



Löffel®

**betonform**®

DESIGN LÖFFEL®



before  
after



Poggio S. Ilario (PR)



Löffel®



before  
after



Acireale (CT)



Summer



Winter

Vintl (BZ)

 betonform®



before



after

Schalders (BZ)

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Retaining walls of stone spoon stand clearly out from traditional concrete walls. Spoon stones allow a harmonious combination of soil, vegetation and water. That's why spoon stones seem to meet an increasingly growing common desire: To prevent the environment to transform into a sterile and lifeless concrete landscape. Walls of spoon stone merge with nature and therefore, instead of worsen the landscape, they improve it.

### The variety of models

The spoon family offers a variety of models, differing in weight, shape and size. According to individual needs all sorts of esthetical or static issues can be solved.

# Löffel® (The Spoon) family

FOR THE STABILIZATION OF INCLINATIONS OF ALL KINDS



**BIG LÖFFEL®**

approx. 120 kg  
approx. 57 x 57 x 27 cm



**LÖFFEL®**

approx. 60 kg  
approx. 50 x 45 x 19 cm



**ACQUARIO LÖFFEL®**

approx. 160 kg  
approx. 57 x 57 x 27 cm



**LÖFFEL® ARBALETT**

approx. 500 kg  
approx. 115 x 115 x 45 cm



## Retaining walls of spoon stones

These walls belong to the category of so-called heavyweight walls, as they fulfill their task of stabilization through their own weight.

Walls of spoon bricks, whose typical structure can be found in the adjacent illustration, can reach different heights: 2 to 4 m when using elements of the spoon type and 6 to 8 m when using elements of the big spoon type. It is possible to create larger design heights if, for the construction, larger elements such as the model Arbalett will be used. These are also used for the construction of noise protection walls. Obviously, all sorts of surveys have to be carried out prior to the start of construction.

Through vertical and horizontal forces caused by the transfer of the soil behind the wall complete stability is secured. Static surveys follow the traditional method for gravity walls with respect to the specific nature of the wall.

Static measurements are carried out using a special automatic key which is the statutory test, the tension between  $E_d / R_d$ . This occurs in the layers, from the dam crest to the bottom.

Various elements are taken into account: a potential overload of the mountain side calculated on the base of the extent, the size and the distance of/to the dam crest, and the inclinations of the mountain side and valley-side curvature of the projected wall.

The calculation takes also the result of classification of the respective area, in accordance with the provisions of the Italian Ministerial Decree 14/01/2008 (local stability testing - geotechnical and structural limits) regarding assessed earthquake action, into consideration.

To provide reliable parameters in terms of their resistance the spoon stones were subject to various laboratory tests. With their help the average carrying capacity could be established.

The concrete's technical properties are:

- Compression strength: Average  $40 \text{ N / mm}^2$  ( $400 \text{ kg / cm}^2$ )
- Water permeability: maximum penetration depth 17 mm, according to UNI EN 12390 / 8
- Exposure class: XC3, class and XF4 XF3 on request

## WALL WITH „SPOON“-STONES TYPICAL LATERAL CUT

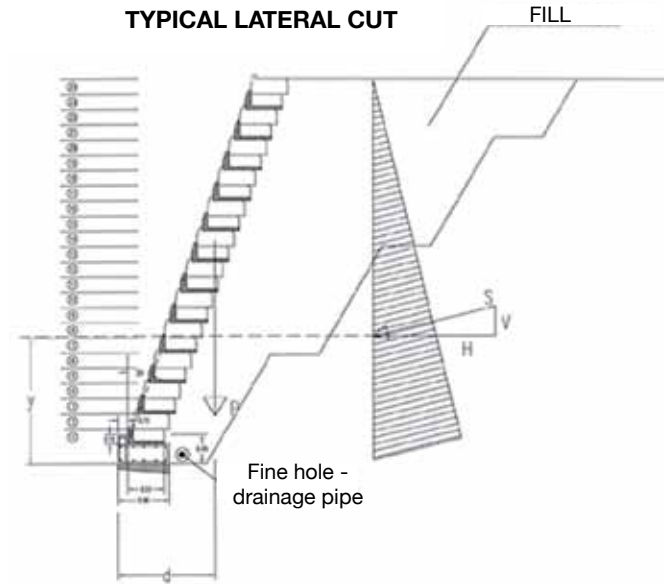
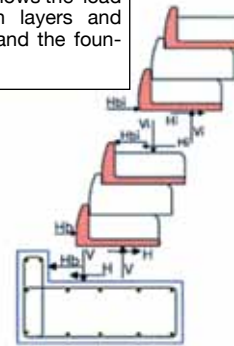
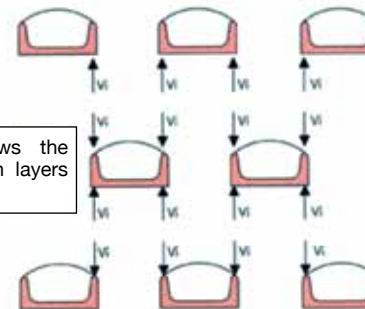


Diagram which shows the load transfer between layers and single elements and the foundation.



## LATERAL CUT

Diagram which shows the load transfer between layers and single elements



Poggio S. Ilario (PR)

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Pfalzen (BZ)



# Löffel®



**FUNCTION LÖFFEL**  
 approx. 60 kg  
 approx. 50 x 45 x 19 cm

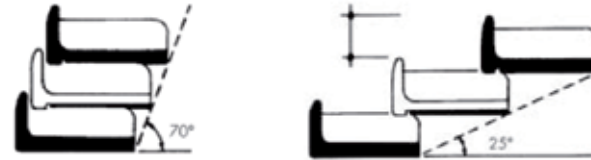
Verucchio (PU)



### Function

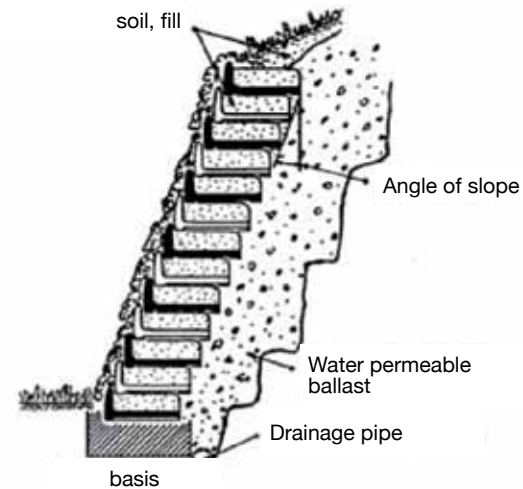
The main task of spoon rocks lies in fortifying any type of slope. They can be used for the construction of abutments.

Thanks to the body shape, the stones which are filled with soil retain more moisture. These are ideal conditions for the growth of plants and also for a higher security against flushing.



### Technical data

- Weight per item: 60 kg
- Dimensions of each unit:  
 Length: 50 cm  
 Width: 45 cm
- Number of items per m<sup>2</sup>: 6,5 pcs
- Minimum inclination of the wall: 25 °
- Maximum gradient of the wall: 70 °



### Plantation

The planting of each spoon stone is carried out individually according to an intended purpose of the slope protection and the protection walls. The elements are also suitable for the installation of a drip irrigation system.

## SLOPE PROTECTION ON BUCKET WITH STONES BACK ANCHORING

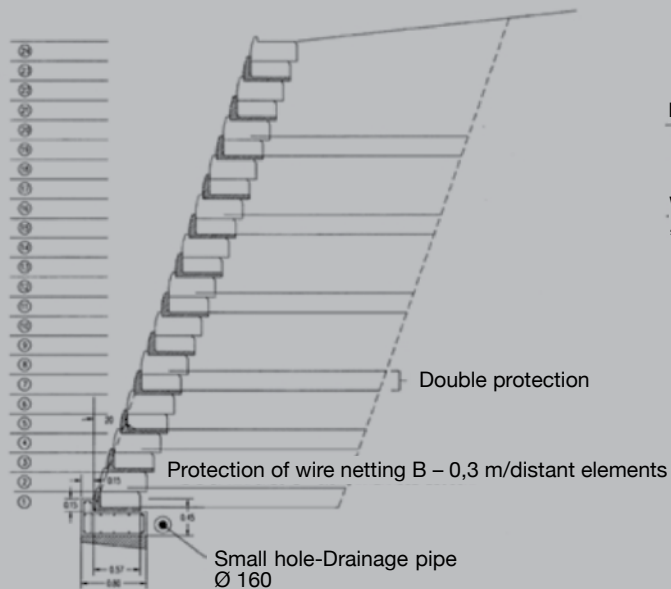
Due to the continued exploration of fastening systems for block masonry new and solution-oriented construction systems have been developed. They ensure better results and a higher degree of safety. The development of construction technology for reinforced walls led to the development of spoon stone with a special anchoring system, called "Rücker". This creates a new type of reinforced protection walls with a stone front bucket and a rear reinforcement of regular layers, made of galvanized wire netting. The diagram below explains the system. Through this technique, the front bucket of stones is almost completely relieved by the forces acting on them. Therefore it is also suitable for the consolidation of slopes of considerable elevations and of embankments subject to slipping risk.

Another advantage of this solution lies in the fact that the front is self-supporting and that the spoons can be planted. Therefore it is not necessary to support the elements while they will be laid out and the filling material can be compressed with the utmost security to the front wall. The concave shape of the spoon stones creates an adequate soil substrate which ensures the retention of sufficient moisture. So, the plants can grow easily.

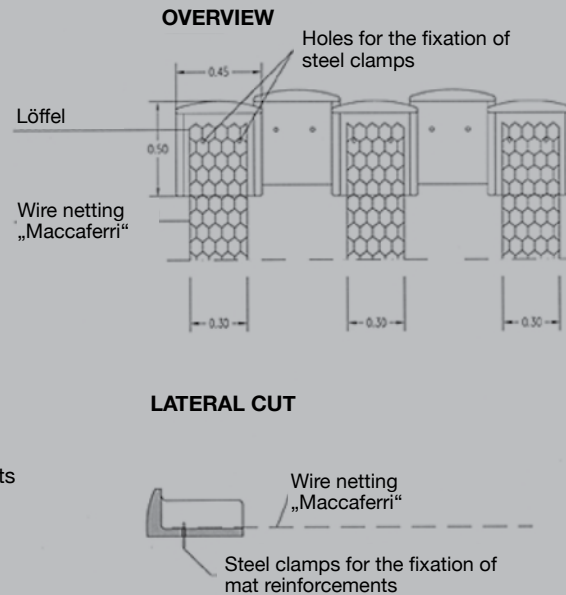
The reinforcement is made of 32 cm wide and long wire layers, based on the particular requirements. In order to fortify the wire netting on the elements, steel clamps are used. Due to this particular technique it is possible to build significantly higher walls than usually.

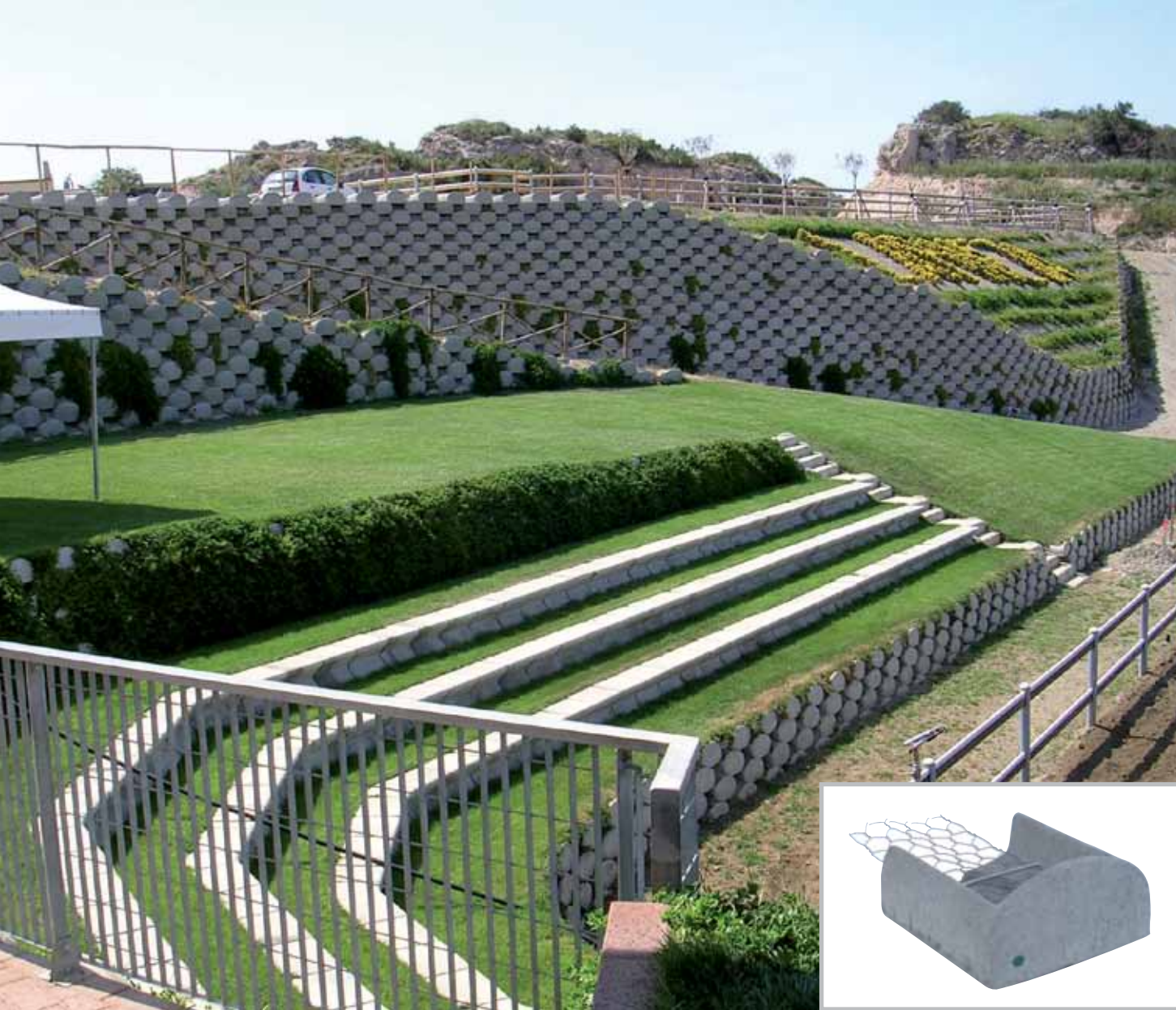


### SLOPE PROTECTION WITH REINFORCED SPOON STONES LATERAL CUT



### Detailed anchoring of wire netting layers on spoon stones





These elements are ideal for challenging situations. Due to the spoon system considerable elevations and embankments subject to slipping risk can be consolidated.

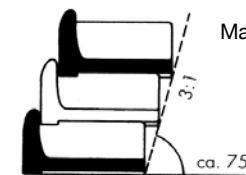
#### Technical data

- Weight per element: 120 kg
- Dimensions of each unit:
- Length: 57 cm
- Width: 57 cm - height: 27 cm
- Number of items per m<sup>2</sup>: about 3.4 units (based on the actual wall surface)
- Minimum inclination of the wall: 25 °
- Maximum gradient of the wall: 75 °

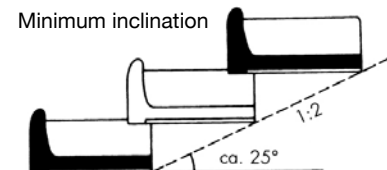


**BIG LÖFFEL**  
**WITH REAR ANCHORAGE SYSTEM**  
 approx. 120 kg  
 approx. 57 x 57 x 27 cm

**Big Löffel® „Armaterra“**



Maximum gradient



Minimum inclination



S. Palomba (ROMA)



L'Aquila

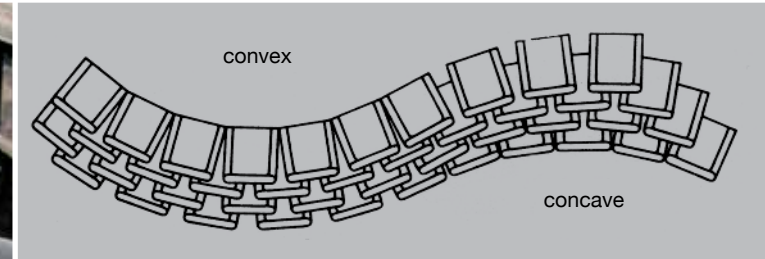
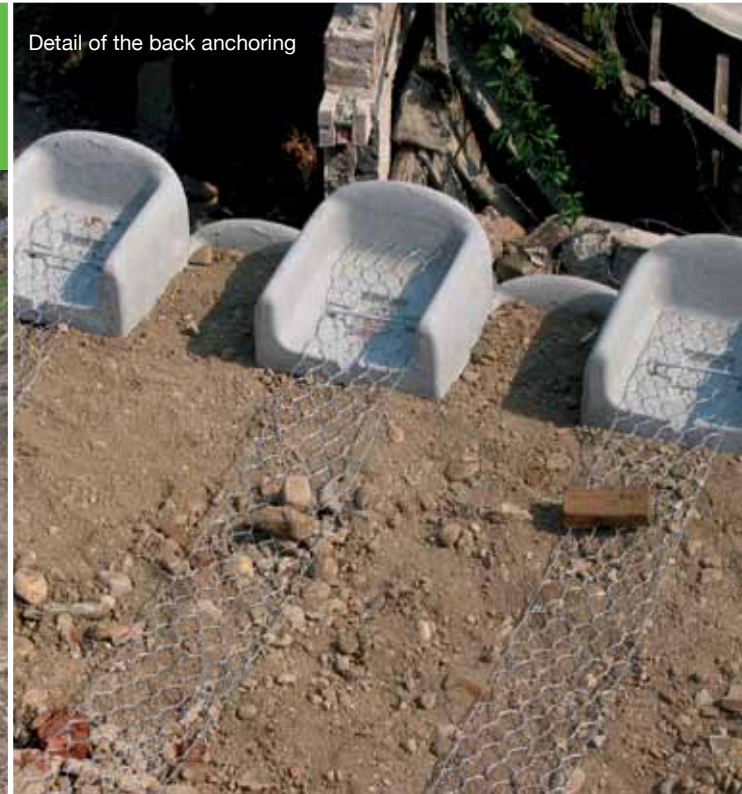


Löffel®

Lissone (MI)



Detail of the back anchoring



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## NEW HABITAT FOR ANIMALS AND PLANTS ...

The water bucket „ACQUARIO“ stands out from the traditional concrete walls as it is merging as a supporting element with nature. Spoon stones for waterside lining and waterside protection to fulfill all requirements of modern, intelligent and environmentally sound water projects. They allow a fusion of all the advantages of the conventional technique obstruction with stone or concrete walls without their negative aspects.

**BIG LÖFFEL  
„ACQUARIO“**  
approx. 160 kg  
approx. 57 x 57 x 27 cm

**Big Löffel® „Acquario“**





PO - Delta



### Function

Anchoring of banks and shores of lakes, canals, rivers and streams.

### Properties

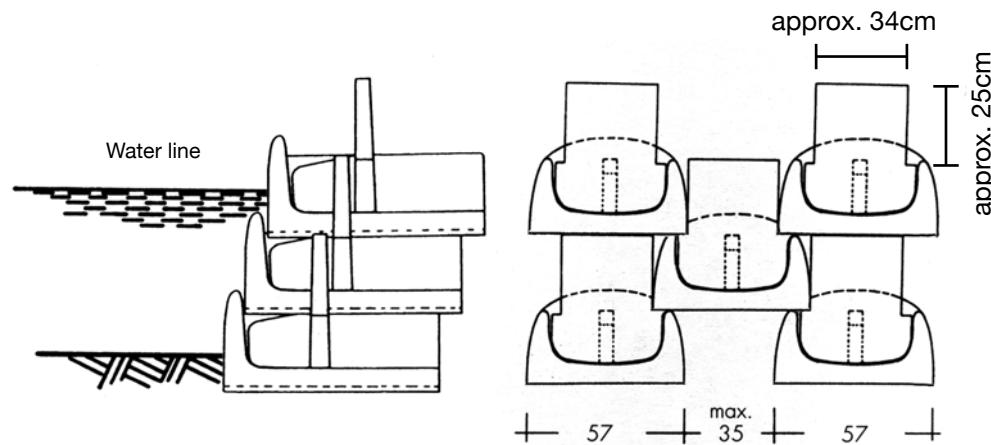
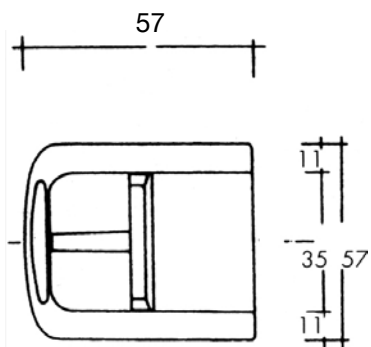
Bank protection with water buckets fit harmoniously into the natural environment because they can be greened up. So, the elements disappear. The water spoon „Acquario“ is versatile and suitable for every requirement. Due to its versatility it is immune to subsidence of the ground. Its strength and its structural properties will not be affected by anything. The particular shape of the collection van and the final element prevent the washing out of the bank soil behind the structure. At the same time the spoon stones can not be broken by the flow from its anchorage. „SPOON ACQUARIO“ is also suitable for the consolidation of curved shore areas, even if the curve radius varies. The spoon stones can easily be laid out.

### Inclination angle

Slope protection can be provided with a maximum tilt angle between 45 ° and 75 °.

### Technical data

- Weight per item: about 160 kg
- Dimensions of each unit:  
 Length: 57 cm  
 Width: 57 cm - height: 27 cm
- Number of items per m<sup>2</sup>: about 3.4 units  
 (based on the actual wall surface)
- Minimum inclination of the wall: 25 °
- Maximum gradient of the wall: 75 °





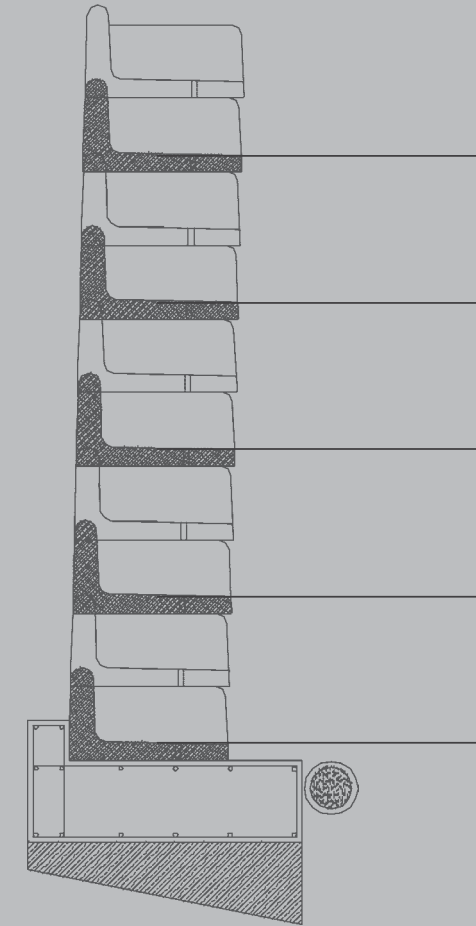
# Löffel®

- ELEMENT FOR VERTICAL WALLS
- 90 ° ELEMENT CONCAVE
- 90 ° ELEMENT CONVEX
- LATERAL COMPLETION
- GAIN LENGTH FOR BUSH TURNS



## SPECIAL ELEMENTS OF VERTICAL WALLS (SPOON AND BIG SPOON)

The rounded spoon stone is a variation of the proven elements and suitable for the construction of almost vertical walls. It is necessary, though, to adhere to a marginal inclination towards the hillside. (About 2 / 3 cm per meter height).



# SPECIAL ITEMS



### Curvatures

Spoon stones allow both, concave and convex curves. Therefore, the elements fit perfectly with the characteristics of the terrain. Our technicians will help out in any way they can and will calculate the correct spacing between the elements depending on the curvature, curvature radius and height of the walls.

### Statics

For retaining walls made of spoon stones prior static projections are recommended to be done since the maximum possible support levels depend on the dimensions of the non-adjustable load-bearing surface of the wall inclination and the specific characteristics of the existing filling material.

### Foundation

The type of foundation will be defined from case to case, depending on the nature of the substrate and the characteristics of the project.



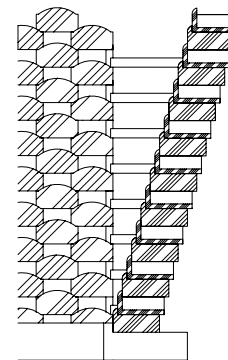
Pianello Valtidone (PC)



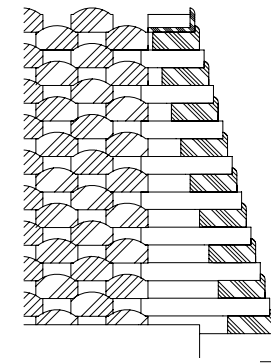
### How are the spoon elements laid out (general scheme)?

The procedure for a proper installation of all spoon elements is very simple. The only difference between the various types lies in the distance between the elements of the first layer because it depends on the function and the size of the elements.

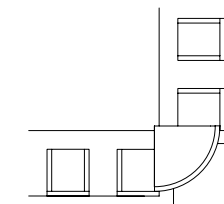
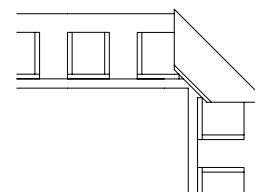
First of all the first layer has to be laid out. The single elements have to be immediately filled with soil. The requested distance between the elements has to be maintained (curves are an exception). This is done, layer by layer. Behind the wall made of spoon stone there needs to be set a strong drainage layer of 40 cm. In order to fill this gap the excavated material can be used. It is very important to compress the fill material layer by layer using the appropriate instruments. The seating for the individual elements must be perfectly horizontal. If there is an inclination towards the front wall, the foundation must be prepared stepwise. The laying out of the spoon stones will then follow this profile.



Concave 90°



Convex 90°





Borgotaro (PR)



Autostrada MI-BO Pontenure (PC) (3)

**Strong and powerful!**

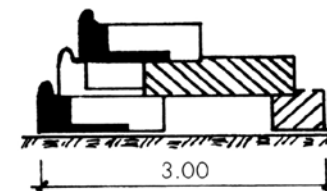
Behind the wall,  
no one bothers you!

**„ARBALETT“**  
approx. 500 kg  
approx. 115 x 115 x 45 cm

**Technical data**

- Weight per item: about 500 kg
- Dimensions of each unit: length 115 cm
- Width 115 cm - 45 cm effective height
- Number of items per m<sup>2</sup>: about 1.14 units  
(based on the actual wall surface)
- Maximum gradient of the wall: 85 °

# Löffel<sup>®</sup> Arbalett





## Function

„SPOON ARBALETT“ meets all the requirements for a plantable slope and noise protection.

## Properties

- Large construction heights possible
- Simple design
- Good sound absorption
- Small footprint
- Large ratio between surface and plantable concrete
- About 1.14 blocks per m<sup>2</sup>

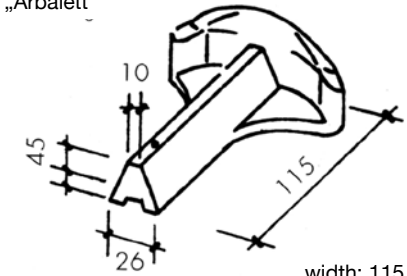
## Installation

The installation occurs in layers on the pre-established foundation. In order to ensure the stability of the elements vertical link elements are used. Each Arbalett element has to be filled with soil, layer by layer, and backfilled with drainage material. The filling material has to be compressed with appropriate instruments.

Due to its weight (about 500 kg / pcs.) each element has to be laid out by using a machine.

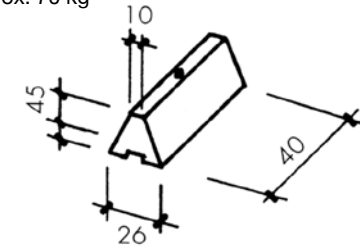
It is recommended to equip vertical walls with an irrigation system that ensures an effective planting. In particularly difficult circumstances it makes sense to install specific extension elements in order to increase the anchoring depth and in order to be protected from the high pressure on top of the wall, from the poor quality of the filler material or from the particularly high retaining walls. Sometimes connection elements between the elements or between the elements and the extension have to be used in order to ensure the best possible stability of the structure.

Spoon stone  
„Arbalett“

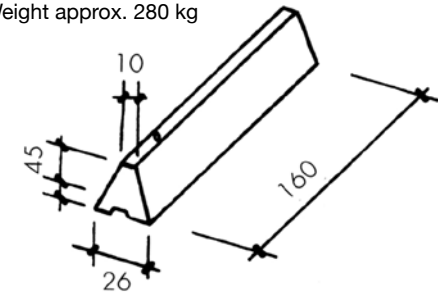


width: 115 cm

Connection element  
Weight approx. 70 kg



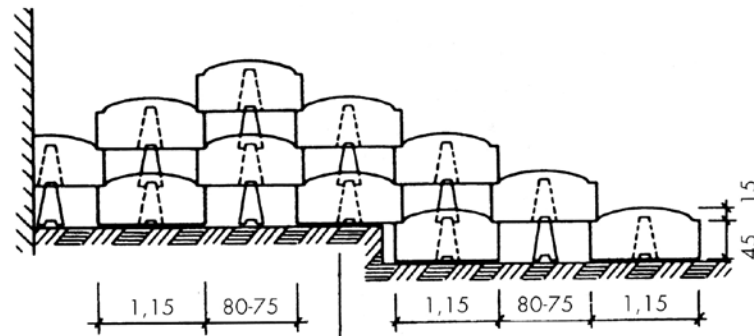
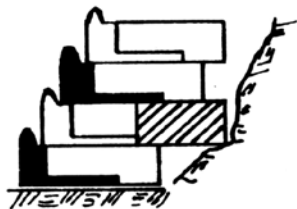
Extension  
Weight approx. 280 kg



Noise protection wall



Retaining wall



## Foundation

The formation of the foundation depends on the soil condition, the wall height and the function of the "wall body".

## Inclination angle

With the „SPOON ARBALETT“ vertical walls or walls with a maximum tilt angle of 85 ° can be created.

## Statics

Since the properties of a wall depend on many factors it is advisable to ask for support regarding a detailed consultation and a static calculation.

# Löffel® Product family

FOR HORTICULTURE

## MICRO LÖFFEL AND MINI LÖFFEL

### Function

Lightweight, handy and particularly suitable for the construction of horticultural walls. With the spoon-type micro stones 100/130 cm high walls can be built. With those of the type Mini the walls can reach 150/180 cm of height.



### MINI LÖFFEL®

approx. 22 kg  
approx. 30 x 33 x 18 cm



### MICRO LÖFFEL®

approx. 18,5 kg  
approx. 32 x 27 x 17 cm



### LÖFFEL® „TRIANGOLO“

approx. 56 kg  
approx. 45 x 50 x 22 cm



### LÖFFEL® „SECONDO“

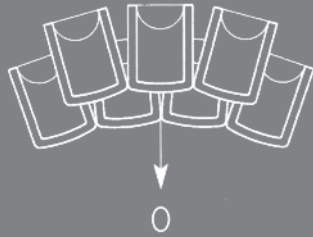
approx. 35 kg  
approx. 54 x 32 x 20 cm



## Curvatures

### Convex

Number layers	Wall height	Minimum radius	Distance between elements
3	0,48	1,00	18,5
6	0,96	1,50	18,5
8	1,44	2,00	18,5



### Concave

Number layers	Wall height	Minimum radius	Distance between elements
3	0,48	1,00	18,5
6	0,96	1,50	18,5
8	1,44	2,00	18,5



### Technical data

Weight per item: about 18.5 kg (micro spoon), about 22 kg (mini spoon). Number of items per m<sup>2</sup>: 10 - 12 (in terms of effective wall surface)

### Inclination angle

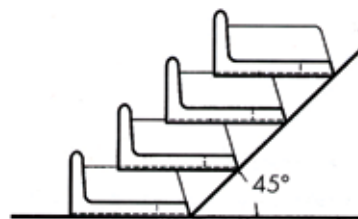
Slope protection can be provided with a maximum tilt angle between 45 ° and 75 °.

### Foundation

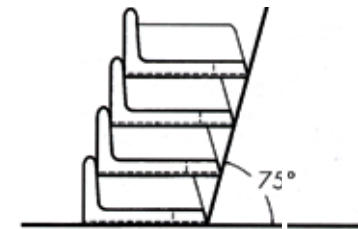
The foundation depends on the terrain and height of the wall. In most cases a compacted ballast basis is sufficient.



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Minimum angle



Maximum tilt angle



## CURVATION

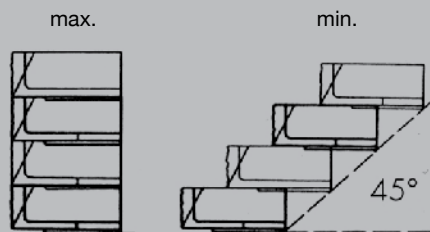
Convex



Concave



## INCLINATION ANGLE

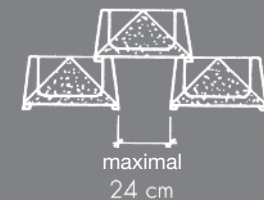


The model spoon TRIANGOLO represents an aesthetic variation for the traditional spoon stones. It differs from the other items through its angled front and its edged, straightforward design.



## LÖFFEL „TRIANGOLO“

approx. 56 kg  
approx. 45 x 50 x 22 cm



### Technical data

Weight per item: about 56 kg

Dimensions of each unit:

Length: 50 cm

Width: 45 cm - height: 22 cm

Number of items per m<sup>2</sup>: 6.5 units  
(based on the actual wall surface)

Minimum slope of the wall: 45 °

Maximum gradient of the wall: 90 °

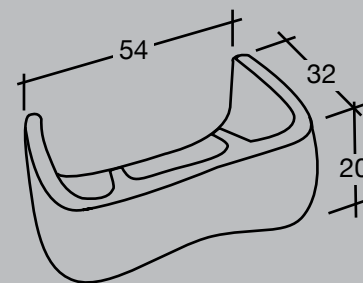
# Löffel® Triangolo



#### Technical data

Weight per item: about 35 kg  
Dimensions of each unit:  
Length: 32 cm  
Width: 54 cm - Height: 20 cm  
Number of items per m<sup>2</sup>: 5-9 units  
(based on the actual wall surface)  
Minimum slope of the wall: 45 °  
Maximum gradient of the wall: 90 °

The spoon stone „Secondo“ is light, handy and, surprisingly, it is not only suitable for the construction of straight and curved walls, but also for 90 ° walls, both, concave and convex shaped. The stone is especially suitable for walls with a maximum height of about 100 / 120 cm.



## LÖFFEL „SECONDO“

approx. 32 kg

approx. 54 x 32 x 20 cm



# Löffel® Secondo



**Q** qualityaustria  
**SYSTEM CERTIFIED**  
ISO 9001:2008 No.01421/0  
RT-05  
OHSAS 18001:2007 No.00391/0



For 35 years the name Betonform® (Concrete Form) has been standing for: CONCRETE: our basic materials and FORM for our shapes: our design. In our factories in Gais (BZ) and Medesan nearby Parma we produce and promote four production lines:  
Precast concrete products for urban and garden design as well as tailor-made design.  
The spoons® family is our very successful retaining wall system.  
Noise protection elements in different forms and materials. Our Erdox® screen, our slopes and avalanche safety field.  
Our latest research, certifications such as ISO 9001, OHSAS and SOA, innovation, our professional preparation and our many years of experience are our guarantee for quality in design, technology, product, in the use of the best materials and, last but not least, in a customer-oriented service. Our experienced team will be happy to give professional advice of all sorts. [www.betonform.it](http://www.betonform.it)

- ▶ Urban and Garden Design
- ▶ System Löffel®
- ▶ Erdox® slope reinforcement
- ▶ Noise control New Jersey



Löffel®

**B** betonform®  
DESIGN LÖFFEL®



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Medesano (PR)

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Plant

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