



Test report no. PB 5.1/18-418-1

dated 11 January 2019
1. Ausfertigung

Subject: *FRK sealing collar* -
Testing the tightness in the fitted state at a water pressure of
10 bar

Client: Flexseal GmbH
Hessenring 31
37269 Eschwege
Germany

Sample receipt: 2586-1 and 2586-2 / 03/08/2018

Testing period: September - November 2018

Person responsible: Dipl.-Ing. Jüling

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1 Scope of tasks

An application-specific investigation was to prove the suitability of *Flexseal GmbH's* sealing collar with the designation *FRK sealing collar* as a seal for pipe penetrations in concrete and reinforced concrete components with high water penetration resistance to pressurised water. The water pressure is to be increased to 10 bar.

2 Object of the examination

The *FRK sealing collar* is a black, cuff-like fitting with profiled discs, Annex 1, Figure 1. According to the client, it is made of EPDM and offered for pipes with an outside diameter of up to 340 mm. The sealing collar is positioned in the middle of the wall or base plate cross section on site above the pipe to be sealed and additionally pressed on with two fastening straps. The profiled discs in the middle of the sealing collar, which is approx. 55 mm wide, aligned perpendicular to the pipe axis are intended to extend the flow path of the water and thus the impermeability of the pipe bushing in concrete or reinforced concrete components with high water penetration resistance. On both sides of the discs, two stainless steel fastening straps, approx. 14 mm wide (material no: 1.4301) secure the position of the sealing collar and ensure the required contact pressure.

The surface of the sealing collar is provided with 2 x 3 annular ribs. The thickness is approx. 9.5 mm in the area of the ribs, outside the ribs approx. 5 mm. The inner diameter of the sealing collar in the area of the ribs is about 150 mm, the outer diameter about 250 mm. The transition between the hollow cylindrical part of the sealing collar that rests against the pipe and the discs is designed as a fillet on both sides. The disc is provided on both sides with five concentrically arranged ribs, approx. 2.5 mm wide. The distance between these ribs is approx. 5.1 mm.

3 Test specimens and test procedure

For the technical application test, a PE pipe which is closed on one side, approx. 0.4 m long and with an outer diameter of approx. 160 mm, and two *FRK sealing collars* (here: FRK9416 for pipes with external diameters from 155 mm to 170 mm) with corresponding fastening straps were provided by the client. The pipe had a wall thickness of approx. 15 mm. In the test laboratory, the sealing collar was pushed onto the pipe in such a way that it was arranged in the middle of the test body thickness. The screws of the fastening straps were tightened according to the specifications of the client with a tightening torque of 7 Nm.

For the functional test, a test specimen with dimensions of 0.6 x 0.6 x approx. 0.3 [m] is produced from C30/37 concrete, which has a maximum grain size of 16 mm and a high resistance to water penetration in accordance with DIN 1045-2¹. The installation of the pipe with vertically aligned axis is the most critical installation case due to possible sacking below the disc. For the test, the tube is wrapped with filter paper and a membrane on the closed side, Annex 1, Figure 2.

¹ DIN 1045-2:2008-08 Concrete, reinforced concrete and prestressed concrete structures; Part 2: Concrete – Specification, properties, production and conformity, rules of application for DIN EN 206-1

This ensures that the water can reach the sealing collar. After stripping, the tube protrudes about 10 cm from the concrete on what will eventually be the bottom of the test specimen.

The test begins four weeks after preparation of the test body. A pressure chamber is fixed over the closed pipe end and sealed so that the installed component and the surrounding part of the concrete surface are located within the chamber. The chamber is filled with water through an opening and pressurised. The water pressure acts on the joint between concrete and pipe during the test. A four-week exposure at a maximum water pressure of 10 bar is envisaged. To this end, in the first week the water pressure is increased daily by 1 bar to 5 bar. In the second week the water pressure is increased daily by 1 bar to 10 bar and this pressure is maintained for a period of 28 days, Annex 1, Figure 3.

4 Test results and evaluation

During the four-week exposure to pressurised water at 10 bar, the joint between the *FRK sealing collar* sealed pipe and the surrounding concrete was watertight, Annex 1, Figure 4. The splitting of the test specimen after disassembly of the test equipment showed a moisture spread of the concrete on the side of the sealing collar exposed to pressurised water and dry concrete on the side facing away from the water, Annex 1, Figure 5 and Figure 6.

The tested *FRK sealing collar* is a pressurised water-tight seal for moisture spread in concrete components with high resistance to water penetration. The professional installation of the sealing element in accordance with the manufacturer's instructions is a prerequisite for the impermeability of the structure.

Leipzig, 11 January 2019

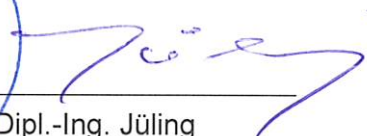
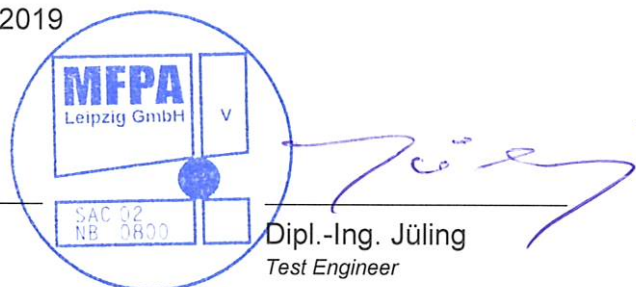

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Test Engineer



Figure 1 *FRK sealing collar* (here: FRK9416)

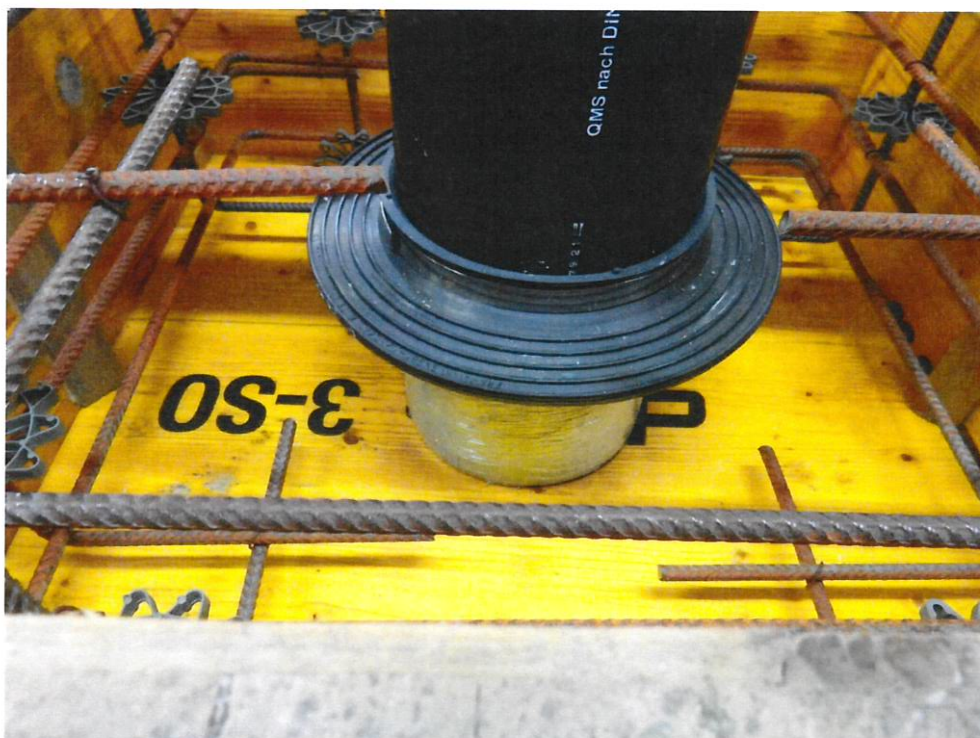


Figure 2 One-sided sheathing of the pipe below the wall collar for later ensuring the water access to the wall collar

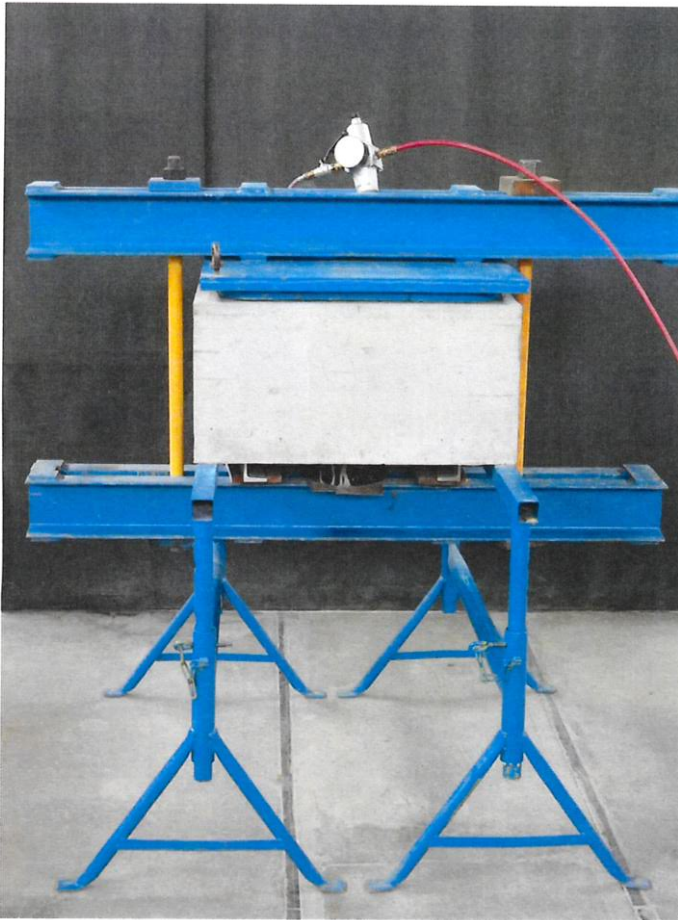


Figure 3
Test specimen during impermeability test
at water pressure

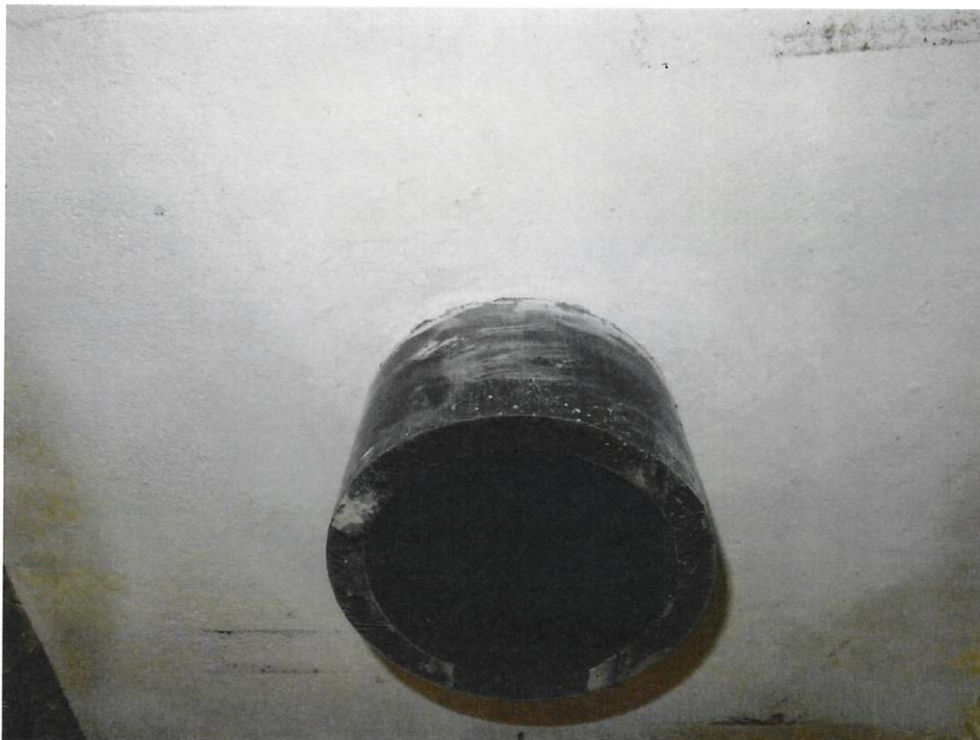


Figure 4 Bottom of the test specimen immediately after the demounting
of the traverses



Figure 5 Split test specimen; inside: Water side; outside: dry side sealed by the sealing collar; extended spread at the bottom due to run-off residual water during splitting



Figure 6 ditto, detail; water side left