Test 9e
Low-High-Low Cyclonic Testing of 0.48-mm BMT Trimdek Roof Sheeting with 75-mm Spacer (re-designed) and 100-mm Insulation

THE UNIVERSITY of ADELAIDE

THE SCHOOL OF CIVIL , ENVIRONMENTAL AND MINING ENGINEERING

THE UNIVERSITY OF ADELAIDE
SOUTH AUSTRALIA 5005
TELEPHONE 618 8303 5451
FACSIMILE 618 8303 4359
Operating through:
Adelaide Research & Innovation Pty. Ltd
ACN 008 027 085

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Prepared By: .....
DR F. POOYA NEJAD
ENGTEST

Approved By: .....
DR TOGAY OZBAKKALOGLU
ENGTEST CONSULTANT

ENGTEST
CIVIL, ENVIRONMENTAL AND MINING

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1. Introduction

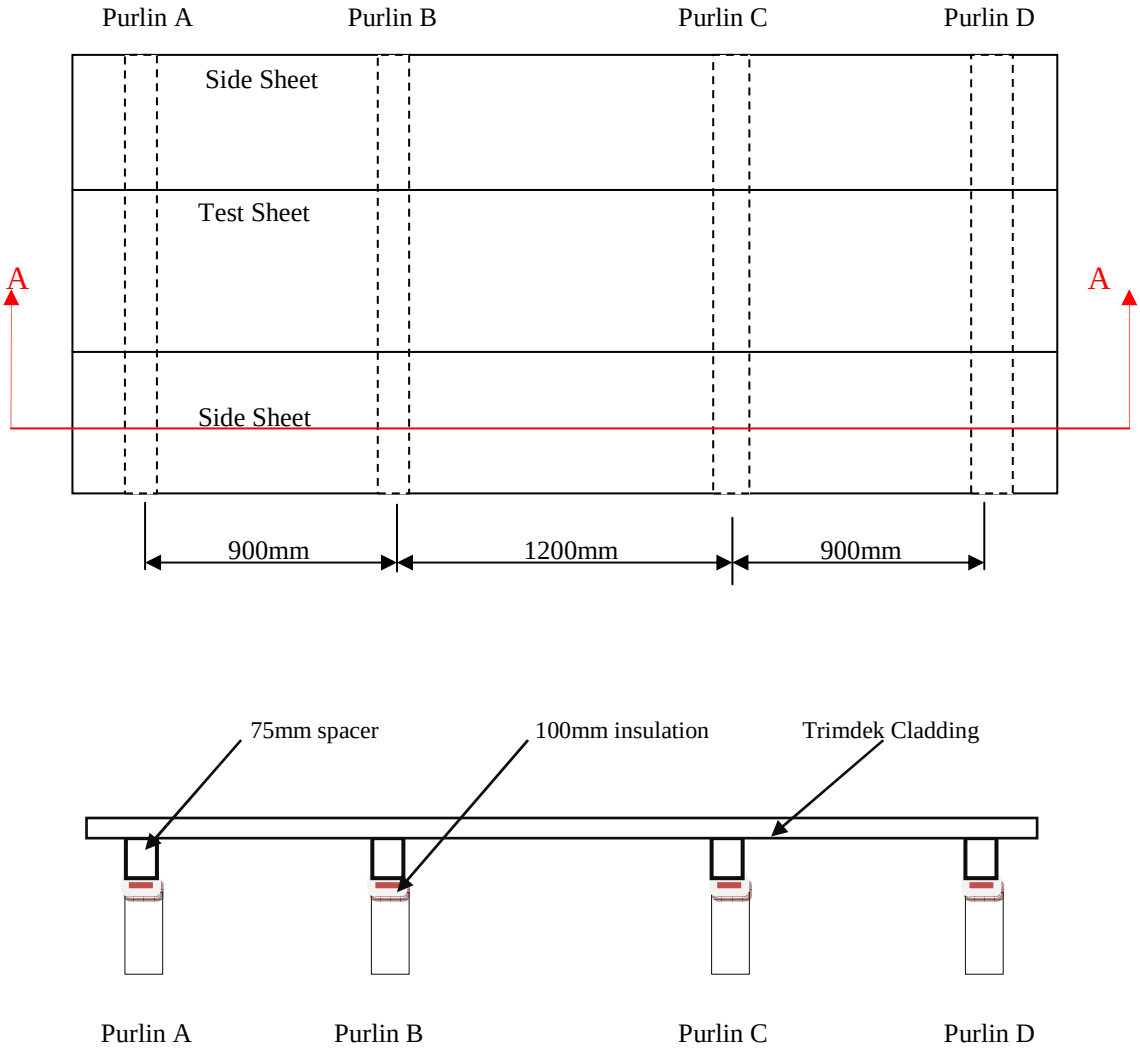
EngTest was approached by Mr. Dean Stubbs of JakMax Pty Ltd on behalf of Carey Roofing to undertake a series of cyclonic and non-cyclonic tests (including serviceability and strength limit states), on Carey Roofing products in accordance with the National Construction Code (NCC) and Australian Standard AS4040, as appropriate. This report relates to the cyclonic testing of Carey Roofing product in accordance with the NCC (2012). All materials (panels, purlins, spacers and screws) were provided by Carey Roofing. Test pressures were provided by Rachael Zeuner Consultant. Fixing of the panels was carried out by EngTest and Carey Roofing in accordance with the drawings and instructions provided by Rachael Zeuner Consultant, which are included in Appendix A. Testing was undertaken on 18th November 2013 by EngTest under the supervision of Mr Brendan Scott, and Dr Togay Ozbakkaloglu from the School of Civil, Environmental and Mining Engineering.

2. Description of Test Procedures and Equipment

The test rig conforms to the requirements of AS4040.0–1992 and consists of two fixed vertical sides and a moveable base between the sides. The base is supported on hydraulic jacks and can be moved vertically. The panel supports are fastened to the sides of the test rig and the panels under test are fastened to the supports. Loads are applied to the sheeting through the airbags placed between the sheeting and the base of the test rig. To simulate cyclonic loading, the base is raised and lowered hydraulically, compressing the airbags and hence, applying a pressure load to the sheeting. The movement of the base is controlled electronically via pressure transducers placed inside the airbags to generate the correct upper and lower pressure limits in the loading cycle. The lower limit is set to a value slightly above zero and below 10% of the upper limit, as specified in AS4040.3-1992. The loading rate is kept below 3Hz throughout the testing.

3. Test Details

Figures 1 and 2 show the test setup and installation arrangement of the panels on the test rig prior to testing. The setup of the airbag rig was undertaken by EngTest. The side sheets and purlin connections to the loading frame were considered to be the part of the test rig, and hence were not under test. The Trimdek sheeting was screwed to the spacers at every rib as illustrated in Figure 2. Figure 3 shows redesigned spacer used in testing and Table 1 provides a summary of the test details and configurations.



Section A-A

Figure 1. Test setup.

Figure 2. Installed sheet prior to testing.

Figure 3. Redesigned spacer used in testing.

Table 1. Test materials and span arrangement.

Spacer height (mm)	Insulation thickness (mm)	Purlin type	Cladding	Cladding span (mm)	Cover plate thickness (mm)	Fasteners	
						Spacer to Purlin	Cladding to Spacer
75	100	C1501.5	Trimdek 0.48mm BMT	900/1200/900	1.35	14_10×25mm Buildex Metal Hex head	14_10×65mm Buildex with square washer

Table 2 shows the pressure multipliers and loading sequence used for each test, which were in accordance with the NCC (2012). It should be noted that to calculate the actual test pressures (P_{test}), the applied airbag pressures *(P_a)* listed in Table 2 should be reduced by multiplying them by a suitable factor to account for the partial contact between the surface of the airbag and the test sheet. That is, P_{test} = *(reduction factor)* × P_a.

Table 2: Pressure Multipliers and Fatigue Test Load Sequence

Sequence	Number of Cycles	Applied Airbag Pressure (P_a = 4.50 kPa)	Max. Airbag Pressure (kPa)
A	4500	0 to 0.45 x P_a	2.02
B	600	0 to 0.6 x P_a	2.70
C	80	0 to 0.8 x P_a	3.60
D	1	0 to P_a, held for at least 10 Sec.	4.50
E	80	0 to 0.8 x P_a	3.60
F	600	0 to 0.6 x P_a	2.70
G	4500	0 to 0.45 x P_a	2.02

4. Test results

During all Load Sequences no permanent damage was observed at the test sheeting, the screws, or the spacers (Figures 4-6). Because the test sheet remained attached to the test setup for the duration of the test and exhibited no signs of damage, this test is deemed to have **passed** under the requirements of the NCC (2012).

Figure 4. Sheeting after testing.

Figure 5. Spacers after testing.

Figure 6. No permanent damage at the spacer after testing.

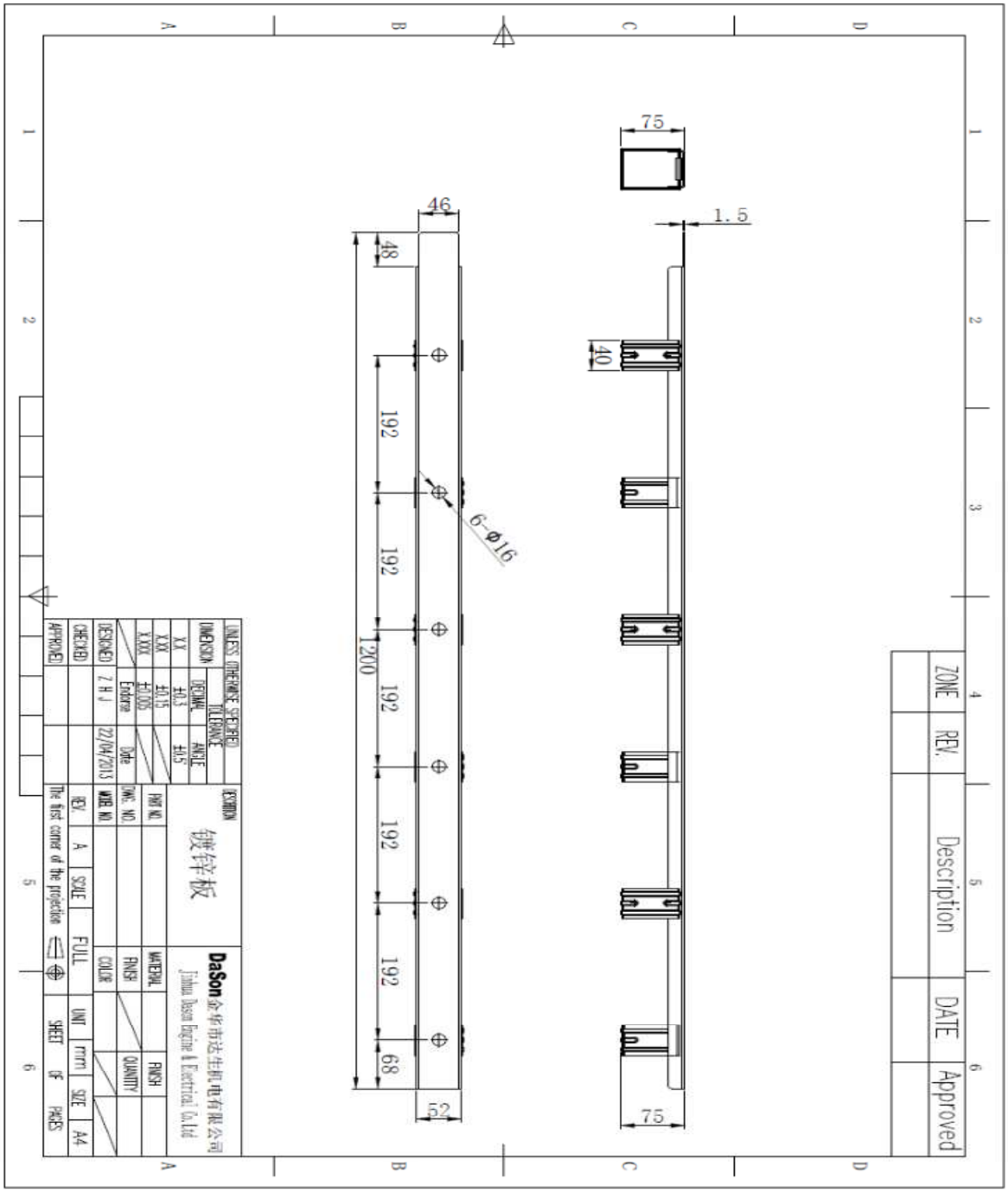
5. References

National Construction Code Series (NCC) 2012; Volume 1, Section B Structures, Specification B1.2 Design of Buildings in Cyclonic Areas; Australian Building Codes Board.

AS 4040.0-1992, Methods of testing sheet roof and wall cladding – Part 0: Introduction, list of methods and general requirements. Standards Australia, Homebush, NSW, Australia.

AS 4040.2-1992, Methods of testing sheet roof and wall cladding – Method 2: Resistance to wind pressures for non-cyclone regions. Standards Australia, Homebush, NSW, Australia.

APPENDIX A: Carey Roofing Fixing Details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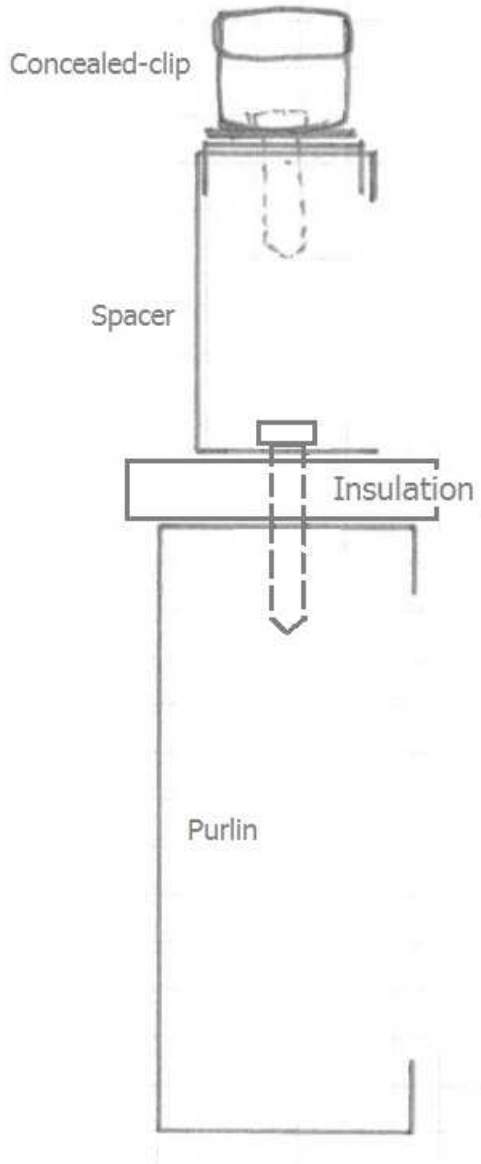
Spacer Installation Diagram



Rachael Zeuner Consulting Engineer

rachael zeuner

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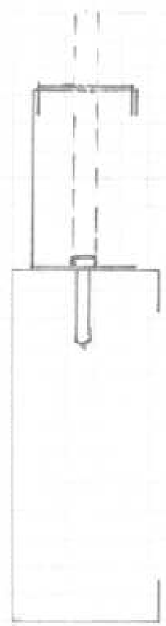
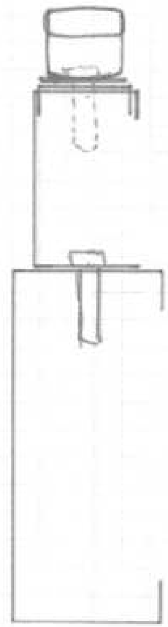
① Step 1



② Step 2



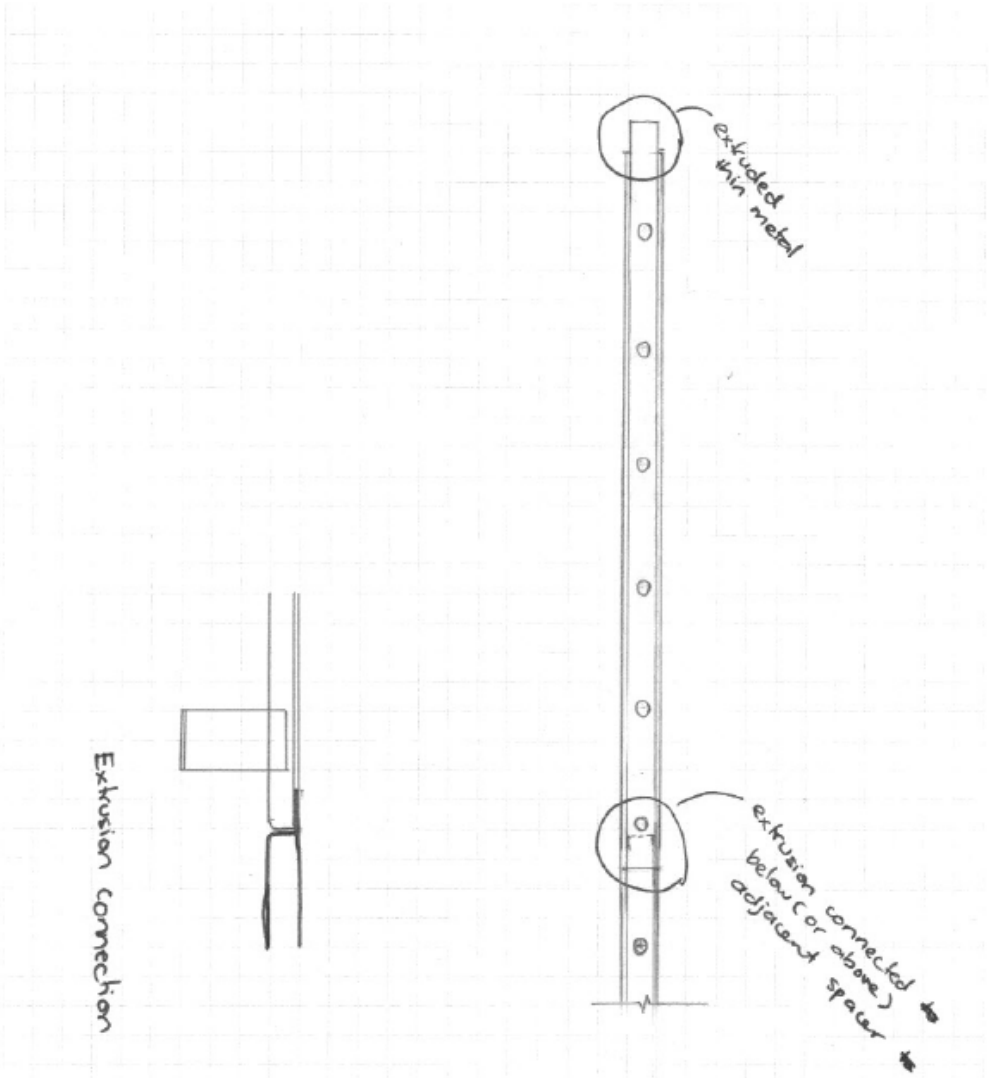
- Fix concealed-clip to spacer

~~Using a socket drive~~ (5/16" socket),
- Place screw into a 5/16" socket drive.
- Put the socket drive through the hole on the top plate of the spacer to fix the legs of the spacer onto the steel purlin supports.

Rachael Zeuner | Structural Engineer | BE MIEAust CPEng | 0411 874 811 | Rachael.zeuner@internode.on.net

Date:
Job:
Page:

rachael zeuner



Rachael Zeuner | Structural Engineer | BE MIEAust CPEng | 0411 874 811 | Rachael7euner@internode.on.net