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Laboratory Test Report

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Date: December 16, 2016

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Laboratory Test to Determine the Hydrostatic Pressure Capacity of Cast-in Place Concrete Construction Joints with RHINOSWELL Waterstop

1 INTRODUCTION

The objective of this test is to determine the hydrostatic pressure capacity of **RHINOSWELL** waterstop in preventing leakages along the construction joints of cast-in-place concrete. The test was designed to simulate jobsite conditions wherein the waterstop material was installed along the construction joints of a specially made concrete test chamber and subjected to controlled hydrostatic pressures in the laboratory.

RHINOSWELL is a flexible, preformed adhesive coil of specially formulated materials that swells in the presence of water, filling the voids in poorly consolidated concrete construction joints, thereby providing a lasting and watertight compression seal for non-moving joints.

2 TEST SET-UP PREPARATION

For the laboratory tests, a cylindrical concrete test chamber Ø0.60 m in diameter and 0.70 m high was prepared using conventional construction techniques. The concrete test chamber had a wall thickness of 200 mm (8") and reinforced by two rows of Ø12 mm steel bars. In preparing the concrete test chamber, the following design mix was implemented:

Mix proportion of concrete per cubic meter:

Cement Type 1 (Elephant Brand)	*350 kg*
Fine aggregate, sand	*720 kg*
Coarse aggregate, 3/8"	*1,100 kg*
Water, W/C (0.46)	*160 kg*

The above design mix had an average compressive strength of 292 kgf/cm^2 (4,153 psi) at curing age of 7 days as previously tested at AIT Laboratory.

The construction was carried out in two stages, i.e., the base, and the wall. At the construction joint between the base and the wall, a sample of **RHINOSWELL** waterstop was installed using primer adhesives. The waterstop material was installed following the general instructions set by the manufacturer.

After completion of the test set-up preparation, the concrete test chamber was filled with water and allowed to cure for 7 days prior to the hydrostatic pressure tests. The sketch of the completed hydrostatic pressure test set-up is shown on Figure 1.

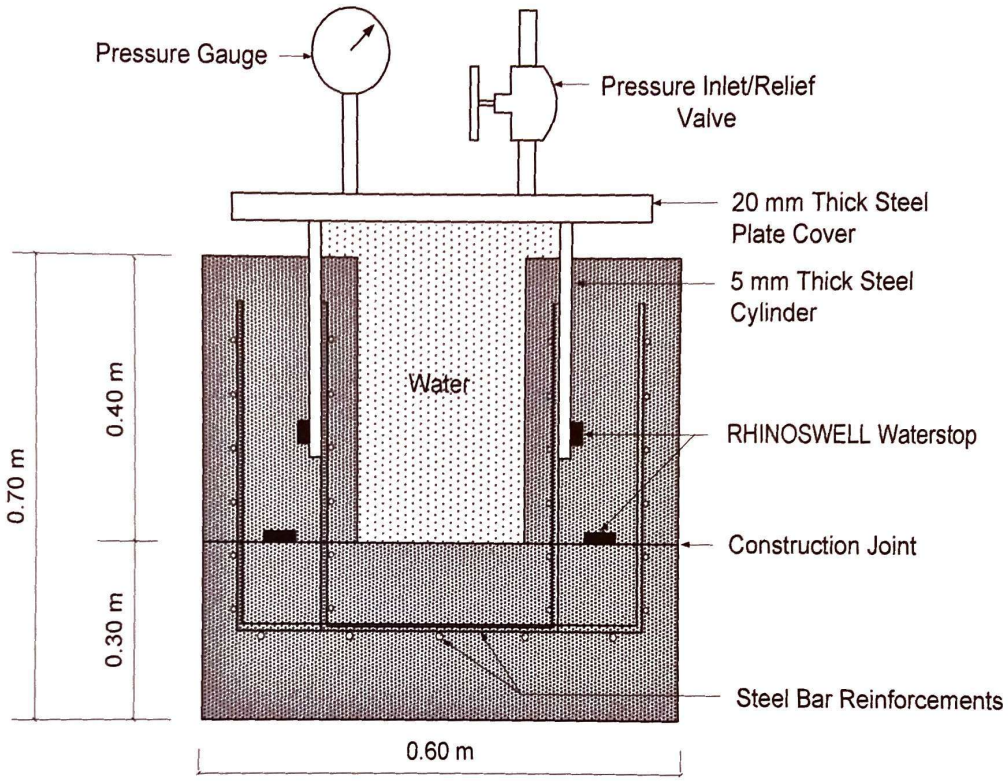


Figure 1. Sketch of the complete hydrostatic pressure test set-up

3 HYDROSTATIC PRESSURE TEST

The hydrostatic pressure test was carried out by supplying constant pressure inside the concrete test chamber starting at 40 psi to facilitate the testing (based from experience, waterstop would never fail at 40 psi). The pressure was gradually increased by 10-psi increments every hour while monitoring the construction joints for any leakages. The pressure increments were continued until the waterstop material failed and leakages were observed along the construction joints.

4 HYDROSTATIC PRESSURE TEST RESULTS

Time Elapsed (hour)	Concrete Test Chamber Pressure (psi)	(m of water)	Remarks
Day 1, 10:00 hrs	40	28.17	no leakage at construction joints
Day 1, 11:00 hrs	50	35.21	no leakage at construction joints
Day 1, 12:00 hrs	60	42.25	no leakage at construction joints
Day 1, 13:00 hrs	70	49.30	no leakage at construction joints
Day 1, 14:00 hrs	80	56.34	no leakage at construction joints
Day 1, 15:00 hrs	90	63.38	no leakage at construction joints
Day 1, 16:00 hrs	100*	70.43	no leakage at construction joints
Day 2, 8:00 hrs	110	77.47	no leakage at construction joints
Day 2, 9:00 hrs	120	84.51	no leakage at construction joints
Day 2, 10:00 hrs	130	91.56	no leakage at construction joints
Day 2, 11:00 hrs	140	98.60	no leakage at construction joints
Day 2, 12:00 hrs	150	105.64	no leakage at construction joints
Day 2, 13:00 hrs	160	112.68	Initial leakage at the construction joint noted

** Pressure inside the concrete test chamber released after completing the 100 psi pressure on Day 1. The hydrostatic pressure test was continued the following day with 110 psi.*

5 CONCLUSION

Based from the samples tested and following the hydrostatic pressure test procedure described in this report, the **RHINOSWELL** waterstop sample was found to be effective in preventing water leakages along the construction joints of the concrete test chamber up to maximum hydrostatic pressure of 150 psi (105.64 m of water). At 160 psi (112.68 m of water) pressure, initial leakage along the construction joint was noted.

Tests performed by:

Supote 16/12/2016

Mr. Supote Thammasittirong — Date
Senior Research Associate

Approved:

16/12/2016

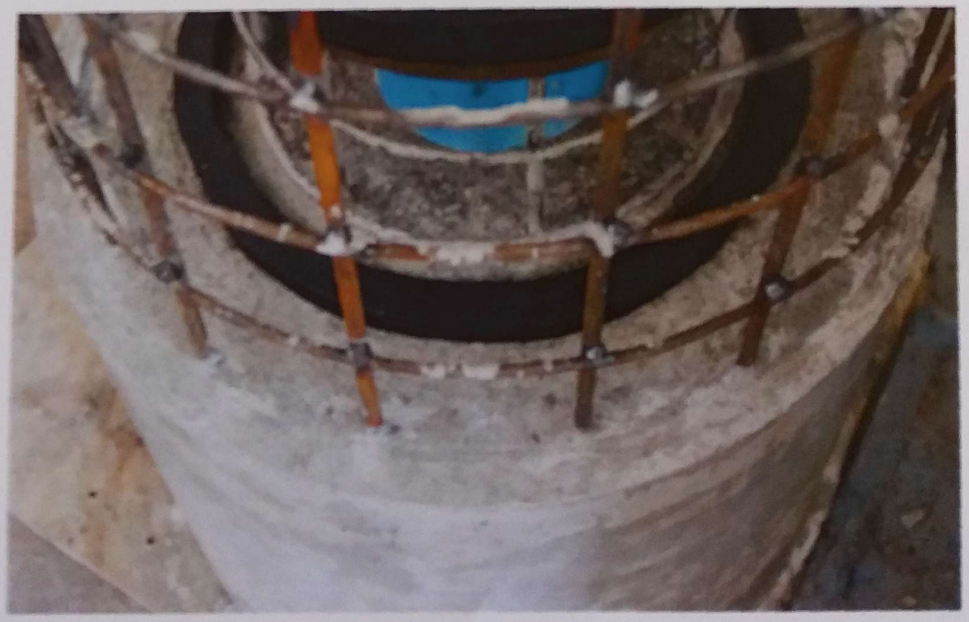
Mr. Arturo G. Roa — Date
Laboratory and Research Manager

Note:
Results obtained from this test are based on the materials submitted as samples and testing conditions and procedures described in this report. No statement can be made on the precision or bias of this test method in relation with the actual performance in the field.

Reference:

Robert L. Nelson and Associates Inc. Construction Materials Laboratory, "A Study to Determine the Effectiveness of Swellable Waterstop Barriers in Concrete Joints".

Photograph 1 –Sample of **RHINOSWELL** waterstop used in the testing



Photograph 2 – **RHINOSWELL** waterstop installed along the construction joint of the concrete test chamber

Photograph 3 – Completed set-up for the hydrostatic pressure tests

Photograph 4 – Concrete test chamber at 130 psi and 150 psi pressures. No leakages along the construction joints were noted after 1.0 hour of test for each pressure level.

Photograph 5 – Concrete test chamber showing initial leakage at the construction joint after one hour at 160 psi (112.68 m of water) pressure.