Leca LWA was selected because of its lightweight properties, weighing 1/3 of traditional rock aggregate and also its ability to be pneumatically blown into place at a long distance through its piping system - resolving and solving these technical difficulties with ease.

Over 330m3 of Leca LWA was pneumatically delivered through the blowing vehicle. This material was topped up with a local stockpile on site, making the delivery of material quick and efficient. Through this pneumatic delivery option, the speed of delivery ensured that the job was complete over a 2-day period, limiting the time required for a traffic controlled system

above the railway arches.

Leca UK Sales Manager commented: “It was great to be a part of a project where Leca LWA provided the problem-saving solution. Through discussing this with the engineers, it was quickly discovered that this project faced many uphill technical battles and this included poor ground conditions and limited access. Alternative aggregate media including traditional rock aggregate was proving to be too heavy and a logistical conundrum for the site engineers.” It was recommended that Leca LWA could provide a lightweight solution which could accomplish the geotechnical require-

Project information

Amount of material: 330m3 of Leca® LWA (10-20mm)

Interesting Fact: This material was topped up with a local stockpile on site, making the delivery of material quick and efficient.

Delivery Method: Pneumatic Delivery

Main Contractor: A.E. Yates Limited

H23 STRAFORD BRIDGE DEVELOPMENT - LONDON RAIL LINE

THE NEW H23 STRATFORD BRIDGE, WHICH SPANS THE MAIN LONDON RAIL LINE, PROVIDES ACCESS TO AN AREA OF SIGNIFICANT REGENERATION.

The new H23 Stratford Bridge, which spans the main London rail line, provides access to an area of significant regeneration. The bridge construction utilised 13,000m3 of 10-20mm Leca LWA to backfill against the high retaining wall abutments reducing the loading by 75% over traditional fill materials.

Leca LWA is a lightweight expanded clay formed by heating and firing natural glacial clay. Its high volume by weight reduced the expected number of truck deliveries onto this busy and difficult to access construction site. Leca LWA is also very easy to handle on site, allowing the simultaneous spreading and compaction of the Leca LWA with the same tracked machine. Leca LWA 10-20mm is a free draining, lightweight fill material which has an average density of 300kg/m3 which is just a seventh of the weight of sand, gravel or crushed rock. It also offers good resistance to moisture retention allowing installation during wet weather.

The Stratford Bridge project is a key element of the complete transport infrastructure development in East London. It was designed and

specified by Arup and the build project awarded to Balfour Beatty.

Contractor Feedback

Project leader Pete Wilkinson had previous experience of using Leca LWA fill. “It’s a great product, easy to handle and the delivery schedule worked well for us even though we had some weather problems.

Leca LWA offered a lightweight fill which could be applied easily and quickly ”The low weight, high volume benefits of Leca® LWA decreased the abutments loading by 75% over traditional fill and the quick compaction, in comparison to traditional fill, enables a faster completion of the build project. Leca® LWA also gives a reduced loading on the ground structure, which is important at the Stratford location where much of the site is reclaimed or disturbed ground.” Leca® LWA exerts much lower horizontal earth pressures compared with other backfill materials, which helps improve stability.

Project information

Amount of material: 13000m3 of LECA® LWA (10-20mm)

Interesting Fact: The differing depths of the planters which at its deepest reached depths of 15 feet meant that the pneumatic delivery provided through the agile pneumatic delivery piping proved to be the most effective solution.

Delivery Method: Pneumatic Delivery

Improving living conditions and protecting the environment

Our products are bringing a number of advantages to the construction market, within the housing, infrastructure and water management sectors. They cater for comfort and wellbeing through positive thermal and acoustic insulation within our homes and living spaces.

We also see the benefits for our products within infrastructure design creating load compensation, reduced load on structures and offering effective drainage properties. Furthermore, we see the positive impact our products on the work environment and transport due to its unique combined lightness and strength. Our sustainable products are often recognized as achieving more with less.

Our organizational ethos of sustainability and protecting the environment is more than the effective engineering results of specifying our products – it is also what we do in our manufacturing processes. We recognize the environmental impact generated within our industry and we are focused on improving our environmental footprint through consistent optimization within all industrial processes throughout the total life cycle of our products.

But we do not rest on laurels on where we are today, we have clear plans of where we want our industry to be tomorrow. Reducing our industrial CO_2 footprint 50% by 2030, in comparison with 2017, is only is only our initial goal, we want to go beyond this. And for LECA sustainability is much more than CO_2 footprint and that is why we are developing transparent information on the full life cycle of our products.

We use energy to expand our aggregate but we are looking at the benefits in the total life cycle of our product – accounting for all the benefits generated during transport, installation and the user phase we believe we go far beyond the basic energy consumed to produce our products.

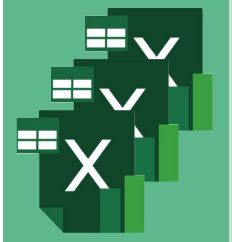
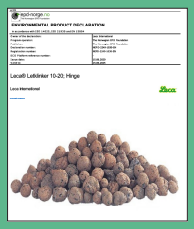
Through assessing the life cycle of our products it is clear that we are producing a sustainable building material. And importantly, not forgetting the end of the life-cycle of our lightweight aggregate, which can be removed and simply reused in the future, thanks to the material's unique and highly sustainable properties.

LECA® LWA is a product of today, with a strong history, and fully prepared for the needs and challenges of tomorrow. But we are not resting on our laurels. We want to take an active part in creating a sustainable future with a sustainable product.

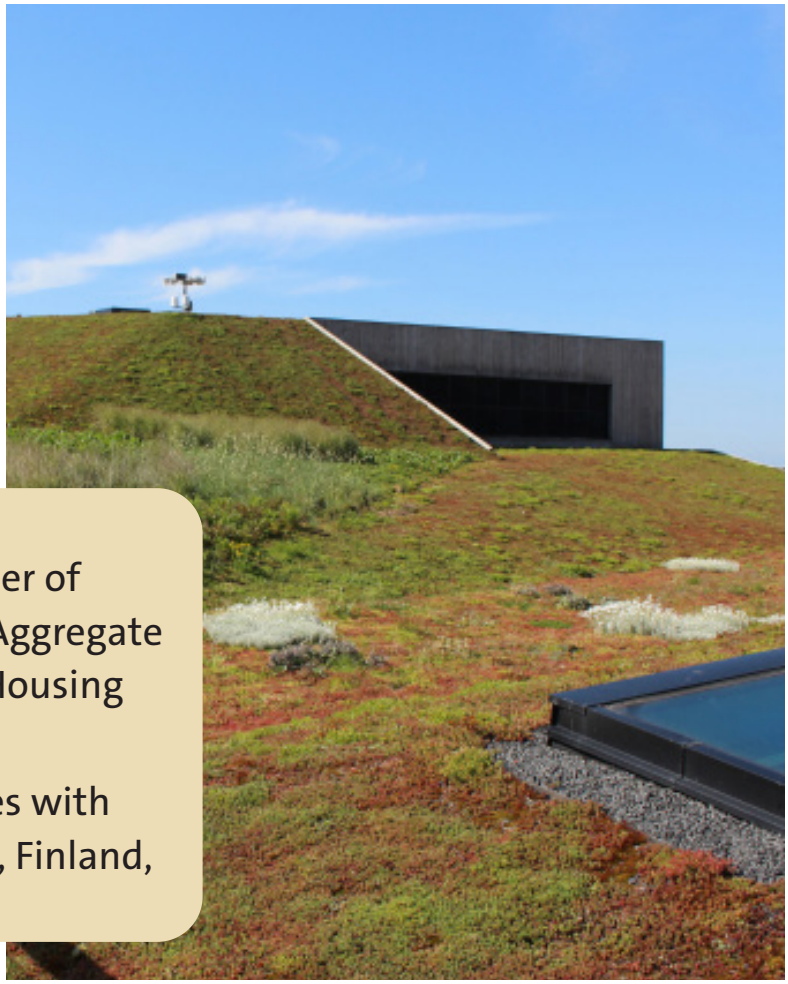
Kim Rosenbom
Business Development and Sustainability Director

Focus
on the Environment

LECA has a strong commitment to the environment. Every day we extract clay from nature to produce our main product, Leca® LWA (Lightweight Aggregate). Even if we transform 1m³ of clay into 5m³ of sustainable construction material it is fundamental for us to understand the full life cycle impact of our products. Therefore, we are working on the Life Cycle Assessment (LCA) of our products which will allow us generate the Environmental Product Declarations (EPDs) – a transparent way to present the cradle to grave information for all our products, from all our

EPD Process	Data collection	Life cycle assessment	Background report	3rd party verification	Publication
					
Executive	Manufacturer	Consultant	Manufacturer	Third-party	Program operator

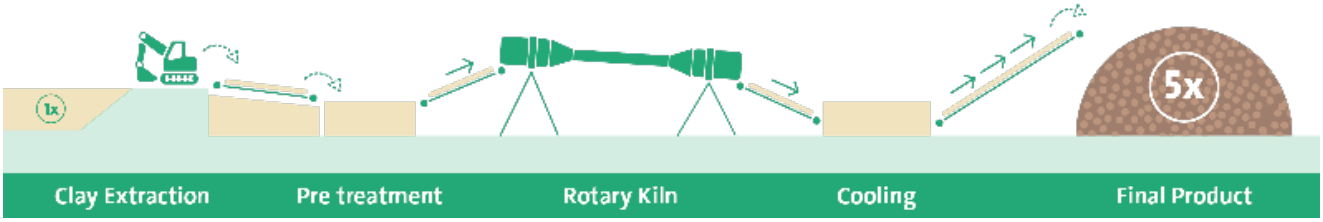
An EPD is an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products in a credible way. EPDs are produced accordingly with the ISO International Standards, ISO 14025, based on the Product Category Rules. For Lightweight Expanded Clay the related CEN Standard is: EN 15804:2012 + A1:2013.



We are the number #1 supplier of Expanded Clay Lightweight Aggregate in Europe in Infrastructure, Housing and Water Management.

We are present in 12 countries with production sites in Denmark, Finland,

Leca® LWA **production process**



Clay extraction: The clay is extracted from clay pits normally located close to the plants, thus keeping haulage costs and carbon emissions to a minimum. The clay pits are restored and rehabilitated to both preserve biodiversity and create new natural habitats.

Pretreatment: The clay goes to the production line where the mechanical treatment took place and some additives are added to the clay.

Rotary kiln: The kilns are heated to temperatures up to 1.150°C and this process transforms the clay into various sized lightweight aggregates with a hard ceramic shell and a porous core. The raw material is expanded approximate 5 times during the kiln process.

Cooling: A correct cooling process is essential to ensure a high-quality product. This process is made with air.

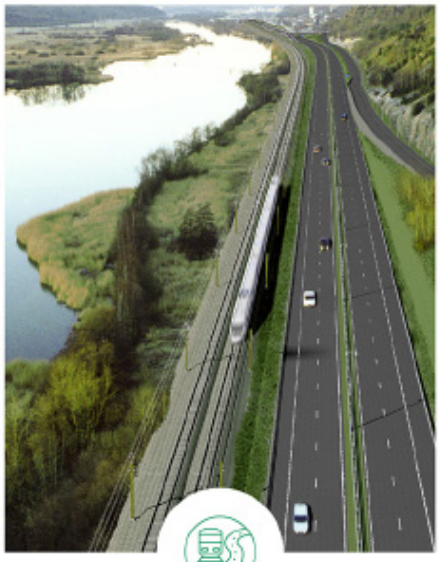
Final product: A sustainable light weight aggregate made for housing, infrastructure or water management applications.

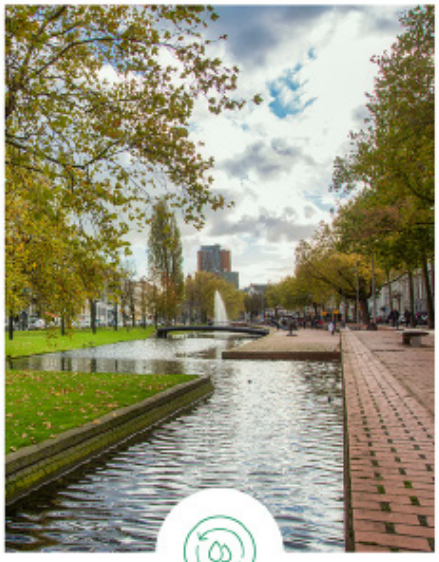
Comparing to traditional filling material Leca® LWA is fast and easy with the following characteristics:

- Lightweight
- Resistant
- Durable
- Improve drainage
- Thermal insulation

Leca® In-Office CPD
Available Now

We offer UK wide in-office CPD seminars (with lunch included) which provides an in depth study of Leca® LWA and its unique properties within structural and geotechnical applications.





Visit www.leca.co.uk to organise a free appointment

Key areas covered:

Geotechnical Engineering (Highways, Rail, Bridges, Pneumatic Infill of Redundant Structures)

Water Management (Landscaping, Flood Prevention)

Coastal Protection (Sheet Pile, Caisson Structures)

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