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THERMAL CLEARANCE TESTING OF THE VERMONT CASTINGS DEFIANT FREE-STANDING APPLIANCE

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Revision Details

Revision	Date	Comments
0	29/04/2021	Preliminary report – awaiting payment and engineering drawings of appliance

THERMAL CLEARANCE TESTING OF THE VERMONT CASTINGS DEFIANT FREE-STANDING APPLIANCE

Report

The Vermont Castings Defiant Free-Standing appliance installed with a Wildcat 6" default flue kit was tested in two positions in a manner conforming to joint Australian/New Zealand Standard 2918:2018, Appendix B.

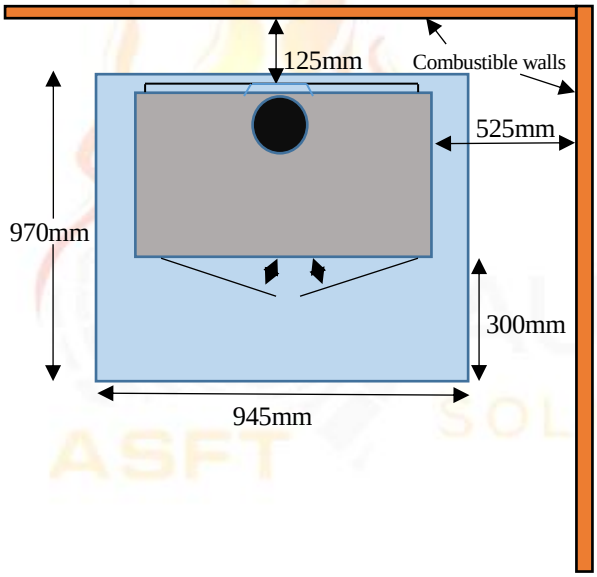
A minimum 970mm deep x 945mm wide x 6mm thick floor protector (compressed board) should be used under and in front of the appliance base when installing the appliance (see joint AS/NZS 2918:2018 3.3.2). The floor protector should extend 300mm in front of the appliance door and be placed centrally in the 945mm width. The Thermal resistivity of the floor protector is 0.026m².K/W for 6mm thick compressed board sheets.

The appliance was installed with an additional flue rear heat shield raised up 335mm from the appliance rear shield x 240mm wide with additional 70mm wide 45 degree extensions on each side. The shield was made of 1.2mm steel.

The Vermont Castings Defiant Free-Standing solid fuel appliance installed with a Wildcat 6" default flue kit conforms to the requirements of the joint AS/NZS 2918:2018 Standard, Appendix B.

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

Position A – Parallel position



Position B – Corner position

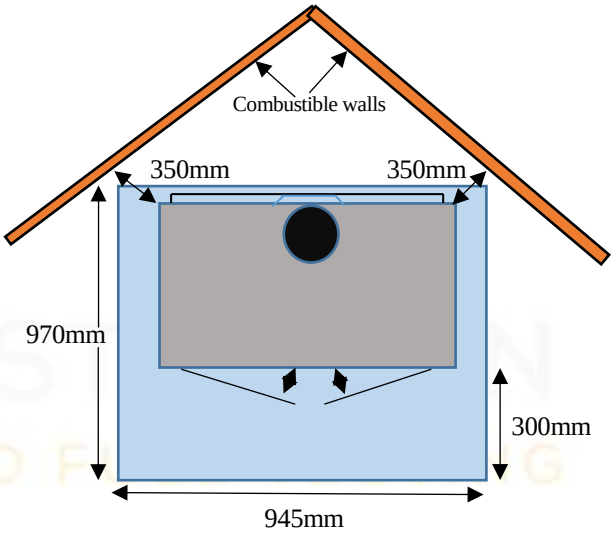


Figure 1 – Clearance Diagram

Signed		**Approved**	
Name	Garry W. Mooney	**Name**	Steve Marland
Title	*Technical Officer*	**Title**	*Managing Director – Australian Solid Fuel Testing*
Date	29/04/2021	**Date**	29/04/2021

1. INTRODUCTION

Thermal Clearance testing of the Appliance and flue system took place on 22 April 2021 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:

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 – 672mm from corner, 2352mm above the floor
9	Floor – 150mm in front of centre	24	Rear wall – 520mm from corner, 939mm above the floor
10	Floor – Centre of flue	25	Rear wall – 741mm from corner, 587mm above the floor
11	Floor – 150mm behind centre	26	RHS wall, 414mm from corner, 552mm above the floor
12	Floor – 300mm behind centre	27	RHS wall, 449mm from corner, 938mm above the floor
13	Floor – 450mm LHS of centre	28	RHS wall, 422mm from corner, 482mm above the floor
14	Floor – 300mm LHS of centre	29	Rear wall – 596mm from corner, 962mm 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 – 959mm from corner, 727mm above the floor
20	Ceiling Ring – 25mm in front	26	RHS wall, 833mm from corner, 539mm above the floor
21	Ceiling Ring – Inner side	27	RHS wall, 1008mm from corner, 903mm above the floor
22	Ceiling Ring – 25mm to side	28	RHS wall, 992mm from corner, 665mm above the floor
23	LHS wall – 672mm from corner, 2352mm above the floor	29	LHS wall, 779mm from corner, 877mm above the floor
24	LHS wall – 899mm from corner, 985mm 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 12.5% moisture. Each firewood piece was 300mm x 100mm x 40mm.

4. FLUE SYSTEM

The flue system used during testing was a Wildcat 6" default Perforated flue kit was supplied by Wildcat Industries (Aust) P/L. This flue system has been tested to joint AS/NZS 2918:2018, Appendix F. The flue height was 4.6 ± 0.1m 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 10.9kg with an average refuelling rate of 1.2kg/10 minutes.

During High Fire testing it was found that the highest surface temperatures occurred when the primary air control of the appliance and the flue by-pass 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 9.2kg.

The highest temperature rises were achieved by leaving the main doors resting against the door catch with the primary air control and the flue by-pass was 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℃

Position	High Fire	Flash Fire
A	10.4 – 18.5	16.4 – 20.3
B	15.6 – 20.9	18.3 – 21.8

Maximum Surface Temperature Rise above Ambient - Position A

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Floor	5	44.7	4	70.1
Ceiling	20	47.3	20	84.7
Rear Wall	25	51.7	29	84.8
Side Wall	26	60.1	26	84.8

Maximum Surface Temperature Rise above Ambient - Position B

Position	Thermocouple Number	High Fire Test (°C)	Thermocouple Number	Flash Fire Test (°C)
Ceiling	20	59.8	20	70.8
RHS Wall	28	59.9	28	79.3
LHS Wall	29	61.5	29	67.9

5.4 Uncertainty of Measurement Statement

5.5.1 The uncertainty of distance measurement for determining clearance distances was not greater than ± 3mm.

5.5.2 The uncertainty of temperature measurement during the entire test period was a maximum of ± 2°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: **Defiant** Serial No: **HF2850669**
Manufacturer: **Vermont Casting**
Overall Height: **750mm** Overall Depth: **670mm** Overall Width: **803mm**
Top Plate Width: **803mm** Top Plate Depth: **406-450mm** Top Plate Thickness: **25mm**
Griddle Width: **481mm** Griddle Depth: **130-237mm** Griddle Thickness: 9**mm**
Appliance Legs Height: **198mm** Depth: **19-63mm** Width: **19-63mm**
Usable Firebox Height: **380mm** Width: **651mm** Depth: **280mm**
Usable Firebox Volume: **69.27 Litres**
Firebox Material Type/Seam Fully Welded: **Fully sealed 8mm cast iron**
Firebrick Type: **Ceramic, sides and rear**
Main Door Opening Height: **335mm** Width: **546mm**
Door Height: **255-409mm** Width: **355mm** Depth: **28mm** **x2 doors**
Door glass Height: **180-225mm** Width: **203mm** **x2 doors**
Primary Air Location: **Below firebox at rear**
Dimension of Primary Air: **1 slot 98×25mm**
Area of Primary (mm^2): **2450mm^2**
Secondary/Tertiary Air Location: **Rear of firebox, 50mm above grate**
Dimension of Secondary/Tertiary Air: **2 holes @ 6mm + 6 holes @ 4.5mm**
Area of Secondary/Tertiary Air (mm^2): **56.56+95.44 = 152mm^2**
Baffle Plate size: **N/A**
Damper: **430×86×5mm**
Flue Dimensions: **152mm**
Spigot Dimensions: (oval) OD: **125 x 275mm** ID: **113 x 162mm**
Spigot to Rear of Appliance: **55mm**
Rear Internal to External Heat Shield: **30-55mm**
Firebox to Side External Heat Shield: **N/A**
Heat Shield Material Type: **1.2mm steel**
Heat Shield Below firebox dimensions: **480-620×525-540×1mm**
Firebox to Bottom Shield: **40mm**
Water Heater Fitted: **No**
Fan Location/Speeds: **N/A**
Catalytic Combustor fitted: **Yes, 325×65×25mm**
Grate: **Yes**
NOTE: Accuracy of measurement is ±5% of the measured value

7. CONCLUSION

The Vermont Castings Defiant Free-Standing appliance installed with a Wildcat 6" default flue kit, 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.

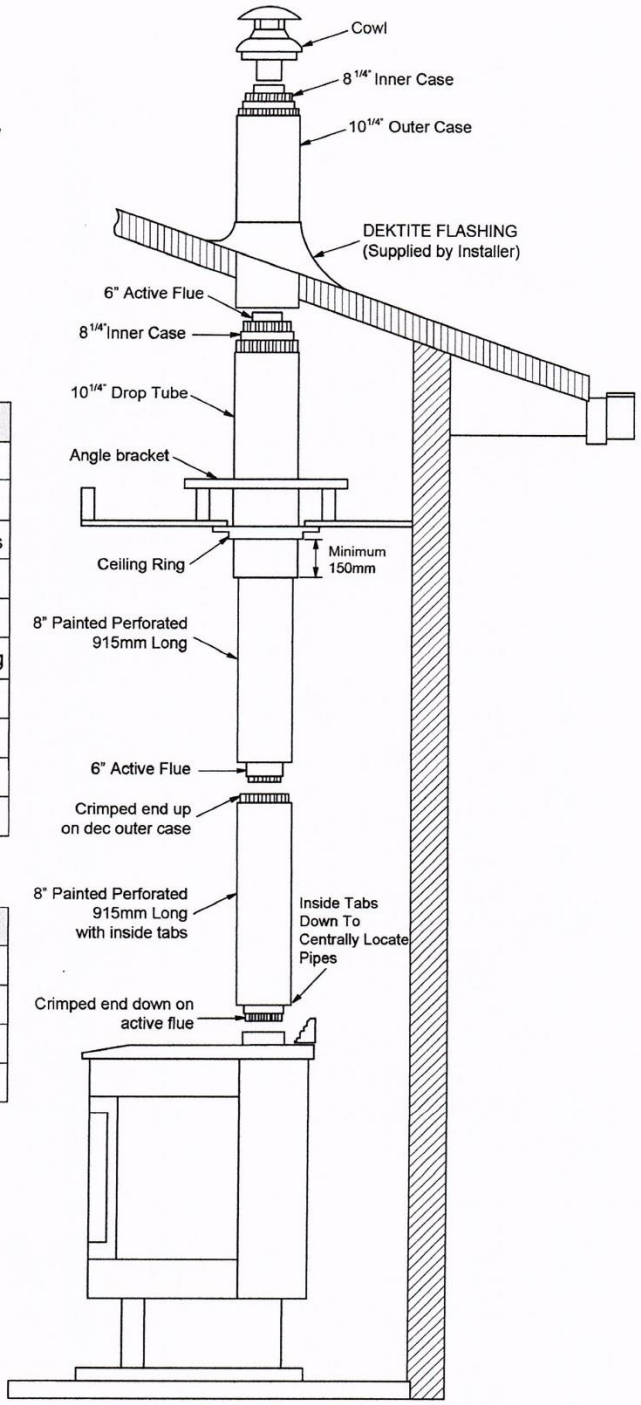
APPENDIX 1:

Wildcat INDUSTRIES (Aust) P/L

Freestanding Universal/ Default Kit Perforated 6" - 8 1/4" - 10 1/4" System

QTY	DESCRIPTION
4	6" Stainless Steel Inner Flue 915mm Long
1	8" Painted Perforated 915mm Long
1	8" Painted Perforated 915mm Long with inside tabs
2	8 1/4" Galvanized Inner Flue Casing 915mm Long
1	10 1/4" Half Painted Drop Tube
1	10 1/4" Galvanized Outer Flue Casing 915mm Long
1	Cowl
1	Ceiling Ring
2	50 x 50 Angles 915mm Long
1	Installation Guide

CARTON SPECIFICATIONS	
Height	460mm
Width	460mm
Length	1150mm
Weight	32kg



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MUST ONLY BE INSTALLED BY AN AUTHORISED PERSON IN COMPLIANCE WITH AS 2918

Default 10 25 Instruction page