# LECA® STORM WATER MANAGEMENT

*When extreme weather is on the horizon*

Leca® Lightweight Aggregate (LWA) is well suited for infiltration, detention and treatment of storm water.

# UTILISING GREEN OUTDOOR AREAS FOR WATER DETENTION

Leca® LWA contributes to infiltration, drainage and insulation.

# HOW SHOULD WE HANDLE RAINWATER?

**Effective management of rainwater can prevent overloading of sewage and drainage systems.**

**Climatic change leads to increased rain and more extreme and unpredictable weather. . Unfortunately, for the general population it is areas of dense and impermeable urban areas which are especially exposed. Along with other measures, local management of rainwater can reduce storm water overload on the drainage system, and thus minimize the risk of flooding.**

As an alternative to costly and inflexible expansion of drainage pipes and systems, this brochure shows how it is possible to manage rainwater through detention, evaporation or infiltration methods where the precipitation first falls.

Managing rainwater locally will contribute to keeping storm water from overloading drainage pipes, but in order for the water management system to perform well - it is important that the local solutions are scaled and designed correctly. There are many different methods for managing storm water locally. Some are based on natural and basic principles, others are more advanced and technical. This brochure presents where and how Leca LWA can be used in different solutions, depending on the local requirements.

Determining which water management system works best will be defined partly by the infiltration requirements, based on the needs and wishes of the user and what additional value the solution should add to the water management operation.

## How can Leca® LWA contribute?

**Storage and infiltration of water**
Proper temporary storage reduces the dangers of flash flooding and provides a steady and manageable flow of water. Leca LWA has a large air volume/percentage of voids between the grains where water are stored. The Leca LWA absorbs water and pre-crushed aggregates have even higher capacity. After the water is absorbed, it will seep into the ground or slowly discharge into the drainage system. This reduces the risk of flooding and provides a steady and manageable flow of water.

**Water detention**
Leca LWA has a special, porous structure and an abundance of voids between the grains. This property allows temporary absorption of water and delays the water flow, so the total load of water from fierce downpours are detained and slowly drained away.

**Drainage**
Leca LWA has properties which make it great for innovating drainage applications. Water that flows along drainage lines and enters permeable surfaces, can quickly be diverted. Larger and rounder Leca LWA grains have higher hydraulic conductivity, thus faster drainage.

**Treatment and filtering**
The abundance of tiny pores in each grain of Leca LWA make it an ideal product for particle trapping. Leca LWA can remove different types of pollutants depending on the construction of a filterbed and the choice of Leca products. This has made LWA an excellent solution for many water- and sewage treatment plants around the world.

## Increased value of the outdoor area

A system made for storm water management using Leca LWA contributes greatly to water detention, infiltration and drainage. Local flood risk can also be considerably reduced. The water is stored in the open pore structure in the crushed Leca LWA, as well as in plants and growth media. A lot of the water will evaporate back into the atmosphere and this is one of the major innovative benefits of specifying Leca LWA . The total volume of water that can be managed is dependent on the choice of solution, environmental conditions and the amount of Leca LWA used.
Well planned water management solutions can provide many additional benefits to the local area:
- green areas with biological diversity
- appealing outdoor spaces and green recreational areas
- better local aesthetics - promoting wellbeing
- efficient use of space - creating more space
- improved air quality in the surrounding area
- cooling effect in summer

## Advantages with stormwater management

Efficient local management of rainwater and water run-off will provide:
- reduced risks of flooding
- removal of pollution and contaminants from flooding
- an alternative to costly and inflexible water reservoirs and drainage pipes
- a city environment customized to local municipal plans and national climate adoption strategies

# STORM WATER SOLUTIONS USING LECA® LWA

## Rain gardens

A rain garden is a planted depression or a trench that allows rainwater runoff from the surrounding areas to be absorbed and detained, this reduces the intensity of storm water on the drainage pipes. A layer of Leca LWA in a rain garden ensures high capacity and facilitates detention or infiltration of large amounts of water. In addition, a quantity of the water will evaporate or be absorbed by the plants. A rain garden can be constructed to blend into various landscapes and urban areas, and may be an aesthetic addition to the local environment.

## Permeable surfaces

The use of permeable and semi-permeable surfaces have proven to be efficient measures against storm water. Fields of grass and paving stones are permeable surfaces that are adaptable to densely built areas and requires no more space than standard, impervious surfaces. Leca LWA is a well-suited substrate material for permeable and semi-permeable surfaces that can act as walkways, parking lots and recreational areas. Leca LWA will increase the overall drainage capability of the surface and detain the total runoff from the area. Leca LWA has traditionally been used as lightweight backfill for geotechnical applications, and has high load bearing strength and will reduce the risk of settlements.

## Ditches and swales

Leca LWA is well suited for detaining and filtering water in ditches and swales, and the material can be easily placed alongside roads and footpaths. Ditches and swales must have a layer of soil and vegetation, followed by a permeable filling of Leca LWA and, if necessary, a drain-pipe. The solution is flexible and the construction can be adapted to the need of detention, storage, infiltration or filtration of water. Ditches and swales can be connected with other local measures for management of storm water.

## Green roofs

Green roofs are a well-known and aesthetic solution for managing rainwater where it first falls. The synergy between Leca LWA and plants provides a good evaporation effect and detains the remaining water sufficiently to reduce the water load on the drainage pipes. Leca LWA has low weight and can be applied to new roofs and for the retrofitting of existing roofs. A green roof with Leca LWA is frost resistant, insulating and reduces the need for cooling in summer. Such solutions can even remove polluting dust and other particles from the city air.

## Outdoor spaces on roofs and other areas

The built-in water detention capabilities of Leca LWA can be used to build functional constructions of roof gardens and other outdoor areas. For instance, it is possible to build a lush outdoor space with vegetation and footpaths on building roofs or above underground parking garages. This will increase the value of the property as well as the capacity for local management of rainwater. The water is stored in the mass of crushed Leca LWA and is then slowly released into the local drainage system. When planning new buildings, it should be taken into account what role the roofs and outdoor spaces should have as a climate adaptation measure. A well designed outdoor space contributes greatly to the detention of water and considerably reduces the risk of local flooding.

## Solutions for infiltration

Rainwater can be guided to dedicated storage and infiltration solutions to delay flood peaks and thus prevent the overload of the drainage and sewage system. Storm water can run-off from the surrounding areas, or enter directly from downpipes or other local measures for water management. Good infiltration requires ground conditions that have suitable infiltration capacity and conductivity. An infiltration system should have a sand trap and the basin filled with Leca LWA. A solution based on Leca LWA can be easily built and maintained, and does not require additional surface area. Leca LWA has a high load bearing capacity and is uninhabitable for vermin.

## Filtering and biofiltration

Because of the highly porous structure and large surface areas of the crushed grains, Leca LWA is perfectly suited for treatment of rainwater. Leca LWA can physically, biologically or chemically bind both dissolved and solid particles. Expanded clay has long been used for water treatment purposes and has long term resistance to clogging. The local environment can be protected by immobilization and removal of pollution that would otherwise end up somewhere else. Leca LWA as a filter solution has low estimated operating costs and a long life span.

# LECA® LWA IS A GOOD SOLUTION

**The right combination of measures for rain- and storm water management will reduce the runoff during rain storms to detain and alleviate pressure on the sewage system.**

When solutions for local storm water management are planned as a part of the city´s recreational areas, they contribute to a lush and green community and allows for more recreational spaces in the urban areas. Also, different solutions lead to more biodiversity, improves air quality and reduces the need for cooling when it is hot. Scaling and design of the systems depends on factors such as the amount of water, soil conditions, weather data, possibilities for infiltration and governmental regulations. City planners should make sure that the combined measures are sufficient to cope with the increasingly intense downpours of the future.

Leca LWA maintains its porosity and detaining effect during frost and is perfect in winter conditions with temperatures that fluctuate around freezing.

Leca LWA is an economical solution that easily adapts to the underlying terrain. The material can be pneumatically blown into place with a blowing truck. The products are developed and tested for use under permeable surfaces, green roofs and for water treatment.

Leca is working on future solutions for water management that takes aesthetics and living environment into account. The local management of rainwater requires a variety of measures that together reduces the total runoff of rain- and storm water from an entire property.

## What is Leca® LWA?

Leca LWA is a lightweight aggregate from burnt, expanded clay. The raw clay is dried and burned in large kilns and expands at about 1200 °C. The resulting product is a strong ceramic material with a hard shell and an inner structure of small, air filled pores. Both crushed and round grains are very strong and light. The applications described in this brochure uses both round and crushed Leca LWA with different grains sizes.

## General characteristics

All kinds of Leca LWA can be used in most solutions for storm water management. Small, large, crushed or round Leca LWA grains have different characteristics, but they all have this in common:

- Natural products
- Lightweight
- Neutral and chemically inert
- Good root growth for plants
- High air permeability
- High hydraulic permeability
- Stable quality
- Sound and heat insulating
- Completely fire resistant


**Download Our stormwater-app**

LecaCalc is the iOS and Android app showcasing the stormwater features of Leca LWA. The app makes it easy for you to try out different combinations of dimensioning and amounts of rain. The runoff is automatically calculated depending on materials and system design, giving the user a quick indication of the achievable performance. LecaCalc is an easy and usable tool to get an overview of different types of Leca LWA for water detention and infiltration, and if you´re making green roofs, permeable surfaces, rain gardens and ditches, you should check out LecaCalc.

*Available for Android in Google Play and iPhone in AppStore.*


**Finely crushed Leca® LWA**
(< 6 mm) optimal for maximum water detention. The material is especially suited for green roofs and as a substrate for permeable paving stones. Bulk density is 400-500 kg/m³.

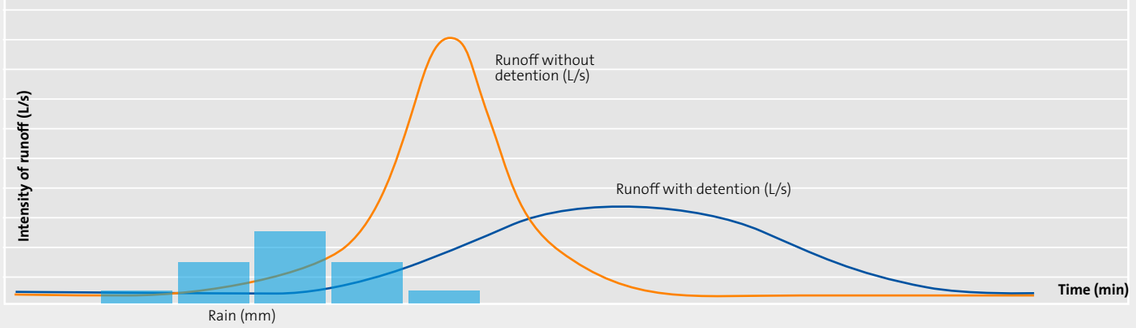

**Coarsely crushed Leca® LWA**
(4-10 mm) is without fines and has larger particles with higher hydraulic permeability. This is an advantage when large weight variations due to water absorption should be avoided. Coarse crushed Leca LWA is very light, the bulk density is 250-300 kg/m³.


**Round Leca® LWA**
(10-20 mm) is good for drainage and water storage. Between the grains there are large voids with space for water when used in subterranean storage solutions. Round, coarse Leca LWA are also commonly used as a draining backfilling and for landscaping. Density is 240-300 kg/m³.

| Applications | Finely crushed Leca® LWA | Coarsely crushed Leca® LWA | Round coarse Leca® LWA |
|---|---|---|---|
| Filtering and biofiltration | WELL-SUITED | SUITED | LIMITED USE |
| Infiltration | SUITED | WELL-SUITED | WELL-SUITED |
| Water detention in green roofs | WELL-SUITED | WELL-SUITED | LIMITED USE |
| Water detention in rain gardens, ditches and swales | WELL-SUITED | SUITED | LIMITED USE |
| Detention under permeable surfaces | WELL-SUITED | WELL-SUITED | LIMITED USE |
| Frost protection and insulation | LIMITED USE | SUITED | WELL-SUITED |
| Drainage | LIMITED USE | SUITED | WELL-SUITED |

## Runoff with and without water detention measures

The plot illustrates how measures to prevent storm water delay and reduce flood peaks by the principle of water detention



A Saint-Gobain Brand

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