

MFPA Leipzig GmbH

Test, Monitoring and Certification Office for
Construction Materials, Components and Types

Business Division V - Civil and Underground Engineering
Prof. Dr.-Ing. Olaf Selle

Work Group 5.1 - Structural Sealing

Test Report PB 5.1 / 15-538-2

dated April 18, 2013

1st copy

object: *Pressio-Elements Wall Penetration Seal Type IL 340 BC -
testing sealing when installed*

client:

*DAKKS
Deutsche
Akkreditierungsstelle
D-PL-11021-01-00*

receipt of sample: September 18, 2012 / December 17, 2012 / February 11, 2013

receipt number of sample: 381-1 / 467-3 / 490

test period: February to April 2013

staff engineer: Dipl.-Ing. Jüling

This document consists of 4 pages and one annex.

This report may only be reproduced in its unabbreviated form. All publication, even in excerpts, requires the prior written permission of MFPA Leipzig GmbH. The legally binding form is the written German form with the original signatures and original stamp of the authorised signatory/signatories.

The general terms and conditions (AGB) of MFPA Leipzig GmbH apply.



Test laboratory accredited by DAKKS GmbH according to DIN EN ISO/IEC 17025. The accreditation applies to the test methods listed in the certificate (marked by * in this document). The certificate can be seen under www.mfpa-leipzig.de.

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

Seat: Hans-Weigel-Str. 2b – 04319 Leipzig/Germany
Managing director: Prof. Dr.-Ing. Frank Dehn
Commercial roll: County court of Leipzig HRB 17719
VAT no.: DE 813200649
Tel.: +49 (0) 341 - 6582-0
Fax: +49 (0) 341 - 6582-135

1 Assignment

The assignment is to use a technical applications test to test the sealing of a modular seal for annular spaces with the designation *Pressio-Elements Wall Penetration Seal Type IL 340 BC* from *4 pipes GmbH* for sealing tubular feedthroughs against pressurising water.

2 Object of the Investigation

The *Pressio-Elements Wall Penetration Seal Type IL 340 BC* consists of individual sealing elements whose size and number are based on the size of the annular gap to be sealed between the media pipe and core drillhole or lining pipe/wall sleeve. The client offers these prepackaged sealing elements for various annular gap sizes. The sealing elements are pressed onto the media pipe and the pipe wall by tightening the screws of the link chain seal inserted into the annular gap which brings about the sealing effect.

The client made an *Pressio-Elements Wall Penetration Seal Type IL 340 BC* available for this test that has the purpose of sealing an annular gap between a stainless steel pipe with an exterior diameter of approximately 139 mm and a lining pipe with an inside diameter of 200 mm (Annex 1, Figures 1 and 2). This seal consists of 13 blue EPDM sealing elements (Shore 35±5) that are connected with one another with M8 screws (l=120 mm, V4A). There are pressure plates made of polyamide arranged between the sealing elements and the screw heads or nuts that provide even pressure.

3 Test Specimen and Carrying out the Test

A test specimen made of C25/30 concrete (maximum grain size 16 mm) with dimensions of 60 x 60 x 20 [cm] is made for this function test with a high level of water penetration resistance in conformity with DIN 1045-2¹. A section of a concrete component 0.20 m thick was replicated in this test specimen that is penetrated by a lining pipe with an inside diameter of 150 mm. The transition between this pipe and the concrete is additionally sealed for this test to eliminate the possibility of any water penetration on the outside wall of the lining pipe.

¹ DIN 1045-2: Concrete, Reinforced Concrete and Prestressed Concrete Structures; Part 2: Concrete - Specification, Properties, Production and Conformity, Application Rules for DIN EN 206-1; Edition 08/2008

The media pipe 0.5 m long is sealed on one side against pressurised water and is arranged to be concentric to the lining pipe. The link chain seal was inserted centrally so that it is possible to tighten the M8 screws on the side away from the water. The media pipe projects 30 cm from the test specimen on this side.

The screws are tightened clockwise (starting at 12 o'clock) with a torque wrench starting off with approximately 4 to 5 rotations each and then in several run-throughs until the sealing insert fills up the annular space completely (Annex 1, Figure 3). The client specifies that the maximum torque is 8 Nm.

After inserting and sealing the media pipe, the test specimen is rotated so that the closed end of the pipe is on the top side. Then the test is started. A pressure chamber is fastened and sealed on the upper side of the test specimen. The chamber is filled with water through a filling opening and impinged with pressure afterwards. This water pressure has an effect on the gap between the pipes and therefore also on the link chain seal during the test. The pressure water is impinged by gradually increasing the test pressure. While the pipe is locked in its position, the shift in the link chain is checked at two opposite points of the cylindrical recess while the pressure water is impinged (shift 1 and shift 2).

3 Test Results and Evaluation

The following table shows a summary of the results of the sealing check.

Table 1: Test results

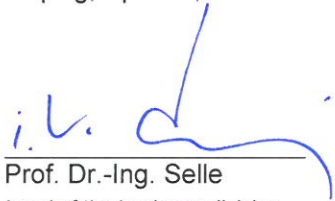
water pressure [bar]	time [d]	shift 1 [mm]	shift 2 [mm]	remarks
1	1	0	0	- torque: 8 Nm - sealed
2	3	0	2	- screws tightened before increasing the test pressure of 8 Nm - sealed
3	1	0	2	- sealed
4	1	3	7	- sealed
5	< 1	> 50	> 50	- the link chain shifted from the annular gap after approximately 10 hours - the deformation in the link chain - breaking off the test



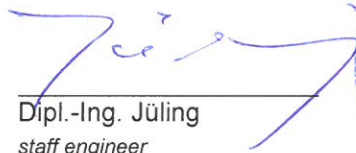
There was no water penetrating in the annular gap sealed with the *Pressio-Elements Wall Penetration Seal Type IL 340 BC* between the fibre cement shell and media pipe during at least 24 hours of impinging with water at pressures ranging between 1 bar and 4 bar. We measured a maximum shift of 7 mm in the link chain during the total of six days of pressure impingement to as much as 4 bar. Increasing test pressure to 5 bar pushed the link chain out after approximately 10 hours of impingement causing the test to be broken off.

The prerequisite for the construction sealing is the correct installation of the sealing element prefabricated at the factory as per the manufacturer's specifications as well as the use of a fibre cement shell or a concrete with a high level of water penetration resistance. Finally, the application limits should be applied for the media pipes.

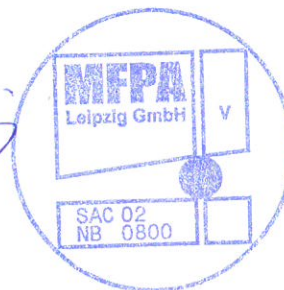
Leipzig, April 18, 2013



Prof. Dr.-Ing. Selle
head of the business division



Dipl.-Ing. Jüling
staff engineer



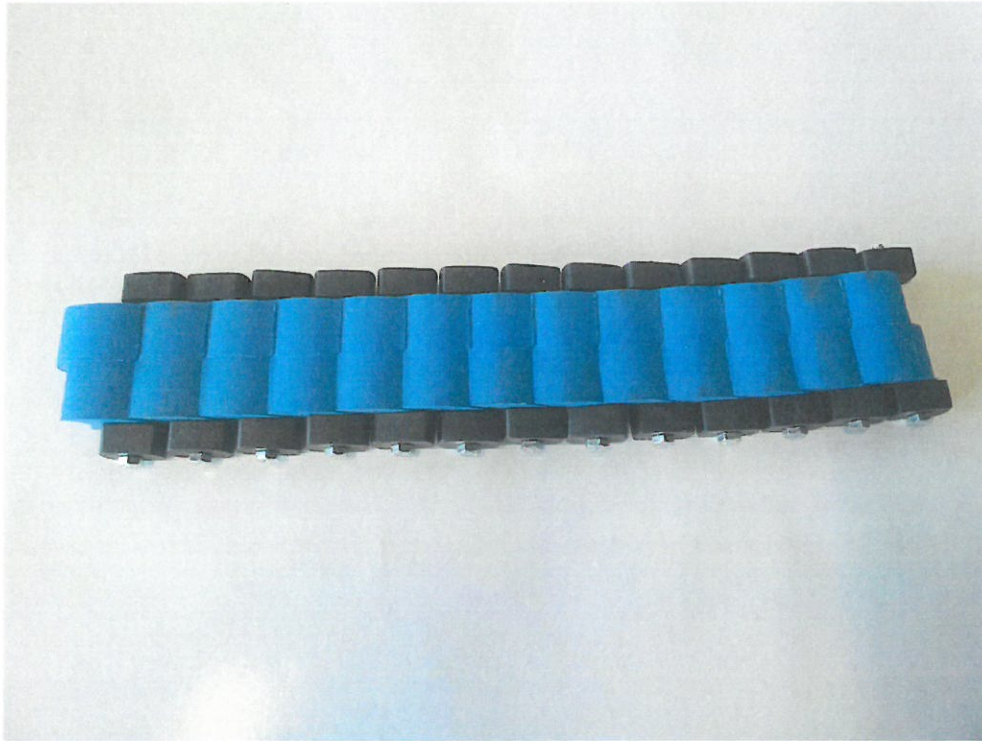


Figure 1: *Pressio-Elements Wall Penetration Seal Type IL 340 BC* before connecting



Figure 2: At the same place – connected as a ring



Figure 3: The link chain seal installed for sealing the annular gap