Prepared for

PIVOT STOVES & HEATING CO.

THERMAL CLEARANCE TESTING OF THE ESSE WD SOLID FUEL COOKING APPLIANCE FITTED WITH A WATER HEATER AND TESTED WITH A VALLEY FLUES DEFAULT FLUE KIT

Test Report No: HCMG/10/21
Issue Date: April 2010
CONFIDENTIAL - CLIENT USE ONLY

By
D. Jeffries

INITIAL DISTRIBUTION

Pivot Stoves & Heating Co. 234-238 Moorbool St Geelong Vic 3220	**Copy No**
Mr Greg Parker-Hill	**1**
HRL Technology Pty Ltd	
HRL Report Archive	**2**
File: 79100699	**3**

This is copy No 1

THERMAL CLEARANCE TESTING OF THE ESSE EW IRONHEART SOLID FUEL COOKING APPLIANCE FITTED WITH A WATER HEATER AND TESTED WITH A VALLEY FLUE DEFAULT FLUE KIT

Report

The appliance and flue system were installed into a standard Clearance Test enclosure and tested in two positions in a manner conforming to joint Australian/New Zealand Standard 2918:2001, Appendix B. A minimum 850.mm deep x 900mm wide x 6mm thick floor protector (cement fibre sheet) 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 0.8m² K/W, per 6 mm thickness.

The Esse WD solid fuel appliance fitted with a water heater, when installed with a Valley Flues default flue kit incorporating a 180° x 900mm stainless steel heat shield, conforms to the requirements of joint AS/NZS 2918:2001, 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)

40mm from rear wall to the edge of the appliance top plate.
100mm from side wall above the hob to the edge of the appliance hob edge.
7mm from left and right side walls below the hob level to appliance side panel.

Refer to Appendix 1 of this report for clearance diagrams.

Investigation: Mr D. Jeffries

Report: Mr D. Jeffries

Checked by: Mr S. Marland

Signed: ..... Approved: .....

Dion Jeffries
Technical Officer

Steve Marland
Senior Technical Officer

1. INTRODUCTION

HRL Technology Pty Ltd was requested to assess the Esse WD solid fuel burning appliance fitted with a water heater, in conjunction with a Valley Flues default flue kit incorporating a 180° x 900mm stainless steel rear heat shield. 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 25th March 2010, by Mr Dion Jeffries The testing was commissioned by Mr Greg Parker-Hill of Pivot Stoves & Heating Co 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 900mm wide x 850mm deep x 6mm thick. The floor protector consisted of one layer of 6mm thick cement fibre sheet with a thermal resistance value of 0.8m² K/W, per 6 mm thickness.

3.2 Flue System

The flue system used throughout testing was a default flue kit incorporating a 180° x 900mm stainless steel rear heat shield, which was manufactured by Valley Flues. 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 200mm and a side wall clearance of 160mm above the hob measured from the edge of the hob, and 7mm below the hob measured from appliance side panel. Clearance measurements were taken from the appliance rear and side panels respectively (see Appendix 1).

5. PROCEDURE

All clearance testing took place on 25th March 2010. 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 Standard. 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 5.1kg with an average refuelling rate of 0.57kg/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 Standard. The average fuel load for initiating the Flash Fire tests was 2.6kg. Highest temperature rises were achieved by fully opening the primary air control and leaving the main door 15mm ajar from the door catch.

5.3 Fuel

The appliance was fired using a standard firewood fuel of *Pinus radiata* with an average moisture content of 14.1%. 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 ± 2°C at the 95% confidence level.

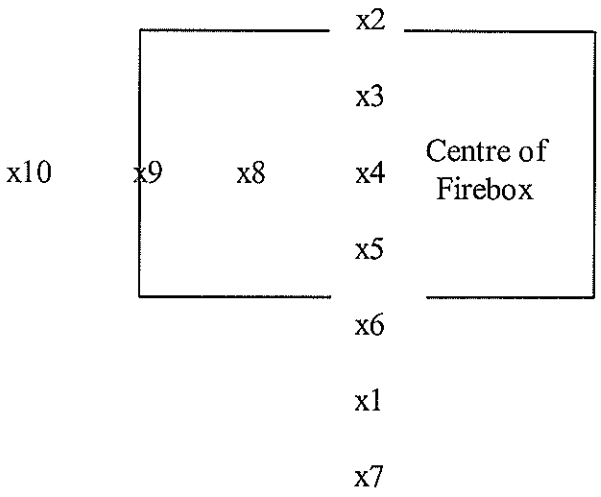
6.2 Test Enclosure Temperatures

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 Esse WD solid fuel cooking appliance appliance, when installed with a default flue kit incorporating a 180° x 900mm stainless steel rear heat shield, 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
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

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
15Rear wall, 585mm from corner, 865mm above floor	15
16 Rear wall 610mm from corner, 1160mm above floor	16
17 Left Hand Side wall, 325mm from corner, 555mm above floor, below hob	17
18 Right Hand Side wall, 330mm from corner, 550mm above floor, below hob	18
19 Outer Right Hand Side wall 500mm from corner, 1055mm above floor, above hob	19
20 Ambient temperature	20

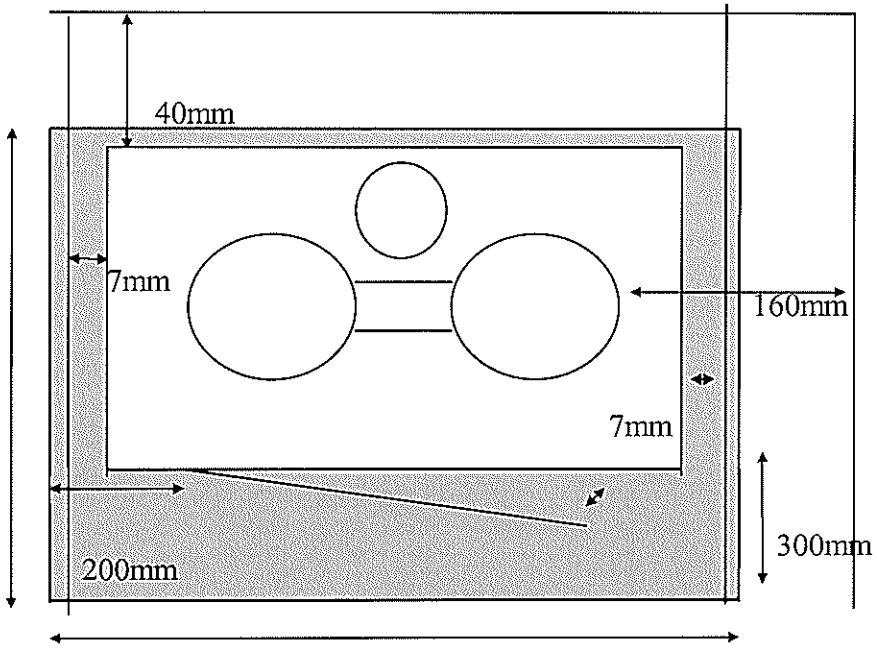
Table 3: Ambient Temperature Range °C

Position	High Fire	Flash Fire
A	16.1 – 29.1	28.1 – 29.6

Table 4: Maximum Temperature Rise - Position A

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Floor	6	39.4	6	44.1
Ceiling	13	10.16	13	13.5
Rear Wall	16	33.3	16	52.8
Side Wall Above Hob	19	25	19	35.6
Side Wall Below Hob	118	47.9	17	46

APPENDIX 1:
MINIMUM CLEARANCES FOR THE ESSE EW IRONHEART SOLID FUEL COOKIN APPLIANCE FITTED WITH A WATER HEATER INSTALLED USING A VALLEY FLUE DEFAULT FLUE KIT



Position A

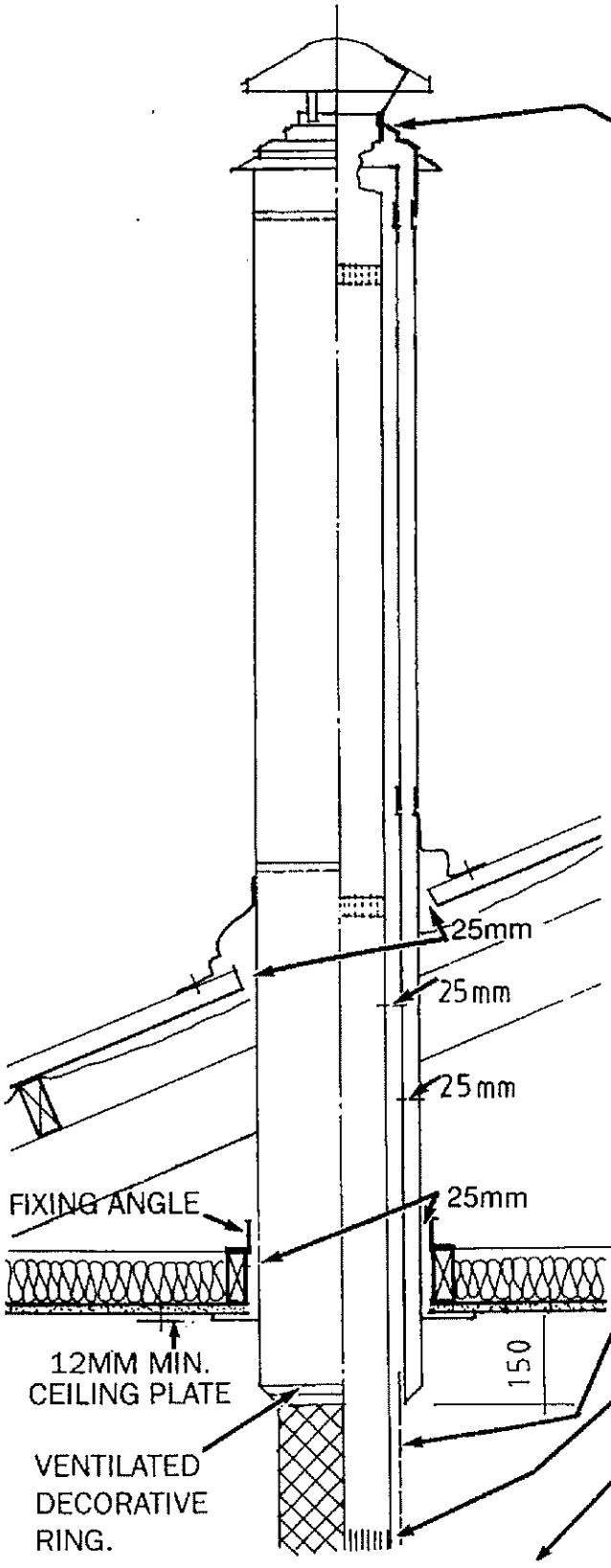
The floor protector consisted of 6mm thick cement fibre sheet which had a thermal resistance of 0.8m² K/W, per 6 mm thickness.

APPENDIX 2:
SOLID FUEL BURNING APPLIANCE CONSTRUCTION DETAILS

Appliance Model Name:	WD		
Manufacturer:	ESSE		
Serial Number:	N/A		
Overall Height (to top of top plate):	900mm		
Overall Width (not including top plate):	900mm		
Overall Depth (not including top plate):	570mm		
Top Plate Width:	900mm		
Top Plate Depth:	600mm		
Top Plate Thickness:	5mm		
Appliance Base:	*Height:118mm*	*Width: 880*	*Depth:570*
Appliance Legs N/A	*Height: N/A*	*Width: N/A*	*Depth: N/A*
Firebox Description:	*Height:300mm*	*Width: 275mm*	*Depth:490mm*
Firebox Material Type/ **Seam Fully Welded:**	Carbon Steel Yes		
Firebrick Size: 8 around firebox walls 2 at top of firebox in place of baffle	*Height*: 8x 360mm 2x 230mm *Thickness*: 25mm		*Width*: 8x 155mm 2x 260mm *No of*: 10
Main Door Opening:	*Height:* 360mm		*Width*: 245mm
Door: **Door Glass:** N/A	*Height: 390 mm* *Height: N/A*	*Width: 275.mm* *Width:N/A*	*Depth: 50mm*
Primary Air Location:	Inside door opening at bottom		
Dimension of Primary Air:	12mm x 3mm Holes x 14		
Area of Primary (mm^2)			
Secondary/Tertiary Air Location:	Air Slot Below Ash Pan Door		
Dimension of Secondary/Tertiary Air:	12mm x 3mm Holes x 9		
Area of Secondary/Tertiary Air (mm^2):	504		
Baffle Plate size and location:	N/A Fire Bricks at top of fire box in place of baffle		
Flue Dimensions:	152mm OD		
Spigot Dimensions: Adapter Plate on Flue Box	160mm OD		155mm ID
Spigot to Rear of Appliance:	5 mm		
Rear Internal to External Heat Shield:	15mm		
Side Internal to External Heat Shield:	35mm		
Heat Shield Material Type:	Carbon Steel		
Water Heater Fitted:	x Yes		☐ No
Fan Location/Speeds:	N/A		
Catalytic Combustor:	☐ Yes		x No
Grate:	☐ Yes		x No
Diagrams:	Over the page		

Signed: ..... **Date:** 30/4/21

APPENDIX 3:
VALLEY FLUE DEFAULT FLUE KIT



TRIPLE SKIN COWL.
COWL SLEEVE TO FIT INTO 6" S.S.
OUTER GALVANIZED SLEEVE TO FIT
OVER 10 $^{1}_{4}$ GALVANIZED CASING
FIXED WITH 3 SCREWS.
SCREWS OR POP RIVETS ARE NOT
SUPPLIED WITH FLUE KIT.

DIMENSIONS.

S.S. CASING	FLUE	152	6"
GAL. CASING	INNER	209mm	8^{1}_{4}"
GAL. CASING	OUTER	260mm	10^{1}_{4}"
PERFORATED CASING		200mm	7^{7}_{8}"

ROOF FLASHING NOT SUPPLIED WITH
FLUE KIT.

10^{1}_{4}" 8^{1}_{4}" GALVANIZED CASINGS TO
BE SEPARATED WITH CLIPS.
CRIMPED END FACING UP.

PERFORATED CASING 7^{7}_{8}"

6" S.S. FLUE CRIMP INTO HEATER.

LOCATING RING ON HEATER TO
LOCATE PERFORATED CASING.