Assessment of the Nitoproof 410 to AS 3740 for testing to AS/NZS 4858:2004 wet area membranes

Report number: SW8534 - 1st Revalidation, AS4858
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The Report number SW8534-AS4858 valid until 30th May 2027

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Limitation

The results reported herein relate only to the item(s) tested.

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1 Summary

Test Standard: Testing was conducted on a waterproofing membrane used for internal wall and floor tiled areas, to assess its performance for: water vapour transmission; water absorption; acceptance of cycle movement; and, durability. The waterproofing properties required by AS 3740 were tested in accordance to the Australian Standard AS/NZS 4858-2004.

All methods were carried out according to Table A1 durability of membranes against the performance criteria of Table 8.1.

Test results: The waterproofing membrane presented for testing complied with the performance criteria set in AS/NZS 4858-2004 '*Wet area membranes'*, confirmed against AS 3740. The following table shows the Nitoproof 410 performance as assessed from testing.

Table 1 Summary of test requirements and test specimen results for AS/NZS 4858:2004

TEST	METHOD	REQUIREMENTS	RESULT	STATUS
(a) Moisture Transmission Rate	ASTM E 96 Desiccant method for Determining Water Vapour Transmission (WVT)	Water Vapour transmission shall be <8g / m^3 / 24hrs. If > 8g / m^3 / 24hrs, additional testing will be required to establish suitability for use over particleboard.	WVT 7.05 g/m^2/24hrs Permeance 48.44 ng/Pa.s.m^2	Complied
(b) Water Absorption	AS 3558.1 Average percentage increase in mass	Maximum record result of percentage mass $w_m\% = (w_m^2-w_m^1)/w_m^1 x100$.	Max. mass 1.23 %	Complied
(c) Acceptance of movement	AS/NZS 4858 Appendix B for assessment of cyclic movement of membrane	Pass or fail criteria by observing any cracking, rupture holing or extending through the thickness for more than 1 mm in from the edge of the specimen.	Class II	Complied
(d) Durability **1. Control** **2. Water immersion** **3. Bleach immersion** **4. Detergent immersion** **5. Heat ageing at 50°C**	AS/NZS 4858 & Appendix A for assessment of membranes durability	Pass or fail criteria; compared to control samples, elongation at break shall be not less than 50 % for the bond breakers given in Table 6.1.	Class II	Complied

Note: The above is only a summary of the overall results, and must be read in conjunction with the relevant sections of this report.

SUMMARY OF RESULTS

AS/NZS 4858:2004 Wet Area Membranes

Appendix A: Assessment of Durability of waterproof membranes

Test Report No.	**8363A**	**SW8534 – AS4858**	
Year of test	2021	2024	
Control	136%	127%	**Class II**
Water Immersion@56 days	105%		PASS
Bleach Immersion@56 days	202%		PASS
Detergent Immersion@56 days	65%		PASS
Heat Ageing @ 50 ºC	129%		PASS

Parchem Construction Supplies Pty Ltd , test sample - The Nitoproof 410 - Waterproofing Membrane achieves the performance requirements of AS/NZS 4858: 2004 Durability of Membranes for Class II membrane installation.

Appendix B: Assessment of resistance of waterproofing membranes to cyclic movement

Pass or Fail criteria by observing any cracking, rupture holing or extending through the thickness for more than 1 mm in from the edge of the specimen.

Result: No fatigue cracking exhibited. PASS

ASTM E96: Water Vapour Transmission of Materials

Result: 7.05 g/m²/24h PASS

AS 3558.1 Methods of testing plastics & composite materials sanitary plumbing fixtures:

Method 1: Determination of water absorption characteristics

Result:	Sample 1	1.23%	
	Sample 2	1.17%	
	Sample 3	1.10%	Average 1.17%

Appendix C: Suitability of waterproofing membranes when used over particle board.

Not required.

Note: The above is only a summary of the overall results and must be read in conjunction with the relevant sections of this report.

2 Introduction

CSIRO Services was engaged by Parchem Construction Supplies Pty Ltd to assess a waterproofing membrane for compliance against AS 3740-2010 'Waterproofing of domestic wet areas', Section 2, Clause 2.4.1 (d) 'Membranes meeting the requirements of AS/NZS 4858', determined by testing to AS/NZS 4858:2004, '*Wet area membranes'* (this Standard sets out the methods for establishing the physical properties for wet area membranes). The details for this assessment are listed in Table 2 below.

Table 2 Details of submitted test specimen.

CSIRO Agreement No.:	SW8534
TEST SPONSOR:	Parchem Construction Supplies Pty Ltd
PRODUCT DESCRIPTION:	Nitoproof 410

Note: CSIRO accepts no responsibility for the selection of specimens. The results in this report apply to the specimens tested and may not be applicable to other specimens of the same product.

This report details the performance, testing conditions and outcomes of the specimen assessed for wet area membranes. Table 3 details the sponsor's specified schedule of tests for the product.

Table 3 Details of the schedule for testing of the submitted specimen.

CSIRO Agreement No.:	SW8534
TEST SCHEDULE:	AS/NZS 4858:2004 wet area membranes, Clause 8 Table 8.1: a) Moisture vapour transmission rate - ASTM Designation E96/E96M – 16, 'Standard Test Methods for Water Vapour Transmission'; b) Water absorption AS 3558.1-1999 'Method of testing plastics and composite materials sanitary plumbing fixtures, Method 1 Determination of water absorption'; c) Acceptance of cyclic movement; Appendix B 'Assessment of resistance of waterproofing membranes to cyclic movement'; and, d) Durability - Appendix A 'Assessment of durability of waterproofing membranes: Table A1 (a) Controls & 1st Revalidation. Table A1 (b) Water immersion Table A1 (c) Bleach immersion Table A1 (d).Detergent immersion Table A1 (e) Heat aging 50°C

3 Test specimen description

The Fosroc Nitoproof 410 / Emer-Proof Quick Dry supplied by Parchem Construction Supplies Pty Ltd is a water based, fast drying, flexible two component, polymer modified cementitious waterproofing membrane. The nominal size of the membrane was 300 mm wide, 303 mm length and 1.55 mm thick.

The supplied specimen for assessment is shown below in Figures 1 and 2.

Figure 1 Top face of Nitoproof 410 for SW8534(1st revalidation)

Figure 2 Underside of Nitoproof 410 for SW8534(1st revalidation)

***Top face of Nitoproof 410 for 8363A (the main previous report)**

4 Test Methodology

4.1 ASTM E96/E96M – 16 Water Vapour Transmission of materials

This Standard outlines the method for determining water vapour transmission (WVT) through the membrane using the desiccant and dummy sample method.

Four test samples were prepared by mechanical sealed using two neoprenes and a Teflon gasket placed onto the open side of the test cups. The test cups contain dried desiccant with the trafficable side facing up were placed in a climate-controlled environment with periodic weighing so that the rate of water vapour movement through the membrane to the desiccant can be determined.

The exposed area (test dish face) for each of the cups was 0.002827 m^2. The test cups (all except the dummy sample, no desiccant) had a 6 mm gap between the desiccant and the underside of the membrane.

All test assemblies were kept in a Steridium environmental where chamber temperature humidity are maintained at a temperature of 23 ±2^oC and 60 ±5% relative humidity, for the 46 days duration. Measurements taken each afternoon (excluding weekends) over this period to determine the weight change and permeance of the membrane.

4.2 AS 3558.1-1999 Determination of water absorption characteristics

This Standard outlines the method for determining the percentage of mass change of the membrane measured after a period of immersion in water, followed by a period of being oven dried.

Three circular test samples of 80 mm diameter (5027 mm^2) were cut from Nitoproof 410, before been placed in an oven set at 50 ±5^oC for a duration of 24 ±0.5 hrs conditioning. Samples were removed from oven (cooled) then weighed and recorded (m^1) before insertion in a test jig. The test jig was used to expose the trafficable surface face of the samples to water to a depth of 50 mm above the surface for a duration of 24 ±0.25 hrs. After the completion of this exposure period the samples were wiped dry and then weighed and recorded (m^2) again, determining the percentage increase in weight measured.

4.3 AS/NZS 4858-2004 Appendix B Resistance to cyclic movement

This Standard outlines the method for determining resistance of membrane to cyclic movement set at 4mm extension.

A rectangular test sample of 65 mm x 25 mm x 1.46 mm was cut from the Nitoproof 410, then held in the test grips (70(w) x 45(l) x 20(t) mm), exposing a 25 x 2 mm central portion of the sample.

An Applied Test Systems Series 904 Vertical Sealant Tester was used for testing. The vertical sealant testing machine used software for cyclic movement control. The vertical testing machine was set to elongate the clamped test sample for the cycling is 4mm extension. Once the test piece reached full extension, it then returned to its original position, which completed one cycle of movement. The elongation and return was then repeated to complete a 50 cycle movement test, each cycle conducted over a nominal 2 hour period.

The test sample was inspected for signs of breakage or cracks and measured for any necking. A reduction in width of more than 1 mm inwards from the edge of the test sample constitutes a failure.

4.4 AS/NZS 4858-2004 Appendix A Durability of membrane

This Standard outlines the method for determining resistance of the membrane's durability after conditioning in various solutions over set periods, then assessed against an unconditioned material.

Testing of the Nitoproof 410 was in accordance with Appendix A Durability of membranes. As specified in A3 the membrane test samples were prepared in accordance with AS 1145.3-2001, Type 5, dumb-bell samples 6mm width with a 25mm gauge length. Test samples were exposed and conditioned to those requirements specified in Table A1 of AS/NZS 4858:2004.

In accordance with A2 Testing, a universal testing machine, fitted with a calibrated 5kN load cell, was used to record the elongation at break and tensile strength. The elongation at break of the immersed test samples were compared to the control test samples.

5 Results

5.1 ATSM E96/E96M - 16 Water Vapour Transmission of materials

The periodic measurements of the membrane test samples were recorded as shown in Table 4, below.

Date of test: 22 February 2021 – 9 April 2021

Table 4 Water Vapour Transmission test results

Product	Samples	Weight change	Water Vapour Transmission	Permeance
		G/t = g / s	(G/t)/A = g / m^2 24hr	WVT/(S9R1-R2) = ng/Pa.s.m^2
Nitoproof 410	8363/53 8363/54 8363/55	2.4 x 10^{-7} 2.2 x 10^{-7} 2.3 x 10^{-7}	7.20 6.84 7.12	49.42 46.99 48.89
	Average	2.3 x 10^{-7}	**7.05**	**48.44**

The performance criteria set out in AS/NZS 4858 – 2004, Table 8.1, specifies a water vapour transmission rate of less than 8 g/m^2 24 hr, or 0.33 g/m^2 hr.

5.2 AS 3558.1-1999 Determination of water absorption characteristics

The measured dimensions of the test samples placed in the test rig stand are shown in Table 4, below.

Date of test: 24th February 2021

Table 5 Water absorption tests results

Product	Thickness Average	Samples	Sample weight after conditioning	Sample weight after exposure	Water absorption percentage
	mm		m^1 = grams	m^2 = grams	M % = (m^2 – m^1) /m^1 x100
Nitoproof 410	1.53 1.53 1.57	8363/49 8363/50 8363/51	8.5443 8.7486 9.0405	8.6492 8.8513 9.1400	1.23 % 1.17 % 1.10 %
					Average = 1.17 %

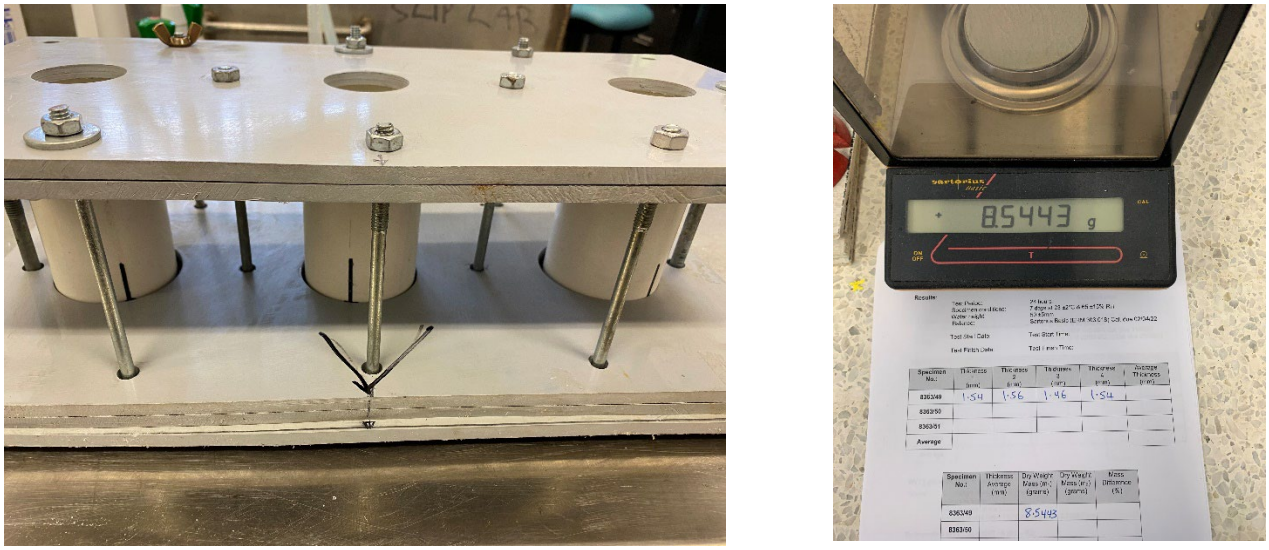


Figure 3 Test apparatus and weighing of Nitoproof 410

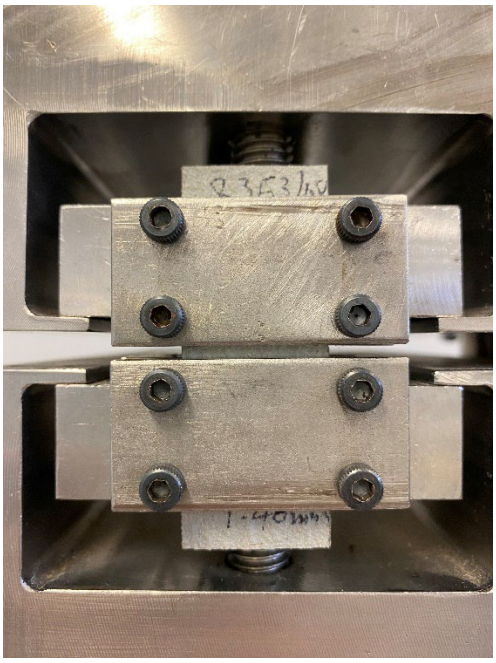
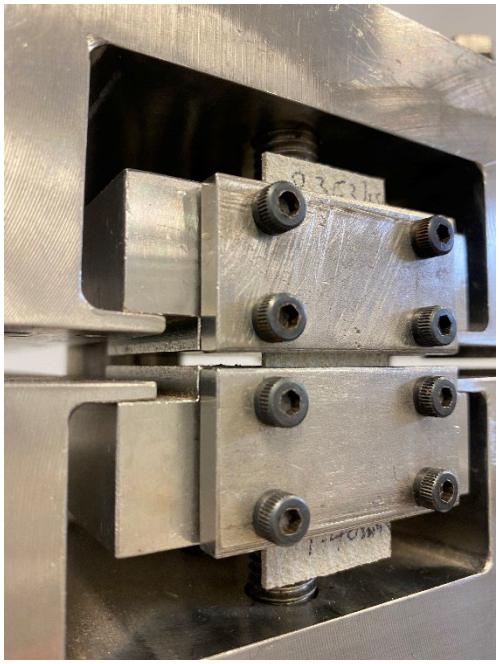
The performance criteria set out in AS/NZS 4858 – 2004, Table 8.1 (b), does not specify a limit. The maximum water absorption measured on the waterproofing membrane samples was 1.23%.

5.3 AS/NZS 4858-2004 Appendix B Resistance to cyclic movement

The test result for cyclic movement of the waterproofing membrane test sample is shown in Table 6 below. The test sample completed 50 cycles for the nominal 2 hour period.

Date of test: 9 March 2021 – 13 March 2021

Table 6 Test sample holding during cyclic movement and test results

Specimen:	**Nitoproof 410**
Test sample and elongation at break:	Test sample 65 (l) mm x 25 (w) mm x 1.46 (t) mm section; Maximum strain used for the cycling shall be 50% of the elongation a break – Class II.
Clamped test sample of cyclic test:	 
Observation and measurement:	<u>Observations:</u> At test completion the specimen showed no signs of rupture holing or cracking.

The performance criteria set out in AS/NZS 4858 – 2004, Table 8.1 (c) and section B4, pass or fail criteria by observing any rupture holing the specimen or extending through the thickness for more than 1 mm in from the edge of the specimen.

5.4 AS/NZS 4858-2004 Appendix A Durability of membrane

The tensile strength and elongation at break were recorded for the control and immersed test samples. Criteria for pass or failure of the immersed test samples were then compared to the control samples. AS/NZS 4858:2004 Table 6.1 joint movement bond breaker was also referenced in Table 7, below.

Date of test: 1st Revalidation **24th of May 2024 &** 08 February 2021, 18 February 2021, 11 March 2021, 2 April 2021, 4 April 2021, and 8 April 2021.

Table 7 Durability test results

Nitoproof 410			Tensile Strength and Elongation		
Control samples	Break Force (N)	Thickness (mm)	Tensile strength (F/A) (MPa)	Elongation at break (mm) & (%)	Passed/Failed
SW8534/01	12.38	1.56	1.32	33.62 & 135	
SW8534/02	12.18	1.59	1.28	32.52 & 130	-
SW8534/03	14.25	1.58	1.50	31.11 & 124	-
SW8534/04	12.14	1.44	1.40	31.07 & 124	-
SW8534/05	11.82	1.58	1.25	30.91 & 124	-
Average	**12.55**	**1.55**	**1.35**	**31.85 & 127**	**Class II**
8363/01	12.57	1.58	1.33	32.64 & 131	-
8363/02	14.11	1.59	1.48	31.28 & 125	-
8363/03	11.90	1.45	1.37	35.64 & 143	-
8363/04	12.50	1.45	1.44	36.91 & 148	-
8363/05	11.99	1.46	1.37	33.58 & 134	-
Average	12.61	1.51	1.40	34.01 & 136	-
Water Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	9.59	1.53	1.05	36.88 & 148	Passed*
28 day period	4.68	1.48	0.52	29.50 & 118	Passed*
56 day period	8.05	1.46	0.92	26.21 & 105	Passed*
Bleach Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	7.41	1.52	0.81	45.16 & 181	Passed*
28 day period	8.64	1.49	0.97	48.52 & 194	Passed*
56 day period	8.79	1.46	1.00	50.48 & 202	Passed*
Detergent Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	10.41	1.55	1.12	35.63 & 143	Passed*
28 day period	4.52	1.44	0.52	27.27 & 109	Passed*
56 day period	4.05	1.48	0.46	16.15 & 65	Passed**
Heat Ageing @ 50°C	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	12.44	1.52	1.37	32.20 & 129	Passed*

Table A1: Pass / Fail and Criteria compared with control samples		*Passed – Elongation at break was above the 25% limit; and all immersed samples were above the 50% criteria for elongation at break Control samples. Class II of Table 6.1. ** Passed – The sample requires an elongation at break strain between 50% and 25% of the controls, the membrane requires addition bond relief above that given in Table 6.1. – Requirement for Joint Movement for Class II membranes. (A 35mm wide bond breaker/tape should be applied over a joint to accommodate the joint opening up by up to 5 mm.)

The performance criteria set out in AS/NZS 4858 – 2004, Table 8.1 (d), specifies a comparison of the immersed test samples to the unconditioned (control) test samples shall be greater than 50% elongation at break.

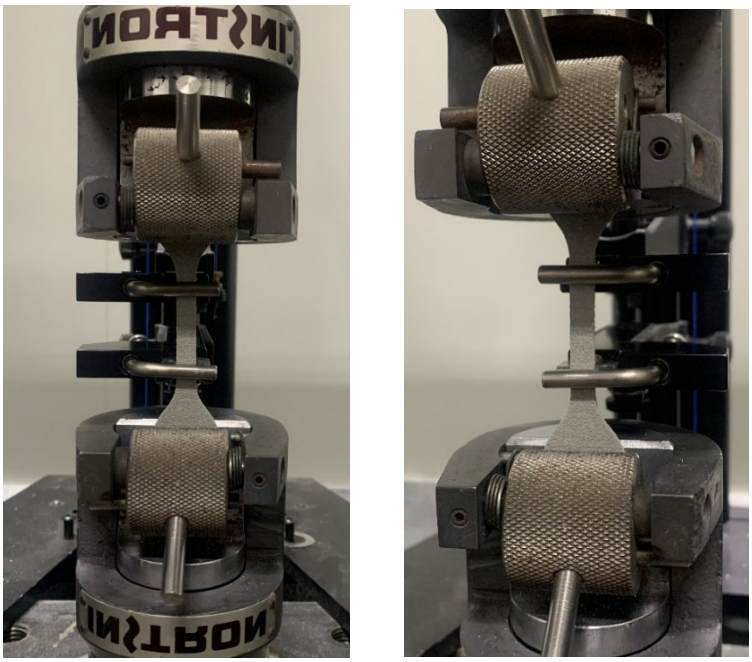


Figure 4 Images of test sample performing durability load / elongation test.

6 Comments

The Nitoproof 410, as described herein, when subjected to the test methods of AS/NZS 4858:2004 '*Wet area membranes*', the properties of (a) moisture vapour transmission, (b) water absorption, (c) cyclic movement (Class II), and (d) durability, met the performance criteria to AS/NZS 4858:2004 Wet Area Membranes,

- 1 st Revalidation Test performed for Control specimens with Strain 127%: Class II.
- The surface of specimens' membrane for 1st Revalidation smoother than the surface of the Membrane specimens of the main report - job No.8363A, which mostly has been applied by Brush, while the new Specimens we received for revalidation mostly been applied by Roller.

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End of report