



Daun, 26.06.2017 Th/-

Test report

No. 0206-17

Client: Hahn Kunststoffe GmbH
Gebäude 1027
55483 Hahn-Airport

Subject: Examination of the load-bearing capacity of „Cellular slabs Horses Home“
made of secondary plastic

Material: „Cellular slabs Horses Home“
of secondary plastic,
Paddock slabs 50 x 50 x 5,3 cm

Receipt of samples: 12.06.2017

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II Preliminary remarks

II.1 Procedure and assignment

In a letter of 06 June 2017, the Eifel Institute was commissioned by Hahn Kunststoffe GmbH with the Order number 2017-624581 to determine the load-bearing capacity of "Cellular slabs Horses Home" made of secondary plastic. The examination of the chemical composition is not a part of our assignment.

II.2 Documents

- [1] DIN 1072: Road and pedestrian bridges; loading assumptions. Issued: December 1985.
- [2] ZTV SoB-StB 04: Additional technical contractual conditions and guidelines for the construction of layers without binding agents in road construction, issued 2004 / edition 2007, FGSV.
- [3] DIN EN 1990 to DIN EN 1999: General dimensioning rules.
- [4] DIN 1055-100: Actions on support structures, Part 100: Principles of support structure planning, safety concept and dimensioning rules.
- [5] DIN EN 124: Gully tops and manhole tops for vehicular and pedestrian areas.
- [6] Design drawing of 07.04.2017 of the cellular slab Horses Home.

II.3 Load-bearing capacity model

The load-bearing capacity of the "Cellular slab Horses Home" is dependent on the rigidity of the substrate. The rigidity of the substrate is to be taken into account when testing the load-bearing capacity of the overall system. For the modelling of the most realistic possible test conditions, an aggregate for frost protection layers was placed in a wooden frame and compacted according to the minimum requirements specified in ZTV SoB-StB 04 [2]. The deformation modulus E_{v2} of the artificially manufactured substrate was around 80 MN/m².

The load-bearing behavior of the "cellular slab Horses Home" is tested using an applied load equivalent to a heavy goods vehicle of the class SLW 60 with a total load of 600 kN (60 t) and a wheel load of 100 kN (10 t). According to DIN 1072 [1] the wheel load of a heavy goods vehicle of the class SLW 60 with a wheel contact area of 1200 cm² (60 x 20 cm) is 100 kN. This is equivalent to a load per unit area of 83.3 N/cm². On account of the surface area of the test tamper (707 cm²), this is equivalent to a test force of 59 kN. Taking into account the dynamic load effect, we have applied a safety factor γ_{Rd} of 3 on the basis of DIN EN 1990 to 1999 [3] as well as DIN 1055-100 [4]. This safety factor γ_{Rd} takes into account the model uncertainties, the higher dynamic loading of the component, temperature differences and the influence on the component due to long-term loading and aging behaviour, including a reserve for unusual loads.

The test load for the determination of the load-bearing capacity of the slab is determined according to equation 1:

$$F_L = S_Q \cdot \gamma_{Rd} \quad (1)$$

F_L = minimum test load to be applied [kN]

S_Q = test load equivalent to a heavy goods vehicle of the class SLW 60 in relation to the surface area of the test tamper]

γ_{Rd} = 3.0 [-] safety coefficient

$$F_L = 180 \text{ kN}$$

The load-bearing capacity of the slabs is to be assessed as adequate if no damage to or plastic deformation of the slabs occurs at a minimum test load F_L of 180 kN.

III Test procedure

III.1 Receipt of samples

On 12 June 2017 the client delivered fifteen "Cellular slabs Horses Home" for the examinations. The cellular slabs were measured and weighed after delivery. The test results are shown in Table 1.

III.2 Test execution

III.2.1 Test on artificially manufactured substrate

In order to ensure a realistic test, five "Cellular slabs Horses Home" with a test tamper placed on top were tested on a subgrade body manufactured under laboratory conditions from lava slag with a granulation of 0 – 45 mm. This artificially manufactured subgrade body is equivalent to the substrate under building site conditions. Figure 1 shows the test setup.



Figure 1: Test setup – "Cellular slabs Horses Home" on an artificially manufactured subgrade

In order to improve the load dissipation between the "cellular slabs Horses Home" and the lava slag, a layer of sand (quartz sand with a granulation of 0 – 2 mm) was applied with a thickness of approximately 2 cm. The cellular slabs were subsequently filled loosely with sand. The test took place using a distance-controlled press at a test speed of 5 kN/s until the minimum test load-based DIN EN 124 [5] was reached. Following the execution of the load test, the "cellular slabs Horses Home" were examined for damage and the formation of cracks. After passing the crack test, the components were loaded until plastic deformation (breaking load) occurred resp. up to the maximum strength of 400 kN. The test results are summarized in Table 2.

III.2.2 Test on rigid substrate

Figure 2 shows the setup for the testing of the "Cellular slabs Horses Home" on a rigid substrate. The cellular slabs were loaded until plastic deformation occurred.

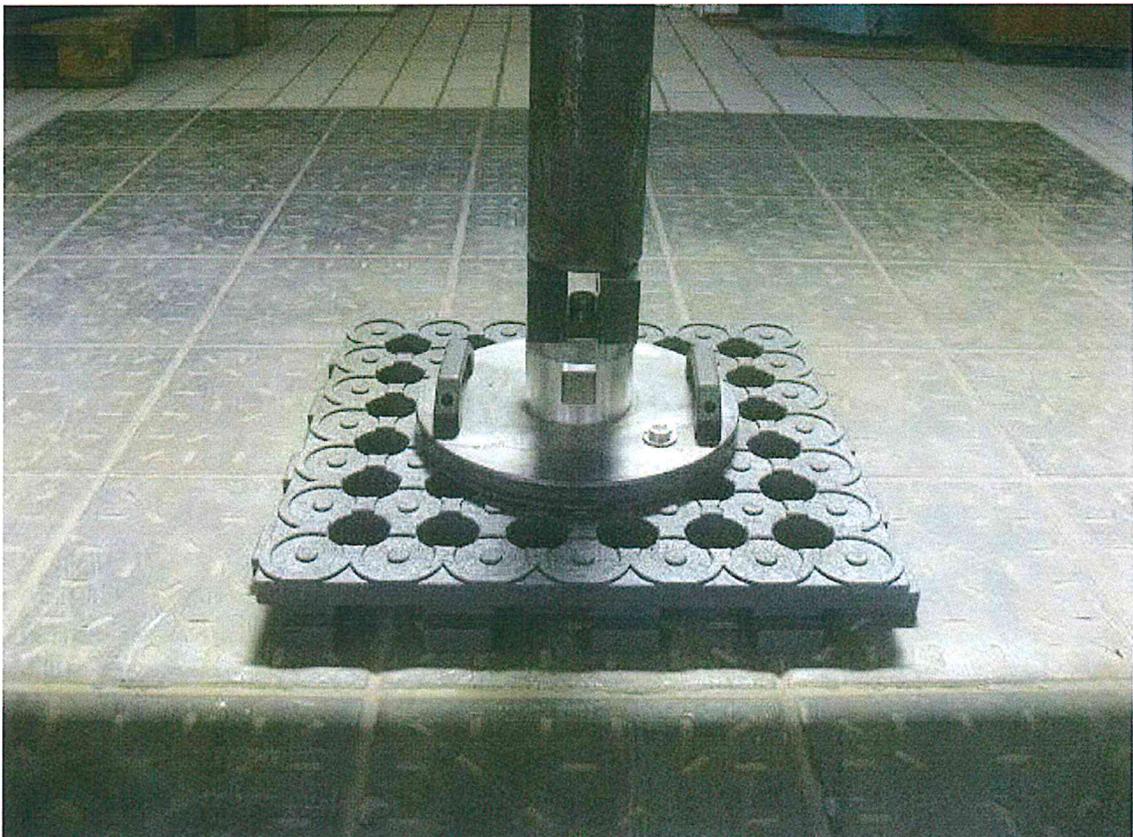


Figure 2: Test setup - "Cellular slabs Horses Home" on a rigid substrate

The test results are illustrated in Table 3.

III.3 Examination results

Table 1: Dimensions of the "Cellular slabs Horses Home"

Cellular slabs Horses Home Nr.	Length [mm]	Width [mm]	Total thickness [mm]	Weight [kg]
1	502	501	53	6,72
2	502	501	53	6,74
3	502	501	52	6,82
4	502	502	52	6,75
5	502	501	53	6,74
6	502	502	52	6,76
7	502	502	52	6,76
8	502	502	52	6,78
9	501	502	53	6,71
10	502	502	53	6,79
Mean value	502	502	53	6,76

Table 2: Test results on artificially manufactured substrate

Cellular slabs Horses Home Nr.	Test load [KN]	Crack inspection on the upper side	Breaking load* [KN]	Test temperature [°C]
1	180	no findings	400	24
2	180	no findings	400	24
3	180	no findings	400	24
4	180	no findings	400	24
5	180	no findings	400	24

* with clear plastic deformation on the top side of the slab, however, no formation of cracks >0,3 mm on the underside of the slab and no damage

Table 3: Test results on rigid substrate

Cellular slabs Horses Home Nr.	maximum test load without plastic deformation [KN]	test temperature [°C]
6	400	24
7	400	24
8	400	24
9	400	24
10	400	24

IV Assessment of the examination results

All "Cellular slabs Horses Home" tested are assessed as having an adequate load-bearing capacity with regard to being driven over by a heavy goods vehicle of the class SLW 60. This assumes an adequate load-bearing capacity of the substrate according to the specifications of ZTV SoB 04 [2]. Provided the substrate has a sufficient load-bearing capacity, the "Cellular slabs Horses Home" tested are suitable for use in fire brigade entrances and parking areas for heavy goods vehicles with wheel loads of up to 10 Mg (t).

EIFELINSTITUT

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Head of testing station:

A handwritten signature in black ink, appearing to read "L. Thielen".

(L. Thielen)