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REPORT

Tests on a liquid retaining barrier mounted on Metacon door-sets

Report no.	2020-Efectis-R002524
Sponsor	Metaalwarenfabriek Metacon B.V. Zuidbaan 450 2841 MD MOORDRECHT THE NETHERLANDS
Product name	METACON Liquid Retaining Barrier
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1. INTRODUCTION

Efectis Nederland BV in Bleiswijk the Netherlands has performed tests on liquid retaining barriers designed to be applied on door-sets manufactured by Metaalwarenfabriek Metacon B.V. in Moordrecht the Netherlands.
At the moment of testing a European standard was not available for this type of construction, therefore, the tests have been carried out according to a test protocol written by Efectis Nederland BV given in chapter 3.
The reason for investigating a liquid retaining barrier has been instigated by the fact that on June 2004 the new PGS 15[1] standard took effect, with a revision in April 2020: PGS 15:2020 interim version 0.2.
In the PGS 15, fire resistant doors should have a liquid retaining barrier in the case of storage of dangerous liquids to prevent liquid from flowing from one compartment to the other. This creates an extra requirement for fire resistant door-sets when applied as liquid barrier doors.

The tested barrier is universal in the sense that it can be installed on multiple types of doors given certain restrains. These restrains will be described and explained in chapter 4.

2. DATE AND TEST LOCATION

The two tests on the 300 mm high barrier have been carried out on the 16th of June and the 8th of December and the test on the 500 mm high barrier has been carried out on 9th of July, all in 2020 at Metacon Moordrecht.

3. DESCRIPTION OF INVESTIGATION

3.1 TEST SETUP

The tests were performed in a container with an open top and a separation made of 'Betonplex' hardwood plywood. The watertight container was separated in two compartments by a wooden section comprising a complete liquid retaining barrier, the tested aperture width was 3000 mm. In Appendix C photos can be found of the test setup.

3.2 TEST PROTOCOL

The test protocol consisted of the following steps:

- The segment is lowered into the guides
- A dead weight generated with metal cylinders with weights of 7.35 kg and 24.65 kg are distributed evenly on top of the barrier
- One compartment is filled with water to a height of 300 mm or 500 mm
- The test is stopped after 4 hours of testing
- The amount of leaked water is measured.

This protocol is repeated for the other side of the barrier in case of the 300 mm barrier.

1 www.https://publicatiereeksgevaarlijkestoffen.nl/publicaties/PGS15.html

3.3 PERFORMANCE CRITERIUM

According to § 3.2.6 of the PGS 15:2020 a liquid retaining barrier is mandatory if a door-set is installed between two or more liquid storages in combination with fire resistant compartments. No maximum allowed leakage rate is defined in this standard.

4. RESULTS INVESTIGATION

4.1 LIQUID BARRIER 300 MM – RGC AND OHD-C

The results of the tests are as follows:

- RGC: with the water at the inside of the liquid retaining barrier and guiding system the liquid retaining barrier showed a leakage of less than approx. 0.2 l after 4 hours of testing. Load 196 kg.
- OHD-C: with the water at the outside of the liquid retaining barrier and guiding system the liquid retaining barrier showed a leakage of approx. 1.45 l after 4 hours of testing. Load 196 kg.

4.2 LIQUID BARRIER 500 MM – OHD-C

The results of the tests are as follows:

- OHD-C: with the water at the inside of the liquid retaining barrier and guiding system the liquid retaining barrier showed a leakage of approx. 0.05 l after 4 hours of testing. Load 150 kg.

5. CRITERIA ON THE LIQUID RETAINING BARRIER

A number of criteria determine the performance of the liquid retaining barrier. Also, the applicability of the test results depends on a number of factors. In this chapter the relevant parameters are identified and enumerated. This chapter starts with the requirements and ends with a description of the tested construction and the doors.

5.1 EFFECTS ON THE FIRE RESISTANCE

The liquid retaining barriers could be mounted on fire resistant doors that separate compartments housing different kinds of chemicals. These chemicals can range from being not dangerous to aggressive. In the case of an incident the liquid retaining barrier should confine the compartment and prevent liquids from flowing to other compartments.
The liquid retaining barrier will not influence the fire resistance for the criteria E and I of the door-set in a negative manner.

5.2 CRITERIA ON THE NONMOVING PARTS

5.2.1 Floor & guides

The floor should be level and free from any irregularities that may influence the liquid retaining capabilities of the barrier. The transition between the floor, the guides and the moving parts should be smooth. The connection between the floor, the wall and guides should be sealed with an appropriate sealant if applicable. The sealant between the guides and the wall should be applied to a height of at least the tested height. The opening and closing of the door-set has to work properly without any restriction due to the fact that a liquid retaining barrier has been added to the construction.

5.3 CRITERIA ON THE MOVING PARTS

5.3.1 Criteria on the barrier

The barrier should be watertight and be made of materials that can withstand the chemicals that are stored.
The barrier should have at least the intended retaining height i.e., should not have any hinged parts under the water line. If that is not the case the hinged construction should be tested for water tightness. Also, in principle the seal should be made of one of piece. If that is not the case a joint should be tested for water-tightness.

5.4 APPLICABILITY OF THE TEST RESULTS

During testing a number of parameters are chosen to test the liquid retaining barrier. These are the height of the liquid level being 300 mm and 500 mm, and the pressure on top of the movable partition part of the construction. Both parameters determine the applicability of the test results:

- The test results are only valid for liquid levels lower or equal to the tested height
- The test results are only valid for equal or larger amounts of mass per meter of barrier, i.e., the pressure on the barrier should be equal or larger. Also, the width of the rubber strip at the underside of the barrier should be equal or larger than the tested width. When the rubber strip is made larger the pressure should increase proportionally to the width increase.

6. DESCRIPTION OF THE CONSTRUCTIONS

6.1 DETAILS OF THE TESTED CONSTRUCTION

The tested construction consisted of two side guides comprising a self-adhesive liquid retaining seal and a segment of the door-set with the seal at the bottom of the panels. The seals consisted of strips of EPDM, dimensions 25 mm x 25 mm with a length of 2000 mm, so at the bottom a non-glued joint was incorporated in the test specimen. Drawings of the liquid barrier are given in Appendix A. The rubber strip was applied along the sides and the bottom of the segment. Potential gaps between any parts like side guides and the plywood of the container were sealed with Bison Polymax transparent sealant.
The guides where made of galvanized steel.

Drawings and details of the RGC and OHD-C door-set panels are given in Appendix A.

6.1.1 300 mm Barrier

The weight of the door-set / construction should generate a pressure of approx. 196 kg test 1 and approx. 150 kg test 3 on the liquid retaining barrier with every clear meter of the door leaf. If the rubber strip at the bottom is made wider than 50 mm the pressure should increase proportionally to the width increase. Also, the rubber strip should be made of one piece.
If the construction of this type of door shall be identical as tested, the expectation of Efectis Nederland BV is that the liquid retaining barrier does not have a negative influence on the fire resistance.

6.1.2 500 mm Barrier

The weight of the door-set / construction should generate a pressure of approx. 196 kg test 2 on the liquid retaining barrier with every clear meter of the door leaf. If the rubber strip at the bottom is made wider than 25 mm the pressure should increase proportionally to the width increase. Also, the rubber strip should be made of one piece.

If the construction of this type of door shall be identical as tested, the expectation of Efectis is that the liquid retaining barrier does not have a negative influence on the fire resistance.

7. CONCLUSION

The Special Testing Team of Efectis Nederland BV, Bleiswijk the Netherlands, has performed tests on a liquid retaining barrier designed to be applied on doors manufactured by Metaalwarenfabriek Metacon B.V.
The liquid retaining barrier is tested for 4 hours at each side of the barrier with a water height of 30 cm and 50 cm. After the test time the amount of leakage is measured.

The liquid retaining barrier is of a universal construction and can be mounted to different kinds of door sets. To determine if mounting the barrier to different kinds of doors gives an equivalent construction, i.e., a construction that gives the same performance, a number of criteria should be met which are given in chapter 5.

Based on the test the opinion of Efectis Nederland BV is that the liquid retaining barrier is allowed to be mounted on Metacon roller shutters and overhead door constructions under the following conditions:

- The liquid retaining barrier may only be applied to METACON RGC and METACON OHD-C sectional door-sets
- Maximum allowed height of the liquid retaining barrier of 300 mm and 500 mm, the latter only for the scenario liquid at the inside of the liquid barrier and the guiding system
- The seal between the guiding system / floor and the moving segment shall be a rubber strip consisting of one piece, so it has no interruptions
- The floor shall be free of obstacles.

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Project leader smoke control & fire resistance

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Project leader fire resistance

APPENDIX A: DETAILS OF THE TEST SETUP

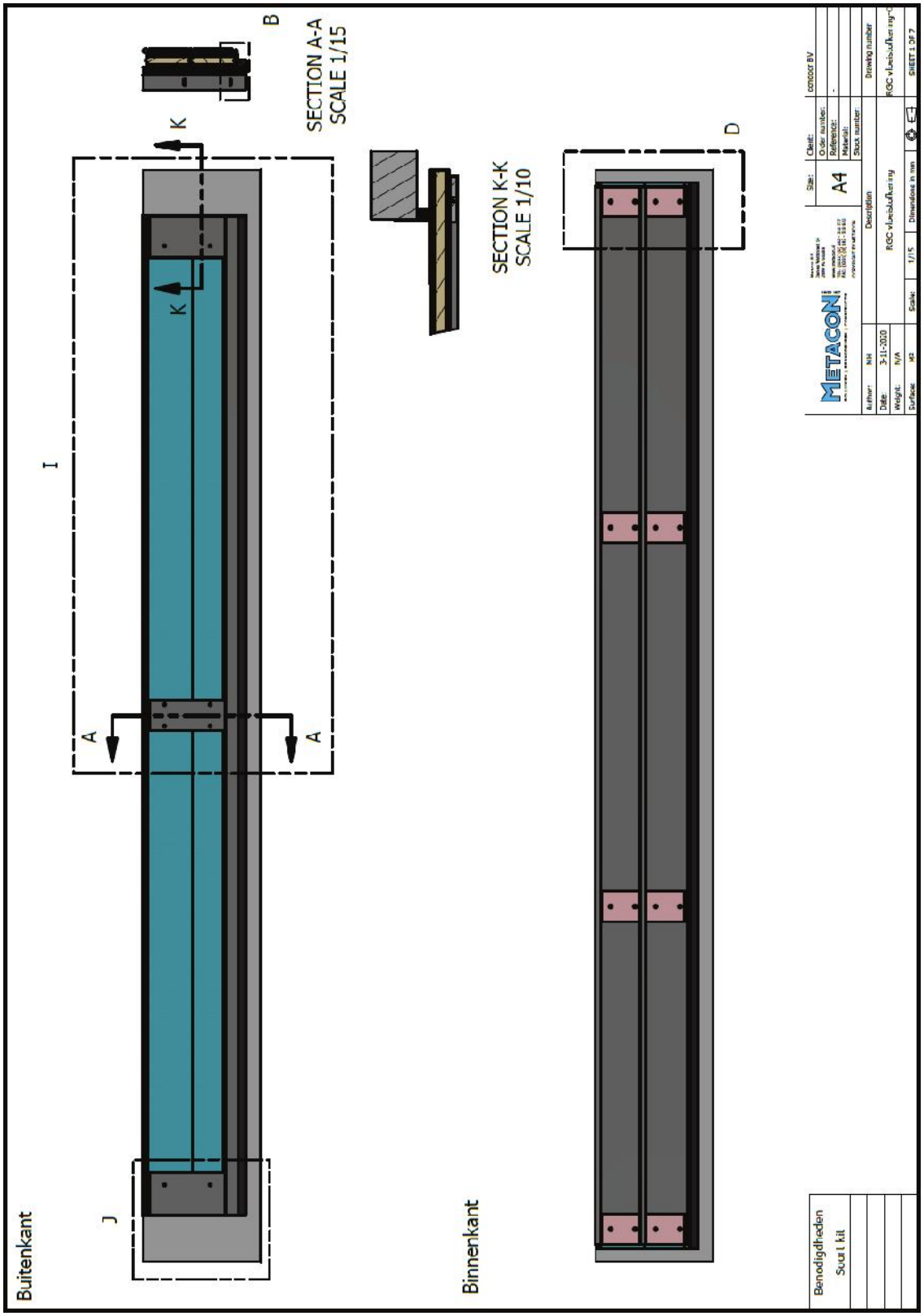

Figure A.1. RGC 1.7

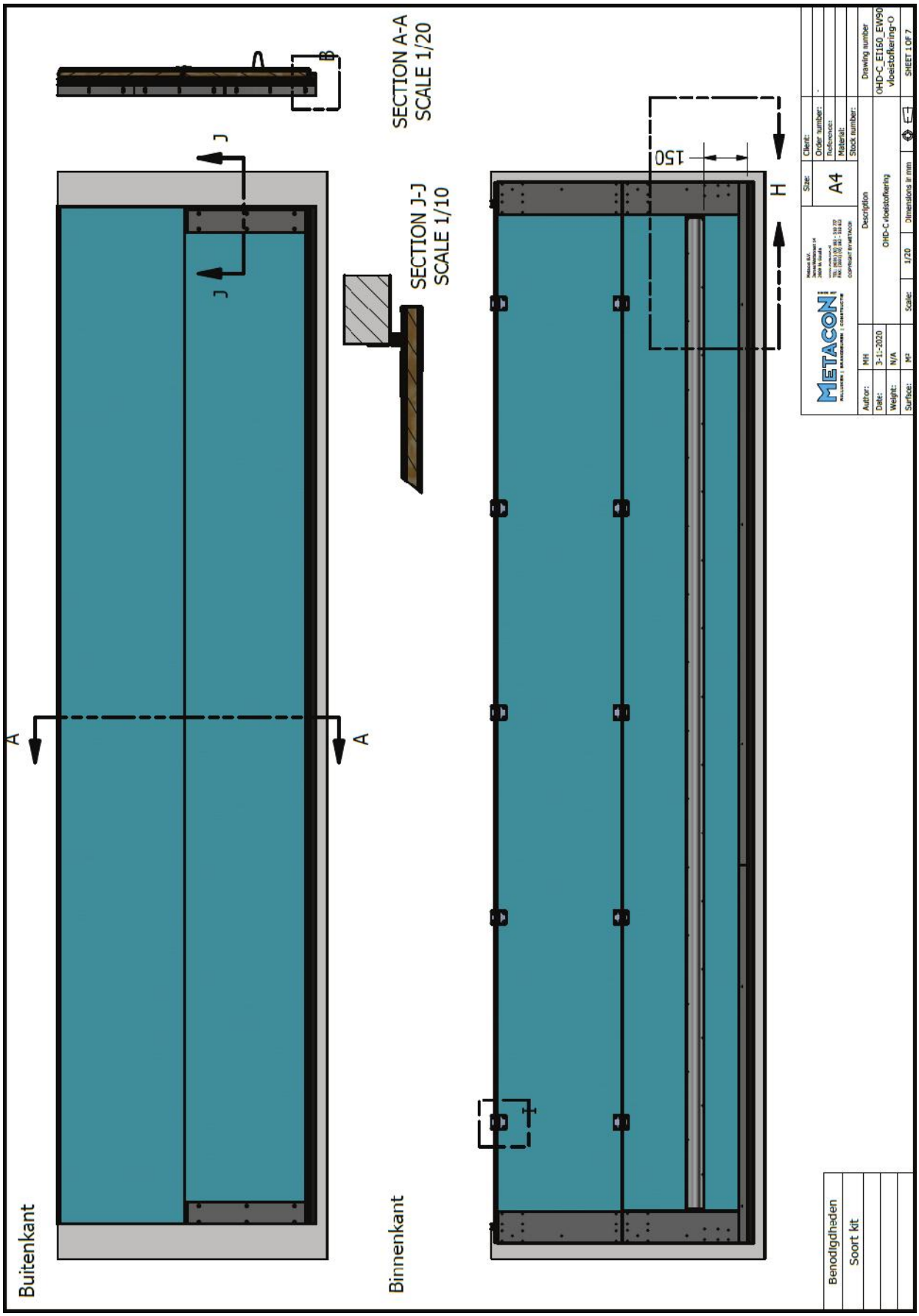

Figure A.8. OHD-C 1.7

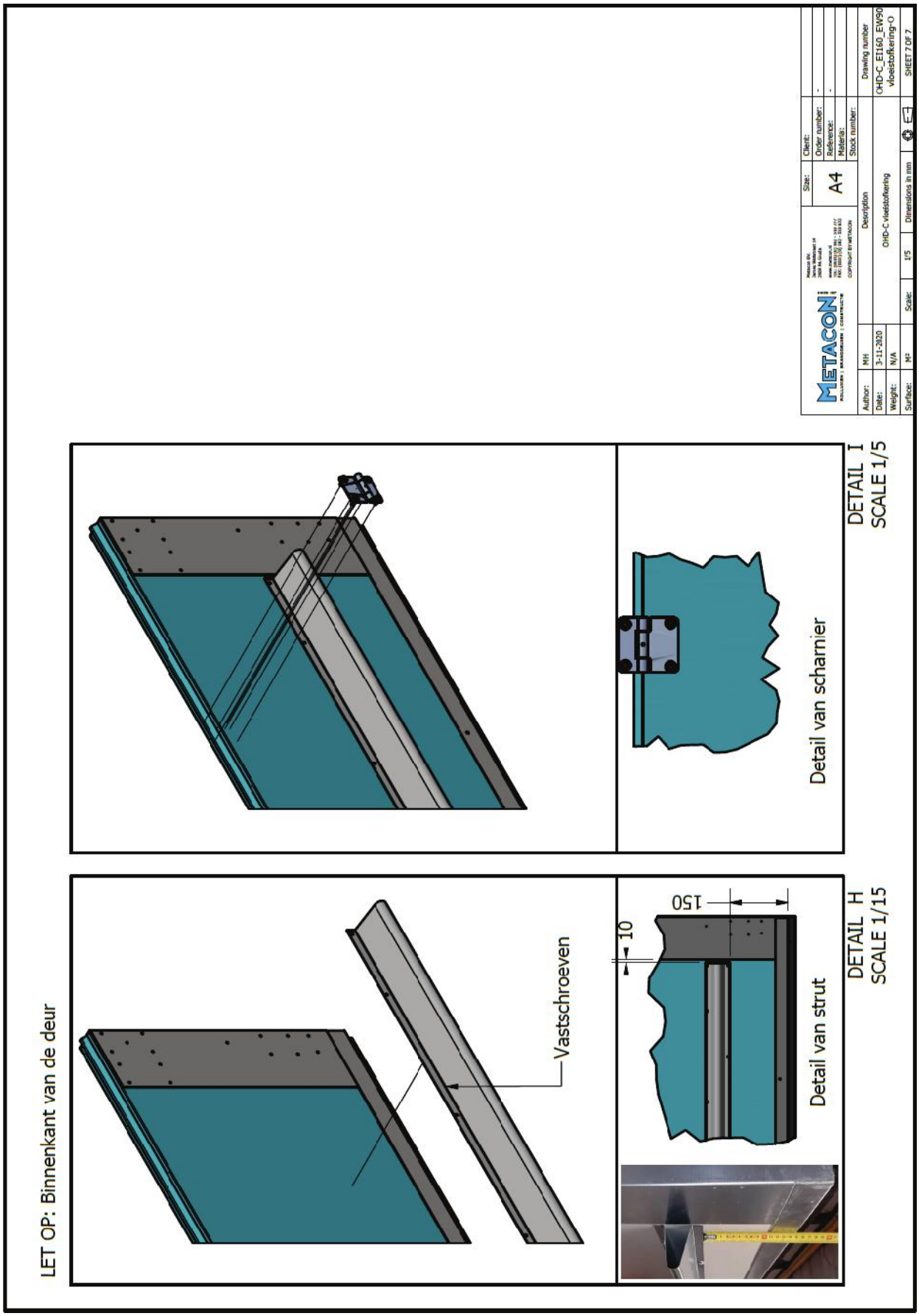

Figure A.14. OHD-C 7.7

APPENDIX B: PHOTOS

RGC – Test 1 - 19-06-2020

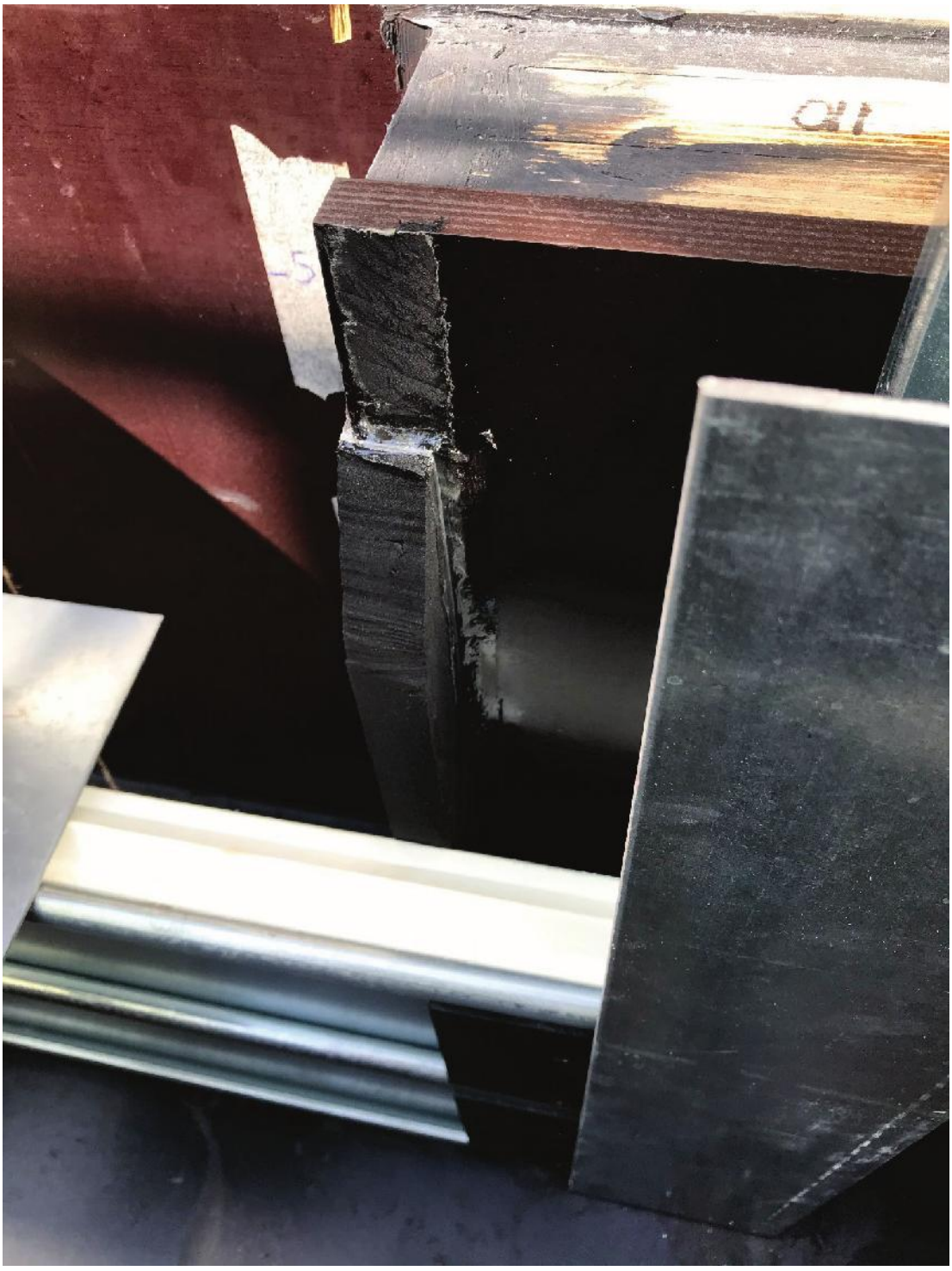

Photo B. 1.9 View of RGC seal, 300 mm test at the inside

RGC – Test 1 - 19-06-2020

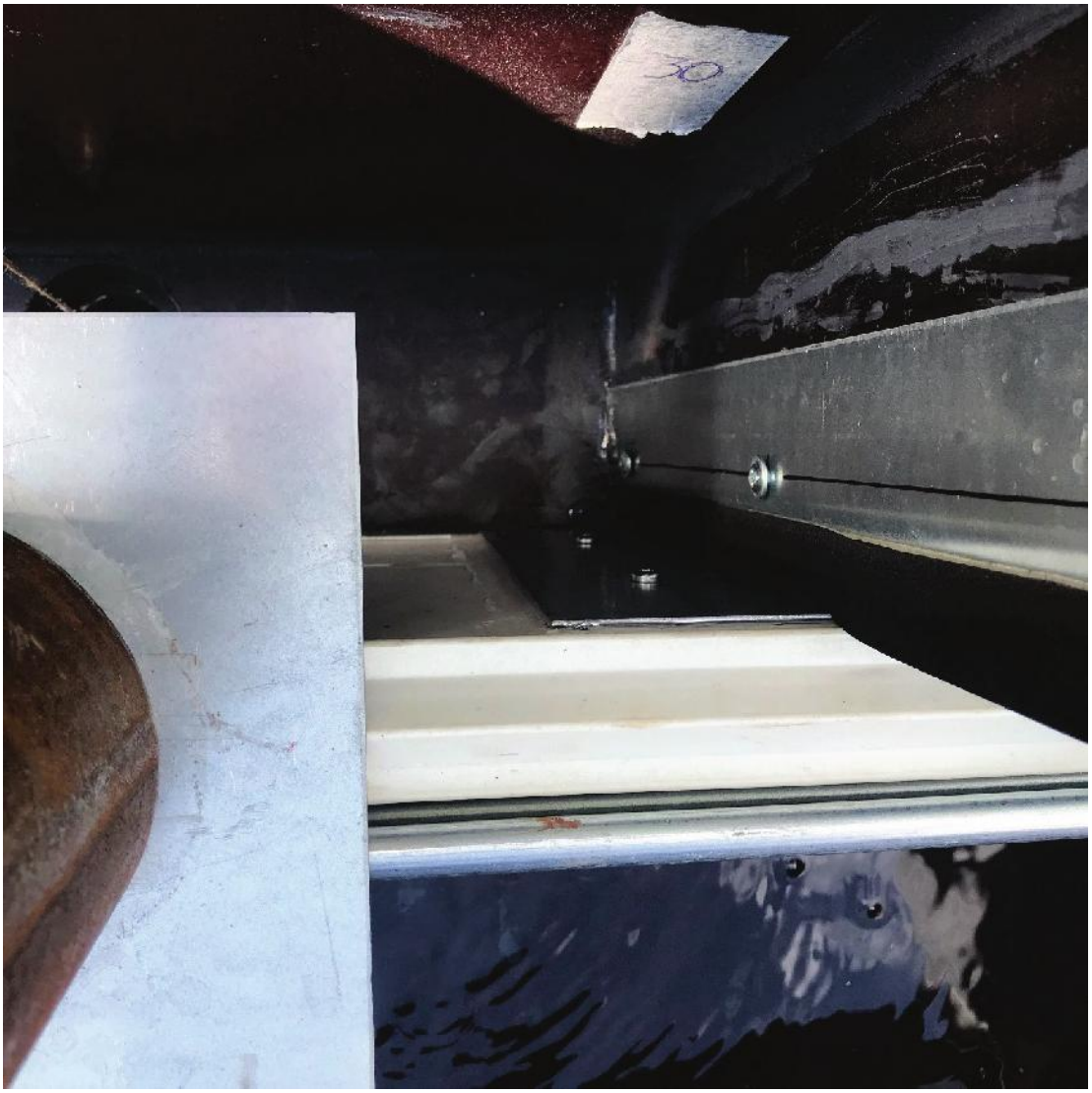

Photo B. 2.9 View of RGC seal, 300 mm test, water at the inside

RGC – Test 1 - 19-06-2020

Photo B. 3.9 Leakage of 300 mm test, water at the inside

OHD-C – Test 2 - 09-07-2020

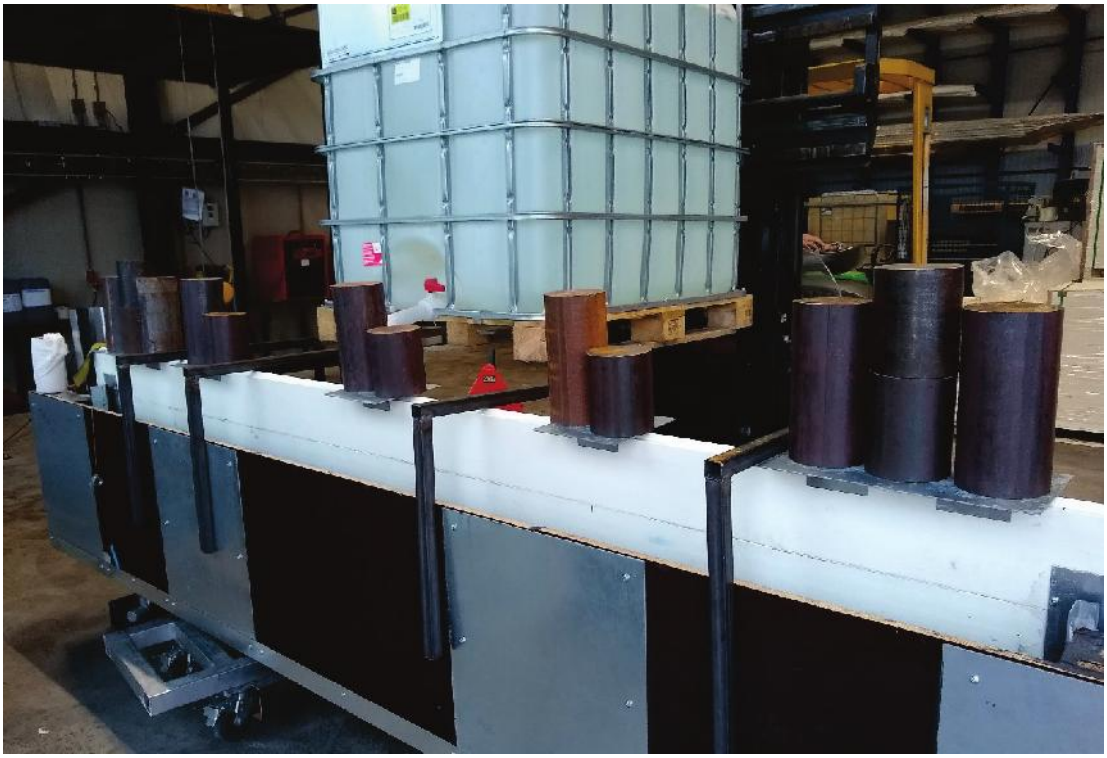

Photo B. 4.9 View of OHD-C with load, 500 mm test 2, water at the outside

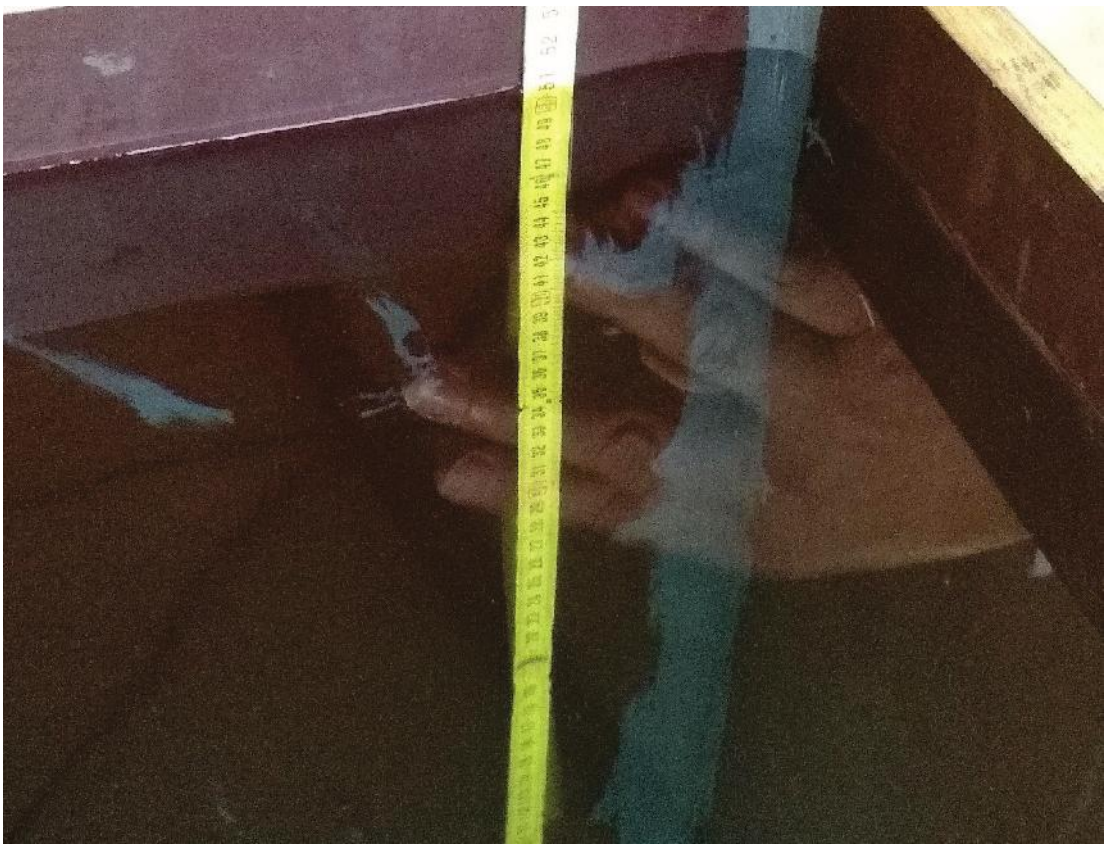

Photo B. 5.9 OHD-C, 500 mm test 2, water at the outside

OHD-C – Test 2 - 09-07-2020

Photo B. 6.9 Leakage of 500 mm test, water at the outside

OHD-C – Test 3 - 08-12-2020

Photo B. 7.9 View of OHD-C with load, 500 mm test 3, water at the inside

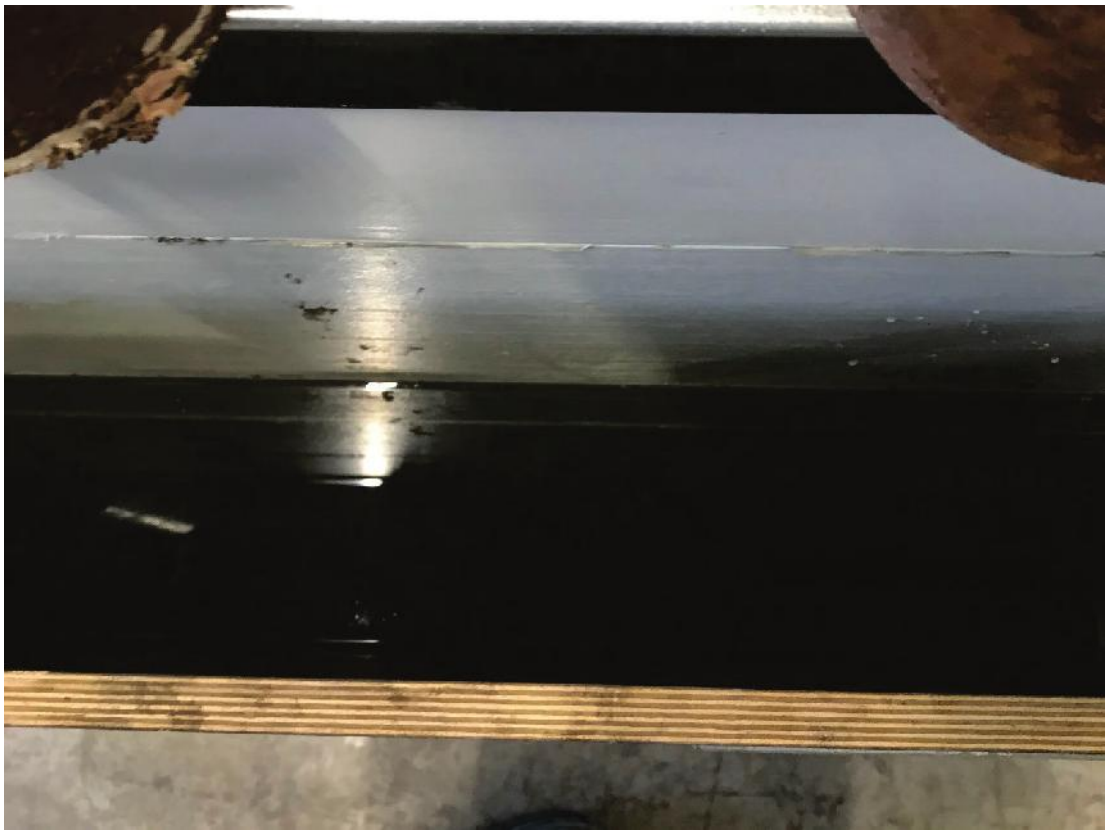

Photo B. 8.9 Level of water 300 mm test, water at the inside

OHD-C – Test 3 - 08-12-2020

Photo B. 9.9 Leakage of 300 mm test, water at the inside