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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 A/B DA7
Specification:	AS 3996: 2019 "Access Covers and Grates"
Report Number:	080376-5
Test Personnel:	Chris Vines
Date:	2 September 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 A/B sealed ductile iron cover with 750 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/E/F/J and section 4.2.6.

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Figure: 1
Subject: Cover submitted for testing (note the securing bolts for uplift resistance under the red caps)

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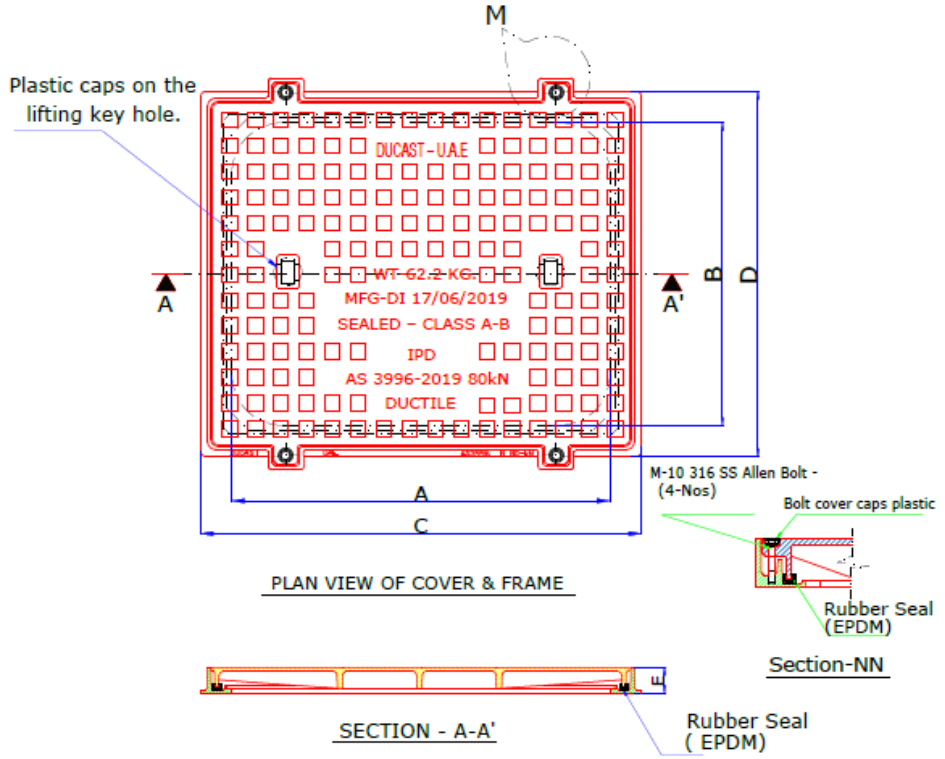

Note :-Anti –Slip Design.
:- Cover seating surface area will be machined if required .
:- Black Bituminous Paint .

CODE	CLEAR OPENING AXB (mm)	OVER BASE CXD (mm)	DEPTH E (mm)	LOADING kN	STANDARD
DA-7	750X600	876X727	52	80 kN	AS3996-2019

DATE : 02-09-19	DESCRIPTION : 750X600 MM CLEAR OPENING DUCTILE IRON LOADING CLASS B 80 kN SINGLE SEAL SOLID TOP COVER & FRAME WITH RUBBER SEAL & BOLTED .	REV : 0	
DRAWN BY : MC		SCALE : NTS	
CHECKED BY: AAB		ALL DIMENSIONS ARE IN MM	
APP.BY: PC.			

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.

The details of the testing apparatus are as follows:

- 'Skid Tester' unit
- Slider 55

The details of the testing conditions are as follows:

Slop of specimen	Tested on a flat level surface
Direction of test	30˚ to profile
Temperature	15˚C
Cleaning	None
Conditioned	Grate P400 paper dry followed by wet lapping film

Test set	#1	#2	#3	#4	#5
Mean BPN of last 3 swings	37	37	37	39	38
Reported SRV of Sample			38		
Temperature corrected SRV of Sample			37		
Class			P3		

Top surface classified as class P3 and hence complies with AS 3996 section 4.2.6.

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:	154mm water (A0986)
Test date:	26/8/2019
Test time:	15 minutes
Observations:	No evidence of leakage in the frame to cover seal

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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 (55mm water in manometer A0986)
Test date:	27/8/2019
Test time:	15 minutes
Observations:	No evidence of leakage in the frame to cover seal (<5mm film of water on lid)

5. UPLIFT LOAD TESTING

The as submitted cover and its frame were installed upside down in a test fixture to perform the uplift tests (flood only). 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:	21.0 kN (flood)
Test date:	28/08/2019
Test deflection:	0.21 mm (flood)
Maximum permitted:	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 AS 3996. 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 (A1769)
- 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.

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

Test Load:	53 kN (Clause 4.2.2.1(a) for CO > 250 mm, Table 3.1 Serviceability design load for Class B = 1) applied via bearing block to the cover in accordance with Appendix C.
Deflection under load:	4.76 mm (No structural failure observed).
Acceptance Criteria:	AS 3996: 2019 Class B CO/45 = 600/45 = 13.3 mm (see Table 4.2) Where: CO – circular opening = 600 mm.
Test date:	28/08/2019

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

Test Load:	5 cycles at 53 kN (see above) applied via bearing block to the cover in accordance with Appendix C
Permanent set:	0.11 mm (No structural failure observed)
Acceptance Criteria:	AS 3996: 2019 Class B CO/100 = 600/100 = 6 mm Where: CO – circular opening = 600 mm.
Test date:	28/08/2019

6.3 Ultimate limit test, Clause C4.7

Test Load:	80 kN (Clause 4.2.2.1(a) for CO > 250 mm, Table 3.1 Ultimate Limit state design load for Class B) 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:	28/08/2019

7. RESULTS

The cover and frame, DA-7, Class A/B 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, and 4.2.8.

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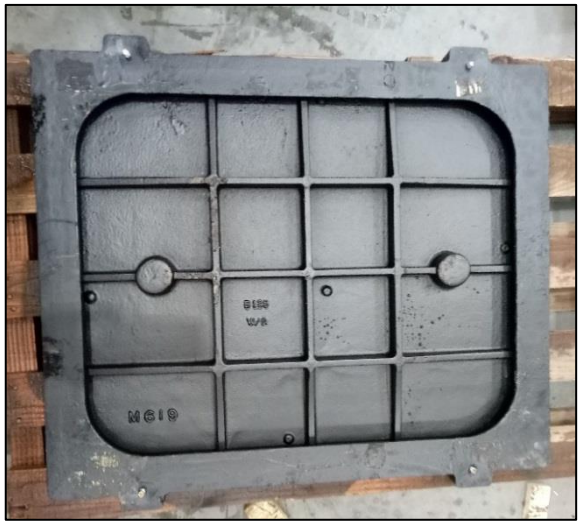

Figure: 3
Subject: Cover underside

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

Figure: 5
Subject: Cover load test

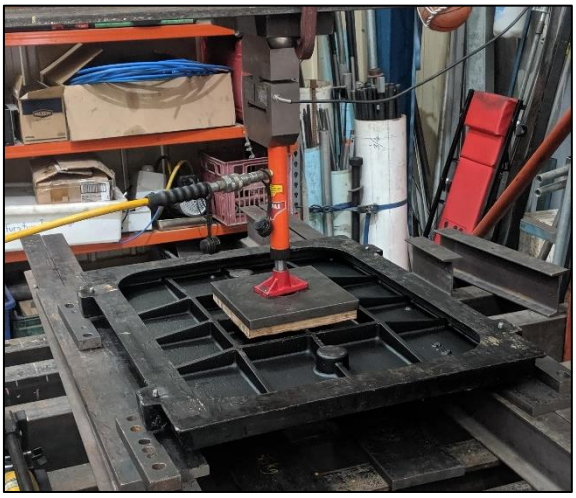

Figure: 6
Subject: Cover uplift test