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**THERMAL CLEARANCE TESTING OF THE ESSE
WARMHEART FREE-STANDING APPLIANCE**

Report Number: ASFT18073-PRELIMINARY REPORT
Issue date: 22 August 2018

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Report Distribution

ESSE Australia
120 Victoria Street
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ASFT Report Archive

Revision Details

Revision	Date	Comments
0	22/08/2018	Preliminary Issue – pending payment of invoice and engineering drawings

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QD-001

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THERMAL CLEARANCE TESTING OF THE ESSE WARMHEART FREE-STANDING SOLID FUEL APPLIANCE

Report

The ESSE WARMHEART Free-Standing appliance and Flo-met Super Single flue kit with a 180° stainless steel rear heat shield to a height of 900mm was tested in a position conforming to joint Australian/New Zealand Standard 2918:2018, Appendix B.

A minimum 960mm deep x 720mm wide x 8mm thick floor protector (CS Sheet) should be used under and in front of the appliance base when installing the appliance (see joint AS/NZS 2918:2018 3.3.2). The floor protector should extend 300mm in front of the appliance fuel loading door and be placed centrally in the 720mm width. The Thermal conductivity of the floor protector is 0.08m².K/W for 8mm thick sheets.

The ESSE WARMHEART Free-Standing solid fuel appliance installed with a Flo-met Super single flue kit with a 180° stainless steel rear heat shield to a height of 900mm conforms to the requirements of the joint AS/NZS 2918:2018 Standard, Appendix B.

The appliance and flue was tested at the following clearances;

Position A – Parallel position

Position B – Corner position

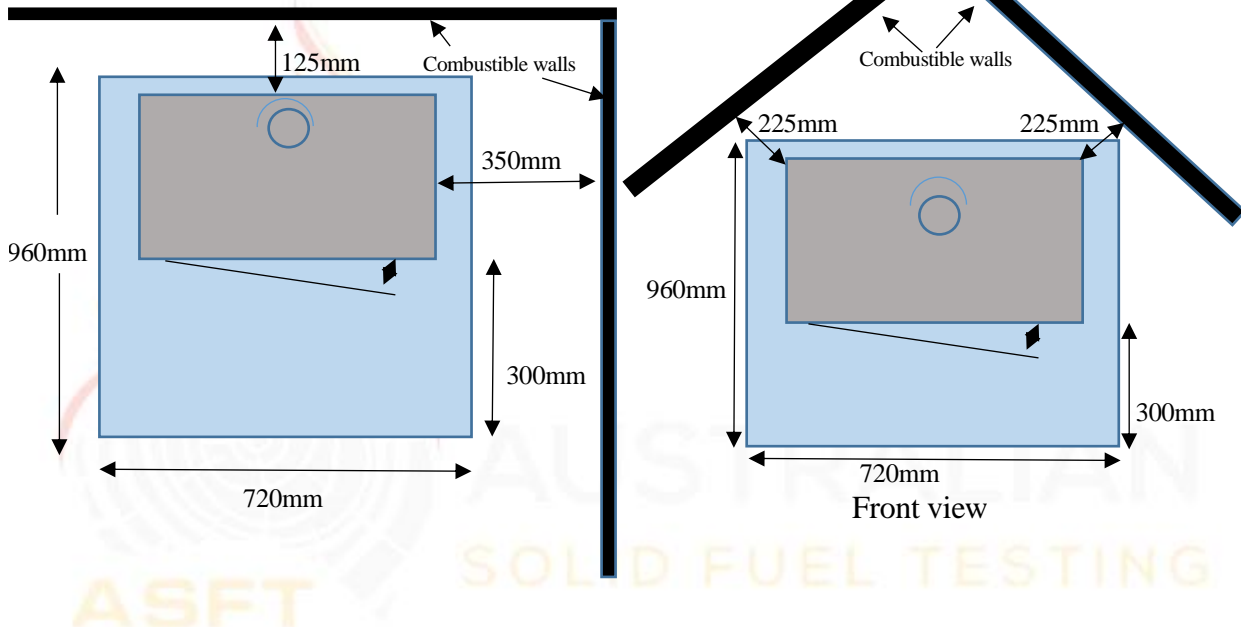




Figure 1 – Clearance Diagram

Signed		Approved	
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Title	<i>Technical Officer</i>	Title	<i>Managing Director – Australian Solid Fuel Testing</i>
Date	22/08/2018	Date	22/08/2018

1. INTRODUCTION

Thermal Clearance testing of the ESSE WARMHEART appliance and flue system took place on August 20 & 21, 2018 at the Australian Solid Fuel Testing Laboratory located at 3 Garden Street, Morwell, Victoria. The testing was performed by Mr G.W. Mooney and Mr S. Marland.

2. PROCEDURE

Testing was conducted as per Appendix B of AS/NZS2918;2018, Hot sites were located with the aid of an infra-red thermometer. 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 the table below;

THERMOCOUPLE POSITIONS

Position A – Parallel Position

Thermocouple No.	Position	Thermocouple No.	Position
1	Floor - 1300mm in front of centre	16	Floor – 150mm RHS of centre
2	Floor – 1200mm in front of centre	17	Floor – 300mm RHS of centre
3	Floor - 1050mm in front of centre	18	Floor – 450mm RHS of centre
4	Floor – 900mm in front of centre	19	Ceiling Ring – Inner front
5	Floor – 750mm in front of centre	20	Ceiling Ring – 25mm in front
6	Floor – 600mm in front of centre	21	Ceiling Ring – Inner side
7	Floor – 450mm in front of centre	22	Ceiling Ring – 25mm to side
8	Floor – 300mm in front of centre	23	Rear wall – 480mm from corner, 809mm above the floor
9	Floor – 150mm in front of centre	24	Rear wall – 722mm from corner, 811mm above the floor
10	Floor – Centre of flue	25	Rear wall – 366mm from corner, 702mm above the floor
11	Floor – 150mm behind centre	26	RHS wall, 453mm from corner, 996mm above the floor
12	Floor – 300mm behind centre	27	RHS wall, 361mm from corner, 823mm above the floor
13	Floor – 450mm LHS of centre	28	RHS wall, 1019mm from corner, 517mm above the floor
14	Floor – 300mm LHS of centre	29	Rear wall – 623mm from corner, 1721mm above the floor
15	Floor – 150mm LHS of centre	30	Ambient temperature

Position B – Corner Position

Thermocouple No.	Position	Thermocouple No.	Position
19	Ceiling Ring – Inner front	25	LHS wall – 534mm from corner, 845mm above the floor
20	Ceiling Ring – 25mm in front	26	RHS wall, 637mm from corner, 1013mm above the floor
21	Ceiling Ring – Inner side	27	RHS wall, 628mm from corner, 938mm above the floor
22	Ceiling Ring – 25mm to side	28	RHS wall, 747mm from corner, 1060mm above the floor
23	LHS wall – 628mm from corner, 957mm above the floor	29	LHS wall – 569mm from corner, 921mm above the floor
24	LHS wall – 733mm from corner, 809mm above the floor	30	Ambient temperature

TABLE 1

3. TEST FUEL

Testing was conducted with Pinus Radiata as the test fuel which had a moisture content of 12.9% moisture. Each firewood piece was 300mm x 100mm x 40mm.

4. FLUE SYSTEM

The flue system used during testing was a Flo-met Super single Flue kit with a 180° stainless steel rear heat shield to a height of 900mm which was supplied by Floate metal fabrications. This flue system has not been tested to joint AS/NZS 2918:2018, Appendix F. The flue height was 4.6 ± 0.1 m from the floor protector. Appendix 1 shows details of the flue system.



5. RESULTS

5.1 High Fire Test

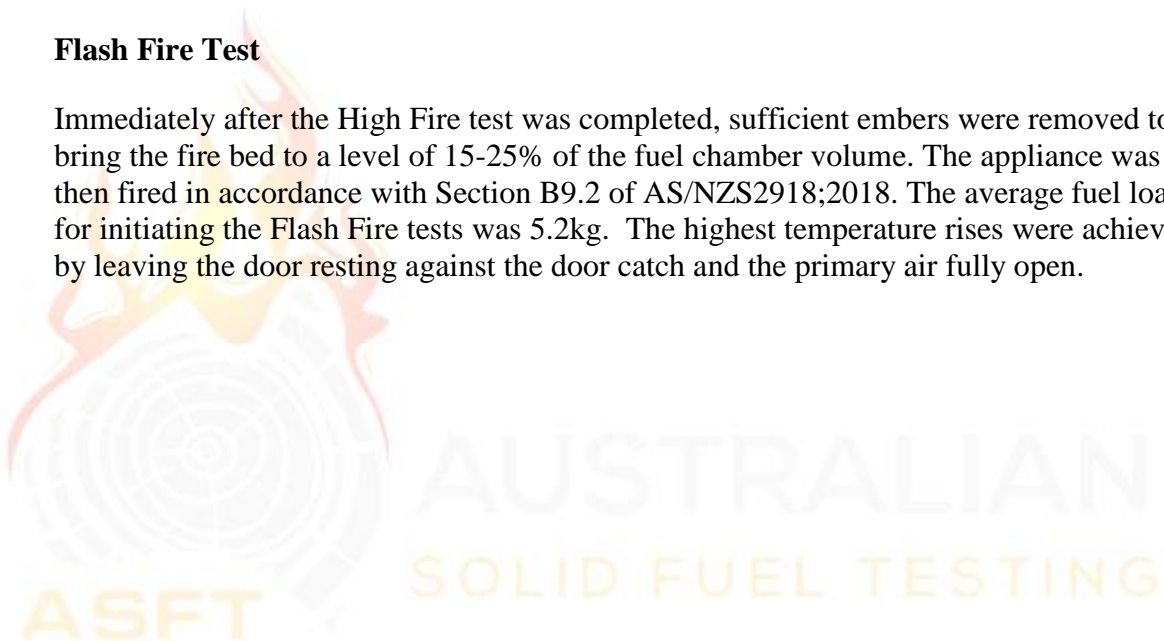
The appliance was fired in accordance with Section B9.1 of AS/NZS2918;2018. The level of fuel was maintained between 50-75% of the full volume level of the fuel chamber during the High Fire test.

The average fuel load for initiating the High Fire tests was 6.2kg with an average refuelling rate of 0.9kg/10 minutes.

During High Fire testing it was found that the highest surface temperatures occurred when the primary air control of the appliance 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 AS/NZS2918;2018. The average fuel load for initiating the Flash Fire tests was 5.2kg. The highest temperature rises were achieved by leaving the door resting against the door catch and the primary air fully open.



5.3 Ambient and Test Surface Temperatures

The Tables below show the Ambient temperatures and test surfaces temperatures during testing of the appliance and flue combination;

Ambient Temperature Range °C

Position	High Fire	Flash Fire
A	10.3 – 20.4	17.2 – 20.9
B	10.5 – 28.2	11.9 – 18.7

Maximum Surface Temperature Rise above Ambient Position A (parallel position)

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Floor	4	54.3	4	50.8
Ceiling	19	25.6	19	30.1
Rear Wall	23	58.1	23	72.5
Side Wall	26	62.7	26	77.3

Maximum Surface Temperature Rise above Ambient - Position B (corner position)

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Ceiling	20	37.0	20	37.5
Right Hand Side Wall	23	54.6	23	58.2
Left Hand Side Wall	26	59.7	26	66.0

5.5 Uncertainty of Measurement Statement

- 5.5.1 The uncertainty of distance measurement for determining clearance distances was not greater than ± 3 mm.
- 5.5.2 The uncertainty of temperature measurement during the entire test period was a maximum of $\pm 2^\circ\text{C}$ at a 95% confidence level.

6. APPLIANCE CONSTRUCTION DETAILS

The test results reported directly relate 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 design/construction of this appliance or flue may invalidate this report. Below are the constructions details of the appliance;

Appliance Model Name: Warmheart		Serial No: N/A
Manufacturer: ESSE Australia		
Overall Height: 752mm	Overall Depth: 660mm	Overall Width: 500mm
Top Plate Width: 500mm	Top Plate Depth: 580mm	Top Plate Thickness: 8mm
Appliance legs Height: 190mm	Depth: 42 - 90mm	Width: 42 - 90mm
Appliance pedestal Height:	Depth:	Width:
Usable Firebox Height: 282mm	Width: 292mm	Depth: 413mm
Usable Firebox Volume: 36.03Litres		
Firebox Material Type/Seam Fully Welded: Fully welded 5mm steel		
Firebrick Type: Fully lined, 25mm Vermiculite top, bottom and rear with 1 x 140mm wide brick on each side at the rear plus 2 x 157mm ceramic bricks on each side at the front of the firebox		
Main Door Opening Height: 230mm	Width: 323mm	
Door Height: 310mm	Width: 393mm	Depth: 22mm
Door glass Height: 230mm	Width: 310mm	
Primary Air Location: Below firebox towards the rear of the appliance, see below and 6 oval shaped holes below door, 14.5mm high, 11.5mm wide		
Dimension of Primary Air: 4 x trapesium slots @ 11-25mm x 28mm high		
Area of Primary (mm ²): 2016mm²		
Secondary/Tertiary Air Location: 4 x 3mm holes on each side at the rear of fire facing inward		
Dimension of Secondary/Tertiary Air: 8 x 6mm holes		
Area of Secondary/Tertiary Air (mm ²): 226.22mm²		
Baffle Plate size: 300 x 157 x 2mm with 10mm downturned lip front and rear		
Post combustor size: 157mm x 157mm x 40mm		
Flue Dimensions: 152mm		
Spigot Dimensions:	OD: 159mm	ID: 153mm
Spigot to Rear of Appliance: 2mm		
Rear Internal to External Heat Shield: 84mm, insulation between firebox and heat shield		
Firebox to Side External Heat Shield: 75mm, insulation between firebox and heat shield		
Heat Shield Material Type: 1mm steel		
Water Heater Fitted: No		
Fan Location/Speeds: No		
Catalytic Combustor fitted: No		
Grate: No		
NOTE: Accuracy of measurement is ±5% of the measured value		

7. CONCLUSION

The ESSE WARMHEART Free-Standing solid fuel appliance installed with a Flo-met Super Single flue kit with a 180° stainless steel rear heat shield to a height of 900mm conforms to the requirements of Australian/New Zealand Standard 2918:2018, with respect to floor, ceiling, side wall and rear wall surface temperatures, when tested in the test positions shown in Figure 1 of this report in accordance with Appendix B of AS/NZS2918;2018.



APPENDIX 1:

