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ABN: 21 006 353 046

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 E DA-1
Specification: AS 3996: 2019 "Access Covers and Grates"
Report Number: 076398-1 Rev 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 rectangular cover in its frame. The subject was described as a Class E sealed ductile iron cover with 600 mm x 600 mm opening dimensions (refer to Figure 1).

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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Prepared by:

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Figure: 1

Subject: Cover submitted for testing (note the securing bolts for uplift resistance)

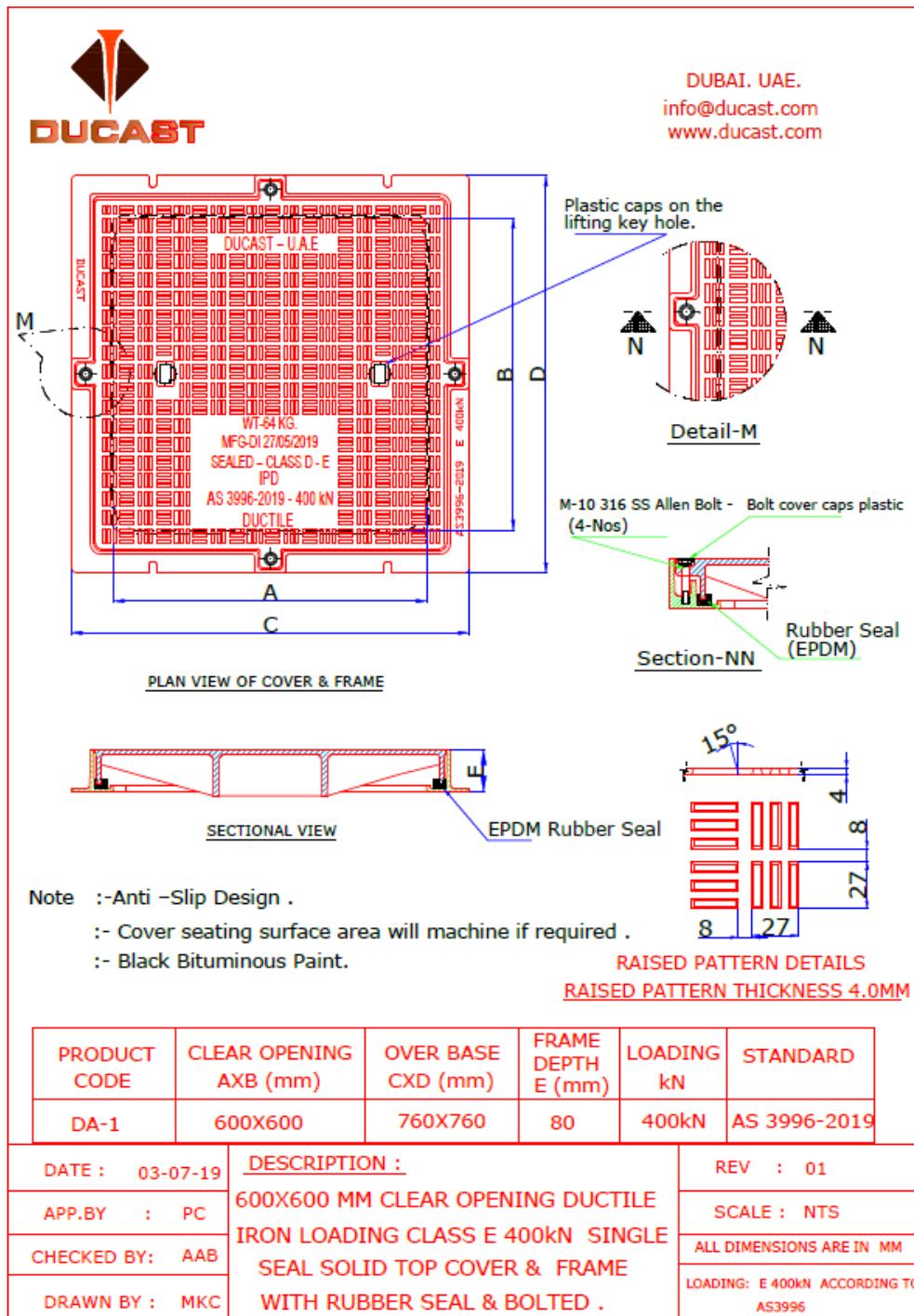
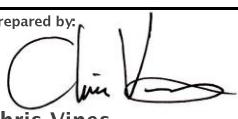


Figure: 2

Subject: Typical design of the cover



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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 M0687.1c 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: 153mm water (A0986)
Test date: 20/5/2019
Test time: 12 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: 21/5/2019
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: | 200 N (traffic), 1710 N (flood) |
| Test date: | 07/06/2019 |
| Test deflection: | 0.04mm (traffic), 1.50mm (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 Dia. (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

| | |
|------------------------|--|
| 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: | 5.39 mm (No structural failure observed). |
| Acceptance Criteria: | AS 3996: 2019 Class E $CO/100 = 600/100 = 6.0 \text{ mm}$ (see Table 4.2) Where: CO – circular opening = 600 mm. |
| Test date: | 07/06/2019 |



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

| | |
|----------------------|---|
| Test Load: | 5 cycles at 267 kN (see above) applied via bearing block to the cover in accordance with Appendix C |
| Permanent set: | 0.14 mm (No structural failure observed) |
| Acceptance Criteria: | AS 3996: 2019 Class E $CO/600 = 600/500 = 1.2 \text{ mm}$ for $(CO) > 500$ Where: CO – circular opening = 600 mm. |
| Test date: | 07/06/2019 |

6.3 Ultimate limit test, Clause C4.7

| | |
|----------------------|--|
| Test Load: | 400 kN (Clause 4.2.2.1(a) for $CO > 250 \text{ mm}$, 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: | 07/06/2019 |

7. RESULTS

The cover and frame, DA-1, 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.

Rev 2 issued to update sample identification.



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Figure: 3

Subject: Cover underside



Figure: 4

Subject: Test set up for water/gas tightness

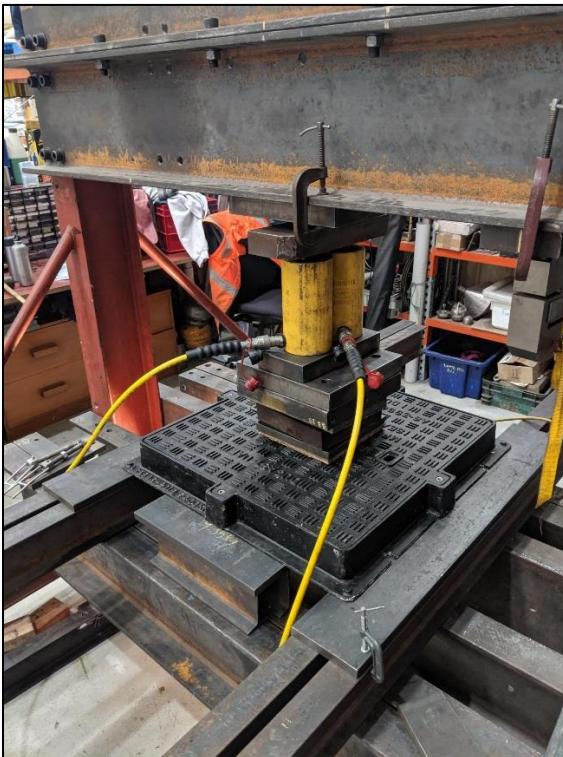


Figure: 5
Subject: Cover load test

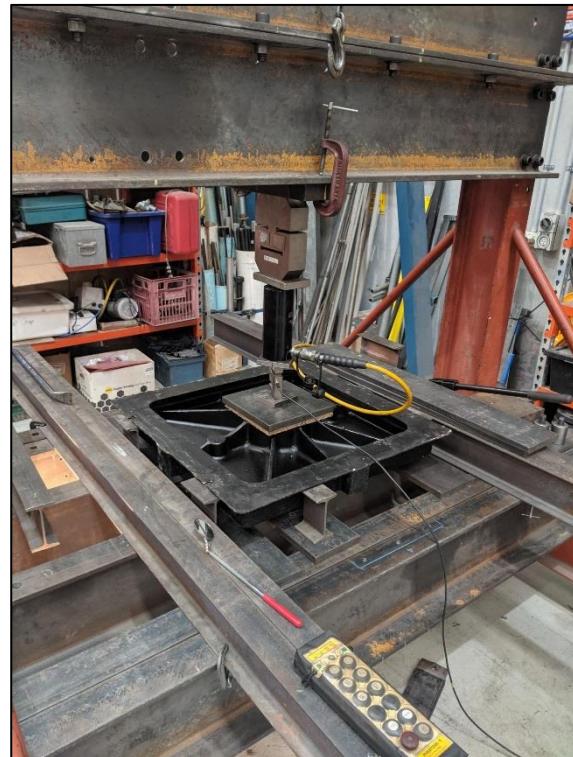


Figure: 6
Subject: Cover uplift test

Rev 1 issued to clarify sample identifications and include slip testing



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Appendix A – Slip test report M0687.1c



Slip Check to AS 4586-2013

DA-1

Report Number: M0687.1c
This Report Replaces Report Number M0687c
Report Date: 22 July 2019
Total Number of Pages 3

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

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Issued by

Safe Environments Pty Ltd
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Prepared for

ALS Global
450 Dynon Road
West Melbourne VIC 3003

Approved by

Dale Rowell
Authorised Signatory

22 July 2019
AS 4586-2013 Template Rev_6
M0687.1c - Slip Check, DA-1

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22 July 2019

Test Report No. M0687.1c

Slip Resistance Classification of New Pedestrian Surface Materials

AS 4586-2013 Appendix A (Wet Pendulum Test)
This Report Replaces Report Number M0687c

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
Product Manufacturer: West Melbourne VIC 3003
Product Description: Ducast
DA-1

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
Slope of specimen: Tested on a flat level surface by wet lapping film
Direction of Test: Approximately 30° to profile

| | Specimen 1 | Specimen 2 | Specimen 3 | Specimen 4 | Specimen 5 |
|----------------------------|------------|------------|------------|------------|------------|
| Mean BPN of last 3 swings: | 40 | 38 | 35 | 36 | 36 |

| | |
|-------------------------|----|
| Reported SRV of Sample: | 37 |
| Class: | P3 |

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22 July 2019
M0687.1c - Slip Check, DA-1

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076398-1 Rev 2 Winston Steel

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22 July 2019

Test Report No. M0687.1c

Slip Resistance Classification of New Pedestrian Surface Materials

AS 4586-2013 Appendix A (Wet Pendulum Test)
This Report Replaces Report Number M0687c

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Requested by: ALS Global
Client Address: 450 Dynon Road

West Melbourne VIC 3003

Product Manufacturer: Ducast

Product Description: DA-1

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: | 40 | 41 | 38 | 38 | 40 |

| | |
|--------------------------------------|----|
| Reported SRV of Sample: | 39 |
| Temperature Corrected SRV of Sample: | 37 |
| Class: | P3 |

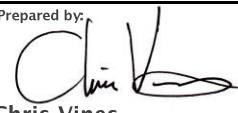
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M0687.1c - Slip Check, DA-1

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