



TECHNICAL MANUAL

LIGHTWEIGHT AGGREGATES

FIXED AREAS YOU CAN DRIVE ON | LANDSCAPING

More about MISAPOR:



Sustainable insulation in building construction
Edition 2018-02



MISAPOR Insulating concrete
Edition 2018-02



MISAPOR is EPD-certified:



Institut Bauen und Umwelt e.V.

Declaration number
EPD-MIS-2012111-D

We are a member of:



2018-01

RELIEVE WITH LIGHTWEIGHT

MISAPOR cellular glass gravel offers tailored solutions for demanding gardening and landscaping problems and thus facilitates the work of all involved.

Layers to relieve static loads on buildings or difficult ground are thus the ideal application areas for MISAPOR cellular glass gravel. In addition to the weight relief gained from its lightweight, the innovative material also easily offers various other benefits, for example when used as a drainage or insulation layer.



NEGOTIABLE TRAFFIC AREAS ON STRUCTURES FOR LIGHTWEIGHT AND HEAVY VEHICLES

Weight relief of supporting elements while at the same time offering a high load capacity.



EXTENSIVE ROOFTOP GREENING

The first choice for the realisation of weight relieving green areas or roof gardens.



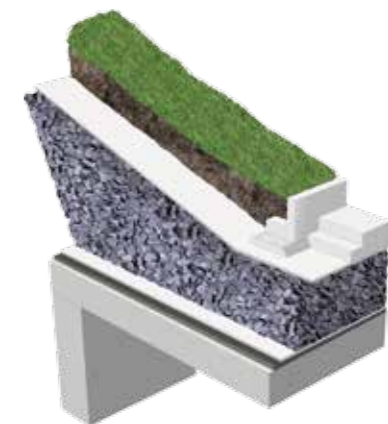
ROOF TERRACES

Perfect for use under wood or slabs on terraces.



WALK-ON AND NEGOTIABLE (LIGHTWEIGHT VEHICLES) GREEN AREAS

Stabilises and relieves difficult ground, walk-on and negotiable (lightweight vehicles).



LANDSCAPED GREEN AREAS

Landscaped designs up to 45° possible without the need of additional support.

CHARACTERISTICS

EXTREMELY LIGHTWEIGHT

with 125 – 190 kg/m³, MISAPOR is ten times lighter than gravel

PERFECT DRAINAGE PROPERTIES

Thanks to a cavity ratio of 30% perfect cross and longitudinal drainage

COMPATIBLE

Helps many conventional systems become lighter and optimises thermal insulation

COMPRESSIVE STRENGTH

High compressive strength of the grains and high internal frictional resistance result in a compressive strength comparable to gravel

DOES NOT ROLL

Designs up to 45° possible without the need of stabilisation

FROST-PROOF AND INERT

MISAPOR is weather resistant and will not rot despite all environmental influences and pests.

QUICK AND EASY TO INSTALL

Can already be walked/driven on and used for landscaping while being installed, regardless of the weather

IDEAL IN TERMS OF CONSTRUCTION PHYSICS

Excellent thermal insulation and especially in the case of increased demands on the U-value the perfect building material, water vapour diffusion-open

* FLL = Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. Load classes and use:

Load class 1: roof terraces, paths and non-negotiable walk-on areas

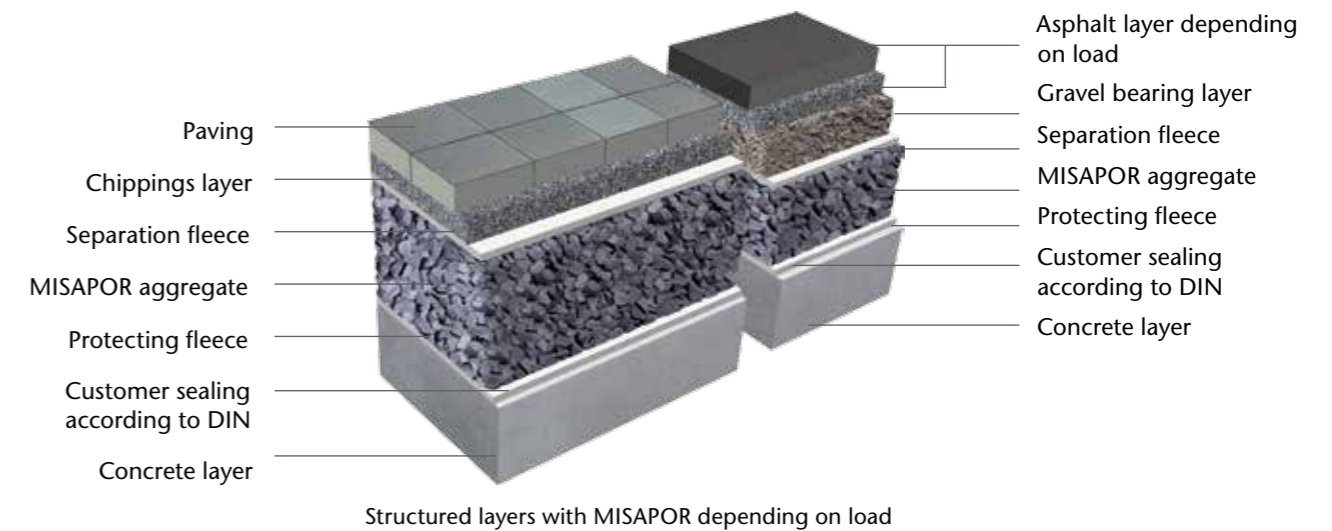
Load class 2: traffic and parking areas for lightweight vehicles with a permissible total weight of up to 2.5 t = 25 kN

Load class 3: traffic and parking areas for lightweight vehicles with a permissible total weight of up to 16 t = 160 kN

STRUCTURAL WEIGHT RELIEF

WALK-/DRIVE-ON TRAFFIC AREAS ON STRUCTURES

Thanks to the large number of application possibilities, MISAPOR cellular glass gravel offers solutions for all three load classes of the FLL directive (permissible total weight up to 16 t) and can be used for structures with considerably higher loads if bound with cement.



A key argument for the use of MISAPOR cellular glass gravel under heavy-load traffic areas is not only the low bulk weight of 160 to 190 kg/m³ but also the very good static load capacity. Especially the cement-bound version meets the very high demands. A cement-bound MISAPOR aggregate with only 350 to 550 kg/m³ when compressed is both lightweight and extremely load-bearing!

TAB 1 - COMPARATIVE DESIGN DRIVE-ON TRAFFIC AREAS

Considerable weight with MISAPOR compared with a conventional construction for heavy-traffic area.

[1 kN/m ² = 100 kg/m ² = surface load]	CONVENTIONAL STRUCTURE	MISAPOR 10/50 COMPRESSED 1,3:1	MISAPOR 10/50 CEMENT-BOUND
Structure sealing and protecting fleece	0,07 kN/m ²	0,07 kN/m ²	0,07 kN/m ²
Absorbing layer (d=20cm) incl. adhesive water	2,70 kN/m ²	0,60 kN/m ²	1,11 kN/m ² *
Filter fleece	0,03 kN/m ²	0,03 kN/m ²	0,03 kN/m ²
Gravel bearing layer (d=15cm)	2,70 kN/m ²	2,70 kN/m ²	2,70 kN/m ²
Separation fleece	0,03 kN/m ²	0,03 kN/m ²	0,03 kN/m ²
Chippings layer (d=4cm)	0,64 kN/m ²	0,64 kN/m ²	0,64 kN/m ²
Concrete building blocks/Paving (d=10cm)	2,10 kN/m ²	2,10 kN/m ²	2,10 kN/m ²
Total weight without traffic load	8,27 kN/m²	6,17 kN/m²	6,68 kN/m²
Weight saving with MISAPOR		2,1 kN/m²	1,6 kN/m²

* for load class 3 the cement-bound version with MISAPOR 10/50 has been taken into account in the planning

→ CONSIDERABLE WEIGHT SAVING OF 1,60 TO 2,10 kN/m² WITH MISAPOR SYSTEM DESIGN!

HEAVY-LOAD LIGHTWEIGHT

WALK-ON / DRIVE-ON TRAFFIC AREAS ON STRUCTURES



MISAPOR cellular glass provides the optimum requirements for walk-on and drive-on traffic areas on structures thanks to its light weight and extremely high compressive strength. On the one hand, the ceiling is relieved and on the other hand, MISAPOR makes a positive contribution to roof insulation. MISAPOR can also be applied in specifically dimensioned layered structures and corresponds to the maximum required load bearing capacities such as according to the FLL load classes (FLL, recommendations for planning and building traffic areas on structures, edition 2005, FLL-Verlag 53115 Bonn) or others.

It is also possible to take significantly higher loads. For example this can be implemented with stabilisation using geogrids or in cementitious and bituminous applications. MISAPOR has a wide network of partners that offer optimum solutions in the system.

Even with a planned drainage layer thickness of 20 cm, a calculated weight saving of 1,6 bis 2,1 kN/m² (= 160 to 210 kg/m²) is achieved with MISAPOR cellular glass gravel.

The thicker the layer, the greater the weight saving and thus the weight relief. Especially existing buildings whose static load bearing capacity is limited can thus be redesigned.

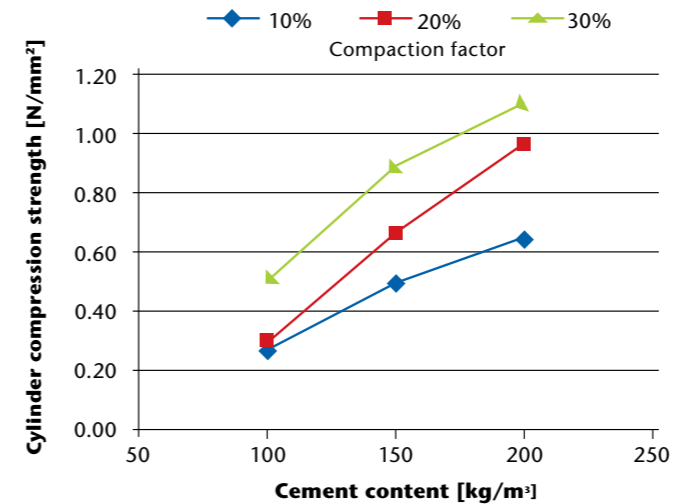
TAB 2 - COMPARATIVE DESIGN LOADS (SURFACE WEIGHT KN/M²)*

According to the norm and the rooftop greening directive (slightly moist and uncompressed)

CALCULATION MODEL	INSTALLATION THICKNESS	MISAPOR LAYERED STRUCTURES	
		Drainage/bearing layer	
		MISAPOR 10/50 compressed 1,3:1	MISAPOR 10/50 cement-bound
Calculation with MISAPOR at 20 cm installation thickness			
MISAPOR 10/50 compressed: (0,2 m x 160 kg/m ³ x 1,3)	41,6 kg/m ²		
Water absorption per ETA: (ETA-13/0549 para. 2)	10 % (Vol. %)		
Adhesive water (0,2 x 100 kg/m ³)	20 kg/m ²		
Total weight:	61,6 kg/m²		
Conversion into kN (61,6 kg/m ² x 9,81 m/s ²)/1000	0,60 kN/m²		
	15 cm	0,45 kN/m ²	0,84 kN/m ²
	20 cm	0,60 kN/m ²	1,11 kN/m ²
	25 cm	0,76 kN/m ²	1,39 kN/m ²
	30 cm	0,91 kN/m ²	1,67 kN/m ²
	40 cm	1,21 kN/m ²	2,23 kN/m ²
	50 cm	1,51 kN/m ²	2,79 kN/m ²
	60 cm	1,81 kN/m ²	3,34 kN/m ²
	70 cm	2,12 kN/m ²	3,90 kN/m ²
	80 cm	2,42 kN/m ²	4,46 kN/m ²

* For layers thinner than 15 cm, MISAPOR 10/25 must be used to ensure proper compression and load bearing capacity. For more information see the datasheets of MISAPOR 10/50 and MISAPOR 10/25.

CYLINDER COMPRESSION MISAPOR 10/50 CEMENT-BOUND



Cylinder compression strength values of cement-bound MISAPOR aggregate according to compaction factor and cement content.

Advantages of cement-bound MISAPOR

- Extremely low weight compared to other structures
- Very good static load bearing capacity for traffic areas subject to repeated and heavy loads
- No water absorption (only adhesive water)
- Variable installation thicknesses
- Good vertical and horizontal drainage capacity
- Easy and quick to install

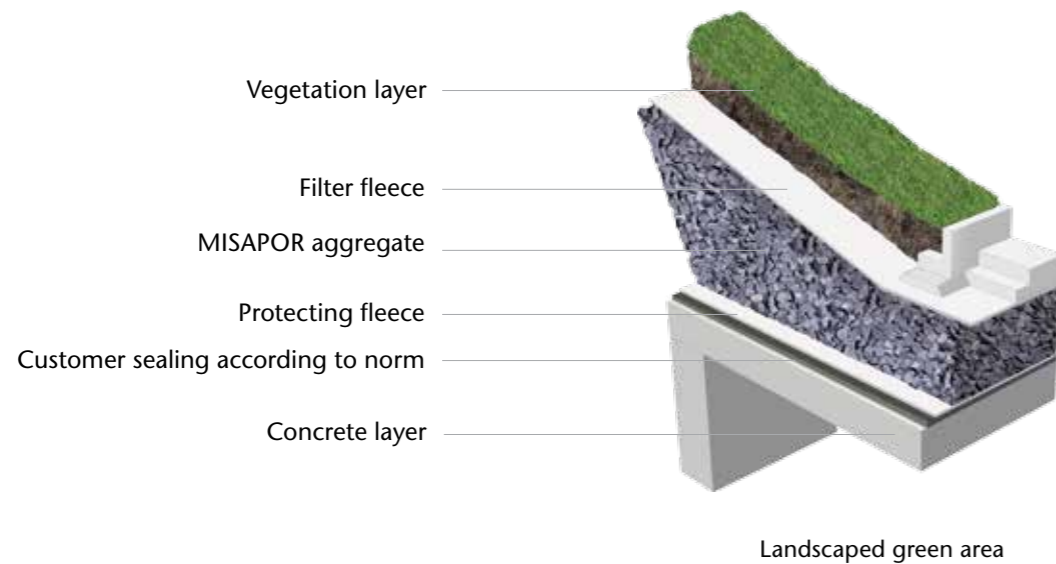
TAB 3 - COMPARATIVE DESIGN LOADS (SURFACE WEIGHT KN/M²)*

According to the norm and the rooftop greening directive (slightly moist and uncompressed)

INSTALLATION THICKNESS	CONVENTIONAL LAYERED STRUCTURES				SUM from - to kN/m ²
	Drainage layer		Bearing layer		
	Expanded slate 8/16 (650 kg/m ³)	Lava 8/16 (1100 kg/m ³)	Lava 0/16 (1300 kg/m ³)	Gravel/chippings 0/22; 0/32; 0/45 (1650 kg/m ³)	
15 cm	0,96 kN/m ²	1,62 kN/m ²	1,91 kN/m ²	2,43 kN/m ²	2,87 - 4,05 kN/m ²
20 cm	1,28 kN/m ²	2,16 kN/m ²	2,55 kN/m ²	3,24 kN/m ²	3,83 - 5,40 kN/m ²
25 cm	1,59 kN/m ²	2,70 kN/m ²	3,19 kN/m ²	4,05 kN/m ²	4,78 - 6,74 kN/m ²
30 cm	1,91 kN/m ²	3,24 kN/m ²	3,83 kN/m ²	4,86 kN/m ²	5,74 - 8,09 kN/m ²
40 cm	2,55 kN/m ²	4,32 kN/m ²	5,10 kN/m ²	6,47 kN/m ²	7,65 - 10,79 kN/m ²
50 cm	3,19 kN/m ²	5,40 kN/m ²	6,38 kN/m ²	8,09 kN/m ²	9,56 - 13,49 kN/m ²
60 cm	3,83 kN/m ²	6,47 kN/m ²	7,65 kN/m ²	9,71 kN/m ²	11,48 - 16,19 kN/m ²
70 cm	4,46 kN/m ²	7,55 kN/m ²	8,93 kN/m ²	11,33 kN/m ²	13,39 - 18,88 kN/m ²
80 cm	5,10 kN/m ²	8,63 kN/m ²	10,20 kN/m ²	12,95 kN/m ²	15,30 - 21,58 kN/m ²

LIGHTWEIGHT CONSTRUCTION ON STRUCTURES

LANDSCAPED GREEN AREAS ON STRUCTURES



With a bulk weight as low as 125 kg/m³, MISAPOR reduces the imposed loads on structures. The closed-cell cellular glass gravel does not absorb water but instead serves as a perfect drainage layer (30 l/s/m²) and maintains its weight even when exposed to rain.

MISAPOR does not roll and can be installed on inclined (up to 15 degrees) surfaces. Its good stability allows for designs up to 45 degrees without the need of lateral support.



Volksbank Villingen-Schwenningen, vegetation layer on landscaped MISAPOR



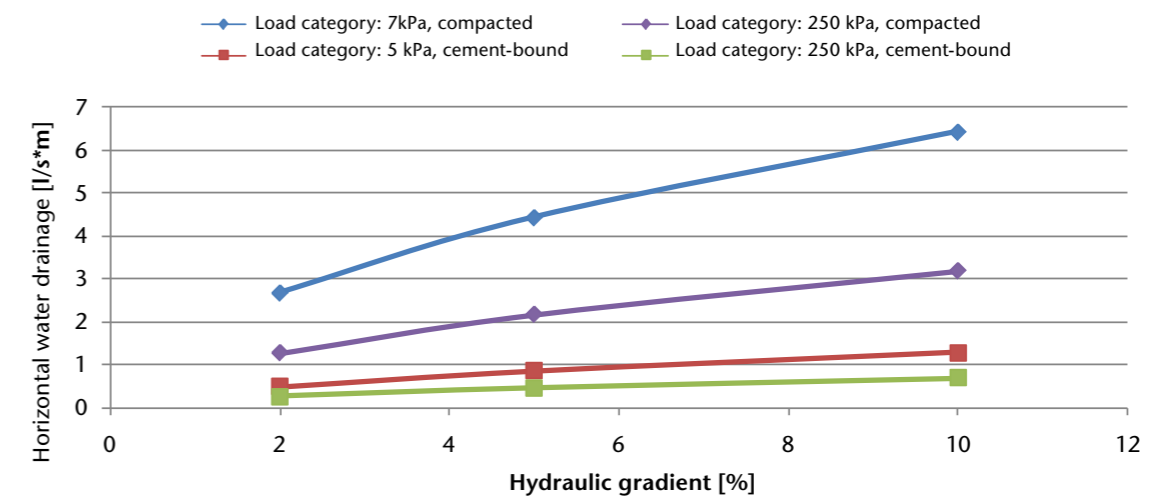
Volksbank Villingen-Schwenningen, landscaped green area

The demands on a material used on structures are high, especially if the structure below is a multi-storey building.

The versatile properties of MISAPOR cellular glass gravel exceed these requirements and emphasise MISAPOR's suitability for use on flat roofs, garages or galleries.

Therefore, use MISAPOR on roofs

- low weight and good load bearing capacity
- thermal insulation properties
- no water absorption (only adhesive water)
- non-combustible (class A1) according to DIN EN 13501-1
- non-rotting and resistant to pests
- perfect cross and longitudinal drainage
- easy and quick to install



Horizontal water drainage according to DIN EN ISO 12958 of Misapor 10/50 in bulk and cement-bound (150 kg/m³ CEM I) depending on imposed load and hydraulic gradient.



EDEKA Verbraucherzentrum Konstanz, renovation and redesign of the surface on top of the building



EDEKA Verbraucherzentrum in Konstanz, layout of paths and green areas with a total of 2'000 m³ MISAPOR

DELIVERY AND INSTALLATION

SPECIFICATIONS



MISAPOR cellular glass gravel is delivered as bulk or in Big Bags. 60 - 90 cubic metres can be delivered per lorry load.

If delivered in bulk by lorry, the material is either unloaded directly onto the building ground or onto transport sheets, which are used to transport the material by crane to the installation site.

MISAPOR's coordinated logistics guarantee reliable supply at all times.



Just like the transport sheets, the MISAPOR Big Bags have a dispensing opening. Due to their low weight (250-500 kg/2 m³), they can be efficiently integrated using a building crane, excavator or multi-purpose device, and the content can subsequently be easily distributed by hand.

Thanks to the impressive lightweight of the material, large volumes can be transported with only a few trips - you thus already save time and money during delivery and protect the environment.



MISAPOR is installed from back to front and, if delivery in bulk, distributed with a shovel, excavator or wheel loader. For installation thicknesses exceeding 30 cm, the material is installed in layers.

The material is compressed using light-duty wacker plates weighing 80 to 120 kg at a frequency of at least 85-100 Hz, plate width approx. 50 cm or with a tandem or smooth roller approx. 1.5 t.

Depending on the requirements, the surface can be stabilised with a thin layer of mineral gravel or cement mortar.

RELEVANT SPECIFICATIONS

	MISAPOR 10/75	MISAPOR 10/50	MISAPOR 10/25*
Bulk density EN 1097-3	125 - 150 kg/m ³	160 - 190 kg/m ³	180 - 210 kg/m ³
Bulk density compressed (1,3:1)	163 - 195 kg/m ³	208 - 247 kg/m ³	234 - 273 kg/m ³
Max. adhesive water after underwater storage EN 12087	10 Vol.%	10 Vol.%	10 Vol.%
Freeze-thaw cycle ETA-13/0549	no significant changes	no significant changes	no significant changes
Thermal conductivity of compressed aggregate Design value (dry) according ETA-13/0549	λ _D 0,082 W/(m·K)	λ _D 0,103 W/(m·K)	λ _D 0,103 W/(m·K)
Water vapour permeability (Fraunhofer HoFM-15/2007) DIN EN ISO 12572, diffusion resistance factor	μ = 4,4 [-]	μ = 4,4 [-]	μ = 4,4 [-]
Nominal value of the compressive stress at 10 % compression (1,3:1) EN 826	f _{c,Nenn} = 420 kPa	f _{c,Nenn} = 660 kPa	f _{c,Nenn} = 660 kPa
Constrained modulus of the heat-insulating layer	E _s = 9 000 kPa	E _s = 14 000 kPa	--
Horizontal forces, rates value of shear stress	30 % of the rated value the compressive stress	30 % of the rated value the compressive stress	30 % of the rated value the compressive stress
Angle of friction	φ = 33,8 °	φ = 35,2 °	φ = 35,2 °
Determination of the shear parameters (University Freiberg, 2011)			
Environmental compatibility, DIBT principles 2009, Elution in accordance with LAGA information 33	Z-23.34-1390, Table 1	Z-23.34-1390, Table 1	--
Water permeability coefficient (ALBO-tec T..f.A.u.B. GmbH) Test report Nr. 05030407 according to DIN 18130	k _f = 2,8 x 10 ⁻³ m/s (non-compressed) k _f = 6,8 x 10 ⁻⁴ m/s (compressed)	k _f = 2,8 x 10 ⁻³ m/s (non-compressed) k _f = 6,8 x 10 ⁻⁴ m/s (compressed)	--
Horizontal water drainage according to DIN EN ISO 12958 Test report Nr. 98152/11 (depending on imposed load and gradients)	1,27 bis 6,43 l/(m*s)	1,28 bis 6,82 l/(m*s)	--
Compressed bulk cavity proportion	approx. 30 %	approx. 30 %	approx. 25 %
Capillarity in aggregate	anti-capillary	anti-capillary	anti-capillary
Fire class according to EN 13501-1	A1 non-flammable	A1 non-flammable	A1 non-flammable
Minimum installation thickness (compressed)	20 cm	15 cm	8 - 12 cm

The values of MISAPOR 10/50 and MISAPOR 10/75 are continuously checked and externally monitored according to DIBT regulations. MISAPOR 10/25 is subject to internal production control. New values are added promptly. Please request the latest version.

* Factory specifications

TESTED QUALITY - YOUR SECURITY

Quality and safety are always in the foreground with MISAPOR. So it is no surprise that MISAPOR has the European Technical Approval (ETA-13/0549) as the only manufacturer in central Europe and with it, they meet all requirements of the new Construction Products Regulation EU/305/2011. With this, the unregulated application areas for MISAPOR cellular glass gravel are now also certified.



You can find detailed information at www.misapor.com. The professionals from MISAPOR gladly are also personally available for consultation.