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THERMAL CLEARANCE TESTING OF THE NEO 1.6 FREE-STANDING SOLID FUEL APPLIANCE INSTALLED WITH A TRIPLE SKIN FLUE KIT

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by
S. Marland

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**THERMAL CLEARANCE TESTING OF THE NEO 1.6
FREE-STANDING SOLID FUEL APPLIANCE INSTALLED WITH A 6 INCH TRIPLE
SKIN (DEFAULT) FLUE KIT
Report**

The appliance and flue system were installed into a Clearance Test enclosure and tested in two positions in a manner conforming to joint Australian/New Zealand Standard 2918:2001, Appendix B. A minimum 880mm deep x 835mm wide x 9mm thick floor protector (Bellis board) should be used under and in front of the appliance base when installing the appliance (see joint AS/NZS 2918:2001 3.3.2). The floor protector should extend 300mm in front of the appliance base. The Thermal conductivity of the floor protector is 0.1m²K/W, per 9mm thick sheet.

The Neo 1.6 Free-Standing solid fuel appliance installed with a 6 inch triple skin (default) flue kit conforms to the requirements of the joint AS/NZS 2918:2001 Standard, Appendix B, with respect to rear wall, side wall, floor and ceiling surface temperatures, when tested in the positions described in this report and using *Pinus radiata* firewood as the fuel type.

TEST POSITIONS

The appliance and flue combinations were tested at the following clearances:

Position A (Parallel)

- 320mm from rear wall to the edge of the appliance rear panel when installed with decromesh only.
- 120mm from the rear wall to the edge of the appliance rear panel when installed with a 130° x 900mm stainless steel flue shield between the decromesh casing and active flue.
- 250mm from side wall to the edge of the appliance side panel.

Position B (Corner)

- 150mm from walls when measured from the closest points of the appliance (45° to both walls).

Refer to Appendix 1 of this report for clearance diagrams.

Investigation: A. Wood
Report: S. Marland
Checked by: A. Reid

Signed:
A. Reid
Technical Officer

Approved:
S. Marland
Group Leader, Energy & Greenhouse Div.

1. INTRODUCTION

HRL Technology Pty Ltd was requested to assess the Neo 1.6 Free-Standing solid fuel appliance installed with a 6 inch triple skin (default) flue kit. Clearance testing was performed according to joint AS/NZS 2918:2001, Appendix B.

This report provides details of the safety clearance tests performed at the Solid Fuel Heater Testing and Research Laboratory of HRL Technology Pty Ltd. The testing was conducted on February 10 and 11, 2015, by Mr A. Wood. The testing was commissioned by Pacific Energy Fireplace Products and the test results remain the property of this company.

The appliance was tested using *Pinus radiata* as firewood. No testing was undertaken with coal or briquettes.

2. DETAILS OF APPLIANCE

The test results reported below apply only to the appliance/flue system tested. The details of the appliance given in this section include features which may affect safety clearances. Any change in the construction or design of this model of the appliance or flue could invalidate this report.

Appendix 2 gives test appliance construction details.

3. INSTALLATION OF THE APPLIANCE

The appliance/flue combination was installed in two test positions at clearances specified by the manufacturer after preliminary testing. Floor thermocouples were positioned according to joint AS/NZS 2918:2001, Appendix B.

3.1 Floor Protector

A floor protector was installed beneath and in front of the appliance. The floor protector (cement fibre or similar) must be installed so that its leading edge is a minimum of 300mm in front of the appliance base. The floor protector must be a minimum of 835mm wide x 880mm deep x 9mm thick. The floor protector consisted of 9mm thick Bellis Board with a thermal resistance value of 0.1m² K/W, per 4mm thick sheet.

3.2 Flue System

The flue system used throughout testing was the Flue Factory Triple skin flue kit which was manufactured by The Flue Factory. This flue system has not been tested to joint AS/NZS 2918:2001, Appendix F by HRL Technology Pty Ltd. Appendix 3 shows details of the flue system.

The flue height was 4.6 ± 0.3 m from the floor protector.

4. CLEARANCES

4.1 Position A

The appliance was installed into the test enclosure with a rear wall clearance of 320mm when measured from the rear wall to the edge of the appliance rear panel when installed with decromesh casing only or 120mm when installed with a 130° x 900mm stainless steel flue shield between the decromesh casing and active flue.

The side wall clearance was 250mm. Clearance measurements were taken from the appliance rear and side panels respectively (see Appendix 1).

4.2 Position B

The appliance was installed into the test enclosure in a corner position (45° to both side walls) with a clearance of 150mm to the side walls when measured from the appliance rear corners (see Appendix 1).

5. PROCEDURE

All clearance testing took place from February 10 and 11, 2015. The floor thermocouples were installed into positions as per joint AS/NZS 2918:2001, Appendix B. Other thermocouple positions were determined by monitoring surface temperatures during trial burn cycles. Hot sites were located with the aid of a Linear Laboratories C-600E infra-red pyrometer.

All thermocouple tips were stapled onto the test surfaces, with black tape over the first 100 mm to facilitate consistent and accurate recording of temperatures. Thermocouple positions are shown in Tables 1 and 2.

5.1 High Fire Test

The appliance was fully fired in accordance with Section B9.1 of the joint Triple skin. The level of fuel was maintained between 50-75% of the full volume level of the fuel chamber during the High Fire test.

The average fuel load for initiating the High Fire tests was 8.5kg with an average refuelling rate of 1.3kg/10 minutes.

During High Fire testing it was found that the highest surface temperatures caused through the operation of the appliance occurred when the primary air control was fully open.

5.2 Flash Fire Test

Immediately after the High Fire test was completed, sufficient embers were removed to bring the fire bed to a level of 15-25% of the fuel chamber volume. The appliance was then fired in accordance with Section B9.2 of the joint Triple skin. The average fuel load for initiating the Flash Fire tests was 5.8kg. Highest temperature rises were achieved by fully opening the primary air control and By-pass damper and leaving the main door resting against the door catch.

5.3 Fuel

The appliance was fired using a triple skin firewood fuel of *Pinus radiata* with an average moisture content of 11.6%. Each firewood piece was 300mm x 100 mm x 40 mm.

6. RESULTS

6.1 Uncertainty of Measurement Statement

- (a) The uncertainty of distance measurement for determining clearance distances was not greater than ± 2 mm.
- (b) The uncertainty of temperature measurement during the entire test period was $\pm 2^{\circ}\text{C}$ at the 95% confidence level.

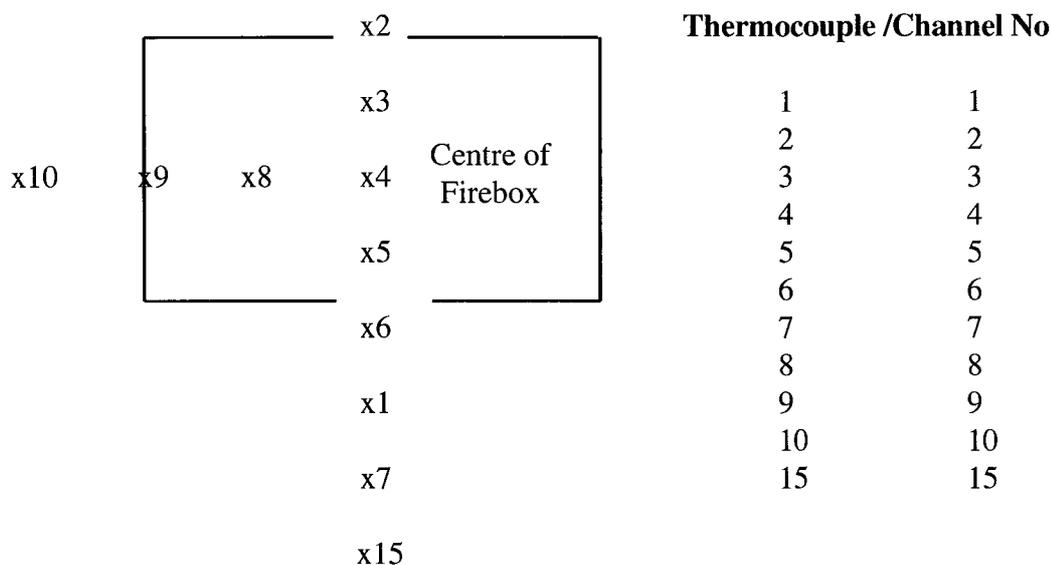
6.2 Test Enclosure Temperatures

Table 3 shows the ambient temperature range during testing. Tables 4 and 5 show the maximum temperature rise above ambient for each test surface.

7. CONCLUSION

The Neo 1.6 Free-Standing solid fuel appliance installed with a 6 inch triple skin (default) flue kit, conforms to the requirements of Australian/New Zealand Standard 2918:2001, with respect to floor, ceiling, side wall and rear wall surface temperatures, when tested in the test positions described earlier in this report in accordance with Appendix B of the joint Standard.

Table 1: Position A



Thermocouple

Channel No

11 Ceiling, inside wooden ceiling rim, to front of appliance	11
12 Ceiling, 25 mm from wooden ceiling rim, to front of appliance	12
13 Ceiling, inside wooden ceiling rim, to LHS of appliance	13
14 Ceiling, 25 mm from wooden ceiling rim, to LHS of appliance	14
16 Rear wall, 1175mm from corner, 740mm above floor	16
17 Rear wall, 670mm from corner, 1093mm above floor	17
18 Side wall, 640mm from corner, 1015mm above floor	18
19 Side wall, 565mm from corner, 1173mm above floor	19
20 Ambient temperature	20

Table 2: Position B

Thermocouple

Channel No

11 Ceiling, inside wooden ceiling rim, to RHS of appliance	11
12 Ceiling, 25 mm from wooden ceiling rim, to RHS of appliance	12
13 Ceiling, inside wooden ceiling rim, to LHS of appliance	13
14 Ceiling, 25 mm from wooden ceiling rim, to LHS of appliance	14
16 RHS wall, 550mm from corner, 1160mm above floor	16
17 RHS wall, 408mm from corner, 1002mm above floor	17
18 LHS wall, 420mm from corner, 1102mm above floor	18
19 LHS wall, 310mm from corner, 1065mm above floor	19
20 Ambient temperature	20

Table 3: Ambient Temperature Range °C

Position	High Fire	Flash Fire
A	25.9 – 32.0	31.0 – 33.6
B	20.2 – 29.6	28.8 – 29.7

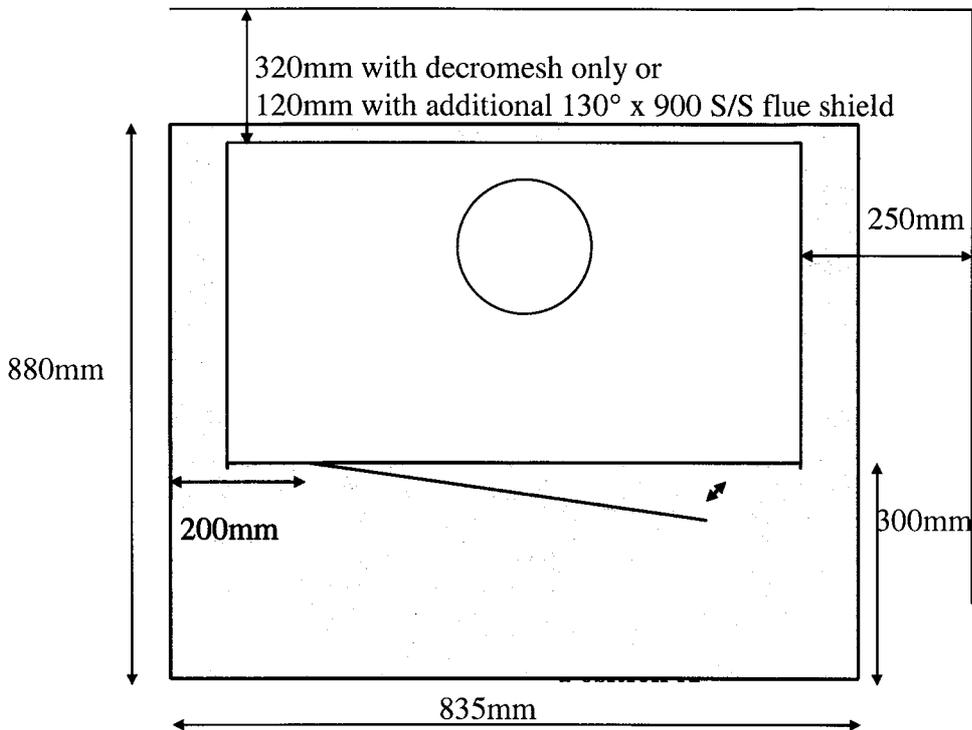
Table 4: Maximum Temperature Rise - Position A

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Floor	15	46.0	15	52.2
Ceiling	11	21.0	13	24.4
Rear Wall	19	53.4	19	62.4
Side Wall	16	59.6	16	70.9

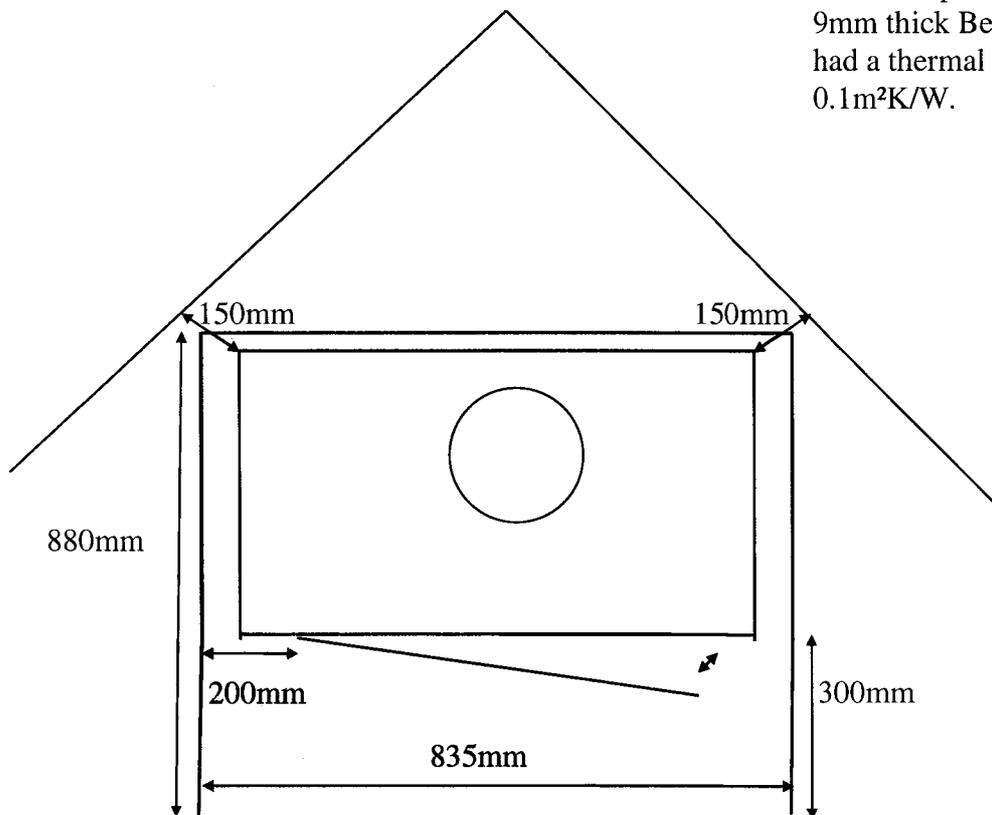
Table 5: Maximum Temperature Rise - Position B

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Ceiling	13	22.2	11	23.8
RHS Wall	17	48.1	17	64.8
LHS Wall	18	45.6	19	58.0

**APPENDIX 1:
MINIMUM CLEARANCES FOR THE NEO 1.6 FREE-STANDING SOLID FUEL
APPLIANCE INSTALLED WITH A 6 INCH TRIPLE SKIN (DEFAULT) FLUE KIT**



The floor protector consisted of 9mm thick Bellis Board which had a thermal resistance of 0.1m²K/W.

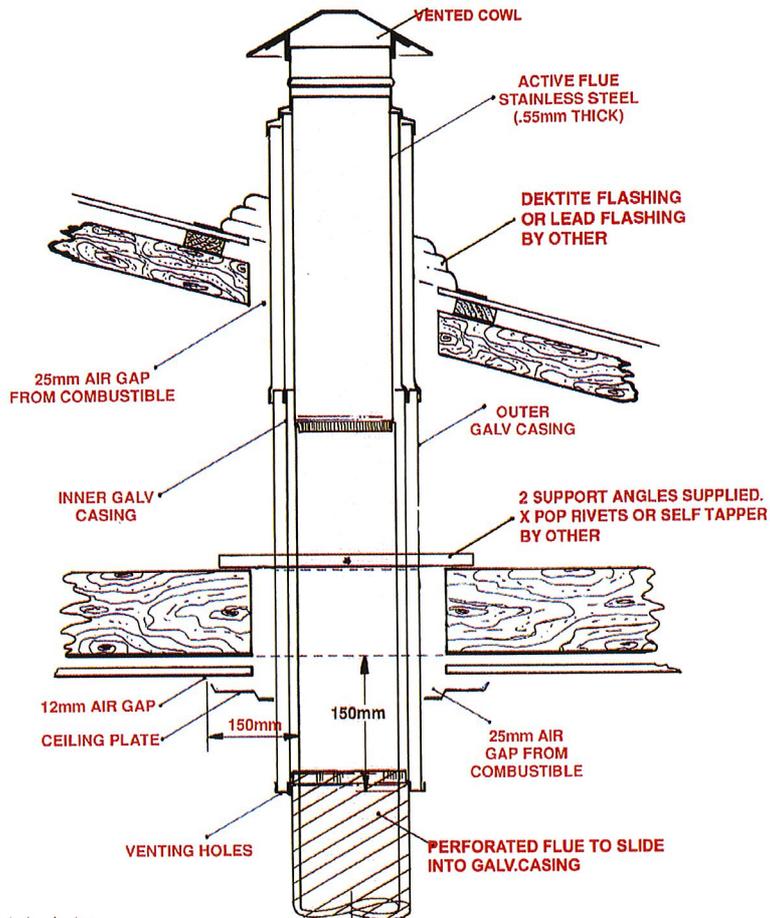


**APPENDIX 2:
SOLID FUEL BURNING APPLIANCE CONSTRUCTION DETAILS**

Appliance Model Name:	<i>Neo 1.6 Free-Standing</i>		
Manufacturer:	Pacific Energy Fireplace Products		
Serial Number:	402101245		
Overall Width:	660mm		
Overall Depth:	581mm		
Overall Height:	913mm		
Top Plate Width:	690mm		
Top Plate Depth:	440mm		
Top Plate Thickness:	8mm		
Firebox Description:	<i>Height: 300mm</i>	<i>Width: 465mm</i>	<i>Depth: 288mm</i>
Firebox Material Type/ Seam Fully Welded:	3.5mm steel, seams fully welded		
Firebrick Size:	Firebox is fully lined with bricks		
Main Door Opening:	<i>Height: 285mm</i>	<i>Width: 434mm</i>	
Door:	<i>Height: 373mm</i>	<i>Width: 515mm</i>	<i>Depth: 45mm (max)</i>
Door Glass:	<i>Height: 265mm</i>	<i>Width: 415mm</i>	
Primary Air Location:	Under firebox		
Dimension of Primary Air:	3 holes 1 @ 9.0mm dia + 1 @ 20mm dia + 1 @ 39mm dia		
Area of Primary (mm²)	1573mm ²		
Secondary/Tertiary Air Location:	Incorporated into baffle plate		
Dimension of Secondary/Tertiary Air:	24 holes @ 4mm dia + 18 holes @ 5.0mm dia + 12 holes @ 6.5mm dia		
Area of Secondary/Tertiary Air (mm²):	361mm ²		
Flue Dimensions:	152mm OD		
Spigot Dimensions:	160mm OD	152mm ID	
Spigot to Rear of Appliance:	70mm		
Rear Internal to External Heat Shield:	62mm		
Side Internal to External Heat Shield:	39mm		
Heat Shield Material Type:	Stainless steel		
Water Heater Fitted:	NO		
Fan Location/Speeds:	Variable speed with thermostat control at rear of appliance		
Catalytic Combustor:	NO		
Grate:	No, does have ashpan with removeable brick to fill		
Diagrams:	Over the page		
Note the accuracy of measurements in Appendix 2 are ± 5% of the recorded value			
Signed:	<i>Alfred</i>		
Date:	<i>12/5/15</i>		

APPENDIX 3:
FLUE FACTORY FLUE KIT

The
**Flue
Factory** Pty. Ltd.



6" Default Kit

NOTE:

- A. Cut correct hole in plaster
- B. Put ceiling plate in position
- C. Insert bottom outer galv. crimped end up in position on joists using angles
- D. Now proceed to join the outer Flues in their positions ensuring all gaps tight
- E. Stainless steel flues crimped end face down
- F. Galv. flue crimped end face up
- G. All stainless steel joins to be pop rivetted or self tapped

IMPORTANT INFORMATION

1. A permit from your local council must be obtained prior to installing your heater.
2. In most normal installations, a triple skin flue should be used where installation is in close proximity to combustible materials, eg. where the flue kit above the ceiling continues through another storey or if the flue kit is within a cupboard or similar space, rather than a ceiling, consult your dealer.
3. Correct installation is the responsibility of the licenced plumber installing the flue kit. **NOT** the manufacturer of the kit.
4. Regular inspection of your flue for creosote deposit or damage, and cleaning with a flue brush will ensure continuing good surface. The cowl is to be attached with 2 self tapping screws, and can be removed for cleaning.
5. A Certificate of Compliance must be issued by the installing plumber for council and insurance purposes.

COMPONENTS:-

- 1 x VENTED COWL
- 1 x 10" GAL WITH CAP
- 1 x 10" GAL FLUE
- 2 x 8" GAL FLUE
- 4 x 6" STAINLESS FLUE
- 1 x 8" PERF
- 1 x 8" PERF WITH RING
- 2 x SUPPORT ANGLES
- 1 x CEILING PLATE

In accordance with AS/NZS 2918:2001