Assessment of the Aquaproof 115 UV-R Waterproofing Membrane to AS 3740 for testing to AS/NZS 4858:2004 wet area membranes

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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 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 Aquaproof 115 UV-R - Waterproofing Membrane 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 7.79 g/m^2/24hrs Permeance 64.17 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 1.88 %	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

SUMMARY OF RESULTS

AS/NZS 4858:2004 Wet Area Membranes

Appendix A: Assessment of Durability of waterproof membranes

Test Report No.	**8319.1**	**SW8501-01**	
Year of test	2020	2023	
Control	328%	332%	**Class III**
Water Immersion@56 days	349%		PASS
Bleach Immersion	355%		PASS
Detergent Immersion	362%		PASS
Heat Ageing @ 50 ºC	368%		PASS

The Trustee for Pasco Construction Solutions Unit Trust, test sample, the Aquaproof 115 UV-R - Waterproofing Membrane 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

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:	7.79 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	1.36%	
	Sample 2	1.47%	
	Sample 3	1.88%	Maximum 1.60%

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 The Trustee for Pasco Construction Solutions Unit Trust 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.:	SW8649
TEST SPONSOR:	The Trustee for Pasco Construction Solutions Unit Trust
PRODUCT DESCRIPTION:	Aquaproof 115 UV-R - Waterproofing Membrane

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.:	SW8649
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 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 Aquaproof 115 UV-R - Waterproofing Membrane supplied by The Trustee for Pasco Construction Solutions Unit Trust is a one-component moisture curing membrane and has a polyurethane base. The nominal size of the membrane was 200 mm wide, 430 mm length and 1.2 mm thick.

For 1st revalidation, The nominal size of the membrane 300 X 150 X ~1.00 mm, 3 sheets.

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

Figure 1 Top face of Aquaproof 115 UV-R – Waterproofing Membrane

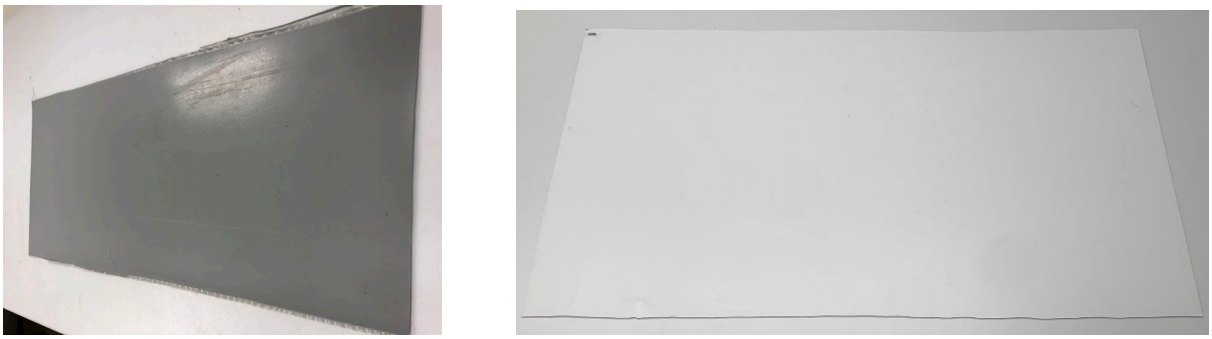


Figure 2 Underside of Aquaproof 115 UV-R – Waterproofing Membrane

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 is maintained at a temperature of 23 ±2°C and 50 ±5% relative humidity, for the 37 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 Aquaproof 115 UV-R - Waterproofing Membrane, 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 1.22 mm was cut from the Aquaproof 115 UV-R - Waterproofing Membrane, 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 Aquaproof 115 UV-R - Waterproofing Membrane 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: 29 July 2020 – 4 September 2020

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
Aquaproof 115 UV-R - Waterproofing Membrane	8319.1/53 8319.1/54 8319.1/55	2.3×10^{-7} 2.6×10^{-7} 2.8×10^{-7}	7.07 7.88 8.41	58.29 64.91 69.32
	Average	2.5×10^{-7}	**7.79**	**64.17**

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: 02nd July 2020

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
Aquaproof 115 UV-R - Waterproofing Membrane	1.23 1.18 1.19	8319.1/49 8319.1/50 8319.1/51	7.9586 7.7282 7.6455	8.0670 7.8415 7.7889	1.36 % 1.47 % 1.88 %
					Average = 1.60 %

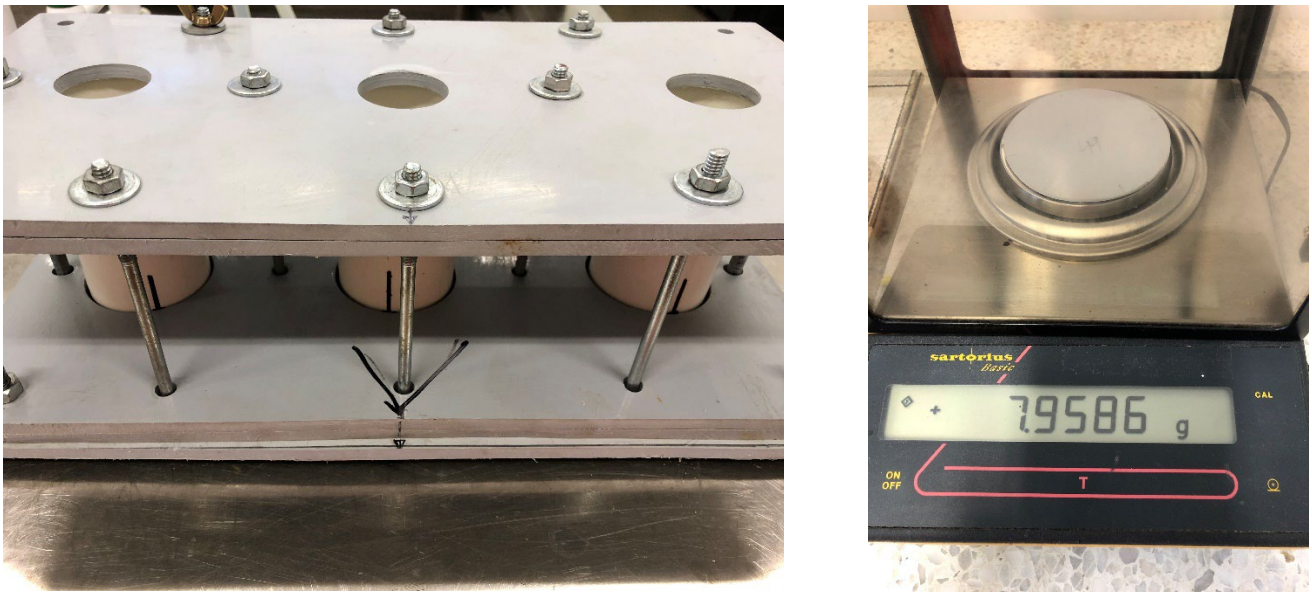


Figure 3 Test apparatus and weighing of Aquaproof 115 UV-R - Waterproofing Membrane

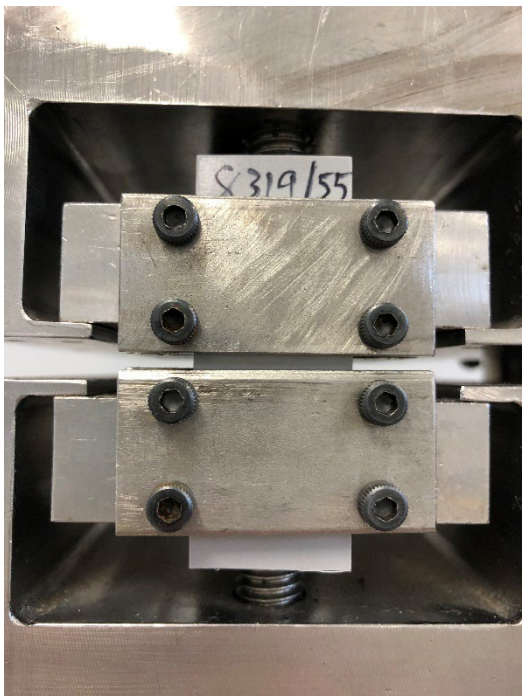
The performance criteria set out in AS/NZS 4858 – 2004, Table 8.1 (b), does not specify a limit. The maximum water absorption measured on the waterproofing membrane samples was 1.88%.

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: 19 March 2020 – 23 March 2020

Table 6 Test sample holding during cyclic movement and test results.

Specimen:	Aquaproof 115 UV-R – Waterproofing Membrane
Test sample and elongation at break:	Test sample 65 (l) mm x 25 (w) mm x 1.22 (t) mm section; Maximum extension movement used for the cycling is 4 mm 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.

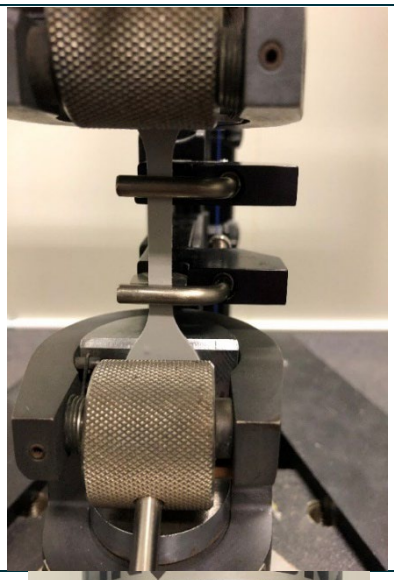
Date of test: 01 April 2020, 03 April 2020, 24 April 2020, 25 May 2020, and 25 June 2020,

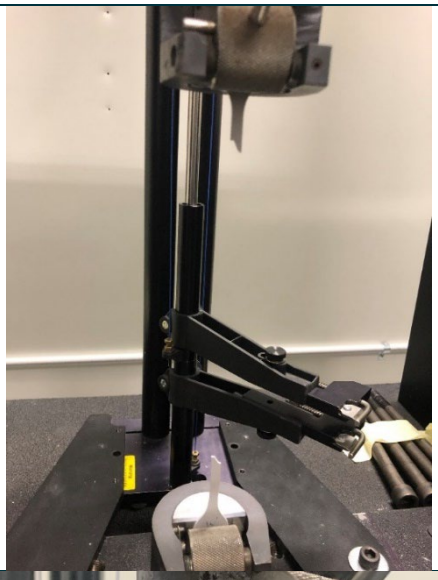
Date of test: for 1st revalidation report SW8501-01 : 15 December 2023.

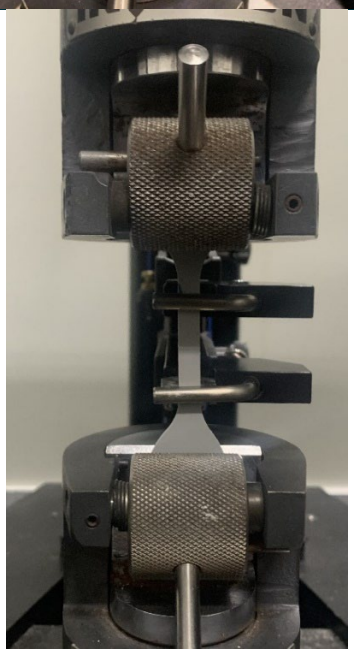
Table 7 Durability test results

Aquaproof 115 UV-R - Waterproofing Membrane			**Tensile Strength and Elongation**		
Control samples 1st revalidation 15/12/2023	Break Force (N)	Thickness (mm)	Tensile strength (F/A) (MPa)	Elongation at break (mm) & (%)	Passed/Failed
SW8501-01/01	49.18	0.96	8.54	85.86 & 343	-
SW8501-01 /02	43.58	0.94	7.73	77.59 & 310	-
SW8501-01 /03	46.34	0.93	8.30	83.62 & 334	-
SW8501-01/04	47.31	0.91	8.66	84.46 & 338	-
SW8501-01 /05	43.43	0.92	7.87	83.02 & 332	-
Average	45.97	0.93	8.22	**82.91 & 332**	-
Control samples	Break Force (N)	Thickness (mm)	Tensile strength (F/A) (MPa)	Elongation at break (mm) & (%)	Passed/Failed
8319.1/01	50.90	1.26	6.73	83.19 & 333	-
8319.1/02	52.45	1.25	6.99	85.83 & 343	-
8319.1/03	52.63	1.22	7.19	86.20 & 345	-
8319.1/04	47.94	1.27	6.29	77.25 & 309	-
8319.1/05	47.53	1.25	6.34	77.68 & 311	-
Average	50.29	1.25	6.71	82.03 & 328	-
Water Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7-day period	54.20	1.26	7.14	83.61 & 334	Passed*
28-day period	53.98	1.18	7.62	92.10 & 368	Passed*
56-day period	54.90	1.19	7.69	87.20 & 349	Passed*
Bleach Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-
7-day period	60.58	1.29	7.85	91.83 & 367	Passed*
28-day period	47.22	1.20	6.56	91.49 & 366	Passed*
56-day period	43.89	1.26	5.81	88.82 & 355	Passed*
Detergent Immersion	Average (N)		Average (MPa)	Average (mm) & (%)	-

7-day period	51.11	1.17	7.28	90.80 & 363	Passed*
28-day period	46.52	1.20	6.45	93.17 & 373	Passed*
56-day period	50.63	1.25	6.75	90.45 & 362	Passed*
Heat Ageing @ 50°C	Average (N)		Average (MPa)	Average (mm) & (%)	-
7-day period	59.37	1.16	8.53	91.97 & 368	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.		







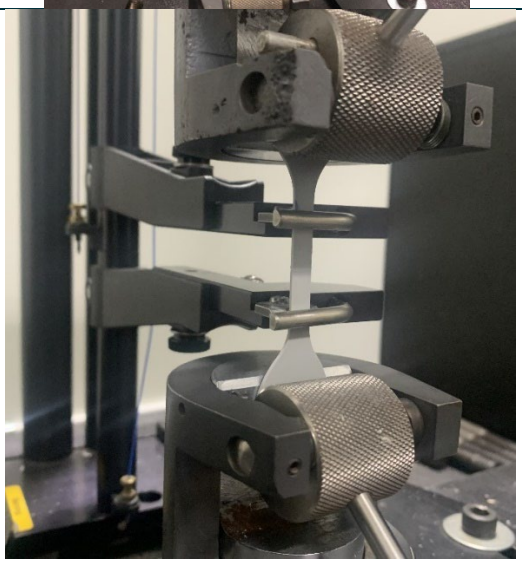


Figure 4 Images of test sample performing durability load / elongation test.

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 Aquaproof 115 UV-R - Waterproofing Membrane, 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, met the performance criteria to AS/NZS 4858:2004 Wet Area Membranes.

- The thickness range for the control specimens of the 1st revalidation report SW8501.01 is 0.91 – 0.96mm, which is less than the thickness range of the control specimens for the original report 8319.1, where was the range of 1.22 – 1.27mm.
- The average result of the 1st revalidation of the Control' specimens of the for SW8501-01, AS/NZS 4858:2004 for Control is **332**%, which is **greater** than 300%,
  Class III – High Extensibility.

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End of report