TEST REPORT

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TEST SUMMARY

Objective

Assessment of supplied sample to AS4654.1-2012

Project

Evaluation of Nitoproof 810 to AS4654.1-2012

Report Number

397-23 AS4654.1-2012

Customer

NAME	**Fosroc**
ADDRESS	**1956 Dandenong Rd, Clayton VIC 3168**
CONTACT PERSON	**Phil Jones**
TELEPHONE	**+64 21 833216**

Name of test material

Nitoproof 810

Description of test material

Single component water based grey membrane

Date of receipt of test material

14/11/2024

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Testing Facility and Location

NAME	XTec Gen Pty Ltd
ADDRESS	30-32 Park Avenue Woodville North 5012
ABN	22634729294

LIMITATION

The test results reported here relate only to the items tested.

CUSTOMER SUPPLIED INFORMATION & DATA

2 x coats @ 750um
Expected DFT: 750um
Dried film supplied

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the *XTecGen Test Request and Sample Submission Form*.

SIGNATORIES

Author	Reviewer
Michael Bakanyozo	*Eric Scardigno*
Head Laboratory Technician	*Laboratory Manager*

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SUMMARY OF TESTS

AS4654.1 Requirements:

PROPERTY	METHOD	RESULT	ASSESSMENT CRITERIA	ASSESSMENT
Abrasion Resistance: Non-Trafficable	*AS 1580.403.2*	***0.046 mm***	*AS 4654.1 Paragraph 2.3*	**Meets requirement for non-trafficable membrane**
Abrasion Resistance: Trafficable	*AS 1580.403.2*	***0.097 mm***	*AS 4654.1 Paragraph 2.3*	**Meets requirement for occasional service vehicle traffic and pedestrian traffic**
Bond Strength	*ASTM C794*	***45.97 N***	*State result*	
Acceptance of Cyclic movement	*AS 4654.1 Appendix B*	***Failure not observed***	*AS 4654.1 Appendix B, Paragraph B4*	**PASS**
Durability: Control Elongation at Break	*AS1145.3*	***426 %***	*AS 4654.1 Appendix A, Table A1*	**CLASS III**
Durability: Control Tensile Strength		***0.68 MPa***	*State result*	
Durability: Water Immersion Elongation at Break	*AS 4654.1 Appendix A*	***452 %***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: Water Immersion Tensile Strength		***0.16 MPa***	*State result*	
Durability: Detergent Immersion Elongation at Break		***398 %***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: Detergent Immersion Tensile Strength		***0.08 MPa***	*State result*	
Durability: Heat Aging Elongation at Break	*N/A*	***285 %***	*AS 4654.1, Table A4*	**PASS**
Durability: Heat Aging Tensile Strength		***1.57 MPa***	*State result*	

Durability: Ultraviolet Resistance Elongation at Break	*UV Lamp*	***235 %***	*AS 4654.1 Appendix A, Table A4*	**PASS**
Durability: Ultraviolet Resistance Tensile Strength		***1.19 MPa***	*State result*	[redacted]
Temperature Resistance: Water Vapour Transmission	*AMTM004*	***4.16g/m²/24 hours***	*State result*	
Water Vapour Transmission	*ASTM E96*	***4.34g/m²/24 hours***	*State result*	

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ABRASION RESISTANCE: NON-TRAFFICABLE

Testing

Test carried out in accordance with AS 1580.403.2.

Additions, deviations and/or exclusions from AS1580.403.2:

Determination of abrasive wear performed as per AS4654.1, Paragraph 2.3.1

Results

Date of test: 16/12/2024

PARAMETER	VALUE
Abrasion assessment method	Depth of abrasion
Abrasive wheels: Model	CS-10
Panel 1 Abrasive wheels: Serial Number & Expiry Date	LX20C1 – November 2026
Panel 2 Abrasive wheels: Serial Number & Expiry Date	LX20C1 – November 2026
Model of abraser	Gester GT-C14B-2
Number of cycles per test panel	500

PANEL	READING	THICKNESS BEFORE ABRASION (mm)	THICKNESS AFTER ABRASION (mm)	LOSS OF MEMBRANE BUILD (mm)
1	1	3.327	3.312	0.015
	2	3.442	3.383	0.059
	3	3.117	3.063	0.054
2	1	3.480	3.449	0.031
	2	3.210	3.157	0.053
	3	3.482	3.417	0.065
Mean		3.343	3.297	0.046
Standard Deviation		0.165	0.168	0.019

Passing Requirement: "*When tested in accordance with AS 1580.403.2 using the CS-10 wheel with 500 cycles, for areas subjected only to maintenance access, the depth of abrasion shall be less than 0.2mm*"

Result: 0.046mm. This sample is suitable for areas subjected to only maintenance access.

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ABRASION RESISTANCE: TRAFFICABLE

Testing

Test carried out in accordance with AS 1580.403.2.

Additions, deviations and/or exclusions from AS 1580.403.2:

Determination of abrasive wear performed as per AS4654.1, Paragraph 2.3.2

Results

Date of test: 16/12/2024

PARAMETER	VALUE
Abrasion assessment method	Depth of abrasion
Abrasive wheels: Model	H-22
Panel 1 Abrasive wheels: Serial Number	NA22B1
Panel 2 Abrasive wheels: Serial Number	NA22B1
Model of abraser	Gester GT-C14B-2
Number of cycles per test panel	1000

PANEL	READING	THICKNESS BEFORE ABRASION (mm)	THICKNESS AFTER ABRASION (mm)	LOSS OF MEMBRANE BUILD (mm)
1	1	3.362	3.328	0.034
	2	3.458	3.356	0.102
	3	3.460	3.318	0.142
2	1	3.365	3.272	0.093
	2	2.943	2.857	0.086
	3	3.232	3.105	0.127
Mean		3.303	3.206	0.097
Standard Deviation		0.056	0.020	0.038

Passing Requirement:

"Abrasion resistance for trafficable shall be as follows:

a) When tested in accordance with AS 1580.403.2 using the H-22 wheel with 1000 cycles, for areas subjected only to pedestrian traffic, the depth of abrasion shall be less than 0.2mm.

b) When tested in accordance with AS1580.403.2 using the H-22 wheel with 1000 cycles, for areas subjected only to occasional service vehicle traffic, the depth of abrasion shall be less than 0.1mm.

c) When tested in accordance with AS 1580.403.2 using the H-22 wheel with 1000 cycles, for areas subjected to regular vehicle traffic, the depth of abrasion shall be less than 0.05mm."

Result: The test achieved a depth of abrasion of 0.097mm. This sample is suitable only for occasional service vehicle traffic, and pedestrian traffic.

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BOND STRENGTH

Date of test: 14/01/2025

Testing:

Testing carried out in accordance with ASTM C794.

Additions, deviations and/or exclusions from ASTM C794:

Nil

Specimen Preparation:

PARAMETER	VALUE
Substrate	Concrete block
Substrate preparation	Wiped with damp cloth
Substrate primer	WPA 360
Mesh preparation	Wiped with damp cloth
Mesh primer	N/A

Test Results:

READING	PEAK PEEL FORCE (N)	MODE OF FAILURE			
		SUBSTRATE FAILURE (%)	ADHESIVE FAILURE (%)	COHESIVE FAILURE (%)	SCREEN DELAMINATION (%)
Specimen 1 Reading 1	62.03	0	0	0	100
Specimen 1 Reading 2	47.42	5	0	0	95
Specimen 1 Reading 3	46.01	10	0	0	90
Specimen 1 Reading 4	43.51	0	20	0	80
Specimen 2 Reading 1	50.52	0	0	0	100
Specimen 2 Reading 2	43.21	5	0	0	95

Specimen 2 Reading 3	39.99	5	0	0	95
Specimen 2 Reading 4	42.64	0	0	0	100
Specimen 3 Reading 1	48.15	0	0	0	100
Specimen 3 Reading 2	41.75	0	5	0	95
Specimen 3 Reading 3	41.55	0	0	0	100
Specimen 3 Reading 4	44.81	0	0	0	100
Average	45.97				
Std Dev	5.91				

Result: 45.97N

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CYCLIC MOVEMENT

Date of test: 2/12-6/12/2024

Testing:

Testing carried out in accordance with AS 4654.1 Appendix B "Assessment of resistance of waterproofing membranes to cyclic movement"

Additions, deviations and/or exclusions from AS 4654.1 Appendix B:

Nil

Test Parameters:

PARAMETER	VALUE
Membrane class	III
Number of cycles	50
Cycle time	2 Hours
Cycle expansion	4 mm
Sample Size	65 mm x 25 mm
Sample span	2 mm between plates
Sample thickness	0.792 mm

Test Results:

TEST RESULT	VALUE
Number of cycles completed	50
Surface crazing	Nil
Surface tears	Nil
Membrane rupture	Nil

Test Observations:

DAY	DATE	NUMBER OF CYCLES	Failure Observed		
			RUPTURE/HOLING		OTHER
1	2/12/2024	0	☐Yes	☒No	
2	3/12/2024	13	☐Yes	☒No	
3	4/12/2024	23	☐Yes	☒No	
4	5/12/2024	37	☐Yes	☒No	
5	6/12/2024	50	☐Yes	☒No	

Passing requirement: *"Any rupture holing the specimen or extending through the thickness for more than 1mm in from the edge of the specimen shall be taken as a failure and the number of cycles to failure shall be reported. If failure does not occur after 50 cycles it shall be reported together with the*

types of any surface defects that have been induced and the number of cycles at which onset of the defect occurred"

Result: Pass. Meets the requirement for CSIRO moving joint test as per AS 4654.1 Appendix B.

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DURABILITY OF MEMBRANE

CONTROL SET

Date of test: 25/11/2024

Testing: Test carried out in accordance with AS 1145.3.

Additions, deviations and/or exclusions from AS 1145.3: Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	23.4-24.9°C
Ambient humidity (conditioning)	38.0-48.9%RH
Ambient temperature (testing)	23.9°C
Ambient humidity (testing)	56.9%RH
Accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Video Extensometer
Method of preparation of specimens	Dry film supplied
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Replicate	Sample thickness (mm)	Maximum Extension (mm)	Tensile Strength (MPa)	Elongation at Break (%)
1	0.81	210.9	0.68	421
2	0.80	201.1	0.68	402
3	0.82	225.0	0.72	450
4	0.80	218.3	0.70	437
5	0.80	209.1	0.64	418
Mean	0.81	212.9	0.68	426
Std Deviation	0.01	9.1	0.03	18

Requirement for Class III (high extensibility): ≥300% elongation at break

Requirement for Class II (medium extensibility) 60-299% elongation at break

Requirement for Class I (low extensibility) <60% elongation at break.

Classification: Class III

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DURABILITY OF MEMBRANE

WATER IMMERSION

Date of test: 17/12/2024 – 4/02/2025

Testing:

Test carried out in accordance with AS 4654.1 Table A4.

Additions, deviations and/or exclusions from AS 4654.1 Table A4.

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	23.4-24.9°C
Ambient humidity (conditioning)	38.0-48.9%RH
Ambient temperature (testing)	23.3-24.5°C
Ambient humidity (testing)	39.9-59.1%RH
Minimum accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Video Extensometer
Method of preparation of specimens	Dry film supplied
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Sample Number	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	0.92	280.0	0.18	560
2	0.92	263.6	0.17	527
3	0.92	269.4	0.19	539
7 Day Means	0.92	271.0	0.18	542
7 Day Std Devs	0.00	8.3	0.01	17
4	1.05	203.4	0.12	407
5	1.06	188.2	0.11	376
6	1.02	188.8	0.11	378
28 Day Means	1.05	193.5	0.11	387
28 Day Std Devs	0.02	8.6	0.01	17
7	0.99	230.6	0.15	461

8	0.99	218.8	0.18	438
9	0.99	228.3	0.17	457
56 Day Means	0.99	225.9	0.16	452
56 Day Std Devs	0.00	6.3	0.02	13

Passing Requirement*: "Elongation at break shall not be less than 25% retention of elongation at break of the controls"58] Table 6.1. A failure is for less than 25% retention of elongation at break of the controls".*

To pass this condition an elongation at break value of 107% or greater is required.

Result: 452% PASS

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DURABILITY OF MEMBRANE

DETERGENT IMMERSION

Date of test: 17/12/2024 – 4/02/2025

Testing:

Test carried out in accordance with AS 4654.1 Table A4.

Additions, deviations and/or exclusions from AS 4654.1 Table A4:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	23.4-24.9°C
Ambient humidity (conditioning)	38.0-48.9%RH
Ambient temperature (testing)	23.3-24.5°C
Ambient humidity (testing)	39.9-59.1%RH
Minimum accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Video Extensometer
Method of preparation of specimens	Dry film supplied
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results: Detergent Immersion

Sample Number	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	0.95	273.0	0.16	546
2	0.94	275.0	0.19	550
3	0.94	269.3	0.19	539
7 Day Means	0.94	272.4	0.18	545
7 Day Std Devs	0.00	2.9	0.02	6
4	1.01	133.9	0.08	268
5	1.03	182.9	0.10	366
6	1.01	208.4	0.12	417
28 Day Means	1.01	175.1	0.10	350
28 Day Std Devs	0.02	37.9	0.02	76
7	1.02	205.0	0.07	410

8	0.98	226.0	0.09	452
9	1.00	166.5	0.08	333
56 Day Means	1.00	199.2	0.08	398
56 Day Std Devs	0.02	30.2	0.01	60

Passing Requirement: *"Elongation at break shall not be less than 25% retention of elongation at break of the controls".*

To pass this condition an elongation at break value of 107% or greater is required.

Result: 398% PASS

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DURABILITY OF MEMBRANE

HEAT AGING

Date of test: 11/12/2024

Testing:

Test carried out in accordance with AS 4654.1 Table A4.

Additions, deviations and/or exclusions from AS 4654.1 Table A4:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	23.4-24.9°C
Ambient humidity (conditioning)	38.0-48.9%RH
Ambient temperature (testing)	24.5°C
Ambient humidity (testing)	47.2%RH
Accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Video Extensometer
Method of preparation of specimens	Dry film supplied
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Number of replicates	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	0.79	134.2	1.80	268
2	0.80	147.8	1.44	296
3	0.80	144.8	1.46	290
Mean	0.79	142.3	1.57	285
Std Deviation	0.01	7.2	0.20	14

Passing Requirement*: "Elongation at break shall be not less than 50% of the result recorded for the controls".*

To pass this condition an elongation at break value of 213% or greater is required.

Result: 285% PASS

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DURABILITY OF MEMBRANE

ULTRAVIOLET EXPOSURE

Date of test: 8/01/2025

Testing:

Test carried out in accordance with AS 4654.1 Table A4, Appendix A.

Additions, deviations and/or exclusions from AS 4654.1 Table A4, Appendix A:

Nil

Test Parameters:

PARAMETER	VALUE
Ambient temperature (conditioning)	23.4-24.9°C
Ambient humidity (conditioning)	38.0-48.9%RH
Ambient temperature (testing)	24.2°C
Ambient humidity (testing)	44.7 RH
Accuracy grading of test machine	A
Specimen type	Type 2
Elongation measurement type:	Video Extensometer
Method of preparation of specimens	Dry film supplied
Orientation of specimens to direction of cast	Parallel to direction of casting blade
Clamping device:	Pneumatic jaws
Testing speed:	50mm/min

Test Results:

Number of replicates	Sample thickness (mm)	Maximum Extension (mm)	Tensile strength (MPa)	Elongation at break (%)
1	0.79	110.3	1.20	221
2	0.76	125.1	1.12	250
3	0.76	117.1	1.24	234
Mean	0.77	117.5	1.19	235
Std Deviation	0.02	7.4	0.06	15

Passing Requirement*: "Elongation at break shall be not less than 40% of the result recorded for the controls ".*

To pass this condition an elongation at break value of 171% or greater is required.

Result: 235% PASS

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TEMPERATURE RESISTANCE

Date of test: 2/12 - 16/12/2024

Testing:

Test carried out in accordance with AMTM004.

Additions, deviations and/or exclusions from AMTM004:

Nil

Test Parameters:

PARAMETER	VALUE
Cold exposure: Immersion date	25/11/2024
Cold exposure: Removal date	27/11/2024
Cold exposure: Temperature range	-15.0/-17.6
Heat exposure: Immersion date	27/11/2024
Heat exposure: Removal date	29/11/2024
Heat exposure: temperature range	85°C
WVT: Date of test	2/12-16/12/2024
WVT: Test temperature	23.1-24.3°C
WVT: Test humidity	48.1-58.6% RH
WVT: Cup design	Round, anodised aluminium cup
WVT: Cup sealant	Paraffin Wax
WVT: Desiccant	Anhydrous Calcium Chloride

Test Results- Temperature Resistance

SAMPLE	THICKNESS (mm)	SIDE OF SPECIMEN HIGHER VAPOUR PRESSURE WAS APPLIED TO	REGRESSION		WATER VAPOUR TRANSMISSON RATE ($g/m^2/24$ hours)
			EQUATION	r^2 VALUE	
1	0.78	Side A, top of cast film	$Mass_{(g)}=0.0006(Time_{hr})+170.05$	0.9993	4.34
2	0.79	Side A, top of cast film	$Mass_{(g)}=0.0005(Time_{hr})+161.98$	0.9990	3.60
3	0.79	Side B, bottom of cast film	$Mass_{(g)}=0.0006(Time_{hr})+171.35$	0.9995	4.34

4	0.77	Side B, bottom of cast film	$Mass_{(g)}=0.0006(Time_{hr})+170.81$	0.9996	4.34
Mean	0.78				4.16
Std Deviation	0.01				0.37

Result: 4.16 g/m^2/24 hours. PASS

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WATER VAPOUR TRANSMISSION RATE

Date of test: 26/11 - 10/12/2025

Testing:

Test carried out in accordance with ASTM E96 Desiccant Method.

Additions, deviations and/or exclusions from ASTM E96 Desiccant Method:

Nil

Test Parameters:

PARAMETER	VALUE
Test temperature:	23.5-24,3°C
Test humidity:	48.1-59.6% RH
Cup design:	Round, anodised aluminium cup
Sealant:	Paraffin Wax
Desiccant:	Anhydrous Calcium Chloride

Test Results

SAMPLE	THICKNESS (mm)	SIDE OF SPECIMEN HIGHER VAPOUR PRESSURE WAS APPLIED TO	REGRESSION		WATER VAPOUR TRANSMISSION RATE (g/m^2/24 hours)
			EQUATION	r^2 VALUE	
1	0.78	Side A, top of cast film	$Mass_{(g)}=0.0006(Time_{hr})+170.95$	0.9996	4.34
2	0.78	Side A, top of cast film	$Mass_{(g)}=0.0006(Time_{hr})+170.99$	0.9997	4.34
3	0.77	Side B, bottom of cast film	$Mass_{(g)}=0.0006(Time_{hr})+170.18$	0.9997	4.34
4	0.76	Side B, bottom of cast film	$Mass_{(g)}=0.0006(Time_{hr})+171.07$	0.9996	4.34
Mean	0.77				4.34
Std Deviation	0.01				0.00

Result: 4.34 g/m^2/24 hours. PASS

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END OF REPORT