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PRODUCT TESTING REPORT

Subject	COVER TYPE TESTING
Prepared For:	DUCAST AUSTRALIA
Address:	2 STACEY STREET BANKSTOWN NSW 2200
Attention:	JOHN GILBERT
PO Number:	TBC
Identification:	DUCTILE IRON COVER AND FRAME 600mm CLEAR OPENING CLASS D-E DA-3
Specification:	AS 3996: 2019 "Access Covers and Grates"
Report Number:	076398-2
Test Personnel:	Chris Vines
Date:	23 July 2019

1. INTRODUCTION

It was requested that type load testing, water tightness testing, gas tightness testing, uplift testing (traffic and flood) and slip resistance testing be performed on a 600 mm clear opening circular cover in its frame. The subject was described as a Class D/E sealed ductile iron cover with 600 mm opening dimensions (refer to Figure 1) and hinged on one side. Unit was tested with a 70 Duro hardness seal installed.

The testing was performed in accordance with AS 3996: 2019 "Access Covers and Grates" Appendices C/D/E/J and section 4.2.6.

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Figure: 1
Subject: Cover submitted for testing (note the hinge at the top end and securing bolts at the bottom)

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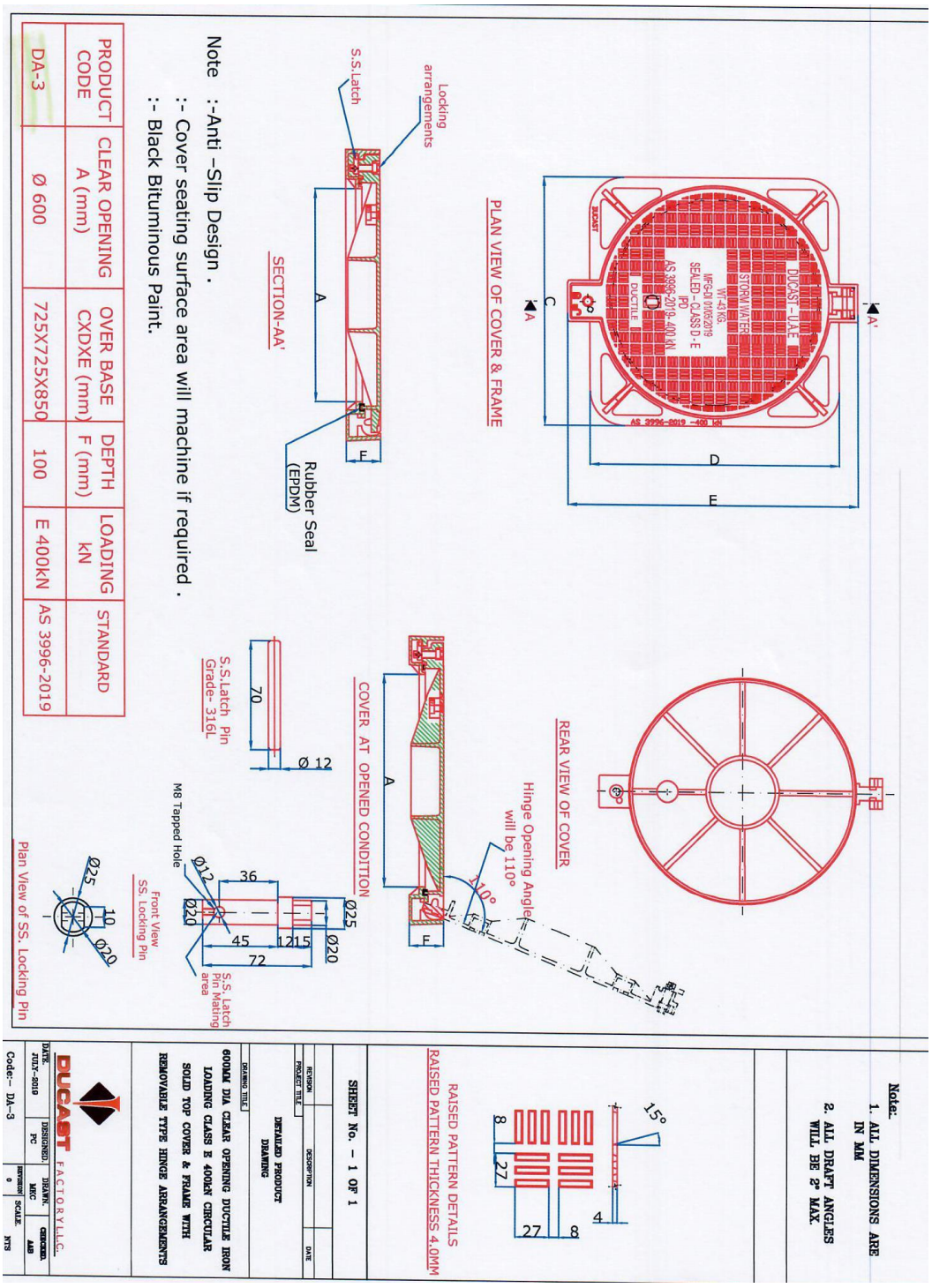

Figure: 2

Subject: Typical design of the cover

Prepared by:

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Victoria, Australia

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2. SLIP RESISTANCE TESTING

The as submitted cover and its frame were fixed to a flat surface and the slip resistance of the top surface determined using the wet pendulum method as per AS 4586 "Slip Resistance Classification of New Pedestrian Surface Materials" – 2013.

Top surface classified as class P3 and hence complies with AS 3996 section 4.2.6., refer to test report M0687.1d appended to this report.

3. WATER TIGHTNESS TESTING

The as submitted cover and its frame were installed in a test fixture which kept water on the topside of the assembly to a known depth and allowed for observation of the underside. The following test parameters were to achieve the result listed below (as per AS 3996-2019 appendix E):

Sealant used:	Unit tested as supplied by client
Coating system:	Unit tested as supplied by client
Water depth:	152mm water (A0986)
Test date:	11/07/2019
Test time:	10 minutes
Observations:	No evidence of leakage in the frame to cover seal

4. GAS TIGHTNESS TESTING

The as submitted cover and its frame were installed in a test fixture which kept air pressure on the underside of the assembly and the top region was covered in a thin film of water. The following test parameters were to achieve the result listed below (as per AS 3996-2019 appendix F):

Sealant used:	Unit tested as supplied by client
Coating system:	Unit tested as supplied by client
Test pressure:	0.50 kPa (52mm water in manometer A0986)
Test date:	12/07/2019
Test time:	15 minutes
Observations:	No evidence of leakage in the frame to cover seal (<5mm film of water on lid)

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5. UPLIFT LOAD TESTING

The as submitted cover and its frame were installed upside down in a test fixture to perform the uplift tests (traffic and flood). The following test parameters were to achieve the result listed below (as per AS 3996-2019 appendix J):

Sealant used:	Unit tested as supplied by client	
Test block:	Test block 240 mm x 240 mm square (25 mm plywood)	
Test load:	315 N (traffic),	1360 N (flood)
Test date:	07/06/2019	
Test deflection:	0.00mm (traffic)	4.18mm (flood)
Maximum permitted:	12.5mm	12.5mm
Observations:	Deflection was less than the maximum permitted.	

6. TYPE LOAD TESTING, Clause C4.3

The cover was tested in accordance with Appendix C of AS3996. The subject was placed in the loading rig and positioned such that it was supported by the frame in horizontal plane with a minimum 25 mm clearance to the unobstructed opening and the load applied vertically to the geometric centre of the cover. The details of the testing apparatus are as follows:

- Compression test unit (A0260)
- Test block 240 mm x 240 mm square (25 mm plywood)
- Dial Gauge (A0230)

The test load equal to the serviceability design load was gradually applied and elastic deflection was recorded, after which load was released and reapplied for a total of 5 cycles with a minimum of 5s hold at each peak load. After the final load application the permanent set was recorded.

The test load equal to the ultimate limit state design load was then gradually applied and maintained for a minimum of 30 seconds after which the cover was assessed for failures.

6.1 Elastic deflection due to the serviceability design load test, Clause C4.5 Class D

Test Load:	160 kN (Clause 4.2.2.1(a) for CO > 250 mm, Table 3.1 Serviceability design load for Class D = 1) applied via bearing block to the cover in accordance with Appendix C.
Deflection under load:	5.90 mm (No structural failure observed).
Acceptance Criteria:	AS 3996: 2019 Class D CO/100 = 600/100 = 6.0 mm (see Table 4.2) Where: CO – circular opening = 600 mm.
Test date:	10/07/2019

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6.2 Permanent set due to the serviceability design load test, Clause C4.6 Class D

Test Load:	5 cycles at 160 kN (see above) applied via bearing block to the cover in accordance with Appendix C
Permanent set:	0.08 mm (No structural failure observed)
Acceptance Criteria:	AS 3996: 2019 Class D CO/600 = 600/500 = 1.2 mm for (CO) > 500 Where: CO – circular opening = 600 mm.
Test date:	10/07/2019

6.3 Ultimate limit test, Clause C4.7 Class D

Test Load:	240 kN (Clause 4.2.2.1(a) for CO > 250 mm, Table 3.1 Ultimate Limit state design load for Class D) applied via bearing block to the cover for a minimum of 30 seconds in accordance with Appendix C
Observations:	No structural failures observed in the test unit
Acceptance Criteria:	No visible cracking, collapse or other similar forms of structural failure occurred.
Test date:	10/07/2019

6.4 Elastic deflection due to the serviceability design load test, Clause C4.5 Class E

At clients request the lid was tested after being loaded to 240 kN as a preconditioning step

Test Load:	267 kN (Clause 4.2.2.1(a) for CO > 250 mm, Table 3.1 Serviceability design load for Class E = 1) applied via bearing block to the cover in accordance with Appendix C.
Deflection under load:	5.75 mm (No structural failure observed).
Acceptance Criteria:	AS 3996: 2019 Class E CO/100 = 600/100 = 6.0 mm (see Table 4.2) Where: CO – circular opening = 600 mm.
Test date:	10/07/2019

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6.5 Permanent set due to the serviceability design load test, Clause C4.6 Class E

Test Load:	5 cycles at 276 kN (see above) applied via bearing block to the cover in accordance with Appendix C
Permanent set:	0.25 mm (No structural failure observed)
Acceptance Criteria:	AS 3996: 2019 Class E CO/600 = 600/500 = 1.2 mm for (CO) > 500 Where: CO – circular opening = 600 mm.
Test date:	10/07/2019

6.6 Ultimate limit test, Clause C4.7 Class E

Test Load:	400 kN (Clause 4.2.2.1(a) for CO > 250 mm, Table 3.1 Ultimate Limit state design load for Class E) applied via bearing block to the cover for a minimum of 30 seconds in accordance with Appendix C
Observations:	No structural failures observed in the test unit
Acceptance Criteria:	No visible cracking, collapse or other similar forms of structural failure occurred.
Test date:	10/07/2019

7. RESULTS

The cover and frame, DA-3, Class D with clear opening of 600 mm **complied** with the type test requirements of AS 3996: 2019 Clauses 4.2.2, 4.2.4, 4.2.5, 4.2.6, 4.2.7 and 4.2.8.

The cover and frame, DA-3, when tested after the preconditioning load, Class E with clear opening of 600 mm **complied** with the type test requirements of AS 3996: 2019 Clauses 4.2.2, 4.2.4, 4.2.5, 4.2.6, 4.2.7 and 4.2.8.

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Figure: 3
Subject: Cover underside

Figure: 4
Subject: Test set up for water/gas tightness

Figure: 5
Subject: Cover load test

Figure: 6
Subject: Cover uplift test

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Appendix A – Slip test report M0687.1d

SafeEnvironments
MANAGING PROPERTY RISK

Slip Check to AS 4586-2013
DA-3SW/DA-3SEW

Report Number: M0687.1d
This Report Replaces Report Number M0687d
Report Date: 22 July 2019
Total Number of Pages 3

Accredited for compliance with ISO/IEC 17025 – Testing

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports

Issued by	Prepared for	Approved by
Safe Environments Pty Ltd Unit 4, 40 Bessemer Street Blacktown NSW 2148	ALS Global 450 Dynon Road West Melbourne VIC 3003	Dale Rowell Authorised Signatory

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Accreditation No: 218 Site No.: 14308
Accredited for compliance with ISO/IEC 17025 - Testing

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22 July 2019

Test Report No. M0687.1d

Slip Resistance Classification of New Pedestrian Surface Materials

AS 4586-2013 Appendix A (Wet Pendulum Test)
This Report Replaces Report Number M0687d

The slip resistance classification has been determined for unused surfaces using specific conditions. Factors such as usage, cleaning systems, applied coatings and patterns of wear may affect the characteristics of the surface after classification. Standards Australia Handbook 198:2014 *Guide to the specification and testing of slip resistance of pedestrian surfaces* provides guidance for the selection of slip resistant pedestrian surfaces classified in accordance with AS 4586-2013. It is recommended that this test report be read in conjunction with AS 4586 and HB 198.

Requested by:	ALS Global		
Client Address:	450 Dynon Road West Melbourne VIC 3003		
Product Manufacturer:	Ducast		
Product Description:	DA-3SW/DA-3SEW		
Test conducted according to:	AS 4586:2013 Appendix A		
Location:	450 Dynon Road, West Melbourne VIC 3003		
Conducted by:	Nasser Cura		
Date:	29 May 2019	Temperature:	14°C
Sample:	Unfixed	Cleaning:	None
Rubber slider used:	Slider 96	Conditioned:	Grade P 400 paper dry followed by wet lapping film
Slope of specimen:	Tested on a flat level surface		
Direction of Test:	Approximately 30° to profile		

	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5
Mean BPN of last 3 swings:	43	46	42	43	46

Reported SRV of Sample:	**44**
Class:	**P4**

Prepared by:

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Product Manufacturer:	Ducast
Product Description:	DA-3SW/DA-3SEW
Test conducted according to:	AS 4586:2013 Appendix A
Location:	450 Dynon Road, West Melbourne VIC 3003
Conducted by:	Nasser Cura

Date:	29 May 2019	Temperature:	14°C
Sample:	Unfixed	Cleaning:	None
Rubber slider used:	Slider 55	Conditioned:	Grade P 400 paper dry followed by wet lapping film
Slope of specimen:	Tested on a flat level surface		
Direction of Test:	Approximately 30° to profile		

	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5
Mean BPN of last 3 swings:	61	62	59	60	59

Reported SRV of Sample:	**60**
Temperature Corrected SRV of Sample:	**58**
Class:	**P5**

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