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**THERMAL CLEARANCE TESTING OF THE ESSE  
BAKEHEART FREE-STANDING COOKING APPLIANCE**

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## THERMAL CLEARANCE TESTING OF THE ESSE BAKEHEART FREE-STANDING COOKING SOLID FUEL APPLIANCE

### Report

The ESSE Bakeheart Free-Standing Cooking appliance and Flo-met Super Single flue kit with a 180 degree stainless steel rear heat shield to a height of 1480mm was tested in a position conforming to joint Australian/New Zealand Standard 2918:2018, Appendix B.

A minimum 960mm deep x 900mm 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 900mm width. The Thermal conductivity of the floor protector is 0.08m<sup>2</sup>.K/W for 8mm thick sheets.

The ESSE Bakeheart Free-Standing Cooking solid fuel appliance installed with a Flo-met Super single flue kit with a 180 degree stainless steel rear heat shield to a height of 1480mm conforms to the requirements of the joint AS/NZS 2918:2018 Standard, Appendix B.

The appliance and flue was tested at the following clearances;

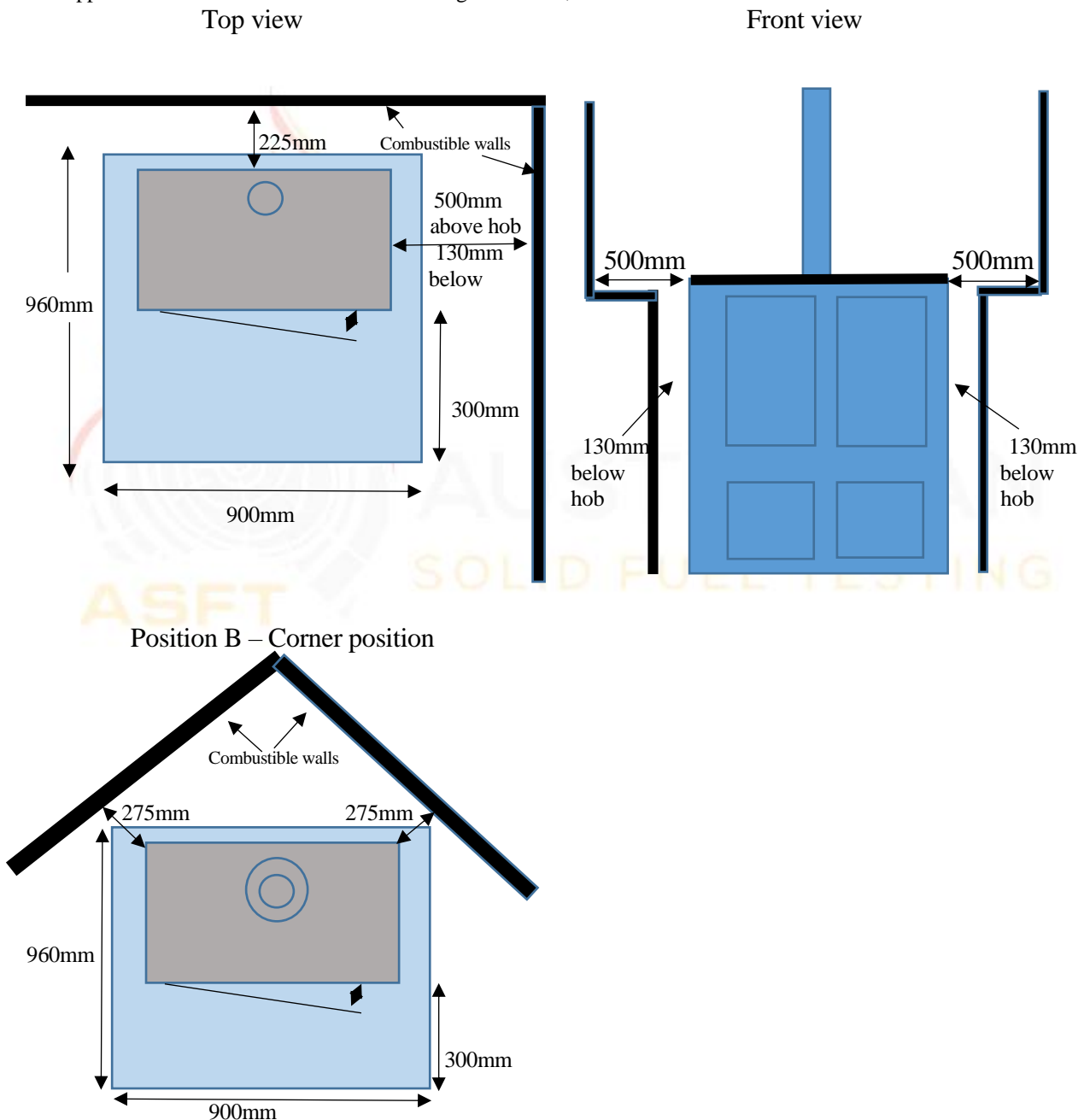


Figure 1 – Clearance Diagram

<b>Signed</b>		<b>Approved</b>	
<b>Name</b>	Garry W Mooney	<b>Name</b>	Steve Marland
<b>Title</b>	<i>Technical Officer</i>	<b>Title</b>	<i>Managing Director – Australian Solid Fuel Testing</i>
<b>Date</b>	17/08/2018	<b>Date</b>	17/08/2018

## 1. INTRODUCTION

Thermal Clearance testing of the ESSE Bakeheart appliance and flue system took place on August 14 & 16, 2018 at the Australian Solid Fuel Testing Laboratory located at 3 Garden Street, Morwell, Victoria. The testing was performed by Mr G. 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 - Below the Hob – 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 – 371 mm from corner, 791 mm above the floor
9	Floor – 150mm in front of centre	24	Rear wall – 309 mm from corner, 693 mm above the floor
10	Floor – Centre of flue	25	Rear wall – 351 mm from corner, 489 mm above the floor
11	Floor – 150mm behind centre	26	RHS wall, 311 mm from corner, 828 mm above the floor
12	Floor – 300mm behind centre	27	RHS wall, 266 mm from corner, 424 mm above the floor
13	Floor – 450mm LHS of centre	28	RHS wall, 598 mm from corner, 617 mm above the floor
14	Floor – 300mm LHS of centre	29	Rear wall – 380 mm from corner, 845 mm above the floor,
15	Floor – 150mm LHS of centre	30	Ambient temperature

### Position A - Above the Hob – Parallel Position

Thermocouple No.	Position	Thermocouple No.	Position
19	Ceiling Ring – Inner front	25	LHS wall – 415mm from corner, 1256mm above the floor
20	Ceiling Ring – 25mm in front	26	RHS wall, 517mm from corner, 1286mm above the floor
21	Ceiling Ring – Inner side	27	RHS wall, 574mm from corner, 1068mm above the floor
22	Ceiling Ring – 25mm to side	28	RHS wall, 1132mm from corner, 763mm above the floor
23	LHS wall – 548mm from corner, 1025mm above the floor	29	Rear wall – 572mm from corner, 1085mm above the floor
24	LHS wall – 474mm from corner, 1172mm above the floor	30	Ambient temperature

### Position B – Above the Hob - Corner Position

Thermocouple No.	Position	Thermocouple No.	Position
19	Ceiling Ring – Inner front	25	LHS wall – 592mm from corner, 1276mm above the floor
20	Ceiling Ring – 25mm in front	26	RHS wall, 678mm from corner, 1312mm above the floor
21	Ceiling Ring – Inner side	27	RHS wall, 719mm from corner, 1221mm above the floor
22	Ceiling Ring – 25mm to side	28	RHS wall, 743mm from corner, 1129mm above the floor
23	LHS wall – 548mm from corner, 1026mm above the floor	29	LHS wall – 643mm from corner, 1112mm above the floor,
24	LHS wall – 610mm from corner, 1180mm 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 degree stainless steel rear heat shield to a height of 1480mm 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  $4.6 \pm 0.1$ 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 6.9kg with an average refuelling rate of 0.8kg/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 5.3kg. 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*

<b>Position</b>	<b>High Fire</b>	<b>Flash Fire</b>
A - Below Hob	10.5 – 18.7	16.6 – 23.1
A - Above Hob	10.1 – 16.8	13.3 – 16.9
B – Above Hob	12.0 – 16.7	14.7 – 17.1

***Maximum Surface Temperature Rise above Ambient below the Hob***

<b>Position</b>	<b>Thermocouple Number</b>	<b>High Fire Test (°C)</b>	<b>Thermocouple Number</b>	<b>Flash Fire Test (°C)</b>
Floor	4	29.4	4	49.1
Ceiling	21	25.9	22	64.3
Rear Wall below hob	29	62.6	29	71.1
Side Wall above hob	26	51.8	26	78.9

***Maximum Surface Temperature Rise above Ambient above the Hob***

<b>Position</b>	<b>Thermocouple Number</b>	<b>High Fire Test (°C)</b>	<b>Thermocouple Number</b>	<b>Flash Fire Test (°C)</b>
Ceiling	22	55.6	22	56.1
Rear Wall above hob	24	61.0	24	71.5
Side Wall above hob	26	53.0	26	67.7

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

<b>Position</b>	<b>Thermocouple Number</b>	<b>High Fire Test (°C)</b>	<b>Thermocouple Number</b>	<b>Flash Fire Test (°C)</b>
Ceiling	22	60.1	22	63.2
Right Hand Side Wall	24	57.3	24	62.7
Left Hand Side Wall	27	60.0	27	70.9

**5.5 Uncertainty of Measurement Statement**

- 5.5.1 The uncertainty of distance measurement for determining clearance distances was not greater than  $\pm 3\text{mm}$ .
- 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: <b>Bakeheart</b>		Serial No: <b>N/A</b>
Manufacturer: <b>ESSE Australia</b>		
Overall Height: <b>964mm</b>	Overall Depth: <b>662mm</b>	Overall Width: <b>500mm</b>
Top Plate Width: <b>500mm</b>	Top Plate Depth: <b>580mm</b>	Top Plate Thickness: <b>8mm</b>
Appliance legs Height: <b>190mm</b>	Depth: <b>42 - 90mm</b>	Width: <b>42 - 90mm</b>
Appliance pedestal Height:	Depth:	Width:
Usable Firebox Height: <b>282mm</b>	Width: <b>286mm</b>	Depth: <b>413mm</b>
Usable Firebox Volume: <b>35.61 Litres</b>		
Oven Height: <b>205mm</b>	Width: <b>322mm</b>	Depth: <b>480mm</b>
Oven Volume: <b>31.68 Litres</b>		
Firebox Material Type/Seam Fully Welded: <b>Fully welded 5mm steel</b>		
Firebrick Type: <b>25mm vermiculite: top, bottom, rear and 135mm each side at rear and 2 x ceramic bricks 145mm on each side at the front of firebox</b>		
Main Door Opening Height: <b>232mm</b>	Width: <b>323mm</b>	
Door Height: <b>308mm</b>	Width: <b>393mm</b>	Depth: <b>20mm</b>
Door glass Height: <b>225mm</b>	Width: <b>310mm</b>	
Oven Door Opening Height: <b>200mm</b>	Width: <b>357mm</b>	
Over Door Height: <b>238mm</b>	Width: <b>392mm</b>	Depth: <b>23mm</b>
Primary Air Location: <b>Below oven towards the rear of the appliance</b>		
Dimension of Primary Air: <b>4 x trapesium slots @ 11-25mm x 28mm high</b>		
Area of Primary (mm <sup>2</sup> ): <b>2016mm<sup>2</sup></b>		
Secondary/Tertiary Air Location: <b>4 x 3mm holes on each side at rear of firebox facing inward</b>		
Dimension of Secondary/Tertiary Air: <b>8 x 3mm</b>		
Area of Secondary/Tertiary Air (mm <sup>2</sup> ): <b>56.6mm<sup>2</sup></b>		
Baffle Plate size: <b>300 x 157 x 5mm, with 10mm turned down lip front and rear</b>		
Post combustor size: <b>157mm x 157mm x 40mm</b>		
Flue Dimensions: <b>152mm</b>		
Spigot Dimensions:	OD: <b>154mm</b>	ID: <b>160mm</b>
Spigot to Rear of Appliance: <b>3mm</b>		
Rear Internal to External Heat Shield: <b>80mm, insulation in between firebox and heat shield</b>		
Firebox to Side External Heat Shield: <b>73mm, insulation in between firebox and heat shield</b>		
Heat Shield Material Type: <b>1mm steel</b>		
Water Heater Fitted: <b>No</b>		
Fan Location/Speeds: <b>No</b>		
Catalytic Combustor fitted: <b>No</b>		
Grate: <b>No</b>		
<b>NOTE: Accuracy of measurement is ±5% of the measured value</b>		



## 7. CONCLUSION

The ESSE Bakeheart Free-Standing Cooking solid fuel appliance installed with a Flo-met Super Single flue kit with a 180 degree stainless steel rear heat shield to a height of 1480mm 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 position shown in Figure 1 of this report in accordance with Appendix B of AS/NZS2918;2018.



**APPENDIX 1:**

