Assessment of the Nitoproof 610 to AS 3740 for testing to AS/NZS 4858:2004 wet area membranes

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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 with 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 610 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 7.97 g/m^2/24hrs Permeance 54.76 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 0.08 %	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 III	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 III	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

Report No.	**8367**	**SW8552(1st Revalidation)**	
Year of test	2021	2024	
Control	434%	469%	**Class III**
Water Immersion(56d)	549%		PASS
Bleach Immersion (56d)	497%		PASS
Detergent Immersion	549%		PASS
Heat Ageing @ 50 ºC	419%		PASS

Full Description: (Inc. All layers); Single component polyurethane waterproofing membrane, With Black Colour.

Parchem Construction Supplies Pty Ltd test sample, Fosroc Nitoproof 610 achieves the performance requirements of AS/NZS 4858: 2004 Durability of Membranes for Class III membrane installation.

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

Class III type membrane: 2mm gauge length for a 4mm extension, repeated 50 cycles.

Requirement: No fatigue cracking exhibited.

Result: PASS

ASTM E96:2016 Water Vapour Transmission of Materials 7.97g/m²/24hr

AS 3558.1:1999 Method 1: Determination of water absorption characteristics

Water absorption:	Sample 1	0.03%	
	Sample 2	0.08%	
	Sample 3	0.06%	Maximum 0.05%

Conclusion: Fosroc Nitoproof 610 does not require a 'Suitability over particleboard' to pass the requirements of AS/NZS 4858 Wet area membranes

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 Job No.:	SW8552
TEST SPONSOR:	Parchem Construction Supplies Pty Ltd
PRODUCT DESCRIPTION:	Nitoproof 610

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 Job No.:	SW8552
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 Nitoproof 610 supplied by Parchem Construction Supplies Pty Ltd is a single component polyurethane liquid which cures by reaction with atmospheric moisture to give a tough elastomeric waterproof membrane. The nominal size of the membrane was 296 mm wide, 298 mm length and 1.53 mm thick.

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

Figure 1 Top face of Nitoproof 610

Figure 2 Underside of Nitoproof 610

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 43 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 610, 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 1.58 mm was cut from the Nitoproof 610, 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 610 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

Results reproduced from the same product test under AS 4654.1:2012 Waterproofing membranes for external above-ground use, Liquid Non-Exposed, reference report 8368.

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: 14 April 2021 – 27 May 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 610	8368/57 8368/58 8368/59	2.6×10^{-7} 2.8×10^{-7} 3.0×10^{-7}	7.59 8.10 8.23	52.15 55.64 56.49
	Average	2.8×10^{-7}	**7.97**	**54.76**

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 5, below.

Date of test: 13rd April 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 610	1.52 1.58 1.44	8367/49 8367/50 8367/51	10.9589 11.7238 10.0384	10.9619 11.7330 10.0442	0.03 % 0.08 % 0.06 %
					Average = 0.05 %

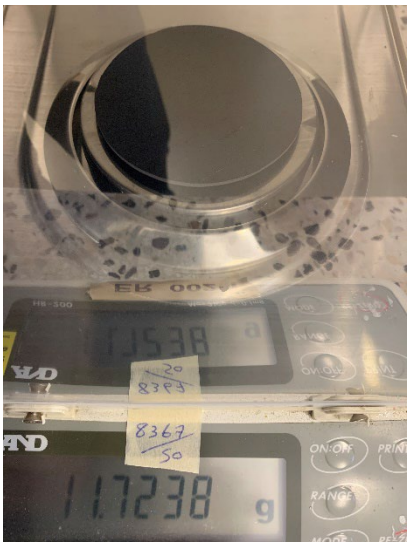


Figure 3 Test apparatus and weighing of Nitoproof 610

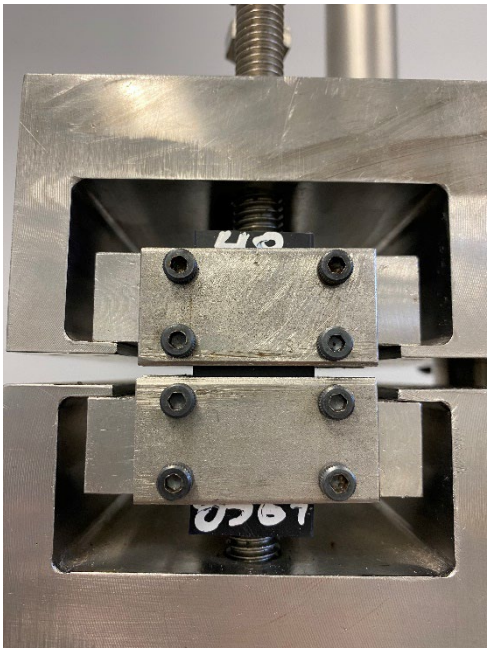
The performance criteria set out in AS/NZS 4858 – 2004, Table 8.1 (b), does not specify a limit. The maximum water absorption measured on the waterproofing membrane samples was 0.08 %.

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: 21st April 2021 – 25th April 2021

Table 6 Test sample holding during cyclic movement and test results

Specimen:	Nitoproof 610
Test sample and elongation at break:	Test sample 65 (l) mm x 25 (w) mm x 1.58 (t) mm section; Maximum extension movement used for the cycling is 4mm extension – Class III.
Clamped test sample of cyclic test:	 
Observation and measurement:	Observations: 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: 15 April 2021, 19 April 2021, 23 April 2021, 14 May 2021, 11 June 2021.

25 September 2024 (1st Revalidation).

Table 7 Durability test results

Nitoproof 610			Tensile Strength and Elongation		
Control samples	Break Force (N)	Thickness (mm)	Tensile strength (F/A) (MPa)	Elongation at break (mm) & (%)	Passed/Failed
SW8552/01	20.33	1.54	2.20	128.21&513	
SW8552/02	18.92	1.53	2.06	120.10&480	
SW8552/03	19.97	1.55	2.15	114.19&457	
SW8552/04	18.35	11.49	2.05	112&448	
SW8552/05	19.34	1.55	2.08	111.21&445	
Average	**19.38**	**1.53**	**2.11**	**117.14&469**	III
8367/01	22.49	1.59	2.36	102.17 & 409	-
8367/02	21.58	1.58	2.28	99.62 & 398	-
8367/03	22.37	1.59	2.34	114.88 & 460	-
8367/04	21.82	1.56	2.33	105.65 & 423	-
8367/05	22.39	1.56	2.39	120.56 & 482	-
Average	**22.13**	**1.58**	**2.34**	**108.58 & 434**	-
Water Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	16.63	1.54	1.80	108.05 & 432	Passed*
28 day period	17.65	1.54	1.90	144.51 & 578	Passed*
56 day period	17.41	1.54	1.89	137.37 & 549	Passed*
Bleach Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	21.36	1.54	2.31	149.86 & 599	Passed*
28 day period	17.27	1.46	1.97	141.83 & 567	Passed*
56 day period	16.91	1.54	1.83	124.20 & 497	Passed*
Detergent Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	16.46	1.56	1.76	127.97 & 512	Passed*
28 day period	15.32	1.53	1.67	137.81 & 551	Passed*

56 day period	15.06	1.57	1.60	137.19 & 549	Passed*
Heat Ageing @ 50°C	Average (N)		Average (MPa)	Average (mm) & (%)	-
7 day period	25.00	1.48	2.65	104.65 & 419	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 III of Table 6.1.		

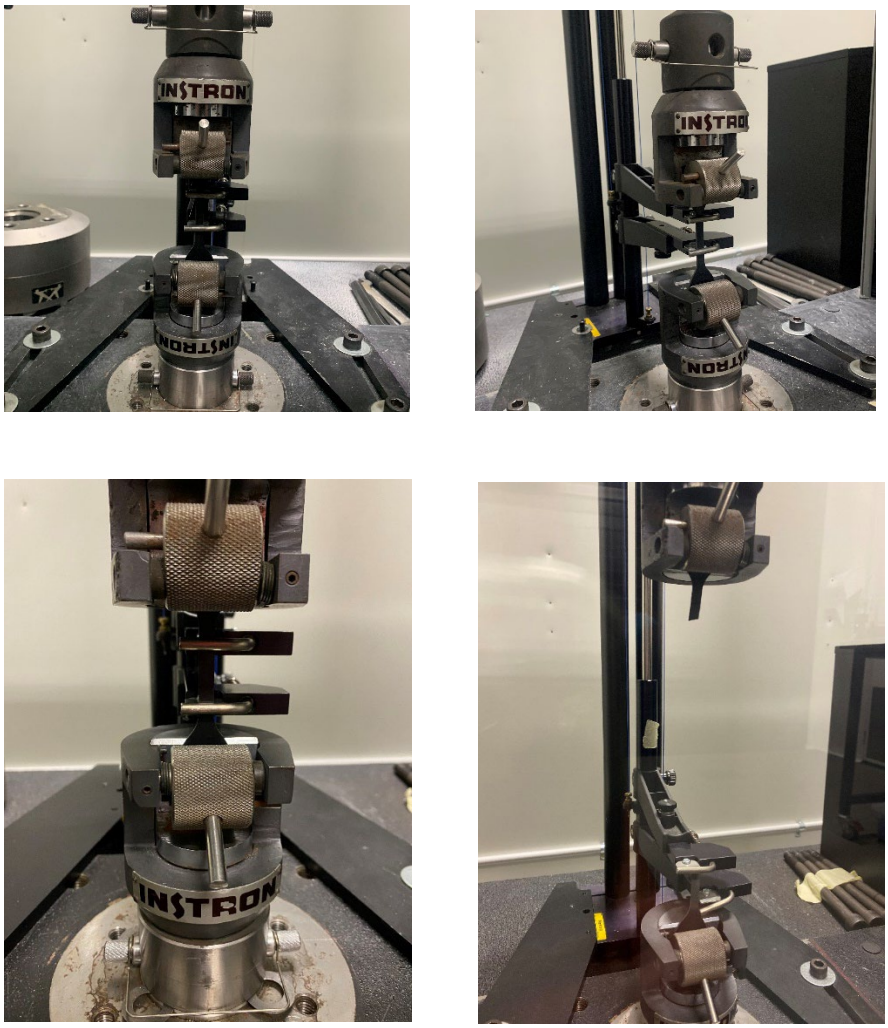


Figure 4 Images of test sample performing durability load / elongation test

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.

6 Comments

The Nitoproof 610, 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 III), and (d) durability (Class III), met the performance criteria to AS/NZS 4858:2004 Wet Area Membranes.

- 1st Revalidation applied with the Control, with Tensile Strength of 469% - Class III.

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End of report