1 Commission

Bekina Compounds NV commissioned the Braunschweig Civil Engineering Materials Testing Institute (MPA) to test penetration elements/tie points provided with BeSealed UFO sealing plug capable of swelling in water for water tightness, for use in structural elements made from concrete with a high water penetration resistance.

2 Testing and test results

For the tests, the client delivered the following penetration elements with the required sealing rings/plugs.

- Sample 1: anchor rod (ribbed steel, Ø = 16 mm) with "BeSealed Sealing Connector" sealing collar ($Ø_{inside}$ = 16 mm, $Ø_{outside}$ = approx. 24 mm, depth = 36 mm)
- Sample 2: glass-fibre rod (ribbed; Ø = 14 mm) with "BeSealed Sealing UFO" sealing flange ($Ø_{inside}$ = 12 mm, $Ø_{outside}$ = approx. 40 mm, depth = 15 mm)
- Sample 3: plastic pipe ($Ø_{inside}$ = 22 mm, $Ø_{outside}$ = 26 mm) with "BeSealed Sealing UFO" sealing flange ($Ø_{inside}$ = 24 mm, $Ø_{outside}$ = 52 mm, depth = 15 mm) and "BeSealed Sealing Plug" (plastic, with seal capable of swelling in water, $Ø_{outside}$ = approx. 23 mm, depth = 40 mm)
- Sample 4: same as series 3; test with negative water pressure acting on the plug

The test for water tightness of the contact faces was made with the penetration elements set in the concrete of concrete slabs (watertight concrete; dimensions: 20 cm x 20 cm x 10 cm; compression strength class 30/37); testing based on DIN 1048-5 (Fig. A1). To allow the water to get to the regions with the sealing rings, and to allow it to escape in case of leaks, the penetration elements were wrapped with a plastic film before placing the concrete; the only region not wrapped was the sealed region. After a 28-day hardening period, the samples were placed in a water penetration test unit, and water pressure was applied in 0.5-bar steps with retention times of 48 hours, raising the pressure up to 5.0 bar, which was then maintained at a constant level for 7 days. Test results are listed in the table below.

Sample No.	Max. water pressure (bar)	Exposure time (d)	Test results[1)]
1	5	7	No leaks
2	5	7	No leaks
3	5	7	No leaks
4	4	2	No leaks

[1)] The assessment was made for the contact face on the side opposite the water pressure

After the test for tightness, the samples were split in the middle, and the depth of water penetration was recorded (photos A2 to A5).

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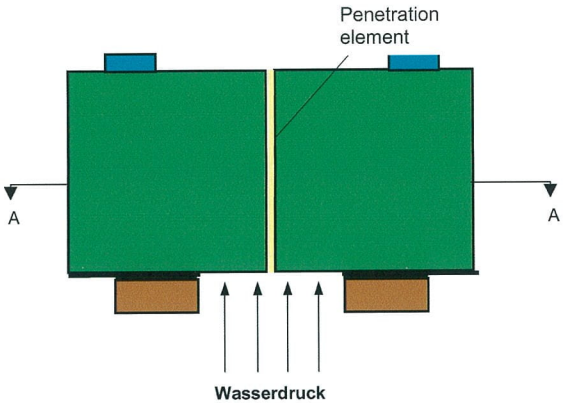

Schnitt A-A

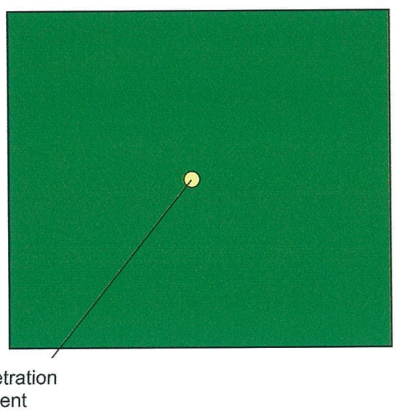

Fig. A1: Sketch showing test for tightness (concrete slabs 20 x 20 x 10 cm)

Fig. A2: Sample 1: anchor rod (ribbed steel Ø = 16 mm)

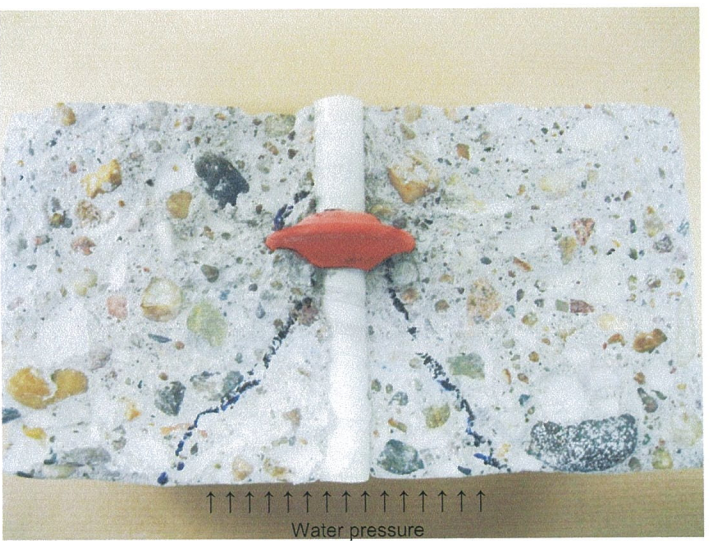

Fig. A3: Sample 2: glass-fibre rod (ribbed Ø = 14 mm)

Fig. A4: Sample 3: plastic pipe ($Ø_{inside}$ = 22 mm, $Ø_{outside}$ = 26 mm)

Fig. A5: Sample 4: plastic pipe ($Ø_{inside}$ = 22 mm, $Ø_{outside}$ = 26 mm); negative water pressure acting on the plug