



Material description

Elements manufactured from stone wool for use in water management applications.

Physical features

Parameter	Typical value			Unit
	WM2005	WM2007	WM2009	
Height	1000 / 500	1000 / 500	1000 / 500	mm
Length	1200	1200	1200	mm
Thickness	150	75	50	mm
Weight	22 / 11	15 / 7.5	12 / 6	kg/element

Water properties

Parameter	Typical value			Unit
	WM2005	WM2007	WM2009	
Porosity	95	94	93	%vol
Water permeability ¹	> 120	> 80	> 50	m/day
Residual water content		3		%vol

The residual water content is caused by isolated droplets in the stone wool matrix, which are not in capillary contact with the main part of the water in the buffer. The actual value may vary in practice and is dependent on drainage speed. If drainage occurs very quickly, there will be more isolated droplets in the matrix, and the residual water content may increase to 6%. If the drainage is constantly stabilised, the residual water content may even be <1%.

¹ Measured by Deltares in accordance with NEN-EN-ISO 17892-11 [1,2]

Load-bearing capacity

Parameter	Typical value			Unit
	WM2005	WM2007	WM2009	
Creep after 30 years ²	1.3	0.5	0.2 ³	%
Static compression strength ⁴ (Y-orientation, 10% moisture)	124	173	275	kPa
	~ 12	~ 17	~ 27	ton/m ²
E50 (Y-orientation, 10% moisture)	5	7	8	MPa
Cyclic Modulus ⁵	15	21	24	MPa

Practical consequences

The systems can be designed for various load bearing capacities. The minimum installation depths for the various traffic categories are summarised in the table below according to the type of stone wool.

Traffic category ⁶ Axle load	Minimum installation depth (top of buffer to ground level) ⁷			Unit
	WM2005	WM2007	WM2009	
Green (no traffic)	>30 (sand)	NA	NA	cm
6 ton	40	40	35	cm
10 ton	40	40	35	cm
15 ton	60	40	35	cm
20 ton	75	45	35	cm

The road construction consists of the following layers:⁸

- 10 cm road bricks or asphalt
- 30 cm foundation of mixed granulate (WM2009: 25cm)
- Variable sand layer thicknesses

² Measured by Deltares in cylindrical samples 20 mm high and with 63 mm cross-section, in a steel ring. Stress is 20 kPa over a period of >14 days. The samples are in contact with water [1].

³ Extrapolated value.

⁴ Static compression strength and E-modulus measured by Deltares in accordance with ASTM D2146 in cylindrical samples with a 63 mm cross-section and a height of 130 mm [1.2].

⁵ The cyclical modulus is derived from the static E50 and is a factor 3-4 times higher than the static E50. The cyclical modulus of WM2005 of 15 MPa is approximately twice the modulus of EPS 150 [1].

⁶

Axle load [ton]	Axle load [kN]	(single) Wheel load [kN]	Wheel imprint (truck) [m x m]
6.	60	15	0.40 x 0.40
10	100	25	0.40 x 0.40
15	150	37.5	0.40 x 0.40
20	200	50	0.40 x 0.40

⁷ Calculated by Deltares in accordance with the method used for the dimensioning of elevations on EPS [3].

⁸ Mixed granulate: 0/31.5 (NEN-EN 13242 (2015) / Standard RAW definition 2015 art. 80.16.05) supply, application and compaction
Sand for sand bed: Standard RAW 2015 definition 2015 art.22.06.03.

References

[1] Deltares report #11200122-000-GEO-0007, 19 January 2018

[2] Deltares report #11202897-002-GEO-0003, 20 March 2020

[3] CROW (2013). Lichte ophoogmaterialen in de wegenbouw. Publication 325. CROW ed., Ede.



Address ROCKWOOL B.V.
 Delfstoffenweg 2
 6045JH, Roermond
 The Netherlands

Contact Daan de Kubber

Phone +31 6 10 40 60 12

E-mail rockflow@lapinus.com

Website www.lapinus.com/rockflow

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