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Investigation of the root penetration resistance of a waterproofing membrane according to FLL guidelines

Original version in German language – translation provided by KEMPER SYSTEM –

Client: KEMPER SYSTEM GmbH & Co. KG

Material: KEMPEROL® V 210

Jointing: seamless, sprayed

1. Test setup

The test setup of the above waterproofing membrane for investigating the root penetration resistance was in accordance with the guidelines of the Forschungsgesellschaft Landschaftsentwicklung - Landschaftsbau e.V. (FLL) (Landscape Research, Development & Construction Society). As the material KEMPEROL® V 210 is first sprayed in situ to form a homogeneous layer on the substrate, there are no seams like when laying prefabricated waterproof sheeting. The investigation was carried out over the years 1990 to 1993 and ended in early October 1993.

Eight aluminium frames 80 x 80 x 35 cm each holding a Perspex container were used for the test. The containers were mounted on 50 cm high aluminium legs so that it was possible at all times to observe any root penetration through the membrane under investigation (Fig. 1).

The Perspex base was first covered with expanded clay pellets (8/16 mm) to a depth of approx. 5 cm. This layer was kept permanently moist through a separate pipe in order to keep alive any roots that might penetrate the test membrane. The membrane material was sprayed as a seamless layer onto a backing fleece placed directly on the layer of expanded clay and the container walls.

The plant containers lined with the waterproofing membrane were filled with approx. 170 l of compost consisting of 70% white peat (Floratorf) and 30% expanded clay pellets (Lecaton 8/16 mm). Approx. 280 g of lime powder was added to fix the pH value between 5.5 and 6.5. Approx. 50 g of Nitrophoska perfekt compound fertiliser was also added. In each of the following years of the test, a further 30 g of Nitrophoska perfekt was added per plant container.

Each container was planted with 2 grey alders (*Alnus incana*) and 2 European aspens (*Populus tremula*) plus 8 Canada thistles (*Cirsium arvense*) as shown in Fig. 2. Any plants that failed to take root were replaced in the November of the same year. Every year, the flower buds on the thistles were removed in order to prevent seeds forming.

The plants were watered from above during the taking-root phase. Later, water was added through a standpipe in the centre of the plant container, which was placed directly on the membrane. This watering pipe was provided with four longitudinal slits at the base. In order to prevent damaging the membrane, the pipe was welded to an aluminium plate approx. 10 x 10

cm (Fig. 1).

In the autumn of each year, the Perspex base of each container was inspected for roots. The client was informed each year in a brief interim report that no root penetration of the waterproofing membrane was visible (Tab. 1).

The plant containers were emptied and the membranes inspected for damage on 4 and 5 Oct 1993.

2. Result

After a certain delay during the taking-root phase, the plants in the test containers developed essentially normally and thereafter could no longer be distinguished from the plants in the control containers (Fig. 3).

After completion of the four-year test, the soil was thoroughly infiltrated by roots right down to the base (Fig. 4). The roots grew along the surface of the membrane without penetrating this (Fig. 5).

3. Summary

During the years 1990, 1991, 1992 and 1993, the seamless, sprayed waterproofing membrane KEMPEROL[®] V 210 was tested for resistance to root penetration according to the FLL guidelines. The test took place in Braunschweig (north Germany) in a greenhouse rented for the purpose. After completion of the four-year test, no infiltration of roots into the waterproofing membrane could be established.

Table 1. No. of root penetrations during the test

Container No.	October 1990	October 1991	October 1992	October 1993
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0

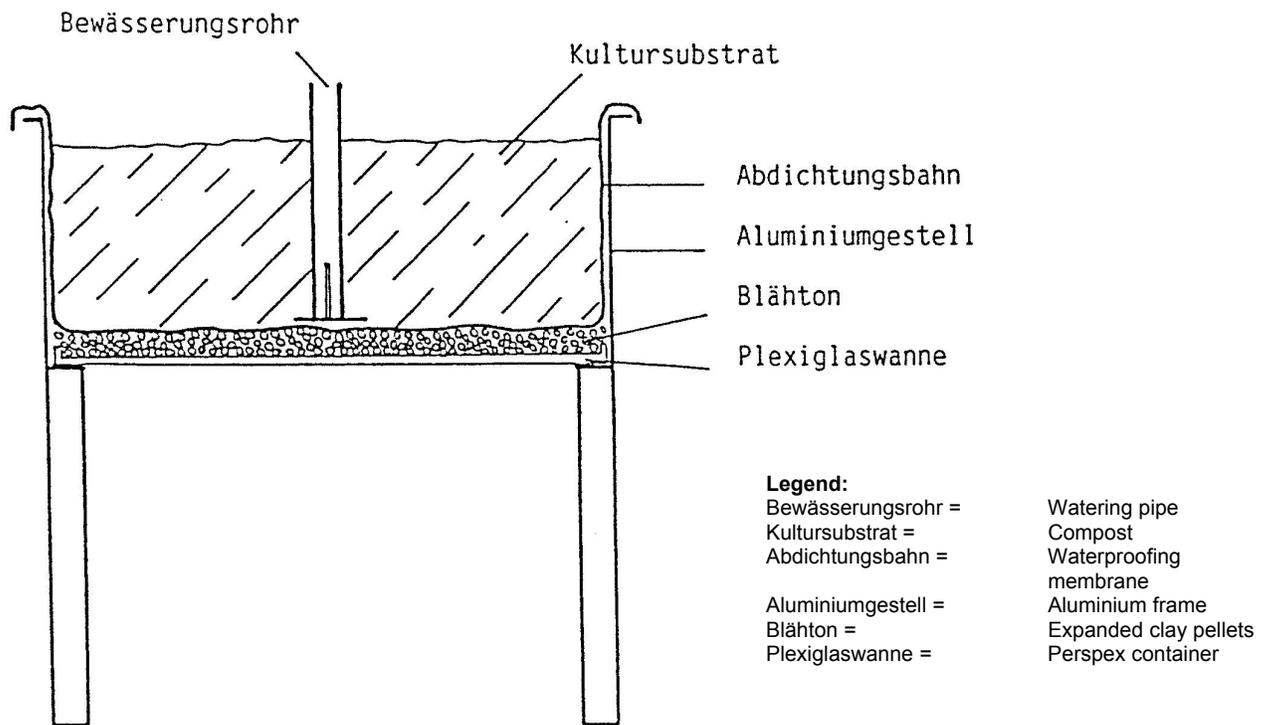


Fig. 1. Section through the test container lined with the test membrane and filled with compost

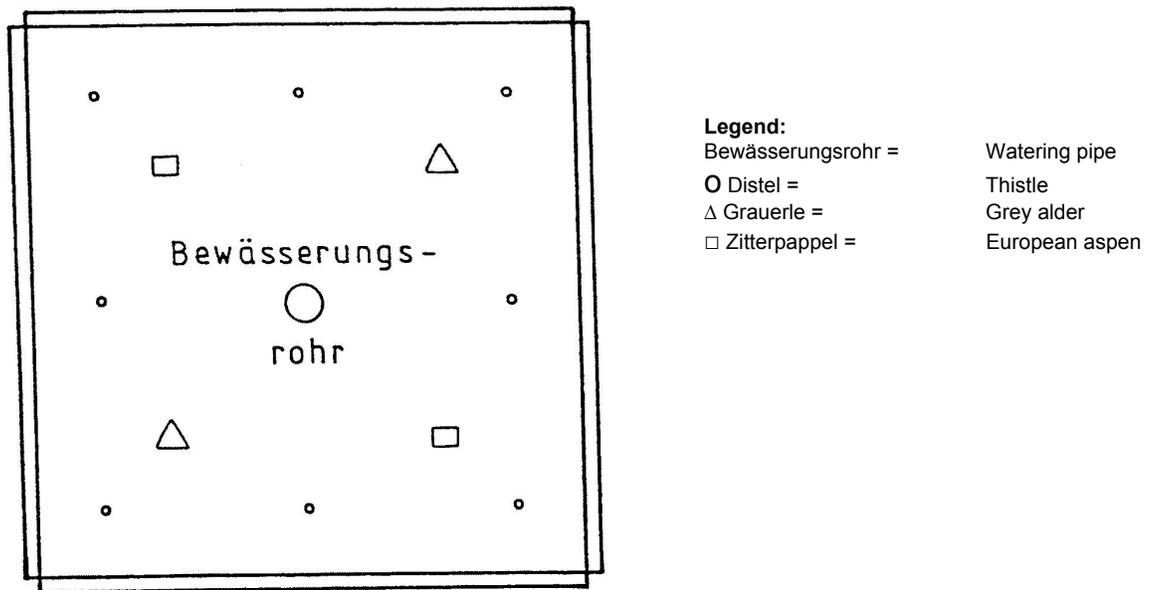


Fig. 2. Layout of plants in test container (plan view)



Fig. 3. Overview of test setup

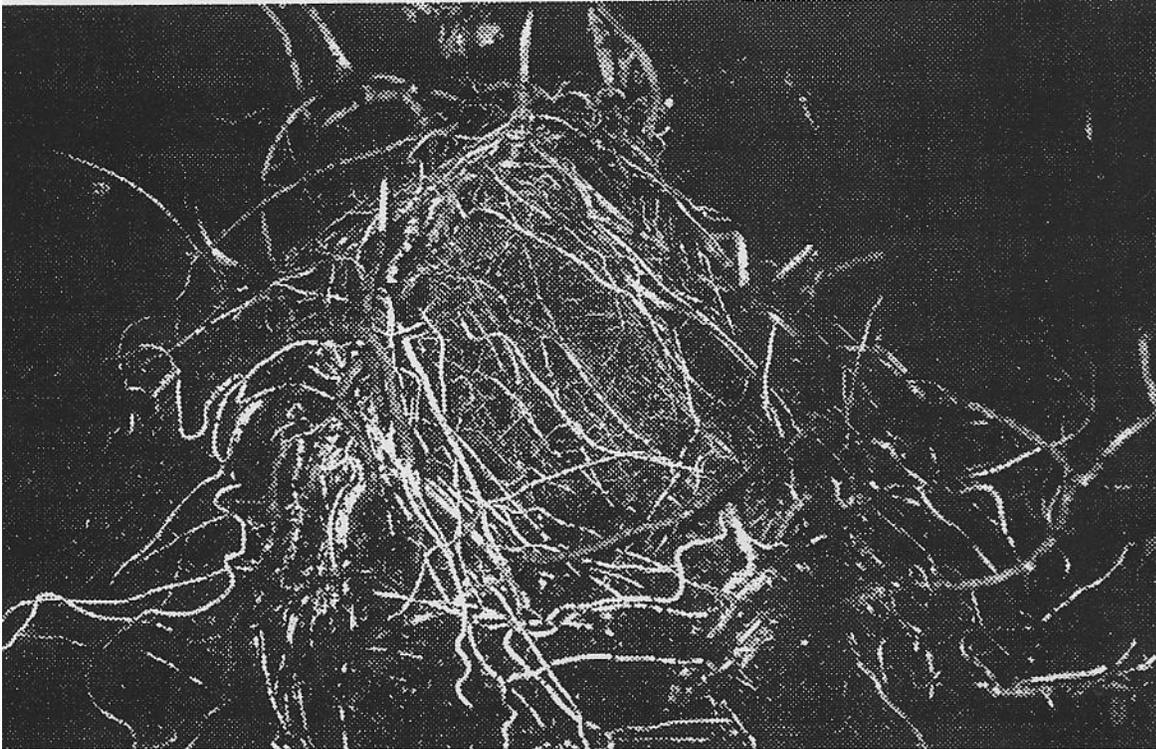


Fig. 4. View of the underside of compost completely infiltrated by roots taken from a test container lined with KEMPEROL[®] V 210



Fig. 5. View of part of the membrane after emptying the test container



Fig. 5. contd.



Fig. 5. contd.