Leca® Lightweight Aggregate Concrete Solutions

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Leca® Concrete Characteristics

1. Less reinforcement required
2. Lighter than Normal Density concrete
3. Good workability
4. Low thermal conductivity
5. High Temperature resistance
6. Potential reduction in depth of beam and slab
7. Reduction in deadload
8. Improved Homogeneous properties

Can be pumped**

Durable and Resitant to Fire (Euroclass A1)

Block Solution, Floor Base, Precast & Screed Solution

By using a **Leca® Lightweight lower density concrete** - a longer span can be achieved for concrete structures.

Leca® Lightweight Aggregate Concrete - reduced weight with optimal strength

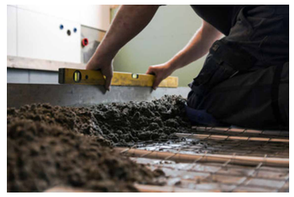
One of the primary benefits of using Leca® Lightweight Concrete in concrete production is its reduced density. The aggregate's unique porous structure significantly decreases the overall weight of the concrete, making them easier to handle and transport.

Leca® Lightweight Concrete's durability is yet another advantage in lightweight concrete production. The aggregate possesses exceptional strength and resistance to external pressures, ensuring the longevity of the concrete. Its stability and ability to withstand extreme weather conditions make it an ideal choice for a wide range of construction projects.

In addition to its physical attributes, Leca® Lightweight Concrete also benefits the environment. The production process incurs minimal environmental impact, as the aggregate is derived from natural clay resources. Furthermore, the lightweight concrete created with Leca® Lightweight Concrete require less energy for transportation, reducing carbon emissions and contributing to sustainable construction practices.

Products

1. Leca® Lightweight Aggregate Concrete


Leca® Lightweight Aggregate Concrete (4-10mm) is mainly used as an additive in industrially manufactured Concrete. One of the primary benefits of using Leca® Lightweight Aggregate Concrete in lightweight concrete production is its reduced density.

The aggregate's unique porous structure significantly decreases the overall weight of the concrete, making them easier to handle and transport. This lightweight characteristic also translates into improved thermal insulation properties, ensuring optimal temperature regulation within buildings.

Typically, in Leca® Lightweight Aggregate Concrete (LWAC) concrete of same cylinder strength, the tensile strengths and strains and shear strengths are lower than Normal density concrete.

Leca® Lightweight Aggregate Concrete Characteristics

Less reinforcement requiredLighter than Normal Density concreteGood workability Low thermal conductivityHigh Temperature resistancePotential reduction in depth of beam and slabReduction in deadloadImproved Homogeneous propertiesCan be pneumatically pumped/ delivered *

Type & Grading (mm)	Dry bulk density (kg/m^3)	Particle density (kg/m^3)	Type of LWAC	Typical LWAC
Leca LWA 2 – 4	400	700	Ordinary strength LWAC	LC 25 / 1700 kg/m^3
Leca LWA 4 – 10	320	550	Ordinary strength LWAC	LC 25 / 1700 kg/m^3

Leca® Lightweight Aggregate Concrete

Specification

- **The product complies with**: EN 13055-1
- Fraction: 4-10 mm
- **Loose bulk density**: 272-368 kg/m 3 (approx. 320 kg/m 3 on average)
- **Crush resistance**: 1.07 N/ mm2
- **Thermal conductivity:** λ = approx. 0.100 W/mK*
- **Reaction to fire**: class A1 (non-flammable)

* Leca LWAC concrete is usually less stiff, consideration needs to be given to the reduction of self-weight and the resulting reduction in the depth of a beam or slab. Creep and Shrinkage should be considered at design stages.

Leca® Lighweight Concrete Recipe

		Per 1 m3 of lightweight concrete						
Recipe number		1	2	3	4	5	6	7
	Unit							
CEM II B-S32S/5R	kg	190	220	270	350	420		
CEM I 42.5	kg						350	440
Sand	kg		150	230	320	510	470	660
Leca LWA - 4-10mm	kg/ m3		260|0.85	260|0.85	100|0.33		140|0.46	88|0.29
Water	L	100	150	170	180	200	180	220
Total	kg	570	890	1050	1150	1445	1350	1598
Characterisitcs								
7 day	N/ mm2	0.5	2.46	4.99	10.25	16.2	12.6	14.9
28 day	N/ mm2	1	3.29	5.96	10.7	19.2	14.3	19.2
Concrete class		-	-	-	LC 8/9	LC 16/18	LC 12/13	LC 16/18
Density	kg/ m3	503	790	938	1075	1363	1261	1498
Density Class		-	-	D 0.1	D 1.2	D 1.4	D 1.4	D 1.6
Water absorption	%	22	33.2	30	17	12.8	12.6	7.79

2. Leca® HD - Low Weight / High Strength Aggregate

Structural applications where normal weight concrete is not the preferred solution and a Higher Strength Leca® Lightweight Aggregate Concrete (LWAC) is the solution, **Leca® HD** is the aggregate of choice.

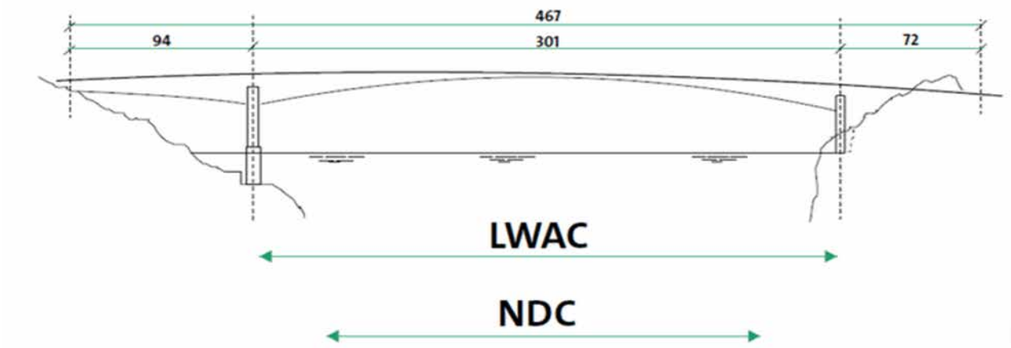
By using a lower density concrete longer span can be achieved. Thus, the positioning of the foundation are more flexible and large costs are saved. The use of LWAC will create a slimmer and more cost-effective construction with lower amount of total use of concrete and therefore, also a greener construction.

The use of LWAC is in floating structures like **Wind Turbines**, **barges**, **floating fish farms**, **floating bridge foundations** etc.

Type & Grading (mm)	Dry bulk density (kg/m^3)	Particle density (kg/m^3)	Type of LWAC	Typical LWAC
Leca HD LWA 4–12	610 - 700	1300	High strength LWAC	LC 45 / 1850 kg/m^3

- **Long Span Structures / Structural Concrete**

The main vertical load on most long span structures is the weight of the structure itself. Therefore, the reduction of concrete density is essential not only for the design of the span and the foundation, but also for the positioning distance between foundation elements. One example for efficient utilization of LWAC is the cantilever bridge.

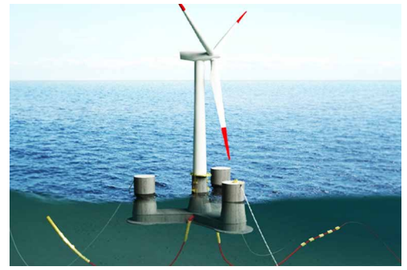


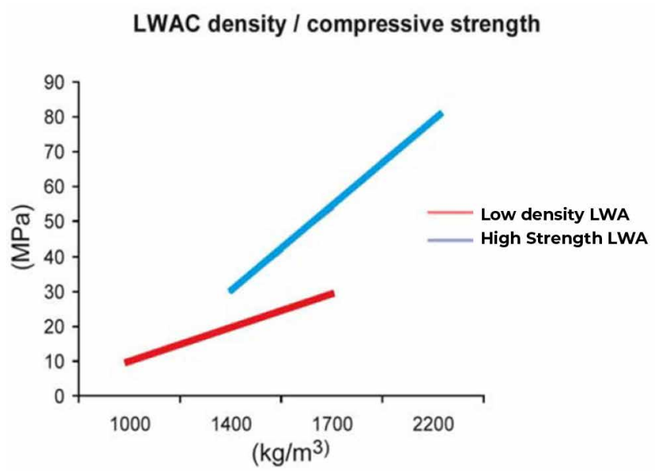
Leca® HD - Low Weight / High Strength Aggregate LWAC

Specification

- **The product complies with**: EN 13055-1
- **Fraction**: 4-12 mm
- **Loose bulk density**: 610-700 kg/m 3 (approx. 320 kg/m 3 on average)
- **Crush resistance**: 5 N/ mm2
- **Thermal conductivity**: λ = approx. 0.100 W/mK*
- **Reaction to fire**: class A1 (non-flammable)

*For dry aggregate



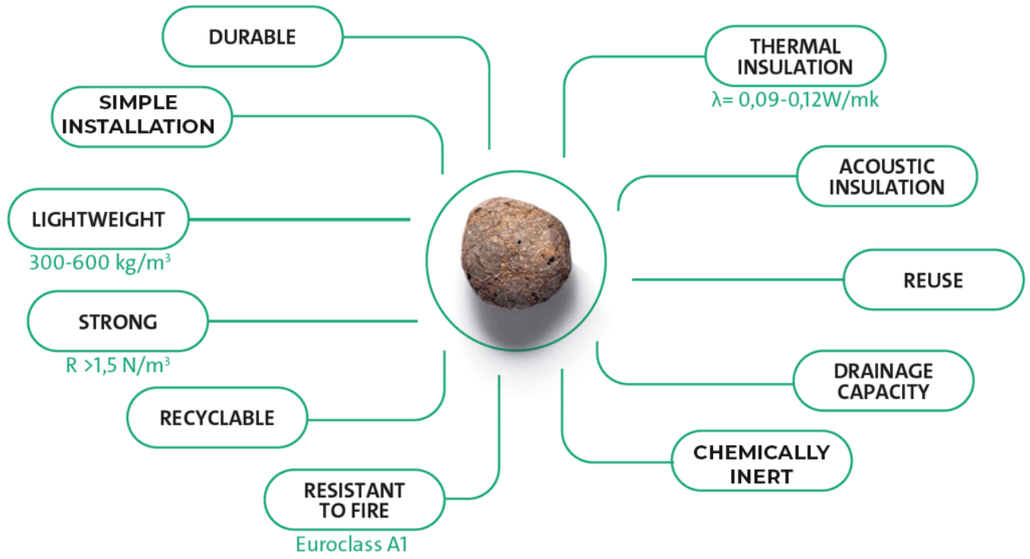


One of the big questions is how and where to utilize the LWAC. LWAC can be used in the same structures as NDA, using traditional admixtures and local cements. The only difference is the use of high-performance Leca LWA that allows to reduce weight without significantly reducing the mechanical characteristics.

Strength	LC 8/9	LC 12/13	LC 16/18	LC 20/22	LC 25/28	LC 30/33	LC 35/38	LC 40/44	LC 45/50	LC 50/55	LC 55/60	LC 60/66	LC 70/77	LC 80/88
Characteristic strength in cubes (fck, cube in MPa)	9	13	18	22	28	33	38	44	50	55	60	66	77	88
Characteristic strength in cylinder (fck, cylinder in MPa)	8	12	16	20	25	30	35	40	45	50	55	60	70	80

More than just an Lightweight Concrete Aggregate

When Leca® Lightweight Concrete Aggregate is applied to any concrete production - it offers solutions to more problems. It is a lightweight and sustainable construction material but brings so much more....



Block Solution, Floor Base, Precast & Screed Solution

next STEP

Delivering Leca® Lightweight Aggregate Concrete

Delivery Made Simple

At Leca® UK we have accumulated a wealth of experience to successfully transport and deliver Leca® Lightweight Expanded Clay Aggregate to diverse construction projects throughout the UK.

Depending on the project requirement and location, we will source the vehicles to best suit the project requirement. For more information on your delivery requirements please Contact Us.

1. **Bulk Bags** (2.2m3) - Ideal for larger scale projects.

2. **Pneumatic Delivery** - Leca® LWA benefits from its ability to be pneumatically delivered. The LWA is blown out through a 5 ”hose at a rate of 1 m3 per minute.

3. **Truck Delivery** - Depending on the project requirement and location, we will source the vehicles to best suit the project requirement

Q & A with Leca® Concrete Specialists



Lightweight aggregate concrete (LWAC) has been used for a long time. One of the earliest uses of reinforced LWAC was in the hulls of ships and barges from around 1918 in the USA. Why is LWAC still an important solution in the infrastructure market today? And what has changed over the last 100 years with LWAC technology?

Geir Norden: Well, we have the same challenges today as 100 years ago. Ships and floaters need to float and to achieve this, lightweight materials achieve better buoyancy. The weight of a concrete structure is still very dependent on the density of the material itself, so lightweight concrete offers a greater advantage. The quality of the LWA has improved significantly during the last 100 years in strength, density, ratio and variation. Today it is simple to make LWAC with a typical compressive strength of 60-70 MPa and still reduce the concrete density by 20-30%. The variations in the quality of the LWA is very low today with uniform and fine pore structure, resulting in standard deviation figures which are lower than for similar normal density concrete, which is remarkable. In addition, the binder system and reinforcement together with the knowledge on LWAC has improved. The largest improvement in recent times is the addition of additives including super plasticizers which make LWAC even more innovative, and this includes LWAC offering self levelling and pumpability for easy delivery to site.

2. Can we compare normal concrete with LWAC, so we can substitute normal concrete with LWAC in every project, in terms of concrete characteristics, price, and sustainability?

Geir Norden: Yes and no. It is possible to substitute all normal weight concrete structures with lightweight concrete, but it is up to the Design Engineer to evaluate the benefits by doing so. It is all in the design, how to design and construct a sustainable structure. The LWA itself costs more than ordinary concrete aggregate, hence this will increase the concrete costs of the LWAC comparable.

From recent projects, my experience tells me that LWAC comes in at a 1.5 to 2 times higher price, depending on the mix design and logistics. It is therefore reasonable to use LWAC where you can find a benefit from the reduced weight and size of the construction. And there are several types of projects. Typical applications are floaters and structures with a long span. Here we can utilize the low weight and reduce the construction costs despite the higher unit price of the LWAC comparable. The LWAC offers good mechanical characteristics and can cover the price differentials when compared to normal density concrete. All designers should be able to calculate and design with LWAC.

Regarding the question on sustainability, the answer is similar; reducing the weight of the structure and being able to construct longer, wider, and slimmer designs, whilst reducing the concrete structure itself, will generate an overall more sustainable structural design.

Case Study



The World's Largest Contilever Bridge with Leca® Lightweight Concrete

Concrete Innovation: Constructed on a new section of the Norwegian coastal motorway, the Trysfjord Bridge is the world's largest cantilever bridge - spanning a total length of 534m! Its deck is made entirely of beams projected horizontally into space and anchored on only one end. This extraordinary technical feat was made possible with Leca® Lightweight Aggregate Concrete, which generated exceptional strength; robust resistance and durability – whilst remaining lightweight - aligning perfectly to the formidable construction requirements.

Mechanical properties of lightweight concrete:

- **Compressive strength**: 70.4 MPa
- **Characteristic compressive strength**: 64.1 MPa
- **Standard deviation**: 4.4 MPa
- **Density 28d cube**: 1940 kg/m3
- **Formed density**: 1931 kg/m3
- **Bulk density Leca® Lightweight Concrete**: 825 kg/ m3
- **Particle density Leca® Lightweight Concrete**: 1450 kg/m3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