



TEST REPORT

TEST OF A NON-CATALYTIC WOOD BURNING STOVE FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS ALT-125, ASTM E2515, ASTM E3053 and CSA B415.1,

Client:

Jotul

55 Hutcherson Dr,
Gorham, USA
04038

Model Name: F 55 V2

Attention: Rafael Sanchez

TESTED BY:

Services Polytests inc.
695-B Gaudette
St-jean-sur-Richelieu, QC, J3B 7S7

TEST DATES: February 5th and 6th 2020

REPORT DATE: February 16th 2020

Project number: PI-20206

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Tested:

A handwritten signature in black ink, appearing to read "Maxime Martin".

Maxime Martin

written by:

A handwritten signature in black ink, appearing to read "Danick Power".

Danick Power, P. Eng

Verified by third party certifier: Intertek

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1 INTRODUCTION

1.1 GENERAL

Laboratory

- Location: Services Polytests Inc., 695-B Gaudette St-jean-sur-Richelieu QC, Canada J3B 7S7
- Elevation: 100 feet above sea level

Test program

- Purpose: unit qualification NSPS 2020 cord wood
- Test dates: February 5th and 6th 2020
- Test methods used:
 - Particulate emissions: ASTM E3053-17; ASTM E2515-11 methods ALT-125 as referred into 40 CFR Part 60 Subpart AAA
 - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Jotul
- Product type: wood heater,
- Combustion system: non-catalytic
- Unit tested: F 55 V2

Particularities

- The F 55 V2 is a unique model to the Jøtul wood heater product line.

In Summary:

- A medium north /south loading adjustable rate free standing non-catalytic wood heater employing a stepped baffle secondary combustion technology. The unit is composed of primarily a steel fire box and cast-iron exterior construction.

1.3 RESULTS

Emission results obtained

- Weighted Average Emissions Rate: 1.31 g/hr
- Weighted Average Overall Efficiency: 67.97 %

Conformity: NSPS Phase 2020, cord wood test method

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier during January 2020 in good condition. The 50hrs of aging was made by the manufacturer's representative R&D Laboratory.

Set up

- Venting system type: 6 inches diameter inch steel pipe and insulated chimney
- System height from floor: 15 feet
- Particularities: this unit as been tested with the optional fan for high, medium and low burn rate.

2 SUMMARY OF TEST RESULTS

2.1 MODEL IDENTIFICATION

Model name number	F 55 V2
Manufacturer	JOTUL
address	55 Hutcherson Dr, Gorham, USA,04038
appliance category	WOODSTOVE
Usable Firebox Volume – ft3	2.76
Catalytic/Non-Cat	Non-Cat
convection air fan (no, standard, Optional)	OPTIONAL

2.2 LABORATORY INFORMATION

Testing laboratory	Polytests Services
address	695-B Gaudette, St-jean-sur-richelieu
ISO/ Accreditation info	17025
Dates tested	February 5 th and 6 th 2020
Test Methods / Standard	ALT-125
Dilution Tunnel Inside diameter – in	8
Filter diameter	47
Filter material	PTFE Pall

2.3 TEST CONDITION SUMMARY

Model Name(s) / number(s)	F 55 V2		
Usable firebox Volume-ft ³	2.76		
Convection Air Fan (No, Standard, Optional)	optional		
Test runs #	1,1	1,2	2.1
Date tested	February 5 th 2020	February 5 th 2020	February 6 th 2020
test run category (L,M,H)	H	L	M
average barometric pressure – in Hg	30,03	30,03	29,60
Max observe Ambient temp. °F	76,05	77,36	77,72
Min observe Ambient Temp °F	69,66	74,54	68,65
Max observe Filter temp °F	89,90	87,51	89,78
Run air settings			
Primary (measured up from minimum)	Full open	minimum setting	medium Setting
Secondary (measured up from minimum)	Fix	Fix	Fix
Convection air setting	ON	ON	ON
Test fuel load			
Cordwood fuel species	Oak	Oak	Oak
specific Gravity (from Table 1)	0,66	0,66	0,66
Higher heating value - Btu/lb (from Annex A1)	8690	8690	8690
Nom. Test fuel piece length - in	16	16	0
Number of test fuel pieces	6	6	6
Test fuel Weight			
Kindling - as fired lb.	4,81	NA	NA
Kindling Wt. - as % of test fuel load	17,1%	NA	NA
Kindling Moisture % Db	9,0	NA	NA
Kindling Kg DB	2,00	NA	NA
SU Fuel Wt- as fired lb	7,10	NA	NA
SU Fuel wt. - as % of test fuel load	25,2%	NA	NA
SU Fuel moisture - % DB	20,0	NA	NA
SU fuel- Kg DB	2,68	NA	NA
Test Fuel Load - As Fired lb	28,16	33,52	33,60
Ave. Test Fuel Load MC % DB	20,34	20,99	19,74
Test Fuel Load - kg DB	10,61	12,57	12,73
Test fuel Loading density lb./ft ³	10,20	12,14	12,17
Residual SU fuel wt. - as fired lb.	3,9	NA	NA
Residual SU fuel wt.- as % of test fuel load	13,8%	NA	NA
Test run duration - minutes	120	512	321
Test run duration - h	2,00	8,53	5,35
Test fuel load wt at the end of the test - as fired lb	2,6	0	0
total fuel burned kg Db	12,35	12,57	12,73
% test fuel load wt at end of the test	9,2%	0,0%	0,0%

2.4 TEST RUN RESULTS SUMMARY

Model name / number	F 55 V2		
Usable Firebox volume	2.76		
Convection air Fan (no, Standard, option)	optional		
Test runs nu.	1,1	1,2	2,1
Date tested	February 5 th 2020	February 5 th 2020	February 6 th 2020
Test run category	H	L	M
Burn rate - Kg/hr DB	6,51	1,47	2,38
Burn rate as % of low to high Midpoint	NA	22,6%	59,6%
Burn duration - h	2,00	8,53	5,35
Heat output btu/hr	84 311	18 962	30 818
Average Dilution Tunnel Flow Rate - dscfm	322,4	344,7	327,1
Average Sample Flow Rates - dscfm			
Train 1	0,1762	0,1763	0,1736
train 2	0,1503	0,1484	0,1466
Total PM Emissions - g			
Train 1 g	4,25	13,15	3,64
train 2 g	4,37	11,93	4,11
Average	4,31	12,54	3,87
PM emission train precision %	1,30%	4,85%	6,11%
PM emission g/kg	0,35	1,00	0,30
PM emission rate g/h	2,15	1,47	0,72
Total Co Emission g	39,8	741,3	414,5
Co emission Rate g/h	27,1	86,9	77,5
1 st hour emission rate g/h	3,1	3,1	2,3
Overall Efficiency - CSA B415,1			
% HHV Basis	67,39%	68,44%	67,78%
% LHV Basis	72,51%	73,64%	72,93%

2.5 WEIGHTED AVERAGE SUMMARY

Model name / number	F 55 V2		
Usable Firebox volume	2.76		
Convection air Fan (no, Standard, option)	optional		
average for each test run category	L	M	H
burn rate kg/h DB	1,47	2,38	6,51
PM Emission rate - g/h	1,47	0,72	2,15
Co emission rate - g/h	86,87	77,47	27,15
Overall Efficiency - CSA B 415,1			
% HHV Basis	68,4%	67,8%	67,4%
% LHV Basis	73,6%	72,9%	72,5%
Heat output - Btu/hr	18962	30818	84311
Category weighting	0,4	0,4	0,2

2.6 WEIGHTED AVERAGE FINAL RESULTS

ASTM E 3053 Weighted averages			
PM Emission Rate - g/h	1,31		
CO Emission Rate g/h	71,2		
Overall Efficiency - CSA B415,1			
% HHV Basis	67,97%		
% LHV Basis	73,13%		
Heat output range - Btu/h	18 962	to	84311
Co Arithmetic average g/min	1.06		

2.7 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before	After	Before	After	Before	After	Before	After
	(F)	(F)	(in.Hg)	(in.Hg)	(%)	(%)	(ft/min)	(ft/min)
1.1	75	74	30,00	30,06	23,1	22,4	0	0
1.2	75	74	30,00	30,06	23,1	22,4	0	0
2.1	74	77	29,71	29,50	21,2	21,9	0	0

2.8 DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (ASTM E2515)

Average dilution tunnel measurements				Sample Data			
Run Number / test category	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1.1	120	322,41	606,87	21,146	18,041	2,40	2,10
1.2	512	344,74	556,90	90,257	75,974	6,80	5,20
2.1	321	327,07	573,12	55,733	47,043	2,00	1,90

2.9 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number / test category	Sample Ratio		Total Emission (g)		
	Train 1	Train 2	Train 1	Train 2	% Deviation
1.1	1829,65	2144,56	4,25	4,37	1,30%
1.2	1955,60	2323,24	13,15	11,93	4,85%
2.1	1883,76	2231,74	3,64	4,11	6,11%

3 PROCESS DESCRIPTION

3.1 DISCUSSION

The wood heater has been received in a good shape by a carrier in January 2020. Maximum burn rate has been done on February 5th 2020 followed by a minimum burn rate. On February 6th 2020 the medium burn rate as been done.

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Restriction: 2.125 X 20.875 inches at the front of unit
- Dimensions: covers the hearth area minus the restriction at front
- Material: Steel and Stainless Steel, Cast iron

Firebox material

- Firebrick 1 ¼ thick lining cover all sides and bottom
- Vermiculite panels covered with Stainless steel insulate the firebox rear wall

Flue gas exhaust

- Location: Top or back
- Dimensions: 6 inches
- Material: Cast Iron

Gasket

- Door: Fiberglass rope. 5/8" dia. Low density
 - Glass: Fiberglass rope. 1/4" dia. Low density
- Refer to appendix 6 for all details and location

Overall unit dimension

- Firebox dimensions: 21-inch-wide x 17.25-inch-deep x 11 to 13 inch high
- Usable volume: 2.76 cuft.
- Overall heater dimension: 27.50-inch-wide 24-inch-deep 31 inch high

Convection fan

- Optional Part Number 156431

Catalyst

- None

3.3 AIR SUPPLY SYSTEM

Description

- Primary air: from the bottom through an air wash above the door.
- Secondary air: From the bottom of the stove to the back, up the back wall and into the secondary baffle and distributed by three rows of holes into the firebox and a fourth row in the top of the baffle above the firebox

Characterization

The following table shows the inlet and outlet sections of each system. The air introduction system number is referred to on a set of drawings in Appendix 6.

AIR INTRODUCTION SYSTEM		INLET (1) sq. in.			OUTLET (sq. in.)
Identification	Type	Imin	Imax	Controlled	
A *	Primary	0.930	3.244	Yes	3.686
B *	Secondary	4.000	4.000	No	2.990
C *	Pilot	0.248	0.248	No	0.331

* This section would be filled by measuring and comparing with the manufacturer's drawings included in the test report.

Legend

Identification: Tag name referred to on drawings in Appendix 14, section airflow pattern

Type: Characterization of air intake

Imin: Minimum air intake of a particular air channel

Imax: Maximum air intake of a particular air channel

Controlled: Determines if a provision for air control is present

Outlet: Total air outlet of a particular air channel

3.4 OPERATION DURING TEST

Run #1.1

This run was performed on February 5th 2020. It lasted 120 minutes and a maximum burn rate was obtained at 6.5 kg/hr & emission at 2.2 gr/hr. The air inlet damper was at the maximum setting and the convection fan was at high position on auto start.

Run #1.2

This run was performed on February 5th 2020. It lasted 512 minutes and a minimum burn rate was obtained at 1.47 kg/hr & emission at 1.47 gr/hr. The air inlet damper was at the minimum setting and the convection fan was at low position on auto start.

Run #2.1

This run was performed on February 6th 2020. It lasted 497 minutes and a medium burn rate was obtained at 2.38 kg/hr & emission at 0.72 gr/hr. The air inlet damper was at the medium setting and the convection fan was at low position on auto start.

- Details: Refer to the front page of each test run data sheets found in appendix for the detailed test sequence showing air supply settings and adjustments, fuel bed adjustments and operational specifics of the test unit.

Test fuel load

- Type of wood: Red Oak, 18 to 25% dry basis moisture content
- Description: for each test, description of the fuel load is found on the front page of each test run data sheet together with photograph in appendix.

3.5 START-UP OPERATION

The complete manufacturer's firing procedure of each burn rate category is fully described in appendix 13.

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel at a point 15 feet from the tunnel entrance. The tunnel has two elbows in the system ahead of the sampling section. The sampling section is a continuous 20-foot section of 8-inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube located 48 inches from the beginning of the sampling section. Thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 4%. Tunnel samplers are located 56 inches downstream of the pitot tube and 24 inches upstream from the end of this section.

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 6.

3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

The complete test equipment list together with all corresponding calibration data can be found in Appendix 3.

4 SAMPLING METHODS

4.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515. This method uses two identical sampling systems with Gelman A/E 61631 binder free (or equivalent), 47 mm diameter EMFAB TX40H 120-WW Pall filters. The dryers used in the sample systems are filled with "Drierite" before each test run.

5 QUALITY ASSURANCE

5.1 INSTRUMENT CALIBRATION

5.1.1 GAS METERS

At the conclusion of each test program the gas meters are verified using the reference dry gas meter. This process involves sampling the train operation for 1 cubic foot of volume. With readings made to .01 fr', the resolution is 1 %, giving an accuracy higher than the 2% required by the standard.

5.1.2 SCALES

Before each test program, the different scales used are checked with traceable calibration weights to ensure their accuracy.

5.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NBS traceable gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments

are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

5.2 TEST METHOD PROCEDURES

5.2.1 LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train. Pre-test and post-test leak checks are conducted with a vacuum of 5 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post-test vacuum value. If leakage limits are not met, the test run is rejected. During these tests, the vacuum is typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

The tunnel velocity is calculated from a center point pitot tube signal multiplied by an adjustment factor. This factor is determined by a traverse of the tunnel as prescribed in EPA Method 1. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

Proportionalities were calculated in accordance with ASTM E2515. The data and results are found in appendix.

St-jean-sur-Richelieu, February 16th 2020

Client: Jotul

Project: PI-20206

Model: F55 V2

APPENDIX 1: Raw data, forms and results

Date: 2020-02-05 Manufacturer: Jotul Model: F55
Project #: PI 20206 Run: 1 Tech: MM Reviewer: DP

- Kindling 118 LBS STAIN FINE (1 min torch)
- At 3 min close door
- Fan on (auto) High
- At 30 LBS insert load
- At 65 LBS stop pump
- Make coal bed
- Set Fan low
- At 8:45 close air inlet (1/2) 302 LBS
- At 14:30 close air inlet completely
- At 400 LBS insert load
- close door immediately

TEST LOAD CONFIGURATION

PRE / POST CHECKS

Date: 2020-02-05 Manufacturer: Jetul Model: 155
 Project #: PT 20206 Run: 1 Tech: MM Reviewer: DL

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-101	7:00	ok	ok

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check (Tunnel velocity).....

Picture.....

0 (max 50 Fpm)	0 (max 50 Fpm)
ok	NA
4 sides ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H₂O).....

Traverse before ignition.....

2020-02-05
2020-02-05
ok
ok

Temperature System:

Ambient (65°-90°F).....

ok °F

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

ok
ok
ok

Sampling Train ID Numbers:

	High fire test			Medium low fire test		
	1 st hour	Train 1	Train 2	1 st hour	Train 1	Train 2
Probe.....	005	30	42	19	21	32
Filter Front.....	08	10	12	15	17	23
Filter Back.....	09	11	13	16	22	24
Filter Thermocouple.....	11	MM & H	12	11	11	12
Filter (80°F ≥ <90°F).....	ok	ok	ok	ok	ok	ok

SAMPLING EQUIPMENT CHECK OUT

Date: 2020-02-05 Manufacturer: Joyle Model: FSS
 Project #: PT 20206 Run: 1 Tech: h m Reviewer: DP

Leakage Checks Tunnel Samplers

High fire test	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	144210.68	144840.48	144210.98	144210.63	085105.90	085642.20
Initial 1minute DGM (Liter)	144210.58	144840.48	144210.84	144210.48	085105.75	085642.00
Change © (Liter)	010	003	012	015	015	020
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK

Low medium fire test	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1minute DGM (Liter)	144842.30	147541.68	144842.50	147541.80	085644.70	087912.12
Initial 1minute DGM (Liter)	144842.15	147541.45	144842.40	147541.75	085644.50	087912.00
Change © (Liter)	015	020	010	005	020	012
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK



SAMPLING EQUIPMENT CHECK OUT

Date: 2020-02-05 Manufacturer: Johval Model: 155
 Project #: PT 20206 Run: 1 Tech: MM Reviewer: DP

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotameter Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	.4	3	.4
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

Date: 2026-02-05 Manufacturer: Johal Model: F55
 Project #: PI 20206 Run: 1 Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	<u>EM-090</u>	<u>44 lbs, Class F</u>	<u>44 lbs</u>
Wood	<u>EM-090</u>	<u>44 lbs, Class F</u>	<u>44 lbs</u>
Analytical	<u>EM-128</u>	<u>106 mg, Class S</u>	<u>106 mg</u>
Analytical	<u>EM-129</u>	<u>200 g, Class S</u>	<u>200 g</u>

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

CONTINUOUS ANALYZERS

Date: 2020-02-05 Manufacturer: Jo/ul Model: F55
 Project #: PL 20206 Run: 1 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 1016 (KPa.) Static pressure (P_q) 0.16 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963Ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0.074	73.21
B - Centroid	3.00	3.50	4	0.075	72.96
A-1	0.40	0.50	0.50	0.060	73.12
A-2	1.50	1.75	2	0.076	73.12
A-3	4.50	5.25	6	0.074	73.21
A-4	5.60	6.5	7.5	0.061	73.12
B-1	0.40	0.50	0.50	0.062	73.96 72.96
B-2	1.50	1.75	2	0.062	72.93
B-3	4.50	5.25	6	0.078	72.92
B-4	5.60	6.5	7.5	0.062	73.06
AVERAGE					

$$v_s = K_p C_p (\sqrt{\Delta_p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

C_p = pitot tube coefficient, dimension less = 0.99 for standard pitot.

Δ_p = manometer reading (inches H₂O)

T_s = average absolute dilution tunnel temperature (°F + 460)

P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qs}$

P_q = static pressure in H₂O
 { 13.6 }

M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

K_p = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_{p,avg}$ = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

Date: 2020-02-05 Manufacturer: Jotul Model: F55
 Project #: PL 2026 Run: 1 Tech: MM Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2981	3000	1000	1000
Tolerance CO	0	+/- 0.02	0.019	+/- 0.15	0.009	+/- 0.05
CO ₂	0	0	1811	1800	982	1000
Tolerance CO ₂	0	+/- 0.02	0.11	+/- 0.5	0.18	+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	2995	1002	0	0.02	0.019	0.15	0.009	0.05	✓	
CO ₂	0	1803	985	0	0.02	0.08	0.5	0.00	0.5	✓	

TEST DATA LOG

Date: 2020-02-05 Manufacturer: Joel Model: F55
 Project #: PT 20206 Run: 1 Tech: mm Reviewer: DP

RAW DRY GAS METER READINGS

		System 1	System 2	Blank
High fire test	Final (Liter)	144839.35	085646.63	00700 mm 017
	Initial (Liter)	144212.11	085106.74	mm 988.978 JL
Low medium fire test	Final (Liter)	147539.67	087908.85	128.76
	Initial (Liter)	144843.49	085645.35	00700

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101.6	101.8
Dry Bulb (F):	74.6	73.6
Humidity (%):	63.1	20.4

FUEL DATA

Date: 2020-02-05 Manufacturer: Jo / v1 Model: FSS
 Project #: PI 20206 Run: 1 Tech: MM Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

KINDLING AND START-UP LOAD

Piece Size	Weight	Meter Moisture Content (% dry)					
x x 16 in.	7812 lbs.	9		9			9
x x in.	lbs.						
x x 16 in.	710 lbs.	20		20			20
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						

HIGHFIRE TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)					
4,00 x3.75 x 16 in.	5488 lbs.	228		241			183
4,50 x4.00 x 16 in.	5126 lbs.	224		186			201
4,00 x3.00 x 16 in.	4498 lbs.	181		186			183
x x in.	lbs.						
4,00 x4.00 x 16 in.	6138 lbs.	201		226			239
3.50 x3.50 x 16 in.	3800 lbs.	181		186			192
3.00 x2.50 x 16 in.	313 lbs.	191		181			206
x x in.	lbs.						
x x in.	lbs.						

FUEL DATA

Date: 2020-02-05 Manufacturer: Jo/vi Model: F 55
 Project #: PT 20206 Run: i Tech: MM Reviewer: YJ

FUEL DESCRIPTION:

Type of wood:

LOW OR MEDIUM TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)				
4.00 x 4.00 x 16 in.	5432 lbs.	201		186		191
5.00 x 4.00 x 16 in.	5984 lbs.	221		203		204
3.00 x 4.00 x 16 in.	5440 lbs.	246		227		230
x x in.	lbs.					
4.00 x 3.50 x 16 in.	5078 lbs.	196		161		190
4.00 x 4.00 x 16 in.	5636 lbs.	221		196		228
5.00 x 4.00 x 16 in.	7176 lbs.	236		191		199
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2020-02-04 Manufacturer: Johel Model: F55
 Project #: PI 20206 Run: 1 Tech: ML Reviewer: SL

HIGHFIRE TEST FILTERS									
SYSTEM 1 - 1 st hour					SYSTEM 1				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	Time	005	08	09	34	30	10	11	14
2020-02-04	17:00	615030	01778	35 0132	107 7241	01781		34 5779	00882
2020-02-05	9:30	615029	01778	35 0133	107 7242	01781		34 5780	00883

SYSTEM 1 - 1 st hour									
SYSTEM 1					SYSTEM 1				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	Time	005	08	09	34	30	10	11	14
2020-02-05	13:00	615034	01793	35 0143	107 7248	01786		34 5793	00886
2020-02-10	8:30	615031	01792	35 0135	107 7243	01785		34 5782	00884
2020-02-11	8:30	615031	01792	35 0134	107 7243	01785		34 5782	00884

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2020-02-04 Manufacturer: Johnson Model: F55
 Project #: PI 20206 Run: 1 Tech: MM Reviewer: DS

HIGH FIRE TEST FILTERS				
SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2020-02-04	17:00	110 3146	01760	35, 1158
2020-02-05	9:00	110 3146	01761	35, 1159

HIGH FIRE TEST FILTERS				
SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			
2020-02-05	15:00	110 3154	01779	35, 1164
2020-02-10	8:00	110 3149	01778	35, 1159
2020-02-11	8:00	110 3149	01778	35, 1160



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2020-02-04
Project #: 9120206 Run: 1
Manufacturer: Jotul
Tech: MM
Reviewer: [Signature]
Model: F55

MEDIUM / LOW FIRE TEST FILTERS									
SYSTEM 1 - 1 st hour					SYSTEM 1				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	19	15	16	15	21	17	22	31	25
17:30	109 0912	0 1770		35 3265	108 7395	0 1746		34 8710	00856
20:20-21:05	109 0913	0 1771		35 3266	108 7395	0 1747		34 8711	00857

[illegible]



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2020-02-04 Manufacturer: Jofvi Model: FSS
Project #: 01 2020 Run: 1 Tech: MM Reviewer: _____

MEDIUM / LOW FIRE TEST FILTERS					
SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	23	24	39	
2020-02-04	17:00	1101790	01716	351704	
2020-02-05	17:00	1101789	01717	351705	

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	23	24	39	
2020-02-05	17:30	1101792	01731	351709	
2020-02-10	8:00	1101792	01764	351707	
2020-02-11	8:00	1101792	01764	351707	

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: JOT

Description du test

Test standard	EPA
Run #	1
Date	05-02-2020
Technicien	M.M
Project #	PI 20206

Description de l'unité

Manufacturier	JOTUL	
Modèle	F55 V2	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	2,7	cu ft.
Appliance weight empty	n.a	lbs
Fan (no, Standard, Option)	optional	

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	n.a	BTU/h Donnée fournie par le manufacturier
Targeted category	1	
Targeted output	n.a	BTU/h
Cp steel	n.a	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,995	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20206
Date 05-02-2020
Technicien m.m

Fuel data

Fuel type	Cord
Fuel specie	Oak
HHV	20207,0 kJ/kg
%C	49,5
%H	6,6
%O	43,7
%Ash	0,2
HHV	8689,9 Btu/lb
LHV	7600,4 Btu/lb

Default Fuel Values

	D. Fir	Oak/Maple
HHV	19 810	20 207
%C	48,73	49,5
%H	6,87	6,62
%O	43,9	43,7
%Ash	0,5	0,2
HHV (Btu/lb)	8519	8690
LHV (Btu/lb)	7451	7600

Adjunct to ASTM E XXXX Wood Heater Cordwood Test Method - May 10, 2017 Version
 Cordwood Fuel Load Calculators - 10 lb/ft³ Nominal Load Density
 Core 45-65% of Total Load Weight, Remainder 35-55% of Total Load Weight

Values to be input manually

For All Usable Firebox Volumes - High Fire Test Only									
Nominal Required Load Density (wet basis)	10 lb/ft ³								
Usable Firebox Volume	2.70 ft ³								
Total Nom. Load Wt. Target	27.00 lb								
Total Load Wt. Allowable Range	25.70 to 28.40 lb								
Core Target Wt. Allowable Range	12.20 to 17.60 lb								
Remainder Load Wt. Allowable Range	9.50 to 14.90 lb								
Core Load Pc. Wt. Allowable Range	4.10 to 6.80 lb								Mid-Point 5.45
Remainder Load Pc. Wt. Allowable Range	2.70 to 14.90 lb								8.80
Core Load Piece Wt. Actual	Pc. #								
	1	5.49 lb	In Range						
	2	5.11 lb	In Range						
	3	4.50 lb	In Range						
Core Load Total Wt. Actual		15.09 lb	In Range						
Remainder Load Piece Wt.	Pc. #								
(1 to 3 Pcs.)	1	6.14 lb	In Range						
	2	3.80 lb	In Range						
	3	3.13 lb	In Range						
Remainder Load Tot. Wt. Act		13.07 lb	In Range						
Total Load Wt. Actual		28.16 lb	In Range						
Core % of Total Wt.		54%	In Range						45-65%
Remainder % of Nominal Target		46%	In Range						35-55%
Actual Load % of Nominal Target		104%	In Range						95-105%
Actual Fuel Load Density		10.4 lb/ft ³							
Kindling and Start-up Fuel									
Maximum Kindling Wt. (20% of Tot. Load Wt.)		5.63 lb							
Actual Kindling Wt.		4.81 lb	In Range						17.1%
Maximum Start-up Fuel Wt. (30% of Tot. Load Wt.)		8.45 lb							
Actual Start-up Fuel Wt.		7.10 lb	In Range						25.2%
Allowable Residual Start-up Fuel Wt. Range		2.8 to 5.6 lb							Mid-Point 4.2
Actual Residual Start-up Fuel Wt.		3.9 lb	In Range						
Total Wt. All Fuel Added (wet basis)		40.07 lb							
High Fire Test Run End Point Range Based on Fuel Load Wt. (w/tares)		Low 2.5 to High 3.1 lb							Mid-Point 2.8
Actual Fuel Load Ending Wt.		2.6 lb	In Range						
Load pieces Length in.		16 in.							

Load high fire

Adjunct to ASTM E XXXX Wood Heater Cordwood Test Method - May 10, 2017 Version
Cordwood Fuel Load Calculators - 12 ft³ Nominal Load Density
Core 45-65% of Total Load Weight, Remainder 35-55% of Total Load Weight

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For Usable Firebox Volumes up to 3.0 ft ³ - Low and Medium Fire									
Nominal Required Load Density (wet basis)									
Usable Firebox Volume	12 in ³	2.70 lb ^a							
Total Nom. Load Wt. Target		32.4 lb							
Total Load Wt. Allowable Range		30.78 lb	to	34.02 lb					
Core Target Wt. Allowable Range		14.58 lb	to	21.08 lb					
Remainder Load Wt. Allowable Range		11.34 lb	to	17.82 lb					
Core Load Fuel P.C. Wt. Allowable Range	4.86	to	8.10	lb					Mid-Point 6.48
Remainder Load P.C. Wt. Allowable Range	3.24	to	9.72	lb					6.48
Core Load Piece Wt. Actual	P.C. #								
Core Load Total Wt. Actual		1	5.43 lb						In Range
		2	5.93 lb						In Range
		3	5.44 lb						In Range
			16.86 lb						In Range
Remainder Load Piece Wt. (2 or 3 Pcs.)	P.C. #								
		1	3.86 lb						In Range
		2	5.64 lb						In Range
		3	7.18 lb						In Range
			54%						In Range
Remainder Load Piece Weight Ratio - Small/Large			16.07 lb						In Range
Remainder Load Tot. Wt. Act.			33.52 lb						In Range
Total Load Wt. Actual			50%						In Range
Core % of Total Wt.			50%						In Range
Remainder % of Total Wt.			50%						In Range
Actual Load % of Nominal Target			103%						In Range
Actual Fuel Load Density			12.4 lb/ft ³						In Range
Allowable Charcoal Bed Wt. Range (lb)	3.4	to	6.7						Mid-Point 5.0
Actual Charcoal Bed Wt.			4.0 lb						In Range
Actual Fuel Load Ending Wt.			0.0 lb						Valid Test
Total Wt. of Fuel Burned During Test Run lb.			33.5 lb						≥ 90%
Load pieces Length in.			16 in						

For Usable Firebox Volumes above 3.0 ft ³ - Low and Medium Fire			
Nominal Required Load Density (wet basis)	12 lb/ft ³		
Usable Firebox Volume	0 lb		
Total Nom. Load Wt. Target	0.00 to 0.00	lb	
Total Load Wt. Allowable Range	0.00 to 0.00	lb	
Core Target Wt. Allowable Range	0.00 to 0.00	lb	
Remainder Load Wt. Allowable Range	0.00 to 0.00	lb	
Core Load Fuel P/c. Wt. Allowable Range	0.00 to 0.00	lb	
Remainder Load P/c. Wt. Allowable Range	0.00 to 0.00	lb	
Core Load Piece Wt. Actual	P/c. #		
	1	lb	In Range
	2	lb	In Range
	3	lb	In Range
Core Load Total Wt. Actual		0.00 lb	In Range
Remainder Load Piece Wt. (3 or 4 P/c.)	P/c. #		
	1	lb	In Range
	2	lb	In Range
	3	lb	In Range
	4	lb	NA
Remainder Load Piece Weight Ratio - Small Range	#NOM/REI		#NOM/REI ≤ 67%
Remainder Load Tot. Wt. Act	0.00 lb		In Range
Total Load Wt. Actual	0.00 lb		In Range
Core % of Total Wt.	#DIV/DI		#DIV/DI 45-65%
Remainder % of Total Wt.	#DIV/DI		#DIV/DI 35-55%
Actual Load % of Nominal Target	#DIV/DI		#DIV/DI 95-105%
Actual Fuel Load Density	#DIV/DI	lb/ft ³	
Allowable Charcoal Bed Wt. Range (lb)	0.1 to >0.1		Mid-Point 0.0
Actual Charcoal Bed Wt.	lb		Out of Range ≥ 90%
Actual Fuel Load Ending Wt.	lb		Valid Test
Total Wt. of Fuel Burned During Test Run	lb		

Fuel Probe Moisture Reading (%-dry basis)				Pc. Wt. Dry Basis	
1	2	3	Ave.	In Range	In Range
20.1	18.6	19.1	19.3	In Range	In Range
22.1	20.3	20.4	20.9	In Range	In Range
24.6	22.9	23	23.5	In Range	In Range
				4.55 lb	2.07 kg
				4.95 lb	2.24 kg
				4.40 lb	2.00 kg
19.6	20.1	19	19.6	In Range	In Range
22.1	19.6	22.6	21.5	In Range	In Range
23.6	19.1	19.9	20.9	In Range	In Range
				5.54 lb	2.69 kg
Total Load Ave. MC % (dry basis)				3.22 lb	1.46 kg
Total Load Ave. MC % (wet basis)				4.64 lb	2.10 kg
Total Test Load Weight (dry basis)				27.71 lb	12.57 kg
Total Fuel Weight Burned During Test Run (dry basis)				27.7	12.57

Fuel Piece Moisture Reading (%-dry basis)			Pc. Wt. Dry Basis		
1	2	3	Ave.		
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			NA	NA	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg
			#DIV/0!	#DIV/0!	kg

Total Load Ave. MC % (dry basis)
 Total Load Ave. MC % (wet basis)
 Total Test Load Weight (dry basis)
 Total Fuel Weight Burned During Test Run (dry basis)

	Start	End
Barometer (kPa):	101,6	101,8
Barometer (in.Hg):	30,002469	30,06152868
Dry Bulb (F):	74,6	73,6
Humidity (%):	23,1	22,4
Air velocity (ft/min)	0	0

High fire test					
DGM #1	Final:	5114,953	cuft	Final:	144839,350
	Initial:	5092,803	cuft	Initial:	144212,110
DGM #2	Final:	3024,370	cuft	Final:	85640,630
	Initial:	3005,516	cuft	Initial:	85106,740
DGM room				Final:	1007,000
				Initial:	978,720

min or med burnrate					
DGM #1	Final:	5210,314	cuft	Final:	147539,670
	Initial:	5115,100	cuft	Initial:	144843,490
DGM #2	Final:	3104,472	cuft	Final:	87908,850
	Initial:	3024,537	cuft	Initial:	85645,350
DGM room				Final:	128,720
				Initial:	7,000

Numéro de la ligne dans "Raw data" à partir duquel les données du test commence	88
Numéro de la ligne dans "Raw data" à partir duquel les données du highfire test commence	121
Numéro de la ligne dans "Raw data" à partir duquel les données du min ou medium fire test commence	259

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	PI 20206
Date	05-02-2020
Technicien	M.M

Filter set weight highfire

Number	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date	Heure
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	gasket			
Before (1)	5	08 09	34	30	10 11	36	42	12 13	40	14		
Before (2)												
Before (3)												
Before (4)												
Before (5)												
Before (6)	61,5030	0,1778	35,0132	107,7241	0,1781	34,5779	110,3146	0,1760	35,1158	0,0882	2020-02-04	17:00
After (1)	61,5029	0,1778	35,0133	107,7242	0,1781	34,5780	110,3146	0,1761	35,1159	0,0883	2020-02-05	09:00
After (2)	61,5034	0,1793	35,0143	107,7248	0,1786	34,5793	110,3154	0,1779	35,1164	0,0886	2020-02-05	13:00
After (3)	61,5031	0,1792	35,0135	107,7243	0,1785	34,5782	110,3149	0,1778	35,1159	0,0884	2020-02-10	08:00
After (4)	61,5031	0,1792	35,0134	107,7243	0,1785	34,5782	110,3149	0,1778	35,1160	0,0884	2020-02-11	08:00
After (5)												
After (6)	61,5031	0,1792	35,0134	107,7243	0,1785	34,5782	110,3149	0,1778	35,1160	0,0884	2020-02-11	08:00
Difference	0,0002	0,0014	0,0000	0,0001	0,0004	0,0002	0,0003	0,0017	0,0000	0,0001		
Total (mg)	1,7			2,4			2,1			0,1		
Total ajusté (mg)	1,60			2,30			2,00					

Project nu.	PI 20206
Date	05-02-2020
Technicien	M.M

Filter set weight Low/ medium fire

Number	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	front / Back	gasket	probe	front / Back			
Before (1)	19	15 16	15	21	17 22	31	32	23 24	23 24	39	25				
Before (2)															
Before (3)															
Before (4)															
Before (5)															
Before (6)															
After (1)	109,0912	0,1770	35,3265	108,7395	0,1746	34,8710	110,1790	0,1716		35,1704	0,0856	2020-02-04	17:00		
After (2)	109,0913	0,1771	35,3266	108,7395	0,1747	34,8711	110,1789	0,1717		35,1705	0,0857	2020-02-05	11:00		
After (3)	109,0918	0,1784	35,3269	108,7399	0,1802	34,8715	110,1792	0,1771		35,1709	0,0860	2020-02-05	23:00		
After (4)	109,0915	0,1783	35,3268	108,7398	0,1795	34,8712	110,1792	0,1764		35,1707	0,0858	2020-02-10	08:00		
After (5)	109,0915	0,1783	35,3268	108,7398	0,1795	34,8712	110,1792	0,1764		35,1707	0,0858	2020-02-11	08:00		
After (6)	109,0915	0,1783	35,3268	108,7398	0,1795	34,8712	110,1792	0,1764		35,1707	0,0858	2020-02-11	08:00		
Difference	0,0002	0,0012	0,0000	0,0003	0,0048	0,0001	0,0003	0,0047	0,0000	0,0002	0,0001				
Total (mg)		1,6			6,8			5,2							
Total ajusté (mg)		1,50			6,70			5,10							

Project nu. PI 20206
Date 05-02-2020
Technicien M.M

* Elapsed Time min	Raw data row	* Weigh Remaining g	* CO %	* CO ₂ %	* Plue Gas %	* 1 Room Temp °F	* 2 Tunnel Dry Bulb °F	* 3 Tunnel Dry Bulb °F	* 4 Unit Top °F	* 5 Unit Back °F	* 6 Unit R. Side °F	* 7 Unit L. Side °F	* 8 Unit Bottom °F	* 9 Mass flow 1 Reading cfm/min	OGM 1 Inlet °F	OGM 1 Outlet °F	Filter 1 Temp °F	Mass flow 2 Reading cfm/min	OGM 2 Inlet °F	OGM 2 Outlet °F	Filter 2 Temp °F
0.00	88.00	11.8	0.0	0.0	83.5	69.7	74.5	72.4	70.4	70.4	70.6	70.4	70.7	0.18	71.59	71.58	81.90	0.15	72.01	72.01	86.82
1.0	89.0	11.8	0.0	0.1	106.7	69.9	74.5	72.4	70.4	70.4	70.6	70.4	70.7	0.18	71.59	71.58	81.90	0.15	72.01	72.01	86.82
2.0	90.0	11.8	0.0	0.1	98.6	69.9	72.7	77.7	70.4	70.4	70.6	70.5	70.7	0.18	71.77	72.15	86.07	0.15	72.07	72.17	87.04
3.0	91.0	11.8	0.0	0.6	93.1	70.0	72.6	78.8	70.5	70.6	70.7	70.5	70.7	0.18	71.87	72.19	86.07	0.15	72.10	72.23	86.38
4.0	92.0	11.7	0.0	0.2	107.4	70.1	72.4	78.8	70.6	70.6	70.7	70.5	70.6	0.18	71.90	72.20	86.23	0.15	72.08	72.24	85.76
5.0	93.0	11.7	0.0	0.2	107.4	70.1	72.4	78.8	70.6	70.6	70.7	70.5	70.6	0.18	71.90	72.20	86.23	0.15	72.08	72.24	85.76
6.0	94.0	11.7	0.0	0.2	107.4	70.1	72.4	78.8	70.6	70.6	70.7	70.5	70.6	0.18	71.90	72.20	86.23	0.15	72.08	72.24	85.76
7.0	95.0	11.7	0.0	0.4	131.2	70.2	73.2	81.1	70.8	70.8	70.8	70.5	70.6	0.18	71.96	72.22	85.63	0.15	72.09	72.27	85.19
8.0	96.0	11.6	0.0	0.5	131.6	70.2	73.2	81.1	70.8	70.8	70.8	70.5	70.6	0.18	71.96	72.22	85.63	0.15	72.09	72.27	85.19
9.0	97.0	11.6	0.0	1.4	166.2	70.2	74.8	91.3	71.3	71.3	71.3	70.6	70.6	0.18	72.03	72.21	84.99	0.15	72.05	72.31	84.70
10.0	98.0	11.4	0.0	3.1	270.4	70.4	80.5	131.3	71.5	71.5	71.5	70.6	70.6	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
11.0	99.0	11.2	0.1	5.4	401.5	70.3	89.9	180.8	72.1	72.1	72.1	71.0	71.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
12.0	100.0	10.9	0.1	7.5	548.1	70.4	104.1	242.3	72.7	72.7	72.7	71.1	71.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
13.0	101.0	10.5	0.1	11.5	679.8	70.6	120.2	300.6	73.0	73.0	73.0	71.4	71.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
14.0	102.0	10.1	0.2	14.5	740.7	70.7	131.7	362.4	74.7	74.7	74.7	71.8	71.8	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
15.0	103.0	9.7	0.4	15.7	768.6	70.7	139.2	411.9	75.8	75.8	75.8	72.4	72.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
16.0	104.0	9.2	0.2	16.6	815.2	71.2	148.3	479.9	82.5	82.5	82.5	73.0	73.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
17.0	105.0	8.7	0.1	17.4	829.6	71.3	153.2	539.8	88.7	88.7	88.7	74.1	74.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
18.0	106.0	8.2	0.2	17.8	812.1	71.3	153.0	581.0	96.2	96.2	96.2	74.1	74.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
19.0	107.0	7.8	0.1	16.6	808.6	71.3	154.4	603.9	104.5	104.5	104.5	75.7	75.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
20.0	108.0	7.4	0.1	16.2	785.7	71.7	152.6	625.7	120.9	120.9	120.9	76.4	76.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
21.0	109.0	7.0	0.1	15.3	749.3	71.7	149.0	625.7	120.9	120.9	120.9	76.4	76.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
22.0	110.0	6.7	0.1	12.5	732.4	71.7	146.8	630.9	135.9	135.9	135.9	77.9	77.9	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
23.0	111.0	6.4	0.1	12.8	744.2	71.9	146.4	635.5	153.4	153.4	153.4	78.3	78.3	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
24.0	112.0	6.1	0.1	13.1	740.0	72.0	147.2	638.6	173.8	173.8	173.8	79.7	79.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
25.0	113.0	5.8	0.1	12.7	720.2	72.0	145.1	635.4	185.2	185.2	185.2	80.7	80.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
26.0	115.0	5.1	0.1	11.4	690.7	72.0	141.1	621.7	196.7	196.7	196.7	82.4	82.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
27.0	116.0	4.9	0.1	10.1	670.8	72.0	137.3	610.5	208.0	208.0	208.0	84.2	84.2	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
28.0	117.0	4.7	0.1	9.8	661.9	72.1	137.8	600.1	219.1	219.1	219.1	85.9	85.9	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
29.0	118.0	4.4	0.2	9.8	656.4	72.0	136.5	592.2	230.4	230.4	230.4	87.3	87.3	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
30.0	119.0	4.0	0.2	9.6	670.2	72.1	136.1	586.1	243.5	243.5	243.5	88.7	88.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
31.0	120.0	3.9	0.2	6.3	654.3	72.2	135.9	583.6	255.4	255.4	255.4	89.9	89.9	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
32.0	121.0	3.6	0.2	6.6	672.3	72.3	144.8	587.2	259.4	259.4	259.4	91.3	91.3	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
33.0	122.0	3.1	0.2	11.1	705.5	72.8	145.3	598.1	269.9	269.9	269.9	92.3	92.3	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
34.0	123.0	3.0	0.0	12.2	742.7	72.4	147.4	612.2	259.0	259.0	259.0	94.0	94.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
35.0	124.0	3.0	0.0	13.1	719.8	72.5	151.3	635.4	255.1	255.1	255.1	95.7	95.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
36.0	125.0	3.0	0.0	14.4	790.3	72.9	152.1	655.4	252.1	252.1	252.1	97.0	97.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
37.0	126.0	2.9	0.0	13.0	778.3	72.9	152.1	655.4	252.1	252.1	252.1	97.0	97.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
38.0	127.0	2.9	0.0	14.7	803.0	73.1	159.0	732.0	242.7	242.7	242.7	98.7	98.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
39.0	128.0	2.9	0.0	14.5	800.9	73.3	159.3	739.9	241.5	241.5	241.5	99.4	99.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
40.0	129.0	2.9	0.0	14.4	805.5	73.3	161.1	743.0	240.9	240.9	240.9	100.7	100.7	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
41.0	130.0	2.8	0.0	14.4	807.1	73.2	160.2	757.6	240.9	240.9	240.9	101.3	101.3	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
42.0	131.0	2.8	0.0	14.5	819.5	73.4	163.5	771.0	242.3	242.3	242.3	102.9	102.9	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
43.0	132.0	2.8	0.0	14.9	823.6	73.2	163.5	771.0	242.3	242.3	242.3	103.6	103.6	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
44.0	133.0	2.7	0.0	15.1	831.0	73.4	165.2	780.2	243.4	243.4	243.4	105.0	105.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
45.0	134.0	2.7	0.0	15.3	833.7	73.5	165.8	791.2	244.8	244.8	244.8	106.2	106.2	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
46.0	135.0	2.5	0.0	15.4	842.7	73.7	167.7	805.4	246.2	246.2	246.2	107.4	107.4	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
47.0	136.0	2.5	0.0	15.7	851.8	73.6	170.0	811.5	250.5	250.5	250.5	108.6	108.6	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
48.0	137.0	2.5	0.0	16.1	866.7	73.9	171.6	820.3	252.8	252.8	252.8	110.0	110.0	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
49.0	138.0	2.5	0.0	16.2	868.3	73.9	170.1	827.3	252.9	252.9	252.9	110.6	110.6	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
50.0	139.0	2.4	0.0	16.1	870.8	74.2	171.4	842.7	260.9	260.9	260.9	112.2	112.2	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
51.0	140.0	2.4	0.0	16.1	871.2	74.2	171.8	845.4	263.8	263.8	263.8	112.8	112.8	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
52.0	141.0	2.4	0.0	16.2	876.2	74.3	172.8	852.9	269.8	269.8	269.8	114.1	114.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
53.0	142.0	2.4	0.0	16.3	876.2	74.3	172.8	852.9	269.8	269.8	269.8	114.1	114.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
54.0	143.0	2.3	0.0	16.2	876.2	74.3	172.8	852.9	269.8	269.8	269.8	114.1	114.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
55.0	144.0	2.3	0.0	16.2	876.2	74.3	172.8	852.9	269.8	269.8	269.8	114.1	114.1	0.18	72.10	72.21	83.73	0.15	72.11	72.33	83.63
56.0	145.0	2.2	0.0	16.2	876.2	74.3	172.8	852.9	269.8	269.8	269.8	114									

82.0	170.0	14.2	0.0	13.8	804.4	74.7	161.5	758.2	346.1	353.6	291.8	425.6	0.18	79.52	76.22	84.57	0.15	79.57	77.12	83.51
83.0	171.0	13.9	0.0	13.8	807.2	74.9	160.8	756.5	350.2	355.3	293.6	432.5	0.18	79.54	76.24	84.59	0.15	79.59	77.16	83.54
84.0	172.0	13.6	0.0	13.8	807.7	75.1	160.9	757.2	354.3	357.3	295.6	440.1	0.18	79.52	76.22	84.57	0.15	79.59	77.16	83.54
85.0	173.0	13.3	0.0	13.9	808.4	75.1	161.0	758.2	358.6	359.4	297.7	447.8	0.18	79.54	76.25	84.11	0.15	79.61	77.21	83.59
86.0	174.0	13.0	0.0	13.9	808.0	75.2	161.7	757.0	363.0	361.4	299.7	455.1	0.18	79.67	76.89	84.02	0.15	79.68	77.32	83.94
87.0	175.0	12.8	0.0	14.0	806.7	75.2	160.8	760.5	367.5	362.9	300.9	462.0	0.18	79.65	76.93	83.80	0.15	79.72	77.36	82.90
88.0	176.0	12.5	0.0	13.9	804.2	75.5	159.5	759.0	371.8	364.8	302.9	469.2	0.18	79.80	77.01	83.80	0.15	79.79	77.42	82.88
89.0	177.0	12.2	0.0	13.8	801.3	75.8	162.1	756.3	376.4	366.4	304.6	477.1	0.18	79.87	77.04	83.76	0.15	79.77	77.45	82.85
90.0	178.0	11.9	0.0	13.6	799.8	75.6	160.5	781.4	381.0	368.0	306.5	484.3	0.18	79.80	77.11	83.75	0.15	79.88	77.52	82.87
91.0	179.0	11.7	0.0	13.5	798.0	75.6	157.4	783.7	385.5	369.9	308.1	491.5	0.18	80.07	77.19	83.69	0.15	80.00	77.62	82.86
92.0	180.0	11.4	0.0	13.5	798.8	75.7	158.6	783.7	390.1	371.5	309.7	498.0	0.18	80.15	77.24	83.71	0.15	80.03	77.67	82.88
93.0	181.0	11.1	0.0	13.4	798.1	75.7	157.4	783.7	390.1	371.5	309.7	498.0	0.18	80.15	77.24	83.71	0.15	80.03	77.67	82.88
94.0	182.0	10.9	0.0	13.4	798.0	75.8	154.1	777.1	399.6	372.8	311.2	506.2	0.18	80.19	77.29	83.72	0.15	80.07	77.74	82.89
95.0	183.0	10.7	0.0	13.2	794.7	75.8	155.1	776.3	404.3	377.0	312.9	513.8	0.18	80.41	77.39	83.66	0.15	80.17	77.78	82.89
96.0	184.0	10.4	0.0	12.9	775.1	75.6	153.4	765.6	409.2	378.2	316.3	520.7	0.18	80.47	77.44	83.62	0.15	80.23	77.85	82.92
97.0	185.0	10.2	0.0	12.4	770.4	75.6	152.4	765.9	414.2	379.8	317.5	528.7	0.18	80.47	77.44	83.57	0.15	80.27	77.88	82.89
98.0	186.0	10.0	0.0	12.3	762.0	76.1	152.4	757.5	419.2	380.9	319.3	535.6	0.18	80.36	77.55	83.57	0.15	80.27	77.90	82.93
99.0	187.0	9.8	0.0	12.1	759.5	75.7	151.8	750.5	424.4	381.5	320.0	543.3	0.18	80.60	77.68	83.54	0.15	80.36	77.94	82.95
100.0	188.0	9.6	0.0	11.9	751.7	75.4	151.5	746.6	429.6	381.6	321.9	551.3	0.18	80.63	77.68	83.58	0.15	80.36	77.98	82.99
101.0	189.0	9.3	0.0	11.8	746.4	75.8	150.7	736.4	435.3	382.0	323.4	564.6	0.18	80.42	77.64	83.53	0.15	80.25	77.97	83.99
102.0	190.0	9.2	0.0	11.7	745.2	75.7	149.7	732.3	442.3	382.0	324.3	570.8	0.18	80.31	77.71	83.48	0.15	80.22	78.02	83.01
103.0	191.0	9.0	0.0	11.7	744.1	75.6	149.1	727.9	449.7	382.1	325.4	577.0	0.18	80.29	77.73	83.48	0.15	80.20	78.05	83.09
104.0	192.0	8.8	0.0	11.6	740.5	75.6	148.7	722.0	457.2	381.8	326.7	583.1	0.18	80.24	77.72	83.55	0.15	80.14	78.09	83.15
105.0	193.0	8.6	0.0	11.5	737.9	75.7	148.9	715.9	465.3	381.6	327.9	588.8	0.18	80.31	77.77	83.59	0.15	80.15	78.12	83.15
106.0	194.0	8.4	0.0	11.4	732.7	75.8	148.7	715.2	472.6	380.9	328.9	594.0	0.18	80.34	77.78	83.59	0.15	80.16	78.16	83.18
107.0	195.0	8.3	0.0	11.4	729.2	75.7	145.5	707.0	479.6	380.4	330.0	599.2	0.18	80.24	77.80	83.64	0.15	80.17	78.15	83.21
108.0	196.0	8.1	0.0	10.3	706.4	75.7	145.4	697.5	485.9	379.5	330.8	603.0	0.18	80.10	77.78	83.61	0.15	80.09	78.17	83.23
109.0	197.0	8.0	0.0	9.8	698.5	75.7	142.8	681.0	491.3	379.1	331.4	605.3	0.18	80.13	77.81	83.57	0.15	80.04	78.20	83.22
110.0	198.0	7.8	0.1	9.6	694.1	75.6	140.8	681.1	499.7	379.2	332.1	608.4	0.18	80.08	77.82	83.52	0.15	80.01	78.23	83.20
111.0	199.0	7.7	0.1	9.6	691.6	75.8	141.3	675.9	503.1	376.1	333.0	615.1	0.18	80.11	77.88	83.51	0.15	80.01	78.26	83.18
112.0	200.0	7.5	0.1	9.1	688.9	75.5	140.1	664.9	506.7	375.1	333.9	616.6	0.18	80.29	77.97	83.40	0.15	80.08	78.27	83.18
113.0	201.0	7.4	0.1	9.3	680.1	75.5	137.6	650.5	513.5	372.8	333.1	620.9	0.18	80.30	78.00	83.40	0.15	80.09	78.33	83.18
114.0	202.0	7.3	0.1	8.8	671.8	75.5	136.9	647.0	516.6	371.2	333.5	623.1	0.18	80.34	78.02	83.31	0.15	80.13	78.35	83.11
115.0	203.0	7.2	0.1	8.5	665.8	75.4	136.6	647.1	520.1	369.5	333.7	627.2	0.18	80.42	78.07	83.26	0.15	80.15	78.39	83.07
116.0	204.0	7.1	0.1	8.5	663.2	75.4	136.6	647.1	520.1	369.5	333.7	627.2	0.18	80.41	78.11	83.15	0.15	80.17	78.45	83.03
117.0	205.0	6.9	0.1	8.5	659.8	75.3	135.3	633.7	523.1	367.7	330.8	630.2	0.18	80.41	78.15	83.10	0.15	80.22	78.50	82.93
118.0	206.0	6.8	0.1	8.5	657.3	75.7	134.9	631.4	526.1	366.3	329.8	631.9	0.18	80.46	78.15	82.99	0.15	80.20	78.50	82.89
119.0	207.0	6.7	0.1	8.5	653.9	75.7	134.9	631.4	526.1	366.3	329.8	631.9	0.18	80.46	78.15	82.99	0.15	80.20	78.50	82.89
120.0	208.0	6.6	0.2	8.5	650.6	75.1	134.8	627.7	529.2	364.7	328.5	633.6	0.18	80.39	78.15	82.99	0.15	80.18	78.53	82.84

* Elapsed Time min	* Raw data row	* Weight Remaining lbs	* CO ₂ %	* Floc Gas	* 1 Room Temp °F	* 2 Room Temp °F	* 3 Tunnel Dry Bulb °F	* 4 Unit Top °F	* 5 Unit Back °F	* 6 Unit R-Side °F	* 7 Unit L-Side °F	* 8 Unit Bottom °F	* 9 Unit Sealing °F	* 10 Mass flow 1 cfm/min	* 11 DGM 1 Inlet °F	* 12 DGM 1 Outlet °F	* 13 Filter 1 Temp °F	* 14 Mass flow 2 cfm/min	* 15 DGM 2 Inlet °F	* 16 DGM 2 Outlet °F	* 17 Filter 2 Temp °F	* 18 DGM 2 Inlet °F	* 19 DGM 2 Outlet °F	* 20 Filter 2 Temp °F
0.00	239.00	32.9	0.6	3.9	74.7	74.7	122.8	401.3	432.4	270.2	254.8	555.9	0.18	77.77	78.24	84.05	0.15	78.53	78.03	86.54	78.03	78.03	86.54	
1.0	260.0	32.7	0.5	2.7	424.4	74.7	111.5	398.4	425.6	268.9	253.6	555.3	0.18	77.94	78.22	84.05	0.15	78.53	78.03	86.54	78.03	78.03	86.54	
2.0	281.0	32.5	0.7	4.6	516.6	74.8	115.7	409.8	416.3	267.3	252.8	554.7	0.18	78.03	78.20	86.43	0.15	78.58	78.05	86.34	78.05	78.05	86.34	
3.0	302.0	32.2	0.5	8.2	603.2	74.8	123.8	442.8	405.8	266.0	251.2	552.5	0.18	78.02	78.18	86.08	0.15	78.57	78.05	86.17	78.05	78.05	86.17	
4.0	323.0	31.9	0.3	10.6	665.5	74.6	132.6	475.1	395.0	264.8	249.5	550.4	0.18	78.12	78.16	85.68	0.15	78.61	78.05	86.17	78.05	78.05	86.17	
5.0	344.0	31.5	0.1	13.4	716.0	74.9	140.7	508.8	375.4	263.8	246.5	548.1	0.18	78.12	78.16	85.68	0.15	78.61	78.05	86.17	78.05	78.05	86.17	
6.0	365.0	31.0	0.1	16.2	767.8	75.1	148.6	542.2	375.4	263.8	246.5	548.1	0.18	78.12	78.16	85.68	0.15	78.61	78.05	86.17	78.05	78.05	86.17	
7.0	386.0	30.6	0.0	19.0	820.2	75.0	156.2	585.6	367.0	264.3	245.2	545.8	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
8.0	407.0	30.1	0.0	21.7	874.7	74.9	163.7	628.1	353.3	265.3	244.2	543.5	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
9.0	428.0	29.8	0.1	24.5	929.6	75.6	171.4	671.2	341.0	270.2	243.4	541.8	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
10.0	449.0	29.4	0.0	27.3	984.5	75.5	179.1	714.5	328.7	276.1	242.5	539.9	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
11.0	470.0	29.0	0.0	30.1	1039.4	75.7	186.8	757.8	316.4	281.6	241.6	538.0	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
12.0	491.0	28.6	0.0	32.9	1094.3	75.8	194.5	800.9	304.2	286.9	240.7	536.1	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
13.0	512.0	28.3	0.0	35.7	1149.2	75.7	202.2	844.0	291.9	292.2	239.8	534.2	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
14.0	533.0	28.0	0.1	38.5	1204.1	75.8	209.9	887.1	279.6	297.3	238.9	532.3	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
15.0	554.0	27.7	0.1	41.3	1259.0	75.7	217.6	930.2	267.3	302.4	238.0	530.4	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
16.0	575.0	27.5	0.1	44.1	1313.9	75.8	225.3	973.3	255.0	307.5	237.1	528.5	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
17.0	596.0	27.2	0.1	46.9	1368.8	75.4	233.0	1016.4	242.7	312.6	236.2	526.6	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
18.0	617.0	27.0	0.1	49.7	1423.7	75.4	240.7	1059.5	230.4	317.7	235.3	524.7	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
19.0	638.0	26.8	0.1	52.5	1478.6	75.5	248.4	1102.6	218.1	322.8	234.4	522.8	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
20.0	659.0	26.5	0.1	55.3	1533.5	75.3	256.1	1145.7	205.8	327.9	233.5	520.9	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
21.0	680.0	26.2	0.1	58.1	1588.4	75.3	263.8	1188.8	193.5	333.0	232.6	519.0	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
22.0	701.0	25.9	0.1	60.9	1643.3	75.6	271.5	1231.9	181.2	338.1	231.7	517.1	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
23.0	722.0	25.7	0.1	63.7	1698.2	75.6	279.2	1275.0	168.9	343.2	230.8	515.2	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
24.0	743.0	25.4	0.1	66.5	1753.1	75.6	286.9	1318.1	156.6	348.3	229.9	513.3	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
25.0	764.0	25.2	0.2	69.3	1808.0	75.6	294.6	1361.2	144.3	353.4	229.0	511.4	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
26.0	785.0	25.0	0.2	72.1	1862.9	75.6	302.3	1404.3	132.0	358.5	228.1	509.5	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
27.0	806.0	24.8	0.1	74.9	1917.8	75.6	310.0	1447.4	119.7	363.6	227.2	507.6	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
28.0	827.0	24.6	0.1	77.7	1972.7	75.6	317.7	1490.5	107.4	368.7	226.3	505.7	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
29.0	848.0	24.4	0.2	80.5	2027.6	75.6	325.4	1533.6	95.1	373.8	225.4	503.8	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
30.0	869.0	24.2	0.2	83.3	2082.5	75.6	333.1	1576.7	82.8	378.9	224.5	501.9	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
31.0	890.0	24.0	0.2	86.1	2137.4	75.6	340.8	1619.8	70.5	384.0	223.6	500.0	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
32.0	911.0	23.8	0.1	88.9	2192.3	75.5	348.5	1662.9	58.2	389.1	222.7	498.1	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
33.0	932.0	23.6	0.2	91.7	2247.2	75.5	356.2	1706.0	45.9	394.2	221.8	496.2	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
34.0	953.0	23.4	0.2	94.5	2302.1	75.6	363.9	1749.1	33.6	399.3	220.9	494.3	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
35.0	974.0	23.2	0.2	97.3	2357.0	75.6	371.6	1792.2	21.3	404.4	220.0	492.4	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
36.0	995.0	23.0	0.2	100.1	2411.9	75.6	379.3	1835.3	9.0	409.5	219.1	490.5	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
37.0	1016.0	22.8	0.1	102.9	2466.8	75.6	387.0	1878.4	0.0	414.6	218.2	488.6	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
38.0	1037.0	22.6	0.1	105.7	2521.7	75.6	394.7	1921.5	0.0	419.7	217.3	486.7	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
39.0	1058.0	22.4	0.1	108.5	2576.6	75.6	402.4	1964.6	0.0	424.8	216.4	484.8	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
40.0	1079.0	22.2	0.1	111.3	2631.5	75.6	410.1	2007.7	0.0	429.9	215.5	482.9	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
41.0	1100.0	22.0	0.1	114.1	2686.4	75.6	417.8	2050.8	0.0	435.0	214.6	481.0	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
42.0	1121.0	21.9	0.1	116.9	2741.3	75.6	425.5	2093.9	0.0	440.1	213.7	479.1	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
43.0	1142.0	21.7	0.1	119.7	2796.2	75.6	433.2	2137.0	0.0	445.2	212.8	477.2	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
44.0	1163.0	21.5	0.1	122.5	2851.1	75.6	440.9	2180.1	0.0	450.3	211.9	475.3	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
45.0	1184.0	21.3	0.1	125.3	2906.0	75.6	448.6	2223.2	0.0	455.4	211.0	473.4	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
46.0	1205.0	21.1	0.1	128.1	2960.9	75.6	456.3	2266.3	0.0	460.5	210.1	471.5	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
47.0	1226.0	20.9	0.1	130.9	3015.8	75.6	464.0	2309.4	0.0	465.6	209.2	469.6	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
48.0	1247.0	20.7	0.1	133.7	3070.7	75.6	471.7	2352.5	0.0	470.7	208.3	467.7	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
49.0	1268.0	20.6	0.1	136.5	3125.6	75.6	479.4	2395.6	0.0	475.8	207.4	465.8	0.18	78.33	78.22	85.35	0.15	78.80	78.13	86.16	78.13	78.13	86.16	
50.0	1289.0	20.4	0.1	139.3	3180.5	75.6	4																	

82.0	14.6	0.1	10.1	547.5	76.3	113.2	611.1	286.1	291.4	252.2	374.5	0.18	82.08	79.87	87.04	0.15	81.39	80.02	85.18
83.0	14.5	0.1	10.1	545.2	76.2	113.2	608.1	286.6	291.3	252.6	375.9	0.18	82.08	79.89	87.02	0.15	81.40	80.02	85.18
84.0	14.3	0.1	10.0	541.2	76.6	113.6	608.3	287.4	291.9	252.3	372.4	0.18	82.11	79.93	87.03	0.15	81.44	80.05	85.15
85.0	14.2	0.1	9.9	538.4	76.5	113.6	608.3	288.4	292.0	252.0	371.8	0.18	82.18	79.97	87.07	0.15	81.48	80.09	85.16
86.0	14.1	0.1	9.8	535.5	76.4	112.9	599.9	289.2	292.0	252.0	371.4	0.18	82.17	79.98	87.10	0.15	81.51	80.09	85.16
87.0	13.9	0.1	9.7	531.5	76.4	113.1	599.3	290.3	292.0	251.8	370.5	0.18	82.15	80.01	87.24	0.15	81.53	80.13	85.14
88.0	13.8	0.1	9.7	528.1	76.4	113.5	593.2	291.1	292.3	251.7	369.9	0.18	82.16	80.03	87.28	0.15	81.54	80.17	85.15
89.0	13.7	0.1	9.6	526.0	76.5	113.5	593.2	291.1	292.3	251.5	369.9	0.18	82.20	80.08	87.34	0.15	81.57	80.24	85.17
90.0	13.5	0.1	9.5	522.7	76.4	112.2	588.7	292.3	292.3	251.4	369.7	0.18	82.25	80.12	87.34	0.15	81.61	80.29	85.15
91.0	13.4	0.1	9.4	519.8	76.7	111.8	587.2	294.4	292.3	251.4	369.7	0.18	82.25	80.12	87.34	0.15	81.61	80.29	85.15
92.0	13.3	0.1	9.4	516.8	76.5	112.3	582.5	295.5	292.0	251.7	367.3	0.18	82.33	80.16	87.41	0.15	81.62	80.31	85.14
93.0	13.2	0.1	9.3	513.2	76.7	112.0	578.2	296.4	291.7	251.1	367.0	0.18	82.33	80.16	87.41	0.15	81.62	80.31	85.14
94.0	13.1	0.2	9.2	511.1	76.7	111.7	568.2	297.7	291.4	250.9	366.9	0.18	82.44	80.24	87.37	0.15	81.72	80.37	85.13
95.0	12.9	0.2	9.2	511.1	76.7	111.6	564.3	298.7	291.0	250.8	366.9	0.18	82.54	80.33	87.33	0.15	81.79	80.41	85.10
96.0	12.8	0.2	9.1	508.6	76.6	111.6	564.3	299.5	290.7	250.6	366.9	0.18	82.58	80.33	87.33	0.15	81.79	80.41	85.10
97.0	12.7	0.2	9.0	505.5	76.7	111.8	562.5	300.5	290.2	250.4	366.9	0.18	82.58	80.33	87.33	0.15	81.79	80.41	85.10
98.0	12.5	0.2	9.1	509.3	76.8	111.6	560.3	301.7	289.5	250.5	367.2	0.18	82.56	80.35	87.33	0.15	81.83	80.45	85.09
99.0	12.4	0.2	9.1	507.4	76.9	111.5	561.0	302.7	289.1	250.3	366.9	0.18	82.48	80.43	87.37	0.15	81.88	80.48	85.09
100.0	12.3	0.2	9.1	505.5	77.0	111.1	559.5	303.8	288.4	250.0	366.9	0.18	82.48	80.43	87.37	0.15	81.88	80.48	85.09
101.0	12.2	0.2	9.2	505.1	76.8	111.1	556.0	305.0	287.6	250.1	367.6	0.18	82.52	80.47	87.39	0.15	81.92	80.55	85.10
102.0	12.1	0.2	9.2	505.9	76.9	109.5	557.3	305.9	286.7	250.0	367.4	0.18	82.51	80.48	87.39	0.15	81.91	80.55	85.10
103.0	12.1	0.2	9.2	503.7	76.9	110.6	555.0	307.2	286.1	249.8	367.6	0.18	82.45	80.49	87.42	0.15	81.89	80.55	85.10
104.0	11.9	0.2	9.1	503.7	76.7	110.3	555.4	308.2	285.4	249.0	366.7	0.18	82.42	80.52	87.38	0.15	81.89	80.55	85.10
105.0	11.7	0.2	9.2	503.7	76.9	110.2	554.2	309.7	284.7	249.8	367.2	0.18	82.40	80.53	87.38	0.15	81.89	80.55	85.10
106.0	11.6	0.3	9.0	500.5	76.9	110.2	554.2	309.7	284.7	249.8	367.2	0.18	82.40	80.53	87.38	0.15	81.89	80.55	85.10
107.0	11.5	0.3	9.0	499.7	77.2	109.1	552.1	311.9	283.8	249.0	367.8	0.18	82.45	80.59	87.27	0.15	81.89	80.61	85.05
108.0	11.4	0.3	8.9	499.3	77.4	109.2	549.5	313.3	282.2	248.5	366.8	0.18	82.44	80.59	87.27	0.15	81.91	80.63	85.01
109.0	11.3	0.3	8.9	498.8	77.4	109.2	549.5	313.3	282.2	248.5	366.8	0.18	82.44	80.59	87.27	0.15	81.91	80.63	85.01
110.0	11.1	0.3	8.9	498.8	77.4	109.2	549.5	313.3	282.2	248.5	366.8	0.18	82.44	80.59	87.27	0.15	81.91	80.63	85.01
111.0	11.0	0.3	8.9	498.8	77.4	109.2	549.5	313.3	282.2	248.5	366.8	0.18	82.44	80.59	87.27	0.15	81.91	80.63	85.01
112.0	10.9	0.3	8.9	498.8	77.4	109.2	549.5	313.3	282.2	248.5	366.8	0.18	82.44	80.59	87.27	0.15	81.91	80.63	85.01
113.0	10.8	0.3	8.8	497.0	77.0	109.7	548.2	316.2	277.9	248.7	367.5	0.18	82.41	80.69	87.22	0.15	81.92	80.75	84.98
114.0	10.7	0.3	8.8	496.2	76.8	109.2	546.2	320.1	277.0	248.3	367.2	0.18	82.48	80.72	87.14	0.15	81.96	80.76	84.90
115.0	10.6	0.3	8.8	496.2	76.8	109.2	546.2	320.1	277.0	248.3	367.2	0.18	82.48	80.72	87.14	0.15	81.96	80.76	84.90
116.0	10.5	0.4	8.6	491.9	76.9	108.6	543.6	322.2	275.4	248.0	367.3	0.18	82.45	80.75	87.05	0.15	81.95	80.81	84.86
117.0	10.4	0.4	8.6	491.9	76.9	108.6	543.6	322.2	275.4	248.0	367.3	0.18	82.45	80.75	87.05	0.15	81.95	80.81	84.86
118.0	10.3	0.5	7.7	473.3	77.1	108.7	540.7	323.2	274.3	247.7	367.8	0.18	82.37	80.77	86.99	0.15	81.96	80.86	84.85
119.0	10.3	0.6	7.4	465.3	77.1	106.4	531.6	324.0	273.3	247.3	367.8	0.18	82.36	80.81	86.99	0.15	81.96	80.86	84.85
120.0	10.1	0.6	7.4	465.3	77.1	106.4	531.6	324.0	273.3	247.3	367.8	0.18	82.36	80.81	86.99	0.15	81.96	80.86	84.85
121.0	10.0	0.6	7.2	454.5	77.2	106.2	524.5	326.4	271.5	247.0	367.9	0.18	82.30	80.79	86.88	0.15	81.92	80.87	84.79
122.0	9.9	0.6	7.2	454.5	77.2	106.2	524.5	326.4	271.5	247.0	367.9	0.18	82.30	80.79	86.88	0.15	81.92	80.87	84.79
123.0	9.8	0.6	7.2	451.9	77.1	105.0	520.3	327.4	269.0	247.0	368.3	0.18	82.38	80.82	86.76	0.15	81.94	80.88	84.71
124.0	9.7	0.6	7.3	449.8	76.9	105.4	495.5	329.7	266.1	246.6	368.5	0.18	82.40	80.87	86.76	0.15	81.95	80.88	84.68
125.0	9.6	0.5	7.3	450.3	77.1	106.3	486.7	330.2	264.9	246.6	368.6	0.18	82.45	80.90	86.71	0.15	81.95	80.88	84.71
126.0	9.5	0.5	7.4	449.7	77.0	106.2	484.3	330.2	264.9	246.6	368.6	0.18	82.45	80.90	86.71	0.15	81.95	80.88	84.71
127.0	9.4	0.5	7.4	449.7	77.0	106.2	484.3	330.2	264.9	246.6	368.6	0.18	82.45	80.90	86.71	0.15	81.95	80.88	84.71
128.0	9.4	0.5	7.5	448.5	77.0	105.6	481.6	331.2	259.9	246.4	369.4	0.18	82.40	80.88	86.63	0.15	81.92	80.96	84.65
129.0	9.3	0.5	7.4	441.1	76.9	104.9	476.1	332.2	258.4	246.4	369.4	0.18	82.38	80.88	86.63	0.15	81.92	80.96	84.65
130.0	9.2	0.7	6.9	432.8	77.1	104.5	471.5	332.2	258.4	246.4	369.4	0.18	82.30	80.89	86.50	0.15	81.86	80.97	84.56
131.0	9.0	0.7	6.9	428.4	76.9	103.2	466.8	333.8	255.1	245.6	369.7	0.18	82.19	80.90	86.50	0.15	81.81	80.95	84.45
132.0	9.1	0.7	6.9	425.9	76.9	103.1	462.0	334.6	253.8	245.7	370.3	0.18	82.13	80.90	86.34	0.15	81.75	80.95	84.45
133.0	9.0	0.7	6.9	424.0	77.0	103.1	458.6	335.5	252.5	245.4	370.7	0.18	82.05	80.89	86.28	0.15	81.67	80.97	84.42
134.0	8.9	0.7	6.9	422.1	76.9	103.1	455.7	336.9	251.1	245.3	371.1	0.18	82.09	80.91	86.26	0.15	81.69	80.99	84.38
135.0	8.8	0.7	6.9	418.0	77.0	103.1	452.8	337.7	249.9	245.2	371.1	0.18	82.05	80.90	86.20	0.15	81.68	80.97	84.38
136.0	8.7	0.7	6.9	415.9	77.0	103.1	448.8	338.8	248.7	245.1	372.6	0.18	82.02	80.91	86.12	0.15	81.65	81.00	84.34
137.0	8.6	0.7	6.9	413.1	76.9	102.4	442.0	340.8	247.5	244.7	372.6	0.18	82.05	80.94	86.03	0.15	81.65	81.00	84.34
138.0	8.5	0.7	6.9	414.9	77.0	102.4	442.0	340.8	247.5	244.7	372.6	0.18	82.05	80.94	86.03	0.15	81.65	81.00	84.34
139.0	8.5	0.7	6.9	413.1	76.9	102.3	437.8	342.8	243.8	243.9	373.4	0.18	82.13	80.93	85.95	0.15	81.67	80.97	84.28
140.0	8.4	0.7	6.9	410.0	76.8	101.2	433.2	344.7	241.6	243.6	374.1	0.18	82.15	80.96	85.86	0.15	81.66	80.96	84.28
141.0	8.3	0.7	6.9	408.8	77.0	102.0	429.5	347.4	240.0	243.6	375.0	0.18	82.15	80.96	85.86	0.15	81.66	80.96	84.28
142.0	8.3	0.7	6.9	407.6	77.0	102.0	429.5	347.4	240.0	243.6	375.0	0.18	82.15	80.96	85.86	0.15	81.66	80.96	84.28
143.0	8.1	0.7	6.9	406.3	76.6	100.4	426.3	349.0	237.8	242.7	375.8	0.18	81.97	80.98	85.79	0.15	81.60	81.00	84.14
144.0	8.0	0.7	6.9	406.3	76.6	100.4	426.3	349.0	237.8	242.7	375.8	0.							

169.0	427.0	6.7	0.9	4.2	353.9	76.9	96.3	382.1	345.1	226.8	226.2	380.7	0.18	81.84	80.99	84.04	0.15	81.45	80.94	83.08
169.0	428.0	6.7	0.9	4.3	352.2	76.9	96.9	379.3	343.4	226.1	227.0	381.4	0.18	81.96	81.01	83.96	0.15	81.45	80.94	83.08
170.0	429.0	6.7	0.9	4.3	347.6	76.9	96.2	377.6	340.7	225.6	226.0	381.6	0.18	81.85	81.01	83.93	0.15	81.48	80.93	83.01
170.0	430.0	6.6	0.9	4.2	344.2	76.9	96.7	375.5	338.5	224.9	224.9	382.2	0.18	81.84	80.98	83.86	0.15	81.48	80.93	83.22
171.0	431.0	6.6	0.9	4.2	341.4	76.9	96.5	372.1	336.2	224.1	223.8	382.3	0.18	81.83	80.99	83.75	0.15	81.41	80.91	85.34
172.0	432.0	6.5	0.9	4.2	344.8	76.9	96.8	369.8	333.9	223.3	223.8	382.3	0.18	81.81	80.98	83.62	0.15	81.41	80.91	85.34
173.0	433.0	6.5	0.7	4.8	340.2	76.9	96.9	366.9	331.7	222.7	221.6	382.7	0.18	81.78	80.98	83.60	0.15	81.38	80.91	86.92
174.0	434.0	6.4	1.1	4.2	337.1	76.7	96.6	363.2	329.7	221.7	220.6	383.2	0.18	81.71	80.97	83.56	0.15	81.35	80.91	86.99
175.0	435.0	6.4	1.1	4.2	331.1	76.7	97.4	362.2	327.5	220.9	219.6	383.8	0.18	81.66	80.98	83.64	0.15	81.32	80.91	86.96
176.0	436.0	6.3	1.1	4.2	331.2	76.6	96.7	357.9	325.3	220.1	218.7	384.5	0.18	81.62	80.96	83.61	0.15	81.32	80.91	86.91
177.0	437.0	6.3	1.1	4.2	329.1	76.7	96.2	353.9	323.7	219.1	217.3	385.4	0.18	81.54	80.94	83.56	0.15	81.28	80.90	86.91
178.0	438.0	6.3	1.1	4.2	327.7	76.6	96.1	352.2	319.7	217.3	215.9	386.4	0.18	81.53	80.94	83.51	0.15	81.23	80.90	86.86
179.0	439.0	6.2	1.1	4.1	325.5	76.7	95.4	349.6	316.5	215.7	214.4	386.7	0.18	81.53	80.94	83.44	0.15	81.17	80.89	86.81
180.0	440.0	6.1	1.1	4.1	322.1	76.7	95.5	346.6	314.4	214.9	213.4	387.0	0.18	81.57	80.91	83.37	0.15	81.19	80.86	86.75
181.0	441.0	6.1	1.1	4.1	320.1	76.6	94.6	342.7	312.7	214.0	211.3	387.9	0.18	81.53	80.90	83.34	0.15	81.17	80.83	86.72
182.0	442.0	6.0	1.1	4.1	318.3	76.7	95.0	340.1	310.9	213.2	210.5	388.5	0.18	81.52	80.87	83.35	0.15	81.16	80.83	86.71
183.0	443.0	6.0	1.1	4.0	316.5	76.7	94.6	337.6	309.7	212.2	209.6	388.4	0.18	81.55	80.88	83.11	0.15	81.16	80.84	86.70
184.0	444.0	5.9	1.1	4.0	314.4	76.5	94.9	335.5	308.3	211.4	208.7	389.1	0.18	81.55	80.85	83.05	0.15	81.16	80.84	86.68
185.0	445.0	5.9	1.0	3.9	312.8	76.6	94.5	332.8	306.8	210.5	207.9	389.8	0.18	81.56	80.86	83.04	0.15	81.15	80.79	85.68
186.0	446.0	5.8	0.9	3.9	311.4	76.4	94.3	329.9	305.7	209.9	207.0	390.2	0.18	81.51	80.84	83.06	0.15	81.12	80.80	85.68
187.0	447.0	5.8	0.9	3.8	309.6	76.4	94.0	327.8	304.4	209.1	206.2	390.6	0.18	81.42	80.81	83.06	0.15	81.04	80.79	85.55
188.0	448.0	5.8	0.9	3.8	308.5	76.3	93.9	325.8	303.3	208.5	205.3	391.2	0.18	81.28	80.80	82.94	0.15	80.96	80.81	85.23
189.0	449.0	5.8	0.9	3.8	306.5	76.3	92.5	323.4	302.1	207.3	204.3	391.6	0.18	81.21	80.79	82.88	0.15	80.95	80.79	85.11
190.0	450.0	5.7	0.9	3.8	304.5	76.3	92.9	321.8	301.1	206.5	203.4	391.6	0.18	81.26	80.80	82.83	0.15	80.94	80.80	84.99
191.0	451.0	5.7	0.9	3.8	302.1	76.5	92.8	320.4	300.0	205.6	202.6	392.1	0.18	81.31	80.78	82.70	0.15	80.95	80.78	84.84
192.0	452.0	5.7	0.9	3.8	300.2	76.6	92.8	318.6	297.9	204.0	201.3	392.1	0.18	81.31	80.77	82.72	0.15	80.96	80.76	84.61
193.0	453.0	5.7	0.9	3.8	300.2	76.6	92.7	316.6	297.2	203.2	200.0	392.3	0.18	81.31	80.76	82.71	0.15	80.95	80.76	84.48
194.0	454.0	5.7	0.8	3.7	298.6	76.6	92.7	314.2	297.2	202.7	199.3	393.1	0.18	81.31	80.76	82.71	0.15	80.95	80.76	84.48
195.0	455.0	5.6	0.8	3.7	297.0	76.7	92.5	312.4	296.3	202.7	198.2	393.2	0.18	81.29	80.76	82.68	0.15	80.95	80.76	84.23
196.0	456.0	5.6	0.8	3.7	295.8	76.5	91.9	311.0	295.6	202.1	197.3	393.2	0.18	81.29	80.76	82.68	0.15	80.95	80.76	84.23
197.0	457.0	5.6	0.8	3.7	294.2	76.7	92.8	307.6	294.7	201.2	196.7	394.0	0.18	81.29	80.76	82.68	0.15	80.95	80.76	84.23
198.0	458.0	5.5	0.8	3.7	293.6	76.7	92.9	306.3	294.3	200.8	196.7	394.0	0.18	81.29	80.76	82.68	0.15	80.95	80.76	84.23
199.0	459.0	5.5	0.8	3.7	292.6	76.7	92.1	305.5	293.6	200.0	195.9	393.4	0.18	81.22	80.71	82.61	0.15	80.91	80.77	83.98
200.0	460.0	5.5	0.8	3.7	291.9	76.4	92.1	304.6	293.0	199.1	195.2	393.8	0.18	81.31	80.71	82.54	0.15	80.93	80.76	83.75
201.0	461.0	5.5	0.8	3.7	290.4	76.6	91.7	303.0	292.6	198.6	194.5	393.9	0.18	81.34	80.72	82.51	0.15	80.93	80.76	83.75
202.0	462.0	5.5	0.8	3.7	288.8	76.6	92.0	301.9	292.2	198.3	193.7	394.3	0.18	81.32	80.71	82.47	0.15	80.94	80.78	83.49
203.0	463.0	5.4	0.8	3.8	287.5	76.7	91.7	300.6	291.8	197.6	192.8	394.6	0.18	81.33	80.73	82.44	0.15	80.94	80.78	83.49
204.0	464.0	5.4	0.8	3.8	286.9	76.6	91.6	299.4	291.2	196.8	192.1	394.9	0.18	81.30	80.71	82.47	0.15	80.92	80.75	83.20
205.0	465.0	5.4	0.8	3.8	285.3	76.6	91.8	297.8	290.0	196.5	191.6	395.3	0.18	81.29	80.69	82.47	0.15	80.94	80.75	83.20
206.0	466.0	5.4	0.8	3.8	283.7	76.6	91.6	296.2	288.7	195.0	190.4	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
207.0	467.0	5.4	0.8	3.8	282.1	76.7	91.8	294.6	287.0	194.3	189.7	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
208.0	468.0	5.3	0.8	3.8	280.5	76.6	91.6	293.0	285.3	193.9	188.9	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
209.0	469.0	5.3	0.8	3.8	278.9	76.7	91.8	291.4	283.7	193.2	188.2	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
210.0	470.0	5.3	0.9	3.9	286.7	76.7	91.5	292.3	292.1	193.9	188.9	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
211.0	471.0	5.3	0.9	3.9	285.1	76.7	91.1	291.7	289.9	193.2	188.2	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
212.0	472.0	5.3	0.9	3.9	283.5	76.7	91.2	290.7	288.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
213.0	473.0	5.3	0.9	3.9	281.9	76.7	91.2	289.7	287.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
214.0	474.0	5.2	0.9	3.9	280.3	76.6	91.6	288.2	286.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
215.0	475.0	5.2	0.9	3.8	281.5	76.7	91.4	286.5	285.9	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
216.0	476.0	5.2	0.9	3.8	280.3	76.6	91.6	284.8	284.9	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
217.0	477.0	5.2	0.9	3.9	282.6	76.6	90.6	283.9	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
218.0	478.0	5.2	0.9	3.9	281.4	76.7	91.3	282.6	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
219.0	479.0	5.1	0.8	3.9	280.4	76.7	91.0	281.4	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
220.0	480.0	5.1	0.8	3.9	278.9	76.6	91.0	280.2	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
221.0	481.0	5.1	0.8	3.9	277.3	76.6	91.0	278.9	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
222.0	482.0	5.1	0.8	3.9	275.7	76.5	90.6	277.3	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
223.0	483.0	5.1	0.8	3.9	274.1	76.5	90.4	275.7	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
224.0	484.0	5.0	0.8	3.7	272.6	75.5	90.4	274.1	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
225.0	485.0	5.0	0.8	3.7	271.0	75.5	90.4	272.6	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20
226.0	486.0	5.0	0.8	3.7	269.4	75.5	90.4	271.0	283.7	192.9	187.6	395.3	0.18	81.25	80.72	82.47	0.15	80.94	80.75	83.20

254.0	513.0	4.5	0.8	3.7	266.3	75.3	88.8	269.1	293.2	179.9	173.1	372.2	0.18	80.97	80.55	86.42	0.15	80.70	80.59	86.76
255.0	514.0	4.4	0.8	3.7	266.4	75.2	89.9	269.3	293.4	179.8	172.6	372.2	0.18	80.90	80.55	86.19	0.15	80.70	80.59	86.63
256.0	515.0	4.4	0.8	3.7	266.3	75.5	89.7	269.0	292.4	179.5	172.5	371.5	0.18	80.88	80.52	85.95	0.15	80.61	80.51	86.69
257.0	516.0	4.4	0.8	3.7	265.8	75.7	89.9	269.3	292.5	179.4	171.9	371.1	0.18	80.87	80.51	85.74	0.15	80.61	80.50	86.57
258.0	517.0	4.4	0.7	3.7	265.8	75.7	90.1	268.8	291.7	179.2	171.6	370.6	0.18	80.90	80.49	85.46	0.15	80.57	80.48	86.42
259.0	518.0	4.4	0.7	3.7	266.7	75.7	89.9	269.1	292.6	179.2	171.3	370.3	0.18	80.92	80.47	85.25	0.15	80.57	80.46	86.31
260.0	519.0	4.3	0.7	3.6	266.2	75.9	90.7	269.3	292.6	178.9	171.0	370.1	0.18	80.94	80.48	85.08	0.15	80.57	80.43	86.19
261.0	520.0	4.3	0.7	3.6	266.2	76.0	90.1	269.0	292.8	178.7	170.3	369.9	0.18	80.99	80.48	84.89	0.15	80.58	80.43	86.06
262.0	521.0	4.3	0.7	3.7	267.3	76.0	90.2	269.3	292.8	178.5	170.3	369.9	0.18	81.03	80.49	84.68	0.15	80.60	80.41	85.91
263.0	522.0	4.3	0.7	3.7	267.3	76.1	89.7	268.6	293.1	178.2	170.0	369.1	0.18	81.00	80.47	84.56	0.15	80.62	80.40	85.77
264.0	523.0	4.3	0.7	3.7	267.3	76.1	89.7	268.6	293.1	178.2	169.7	368.6	0.18	81.00	80.49	84.39	0.15	80.62	80.40	85.63
265.0	524.0	4.2	0.7	3.6	266.0	76.1	89.5	268.0	292.9	177.9	169.3	368.6	0.18	80.97	80.48	84.20	0.15	80.61	80.40	85.51
266.0	525.0	4.2	0.7	3.6	266.0	76.1	89.5	268.0	292.9	177.9	169.3	368.6	0.18	80.90	80.45	84.02	0.15	80.61	80.40	85.36
267.0	526.0	4.2	0.7	3.6	266.3	76.3	90.2	267.5	293.1	177.8	168.9	367.6	0.18	80.86	80.47	83.77	0.15	80.63	80.43	85.18
268.0	527.0	4.2	0.7	3.6	266.3	76.3	89.9	266.9	293.4	177.6	168.3	366.9	0.18	80.80	80.48	83.50	0.15	80.63	80.43	85.05
269.0	528.0	4.2	0.7	3.7	265.7	76.4	89.4	266.7	293.3	177.4	168.1	366.9	0.18	80.81	80.47	83.25	0.15	80.58	80.44	84.78
270.0	529.0	4.2	0.7	3.7	265.7	76.4	89.4	266.7	293.3	177.4	168.1	366.9	0.18	80.81	80.47	83.25	0.15	80.58	80.44	84.78
271.0	530.0	4.2	0.7	3.7	264.8	76.4	89.5	266.4	293.4	177.3	168.0	365.6	0.18	80.80	80.46	83.18	0.15	80.55	80.43	84.52
272.0	531.0	4.1	0.7	3.7	265.0	76.4	89.5	266.4	293.4	177.3	167.6	365.6	0.18	80.80	80.46	83.18	0.15	80.55	80.43	84.52
273.0	532.0	4.1	0.7	3.6	264.6	76.4	89.6	265.3	293.6	177.2	167.4	365.6	0.18	80.80	80.46	83.11	0.15	80.54	80.42	84.36
274.0	533.0	4.1	0.7	3.6	264.6	76.4	89.6	265.3	293.6	177.2	167.4	365.6	0.18	80.80	80.46	83.11	0.15	80.54	80.42	84.36
275.0	534.0	4.1	0.7	3.6	265.8	76.2	89.6	265.4	293.9	177.1	167.2	365.8	0.18	80.79	80.46	82.94	0.15	80.52	80.44	84.01
276.0	535.0	4.1	0.7	3.6	265.8	76.2	89.6	265.4	293.9	177.1	167.2	365.8	0.18	80.79	80.46	82.94	0.15	80.52	80.44	84.01
277.0	536.0	4.0	0.7	3.6	265.7	76.3	89.2	265.0	294.0	176.7	166.9	364.8	0.18	80.64	80.43	82.84	0.15	80.44	80.43	83.66
278.0	537.0	4.0	0.7	3.6	265.1	76.4	88.9	264.1	294.1	176.6	166.6	365.5	0.18	80.64	80.43	82.74	0.15	80.44	80.43	83.74
279.0	538.0	4.0	0.7	3.5	264.3	76.3	88.6	264.1	294.4	176.4	166.4	365.3	0.18	80.61	80.42	82.62	0.15	80.43	80.42	83.60
280.0	539.0	4.0	0.7	3.5	264.3	76.3	88.6	264.1	294.4	176.4	166.4	365.3	0.18	80.61	80.42	82.62	0.15	80.43	80.42	83.60
281.0	540.0	3.9	0.7	3.4	262.5	76.5	88.1	262.9	294.6	175.4	165.9	364.9	0.18	80.49	80.47	82.53	0.15	80.41	80.41	83.45
282.0	541.0	3.9	0.7	3.4	262.5	76.5	88.1	262.9	294.6	175.4	165.9	364.9	0.18	80.49	80.47	82.53	0.15	80.41	80.41	83.45
283.0	542.0	3.9	0.8	3.4	260.6	76.5	88.2	262.2	294.8	175.8	165.3	364.9	0.18	80.47	80.38	82.37	0.15	80.35	80.39	83.08
284.0	543.0	3.9	0.8	3.4	259.6	76.5	88.4	261.3	294.7	175.8	165.0	364.4	0.18	80.51	80.38	82.07	0.15	80.35	80.39	82.94
285.0	544.0	3.9	0.8	3.4	258.5	76.4	88.5	260.6	294.8	175.4	164.9	364.4	0.18	80.56	80.37	81.79	0.15	80.39	80.36	82.84
286.0	545.0	3.9	0.8	3.4	258.5	76.4	88.5	260.6	294.8	175.4	164.9	364.4	0.18	80.56	80.37	81.79	0.15	80.39	80.36	82.84
287.0	546.0	3.8	0.8	3.4	258.0	76.5	88.7	259.8	294.8	175.4	164.3	364.1	0.18	80.61	80.38	81.50	0.15	80.41	80.35	82.76
288.0	547.0	3.8	0.7	3.4	257.6	76.5	88.1	259.6	294.9	175.0	164.4	363.9	0.18	80.60	80.38	81.20	0.15	80.41	80.35	82.61
289.0	548.0	3.8	0.8	3.4	257.6	76.5	88.1	259.6	294.9	175.0	164.4	363.9	0.18	80.60	80.38	81.20	0.15	80.41	80.35	82.61
290.0	549.0	3.8	0.7	3.4	256.6	76.4	88.3	258.9	294.9	174.9	164.0	363.4	0.18	80.46	80.36	80.96	0.15	80.35	80.36	82.41
291.0	550.0	3.8	0.7	3.4	256.6	76.4	88.3	258.9	294.9	174.9	164.0	363.4	0.18	80.46	80.36	80.96	0.15	80.35	80.36	82.41
292.0	551.0	3.8	0.7	3.4	255.7	76.5	88.1	258.5	295.0	174.7	163.7	363.1	0.18	80.44	80.35	80.71	0.15	80.31	80.33	82.03
293.0	552.0	3.7	0.7	3.4	255.6	76.4	88.4	258.3	295.1	174.4	163.4	363.1	0.18	80.42	80.32	80.51	0.15	80.31	80.33	81.89
294.0	553.0	3.7	0.7	3.4	255.6	76.4	88.4	258.3	295.1	174.4	163.4	363.1	0.18	80.42	80.32	80.51	0.15	80.31	80.33	81.89
295.0	554.0	3.7	0.7	3.4	255.6	76.3	88.2	257.9	295.2	174.0	163.2	362.0	0.18	80.42	80.32	80.42	0.15	80.29	80.35	81.66
296.0	555.0	3.7	0.7	3.4	255.6	76.3	88.2	257.9	295.2	174.0	163.2	362.0	0.18	80.42	80.32	80.42	0.15	80.29	80.35	81.66
297.0	556.0	3.6	0.7	3.4	255.6	76.3	88.2	257.9	295.2	174.0	163.2	362.0	0.18	80.42	80.32	80.42	0.15	80.29	80.35	81.66
298.0	557.0	3.6	0.7	3.4	255.6	76.4	88.5	258.6	295.8	173.5	162.4	361.5	0.18	80.44	80.28	80.40	0.15	80.25	80.32	81.53
299.0	558.0	3.6	0.7	3.4	255.6	76.4	88.5	258.6	295.8	173.5	162.4	361.5	0.18	80.44	80.28	80.40	0.15	80.25	80.32	81.53
300.0	559.0	3.6	0.7	3.5	252.9	76.4	87.6	255.7	295.9	172.9	162.3	361.1	0.18	80.47	80.28	80.36	0.15	80.22	80.29	81.37
301.0	560.0	3.6	0.7	3.5	252.9	76.4	87.6	255.7	295.9	172.9	162.3	361.1	0.18	80.47	80.28	80.36	0.15	80.22	80.29	81.37
302.0	561.0	3.6	0.7	3.5	251.8	76.4	88.4	254.9	296.1	172.7	161.6	361.9	0.18	80.36	80.24	80.31	0.15	80.26	80.31	81.25
303.0	562.0	3.6	0.7	3.5	251.8	76.4	88.4	254.9	296.1	172.7	161.6	361.9	0.18	80.36	80.24	80.31	0.15	80.26	80.31	81.25
304.0	563.0	3.6	0.7	3.5	253.0	76.5	87.8	254.3	296.2	172.5	160.8	361.9	0.18	80.36	80.23	80.32	0.15	80.22	80.29	81.25
305.0	564.0	3.5	0.7	3.5	253.2	76.5	87.9	254.3	296.2	172.5	160.8	361.9	0.18	80.36	80.23	80.32	0.15	80.22	80.29	81.25
306.0	565.0	3.5	0.7	3.5	253.2	76.4	87.5	253.8	296.2	172.0	160.6	361.8	0.18	80.36	80.23	80.32	0.15	80.22	80.29	81.25
307.0	566.0	3.5	0.7	3.5	252.2	76.4	87.5	253.8	296.2	172.0	160.6	361.8	0.18	80.36	80.23	80.32	0.15	80.22	80.29	81.25
308.0	567.0	3.5	0.7	3.5	252.9	76.3	87.4	253.3	296.2	171.8	160.5	361.7	0.18	80.35	80.22	80.32	0.15	80.22	80.29	81.25
309.0	568.0	3.5	0.6	3.5	252.9	76.3	87.4	253.3	296.2	171.8	160.5	361.7	0.18	80.35	80.22	80.32	0.15	80.22	80.29	81.25
310.0	569.0	3.5	0.6	3.5	253.4	76.2	88.3	252.9	296.3	171.5	159.9	361.7	0.18	80.28	80.20	80.48	0.15	80.15	80.25	81.05
311.0	570.0	3.5	0.6	3.5	253.4	76.2	88.3	252.9	296.3	171.5	159.9	361.7	0.18	80.28	80.20	80.48	0.15	80.15	80.25	81.05
312.0	571.0	3.4	0.6	3.5	251.8	76.4	87.9	252.4	296.3	171.3	159.6	361.5	0.18	80.20	80.17	82.25	0.15	80.11	80.24	80.77
313.0	572.0	3.4	0.6	3.5	251.8	76.4	87.9	252.4	296.3	171.3	159.6	361.5	0.18	80.20	80.17	82.25	0.15	80.11	80.24	80.77

340.0	599.0	2.9	0.6	3.5	250.7	75.8	87.8	248.8	297.3	107.9	153.8	360.0	0.18	79.56	79.69	87.14	0.15	79.46	79.85	84.95
341.0	600.0	2.9	0.6	3.5	250.8	75.6	87.7	249.2	297.3	108.1	153.9	359.9	0.18	79.53	79.68	86.87	0.15	79.42	79.85	84.95
342.0	601.0	2.9	0.6	3.5	251.1	75.7	87.8	249.1	297.4	107.8	153.4	359.4	0.18	79.54	79.67	86.49	0.15	79.43	79.81	84.94
343.0	602.0	2.9	0.7	3.5	251.6	75.7	87.8	249.2	297.4	107.7	153.3	359.0	0.18	79.57	79.68	86.19	0.15	79.43	79.81	84.94
344.0	603.0	2.9	0.7	3.5	251.5	75.8	88.1	249.5	297.5	107.7	153.2	358.6	0.18	79.53	79.64	85.90	0.15	79.41	79.80	84.94
345.0	604.0	2.9	0.7	3.5	251.3	75.7	87.9	249.7	297.6	107.6	153.1	358.1	0.18	79.51	79.64	85.61	0.15	79.38	79.80	84.94
346.0	605.0	2.9	0.7	3.5	251.4	75.7	88.1	249.5	297.6	107.5	152.9	357.7	0.18	79.52	79.63	85.36	0.15	79.38	79.80	84.94
347.0	606.0	2.8	0.7	3.6	251.8	75.8	88.1	249.5	297.6	107.4	152.8	357.2	0.18	79.52	79.63	85.08	0.15	79.34	79.78	83.72
348.0	607.0	2.8	0.7	3.6	252.1	75.8	88.2	249.8	298.1	107.4	152.6	356.6	0.18	79.48	79.59	84.81	0.15	79.36	79.78	83.56
349.0	608.0	2.8	0.7	3.6	252.6	75.8	88.2	249.8	298.1	107.3	152.5	356.1	0.18	79.48	79.59	84.55	0.15	79.34	79.74	83.41
350.0	609.0	2.8	0.7	3.6	252.3	75.7	87.8	249.1	298.8	107.2	152.1	355.2	0.18	79.48	79.57	84.31	0.15	79.36	79.75	83.28
351.0	610.0	2.8	0.7	3.6	252.6	75.7	87.7	249.1	299.0	107.2	152.2	355.2	0.18	79.52	79.57	84.01	0.15	79.36	79.72	83.11
352.0	611.0	2.7	0.6	3.6	252.3	75.7	87.7	249.1	299.3	107.2	152.0	354.7	0.18	79.52	79.57	83.76	0.15	79.36	79.72	83.01
353.0	612.0	2.7	0.6	3.6	252.4	75.7	87.6	248.7	299.8	107.1	152.0	354.2	0.18	79.47	79.58	83.46	0.15	79.36	79.71	82.85
354.0	613.0	2.7	0.7	3.6	252.5	75.7	87.6	248.7	299.8	107.1	151.8	353.6	0.18	79.42	79.58	83.16	0.15	79.36	79.71	82.85
355.0	614.0	2.7	0.7	3.6	252.7	75.6	87.5	249.4	300.1	107.1	151.6	353.1	0.18	79.42	79.57	82.86	0.15	79.36	79.68	82.69
356.0	615.0	2.7	0.7	3.6	252.7	75.6	87.5	249.4	300.6	107.0	151.5	352.5	0.18	79.36	79.52	82.56	0.15	79.33	79.67	82.94
357.0	616.0	2.7	0.7	3.6	252.4	75.7	87.5	249.7	300.7	107.0	151.4	352.1	0.18	79.34	79.51	82.27	0.15	79.33	79.64	85.00
358.0	617.0	2.6	0.7	3.6	252.6	75.7	87.3	249.5	301.1	107.0	151.2	351.3	0.18	79.39	79.52	81.97	0.15	79.34	79.64	85.00
359.0	618.0	2.6	0.7	3.6	252.5	75.6	87.4	249.8	301.1	107.0	151.1	351.1	0.18	79.44	79.51	81.68	0.15	79.37	79.61	86.78
360.0	619.0	2.6	0.7	3.6	253.1	75.6	87.3	249.9	301.6	106.9	150.8	350.7	0.18	79.48	79.54	81.39	0.15	79.37	79.60	86.81
361.0	620.0	2.6	0.7	3.6	253.3	75.5	87.4	249.9	302.4	106.9	150.7	350.1	0.18	79.45	79.57	81.10	0.15	79.37	79.59	86.81
362.0	621.0	2.6	0.7	3.6	253.1	75.7	87.6	250.4	302.6	106.9	150.6	349.7	0.18	79.37	79.49	80.81	0.15	79.34	79.58	86.69
363.0	622.0	2.5	0.7	3.7	253.6	75.7	87.7	250.5	302.6	106.9	150.6	349.3	0.18	79.33	79.48	80.52	0.15	79.31	79.58	86.43
364.0	623.0	2.5	0.7	3.7	254.3	75.6	87.7	250.9	303.2	106.9	150.4	348.7	0.18	79.31	79.48	80.23	0.15	79.28	79.56	86.31
365.0	624.0	2.5	0.7	3.7	254.9	75.6	87.8	251.2	303.5	106.9	150.2	348.4	0.18	79.29	79.45	80.01	0.15	79.29	79.59	86.16
366.0	625.0	2.5	0.7	3.7	255.3	75.6	87.6	251.3	303.5	106.9	150.1	347.6	0.18	79.33	79.43	80.01	0.15	79.28	79.56	86.03
367.0	626.0	2.5	0.6	3.7	255.6	75.6	87.6	251.3	303.9	106.9	149.9	347.1	0.18	79.29	79.43	80.01	0.15	79.26	79.55	85.86
368.0	627.0	2.5	0.6	3.7	256.1	75.6	87.7	251.6	304.9	106.9	149.7	346.6	0.18	79.27	79.41	80.01	0.15	79.24	79.53	85.71
369.0	628.0	2.4	0.6	3.7	256.1	75.5	87.4	251.5	304.2	106.9	149.5	346.1	0.18	79.23	79.40	80.01	0.15	79.24	79.53	85.52
370.0	629.0	2.4	0.6	3.7	256.8	75.6	87.5	252.0	304.4	106.9	149.3	345.6	0.18	79.22	79.37	80.01	0.15	79.23	79.51	85.32
371.0	630.0	2.4	0.6	3.7	257.0	75.5	87.3	252.2	304.7	106.9	149.3	345.3	0.18	79.22	79.37	80.01	0.15	79.23	79.51	85.12
372.0	631.0	2.4	0.6	3.7	256.6	75.5	87.3	252.2	304.7	106.9	149.3	345.0	0.18	79.27	79.36	80.01	0.15	79.23	79.49	84.81
373.0	632.0	2.4	0.6	3.8	256.6	75.5	87.3	252.3	304.8	106.9	149.1	344.7	0.18	79.28	79.34	80.01	0.15	79.24	79.46	84.62
374.0	633.0	2.4	0.6	3.8	256.6	75.5	87.3	252.3	304.8	106.9	149.1	344.5	0.18	79.27	79.36	80.01	0.15	79.23	79.45	84.45
375.0	634.0	2.3	0.6	3.7	256.8	75.5	88.2	252.5	305.0	106.9	149.1	344.3	0.18	79.26	79.33	80.01	0.15	79.22	79.44	84.25
376.0	635.0	2.3	0.6	3.8	256.8	75.6	87.6	252.7	305.2	106.9	149.1	344.3	0.18	79.21	79.31	80.01	0.15	79.18	79.42	84.06
377.0	636.0	2.3	0.6	3.8	257.2	75.6	87.7	252.9	305.4	106.9	149.1	344.0	0.18	79.21	79.31	80.01	0.15	79.18	79.42	83.87
378.0	637.0	2.3	0.6	3.8	257.2	75.6	87.7	252.9	305.4	106.9	149.1	343.8	0.18	79.21	79.31	80.01	0.15	79.18	79.42	83.68
379.0	638.0	2.3	0.6	3.8	257.1	75.6	87.6	252.7	305.6	106.9	149.1	343.8	0.18	79.21	79.31	80.01	0.15	79.18	79.42	83.49
380.0	639.0	2.3	0.6	3.8	257.1	75.6	87.6	252.7	305.6	106.9	149.1	343.8	0.18	79.21	79.31	80.01	0.15	79.18	79.42	83.30
381.0	640.0	2.2	0.7	3.8	257.2	75.6	87.6	252.9	305.8	106.9	149.1	343.3	0.18	79.17	79.27	80.01	0.15	79.13	79.36	83.11
382.0	641.0	2.2	0.7	3.8	257.2	75.6	87.6	252.9	305.8	106.9	149.1	343.3	0.18	79.17	79.27	80.01	0.15	79.13	79.36	82.92
383.0	642.0	2.2	0.7	3.8	257.2	75.6	87.6	252.9	305.8	106.9	149.1	343.3	0.18	79.17	79.27	80.01	0.15	79.13	79.36	82.73
384.0	643.0	2.2	0.7	3.8	257.3	75.5	87.1	253.3	306.4	106.9	149.1	342.6	0.18	79.16	79.26	80.01	0.15	79.08	79.29	82.54
385.0	644.0	2.1	0.7	3.8	258.0	75.4	87.1	253.3	306.6	106.9	149.1	342.6	0.18	79.11	79.21	80.01	0.15	79.06	79.27	82.35
386.0	645.0	2.1	0.7	3.8	258.0	75.5	87.3	253.4	307.0	106.9	149.1	342.4	0.18	79.09	79.19	80.01	0.15	79.04	79.26	82.16
387.0	646.0	2.1	0.7	3.8	258.3	75.4	87.6	254.2	307.2	106.9	149.1	342.1	0.18	79.08	79.18	80.01	0.15	79.03	79.25	81.97
388.0	647.0	2.1	0.6	3.8	258.3	75.3	87.3	254.3	307.3	106.9	149.1	342.1	0.18	79.05	79.15	80.01	0.15	79.00	79.22	81.78
389.0	648.0	2.1	0.6	3.8	258.4	75.3	87.3	254.3	307.5	106.9	149.1	341.9	0.18	79.01	79.17	80.01	0.15	79.03	79.26	81.59
390.0	649.0	2.1	0.6	3.8	258.4	75.3	87.3	254.3	307.7	106.9	149.1	341.9	0.18	79.01	79.17	80.01	0.15	79.03	79.26	81.40
391.0	650.0	2.1	0.6	3.8	259.1	75.4	87.4	255.6	307.8	106.9	149.1	341.6	0.18	78.96	79.11	80.01	0.15	78.99	79.21	81.21
392.0	651.0	2.0	0.6	3.9	259.1	75.4	87.4	255.6	307.8	106.9	149.1	341.6	0.18	78.96	79.11	80.01	0.15	78.99	79.21	81.02
393.0	652.0	2.0	0.6	3.9	259.2	75.4	87.4	255.6	307.8	106.9	149.1	341.6	0.18	78.96	79.11	80.01	0.15	78.99	79.21	80.83
394.0	653.0	2.0	0.6	3.9	259.2	75.4	87.4	255.6	307.8	106.9	149.1	341.6	0.18	78.96	79.11	80.01	0.15	78.99	79.21	80.64
395.0	654.0	1.9	0.6	3.9	259.9	75.5	87.5	256.3	308.7	106.9	149.1	341.3	0.18	78.88	79.04	80.01	0.15	78.85	79.16	80.45
396.0	655.0	1.9	0.6	3.9	259.9	75.5	87.5	256.3	308.7	106.9	149.1	341.3	0.18	78.88	79.04	80.01	0.15	78.85	79.16	80.26
397.0	656.0	1.9	0.6	3.9	260.5	75.4	87.6	256.5	308.9	106.9	149.1	341.3	0.18	78.82	79.02	80.01	0.15	78.85	79.16	80.07
398.0	657.0	1.9	0.6	3.9	260.2	75.4	87.5	256.2	309.2	106.9	149.1	341.3	0.18	78.82	79.02	80.01	0.15	78.85	79.16	79.88
399.0	658.0	1.9	0.6	3.9	260.2	75.4	87.5	256.2	309.2	106.9	149.1	341.3	0.18	78.82	79.02	80.01	0.15	78.85	79.16	79.69</

426.0	685.0	1.4	0.6	3.5	254.6	75.0	86.9	251.7	306.6	169.3	149.1	342.4	0.18	78.41	78.64	86.86	0.15	78.49	78.75	86.44
427.0	686.0	1.4	0.6	3.5	254.5	75.1	86.5	251.4	306.5	169.0	149.0	342.1	0.18	78.45	78.64	86.86	0.15	78.50	78.75	86.44
428.0	687.0	1.4	0.6	3.5	254.2	75.1	86.5	251.3	306.1	169.0	149.0	342.0	0.18	78.45	78.63	86.85	0.15	78.50	78.73	86.42
429.0	688.0	1.4	0.6	3.5	253.8	75.0	86.8	250.7	306.0	168.9	149.0	341.9	0.18	78.42	78.61	86.85	0.15	78.47	78.73	86.40
430.0	689.0	1.4	0.7	3.4	253.6	75.0	86.8	250.2	305.6	168.9	149.1	341.9	0.18	78.41	78.64	85.27	0.15	78.49	78.72	85.84
431.0	690.0	1.3	0.6	3.4	253.4	74.9	86.7	249.8	305.7	168.8	148.9	341.9	0.18	78.41	78.64	85.27	0.15	78.49	78.72	85.84
432.0	691.0	1.3	0.6	3.4	253.3	74.9	86.7	249.6	305.3	168.7	149.0	341.9	0.18	78.39	78.59	84.92	0.15	78.45	78.71	85.68
433.0	692.0	1.3	0.6	3.4	253.2	74.9	86.6	249.1	305.3	168.6	148.8	341.5	0.18	78.37	78.57	84.61	0.15	78.43	78.69	85.52
434.0	693.0	1.3	0.6	3.4	253.1	75.0	86.6	248.8	305.1	168.6	148.8	341.5	0.18	78.34	78.55	84.29	0.15	78.43	78.70	85.35
435.0	694.0	1.3	0.6	3.4	252.9	75.0	86.5	248.3	305.0	168.5	148.7	341.2	0.18	78.31	78.51	83.99	0.15	78.39	78.67	85.16
436.0	695.0	1.2	0.6	3.4	252.7	75.0	86.5	248.3	305.0	168.4	148.7	341.2	0.18	78.31	78.51	83.69	0.15	78.36	78.66	84.98
437.0	696.0	1.2	0.6	3.4	252.4	74.8	86.4	247.9	305.0	168.3	148.6	341.2	0.18	78.31	78.51	83.40	0.15	78.37	78.66	84.81
438.0	697.0	1.2	0.6	3.4	252.4	74.8	86.4	247.9	305.0	168.3	148.6	341.0	0.18	78.33	78.48	83.14	0.15	78.36	78.63	84.61
439.0	698.0	1.2	0.6	3.4	252.2	74.9	86.3	247.2	305.0	168.1	148.6	340.8	0.18	78.31	78.46	82.91	0.15	78.34	78.63	84.39
440.0	699.0	1.2	0.6	3.4	251.9	74.8	86.2	246.9	304.9	167.9	148.4	340.5	0.18	78.27	78.45	82.66	0.15	78.31	78.60	84.00
441.0	700.0	1.1	0.7	3.5	251.8	74.8	86.2	246.9	304.9	167.9	148.4	340.5	0.18	78.27	78.45	82.66	0.15	78.31	78.60	84.00
442.0	701.0	1.1	0.7	3.5	251.9	74.8	86.2	247.0	305.0	167.7	148.3	340.3	0.18	78.29	78.45	82.02	0.15	78.32	78.56	83.80
443.0	702.0	1.1	0.7	3.5	250.9	74.8	86.0	247.0	305.0	167.7	148.3	340.0	0.18	78.29	78.45	82.02	0.15	78.32	78.56	83.80
444.0	703.0	1.1	0.7	3.5	251.3	74.8	85.7	246.4	305.1	167.5	148.1	339.8	0.18	78.21	78.40	86.98	0.15	78.27	78.58	83.58
445.0	704.0	1.1	0.7	3.5	250.9	74.9	86.2	246.0	305.2	167.2	147.9	339.5	0.18	78.20	78.40	86.76	0.15	78.27	78.55	83.20
446.0	705.0	1.1	0.7	3.5	250.9	74.9	86.2	245.6	305.5	167.1	147.9	339.3	0.18	78.24	78.38	86.83	0.15	78.27	78.55	83.02
447.0	706.0	1.1	0.7	3.5	250.9	74.8	86.3	245.6	305.8	166.9	147.7	339.0	0.18	78.24	78.37	86.41	0.15	78.28	78.53	82.68
448.0	707.0	1.1	0.7	3.6	250.6	74.8	86.0	245.4	305.8	166.8	147.6	338.6	0.18	78.25	78.38	85.88	0.15	78.28	78.54	82.98
449.0	708.0	1.1	0.7	3.6	250.2	74.7	85.8	245.1	306.2	166.7	147.5	338.6	0.18	78.26	78.34	85.36	0.15	78.26	78.51	83.82
450.0	709.0	1.1	0.7	3.6	250.5	74.9	85.7	245.0	306.4	166.7	147.5	338.4	0.18	78.19	78.34	86.85	0.15	78.22	78.48	84.78
451.0	710.0	1.0	0.7	3.6	250.9	74.9	85.7	245.0	306.8	166.6	147.4	338.1	0.18	78.15	78.31	86.43	0.15	78.23	78.47	85.74
452.0	711.0	1.0	0.7	3.6	250.7	74.8	86.2	244.8	307.1	166.4	147.2	337.9	0.18	78.06	78.30	83.46	0.15	78.18	78.44	86.74
453.0	712.0	1.0	0.7	3.6	250.8	74.9	86.3	245.1	307.1	166.3	147.2	337.7	0.18	78.07	78.29	83.21	0.15	78.17	78.44	86.51
454.0	713.0	1.0	0.6	3.6	250.2	74.8	86.2	244.6	308.3	165.2	147.2	337.7	0.18	78.03	78.27	82.92	0.15	78.12	78.41	85.51
455.0	714.0	1.0	0.6	3.6	250.6	74.9	86.3	244.5	308.6	165.0	147.1	337.4	0.18	78.03	78.25	82.52	0.15	78.10	78.39	85.05
456.0	715.0	0.9	0.6	3.6	250.7	74.9	86.1	244.5	309.1	165.9	147.0	337.2	0.18	77.99	78.20	82.33	0.15	78.05	78.37	85.72
457.0	716.0	0.9	0.6	3.6	250.7	74.9	86.2	244.5	309.1	165.9	147.0	337.1	0.18	77.99	78.20	82.33	0.15	78.05	78.37	85.72
458.0	717.0	0.9	0.6	3.6	250.8	74.8	86.3	244.6	309.3	165.9	146.9	337.0	0.18	78.03	78.21	82.10	0.15	78.09	78.39	85.72
459.0	718.0	0.9	0.6	3.6	250.5	74.8	86.5	244.9	309.9	165.9	146.9	336.9	0.18	78.03	78.21	82.10	0.15	78.09	78.39	85.72
460.0	719.0	0.8	0.6	3.6	250.5	74.8	86.1	244.4	310.3	165.7	146.8	336.7	0.18	77.98	78.19	83.01	0.15	78.05	78.37	85.59
461.0	720.0	0.8	0.7	3.6	250.7	74.7	86.1	244.4	310.6	165.7	146.8	336.7	0.18	77.98	78.19	83.01	0.15	78.05	78.37	85.59
462.0	721.0	0.8	0.7	3.6	251.3	74.8	85.6	244.5	310.9	165.7	146.6	336.3	0.18	77.93	78.17	85.99	0.15	78.02	78.36	85.38
463.0	722.0	0.8	0.7	3.6	251.6	74.8	86.4	244.2	311.6	165.4	146.7	336.4	0.18	77.98	78.16	86.98	0.15	78.05	78.34	84.99
464.0	723.0	0.8	0.7	3.6	251.7	74.8	86.4	244.2	311.6	165.4	146.7	336.4	0.18	77.98	78.16	86.98	0.15	78.05	78.34	84.99
465.0	724.0	0.8	0.7	3.6	251.6	74.8	86.4	244.2	311.6	165.4	146.7	336.4	0.18	77.98	78.16	86.98	0.15	78.05	78.34	84.99
466.0	725.0	0.8	0.7	3.6	251.7	74.8	86.4	244.2	311.6	165.4	146.7	336.4	0.18	77.98	78.16	86.98	0.15	78.05	78.34	84.99
467.0	726.0	0.7	0.7	3.2	251.5	74.7	86.2	244.6	312.3	165.3	146.5	335.9	0.18	78.05	78.12	85.43	0.15	78.03	78.29	84.02
468.0	727.0	0.7	0.7	3.2	251.5	74.7	86.2	244.6	312.3	165.3	146.5	335.9	0.18	78.05	78.12	85.43	0.15	78.03	78.29	84.02
469.0	728.0	0.7	0.6	3.5	251.5	74.7	86.1	244.6	312.4	165.3	146.5	335.7	0.18	77.95	78.09	84.77	0.15	78.02	78.28	83.82
470.0	729.0	0.7	0.6	3.5	251.7	74.7	86.0	244.6	312.4	165.3	146.5	335.7	0.18	77.95	78.09	84.77	0.15	78.02	78.28	83.82
471.0	730.0	0.7	0.6	3.5	251.8	74.7	86.0	244.6	312.4	165.3	146.5	335.4	0.18	78.00	78.06	83.48	0.15	78.03	78.24	83.43
472.0	731.0	0.6	0.6	3.5	251.0	74.7	86.3	244.5	312.7	165.3	146.4	335.4	0.18	78.00	78.06	83.48	0.15	78.03	78.24	83.43
473.0	732.0	0.6	0.6	3.5	251.4	74.7	86.2	244.1	312.6	165.3	146.4	335.3	0.18	77.95	78.09	83.48	0.15	78.00	78.22	82.87
474.0	733.0	0.6	0.6	3.5	251.4	74.7	86.2	244.1	312.6	165.3	146.4	335.3	0.18	77.95	78.09	83.48	0.15	78.00	78.22	82.87
475.0	734.0	0.6	0.6	3.5	251.2	74.7	86.1	244.2	312.7	165.4	146.4	335.0	0.18	77.93	78.04	82.96	0.15	77.99	78.22	82.67
476.0	735.0	0.6	0.6	3.5	251.2	74.7	86.1	244.2	312.7	165.4	146.4	335.0	0.18	77.93	78.04	82.96	0.15	77.99	78.22	82.67
477.0	736.0	0.6	0.6	3.5	251.4	74.7	86.2	244.2	312.7	165.4	146.4	335.0	0.18	77.93	78.04	82.96	0.15	77.99	78.22	82.67
478.0	737.0	0.6	0.6	3.5	251.3	74.7	85.3	243.8	312.7	165.3	146.3	334.5	0.18	77.82	78.00	82.07	0.15	77.92	78.20	84.31
479.0	738.0	0.6	0.6	3.5	251.2	74.7	85.3	243.5	312.6	165.3	146.3	334.5	0.18	77.82	78.00	82.07	0.15	77.92	78.20	84.31
480.0	739.0	0.5	0.6	3.5	250.6	74.7	85.3	243.5	312.6	165.3	146.3	334.5	0.18	77.76	77.98	86.47	0.15	77.90	78.16	86.11
481.0	740.0	0.5	0.6	3.5	250.7	74.7	85.3	243.2	312.4	165.1	146.2	333.9	0.18	77.76	77.97	86.47	0.15	77.90	78.16	86.11
482.0	741.0	0.5	0.6	3.4	250.7	74.7	85.3	243.2	312.4	165.1	146.2	333.9	0.18	77.76	77.97	86.47	0.15	77.90	78.16	86.11
483.0	742.0	0.5	0.6	3.4	250.1	74.8	85.4	243.1	312.2	165.1	146.2	333.7	0.18	77.74	77.96	86.44	0.15	77.90	78.13	86.78
484.0	743.0	0.5	0.6	3.4	250.1	74.8	85.4	243.1	312.2	165.1	146.2	333.5	0.18	77.74	77.96	86.44	0.15	77.90	78.13	86.78
485.0	744.0	0.5	0.6	3.4	250.0	74.7	85.3	242.9	312.1	165.0	146.1	333.1	0.18	77.68	77.95	85.72	0.15	77.85	78.12	86.48

512,0	771,0	0,0	0,5	3,2	242,4	74,6	85,2	236,6	307,9	161,6	144,7	327,9	0,18	77,81	77,79	82,67	0,15	77,86	77,93	86,74
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Manufacturer: JOTUL
Model: F55 V2

Run: 1
Project #: PI 20206
Test Duration: 88 min

	HHV	LHV
Eff	67.39%	72.51%
Comb Eff	99.50%	99.50%
HT Eff	67.73%	72.88%
Output	88 879	kJ/h
Burn Rate	6.53	kg/h
Grams CO	40	g
Input	131 888	kJ/h
MC wet	16,90	

Note: In the "input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [i], [w], [j], and [k] refer to their respective variables in Clauses 13.7.3

CO_{2,ult}
F_g
Ultimate CO₂
1,051

Overall Heating Efficiency:
Combustion Efficiency:
Heat Transfer Efficiency:

67.39%
99.50%
67.73%

Heat Output:	84 311 Btu/h	88 879 kJ/h
Heat Input:	125 110 Btu/h	131 888 kJ/h
Burn Duration:	1.47 h	
Burn Rate:	14.39 lb/h	6.527 kg/h
Stack Temp:	781.7 Deg. F	416.5 Deg. C

Air Fuel Ratio (A/F)	
Dry Molecular Weight (M _d)	30.38
Dry Molar Exhaust Gas (N _d)	294.58
Air Fuel Ratio (A/F)	8.44

Manufacturer: JOTUL
Model: F53 V2

Run: 1
Project #: PL 20206
Test Duration: 512.00 min

	HHV	LHV
Eff	68.44%	73.64%
Comb Eff	96.10%	96.10%
HT Eff	71.22%	76.63%
Output	19 989	kJ/h
Burn Rate	3.45	kg/h
Grams CO	743	g
Input	29 207	kJ/h
HC wet	17.35	

Note: In the "Input data", "Calc. % O₂", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a], [b], [c], [h], [u], [w], [i], and [k] refer to their respective variables in Clauses 13.7.3

Ultimate CO₂
CO_{2,ult} 19.86
F_u 1,048

Overall Heating Efficiency:	68.44%	Air Fuel Ratio (A/F)	29.48
Combustion Efficiency:	96.10%	Dry Molecular Weight (M _d)	571.75
Heat Transfer Efficiency:	71.22%	Dry Molar Exhaust Gas (N _d):	16.34
		Air Fuel Ratio (A/F)	

Heat Output:	18 962 Btu/h	19 989 kJ/h
Heat Input:	27 706 Btu/h	29 207 kJ/h
Burn Duration:	8.53 h	
Burn Rate:	3.19 lb/h	1.445 kg/h
Stack Temp:	351.6 Deg. F	177.5 Deg. C

Date: 2020-02-06 Manufacturer: Jotul Model: F55
Project #: PI 20206 Run: 2 Tech: MM Reviewer: JP

- kindling 11.7 lbs start fire (min torch)
- close Door immediately
- Fan ON auto (High)
- At 3.9 lbs insert load
- close Door immediately
- At 6.4 lbs set Fan medium and make coal Bed
- At 4.0 lbs insert load
- At 8:30 close air inlet (1/3)
- At 13:00 close air inlet (2/3)

TEST LOAD CONFIGURATION

PRE / POST CHECKS

Date: 2020-02-06 Manufacturer: Ju/21 Model: F 55
 Project #: PT 2020 Run: 2 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-101	7.00	OK	OK

Pre-Test

Post-Test

Facility Conditions:

Air Velocity from less than 2 feet

Smoke Capture Check (Tunnel velocity).....

Picture.....

	0 (max50 Fpm)	0 (max50 Fpm)
	OK	NA
4 sides	OK	OK

Wood Heater Conditions:

Date Wood Heater Stack Cleaned.....

Date Dilution Tunnel Cleaned.....

Induced Draft Check (max 0.005 H2O).....

Traverse before ignition.....

2020-02-05
2020-02-05
OK
OK

Temperature System:

Ambient (65°-90°F).....

OK	°F
----	----

Proportional Checks:

Thermocouple check.....

Pitot Clean.....

Pitot verification.....

OK
OK
OK

Sampling Train ID Numbers:

	High fire test			Medium low fire test		
	1 st hour	Train 1	Train 2	1 st hour	Train 1	Train 2
Probe.....				17	33	34
Filter Front.....				26	28	453
Filter Back.....				27	29	458
Filter Thermocouple.....		NA		11	11	12
Filter (80°F ≥ <90°F).....				OK	OK	OK

Date: 2020-02-06

Manufacturer: Jotul

SAMPLING EQUIPMENT CHECK OUT

Model: F55

Project #: PJ 2020

Run: 2

Tech: MM

Reviewer: [Signature]

Leakage Checks Tunnel Samplers

High fire test	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)						
Final 1 minute DGM (Liter)						
Initial 1 minute DGM (Liter)						
Change © (Liter)						
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)			NA			
Check OK						

Low medium fire test	System 1 st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15	-15	-15
Final 1 minute DGM (Liter)	147543.33	149234.62	147543.65	149234.79	087914.15	089341.26
Initial 1 minute DGM (Liter)	147543.30	149234.61	147543.62	149234.78	087914.00	089341.56
Change © (Liter)	0.03	0.01	0.03	0.01	0.15	0.20
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	OK	OK	OK	OK	OK	OK



SAMPLING EQUIPMENT CHECK OUT

Date: 2020-02-06 Manufacturer: Jo/VI Model: F55
 Project #: PI 2020 Run: 2 Tech: MM Reviewer: DO

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	- 5	- 5
Rotameter Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

Leakage Checks Pitot

Plugged Probe	Pre Test 3 H ₂ O static	Pre Test 0.4-0.5 H ₂ O velocity	Post Test 3 H ₂ O Static	Post Test 0.4-0.5 H ₂ O velocity
Vacuum (inches Hg.)	3	5	3	4
Check OK (no change after 15 sec.)	OK	OK	OK	OK

PRE-TEST SCALE AUDIT

Date: 2020-03-06 Manufacturer: Joh Model: FS5
 Project #: PT 2020 Run: 2 Tech: mm Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-090	44 lbs, Class F	44 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

LIMITS OF WEIGHT RANGES

ANALYTICAL SCALE: 50%-150% of dry filter weight, ± 0.1 mg
PLATFORM SCALE: 20%-80% of ideal test load weight, ± 0.1 lbs or 1%
WOOD SCALE: 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

CONTINUOUS ANALYZERS

Date: 2020-02-06 Manufacturer: Jofu Model: F55
 Project #: PT 2020 Run: 2 Tech: MM Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 100.6 (KPa.) Static pressure (P_q) 0.16 (inches w.c.)
 Inside diameter: Port A _____ Port B _____
 Tunnel cross sectional area: .1963 ft²
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H ₂ O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0075	70.23
B - Centroid	3.00	3.50	4	0075	70.34
A-1	0.40	0.50	0.50	0061	70.23
A-2	1.50	1.75	2	0074	70.26
A-3	4.50	5.25	6	0070	70.37
A-4	5.60	6.5	7.5	0062	70.37
B-1	0.40	0.50	0.50	0061	70.39
B-2	1.50	1.75	2	0070	70.36
B-3	4.50	5.25	6	0073	70.55
B-4	5.60	6.5	7.5	0061	70.63
AVERAGE					

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

C_p = pitot tube coefficient, dimensionless = 0.99 for standard pitot.

Δ_p = manometer reading (inches H₂O)

T_s = average absolute dilution tunnel temperature (°F + 460)

P_s = absolute dilution tunnel gas pressure or $P_{bar} + P_{qg}$

P_q = static pressure in. H₂O
 { 13.6 }

M_s = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

K_p = 85.49 pitot tube constant, (conversion factor for English units)

Δ_p avg. = average of the square roots of the velocity heads (Δ_p) measured at each traverse point.

CONTINUOUS ANALYZERS

Date: 2020-02-06 Manufacturer: JuLi Model: F55
 Project #: AT 2026 Run: 2 Tech: MR Reviewer: DO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2990	1000	1000	1000
Tolerance CO	0	+/- 0.02	0.010	+/- 0.15	0.009	+/- 0.05
CO ₂	0	0	1799	1800	974	1000
Tolerance CO ₂	0	+/- 0.02	0.01	+/- 0.5	0.06	+/- 0.5
O ₂ informative CSA B415 calculated value	na	na	na	na	na	na
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	2991	1004	0	0.02	0.001	0.15	0.005	0.05	✓	
CO ₂	0	1795	977	0	0.02	0.04	0.5	0.03	0.5	✓	

TEST DATA LOG

Date: 2026-02-06 Manufacturer: Jo tvl Model: F 55
 Project #: PT 20206 Run: 2 Tech: mm Reviewer: dp

RAW DRY GAS METER READINGS

		System 1	System 2	Blank
High fire test	Final (Liter)	N.A.		
	Initial (Liter)			
Low medium fire test	Final (Liter)	14923.74	089340.58	210.04
	Initial (Liter)	147544.42	087914.82	128.74

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100.6	99.9
Dry Bulb (F):	74.2	76.6
Humidity (%):	21.2	21.9

FUEL DATA

Date: 2020-02-06 Manufacturer: Jo/ul Model: F 55
 Project #: pt 20206 Run: 2 Tech: MM Reviewer: SD

FUEL DESCRIPTION:

Type of wood:

KINDLING AND START-UP LOAD

Piece Size	Weight	Meter Moisture Content (% dry)					
x x 1/2 in.	4620 lbs.	9		9		9	
x x in.	' lbs.						
x x 1/2 in.	7110 lbs.	20		20		20	
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						

HIGHFIRE TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)					
425 x 425 x 1/2 in.	4814 lbs.	206		206		206	
450 x 500 x 1/2 in.	580 lbs.	220		195		200	
400 x 350 x 1/2 in.	2814 lbs.	220		230		191	
x x in.	lbs.						
400 x 450 x 1/2 in.	6046 lbs.	234		181		226	
325 x 325 x 1/2 in.	3326 lbs.	241		196		196	
300 x 350 x 1/2 in.	3926 lbs.	236		224		230	
x x in.	lbs.						
x x in.	lbs.						

FUEL DATA

Date: 2020-02-06 Manufacturer: Joel Model: F55
 Project #: PI 20206 Run: 2 Tech: MM Reviewer: JP

FUEL DESCRIPTION:

Type of wood:

LOW OR MEDIUM TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)					
5'00 x 4'50 x 16 in.	6520 lbs.	231		226		201	
4'50 x 4'00 x 16 in.	5080 lbs.	22		181		183	
4'00 x 4'25 x 16 in.	5644 lbs.	201		182		186	
x x in.	lbs.						
5'00 x 5'00 x 16 in.	733 lbs.	219		181		200	
4'50 x 4'25 x 16 in.	5312 lbs.	191		190		186	
4'00 x 3'50 x 16 in.	3708 lbs.	181		183		183	
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						
x x in.	lbs.						

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: _____ Project #: _____ Run: _____ Manufacturer: _____ Model: _____
Tech: _____ Reviewer: _____

HIGHFIRE TEST FILTERS									
SYSTEM 1 - 1 st hour				SYSTEM 1					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	Time								

SYSTEM 1 - 1 st hour							SYSTEM 1		
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
Date	Time								

Date: _____ Manufacturer: _____ Model: _____
Project #: _____ Run: _____ Tech: _____ Reviewer: _____

HIGH FIRE TEST FILTERS				
SYSTEM 2				
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			

SYSTEM 2				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time			

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2020-02-05 Manufacturer: Jotai Model: F55
 Project #01 2020 Run: 2 Tech: PM Reviewer: AP

MEDIUM / LOW FIRE TEST FILTERS										
SYSTEM 1 - 1 st hour					SYSTEM 1					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
Date	Time	17	26	27	3	33	28	29	459	
2020-02-05	17:00	108 9530	01730	34 3782	109 3630	01731		34 3541	00914	
2020-02-06	9:00	108 9531	01729	34 3783	109 3631	01732		34 3541	00914	

SYSTEM 1 - 1 st hour										
SYSTEM 1						SYSTEM 1				
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
Date	Time	17	26	27	3	33	28	29	459	
2020-02-06	18:00	108 9535	01739	34 3785	109 3637	01738		34 3543	00915	
2020-02-06	8:00	108 9532	01739	34 3784	109 3632	01738		34 3541	00915	
2020-02-11	8:00	108 9531	01739	34 3784	109 3632	01738		34 3542	00915	



DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2020-02-06
Project #: PJ 202006
Run: 2
Manufacturer: Jc + J
Tech: MN
Reviewer: NO
Model: P55

MEDIUM / LOW FIRE TEST FILTERS					
SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	34	457 458	45	
2020-02-05	17:20	110 1052	0 1844	34 2510	
2020-02-06	9:00	110 1052	0 1845	34 2509	

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	34	457 458	45	
2020-02-06	18:20	110 1056	0 1864	34 2518	
2020-02-10	8:00	110 1054	0 1863	34 2509	
2020-02-11	8:00	110 1053	0 1863	34 2509	

Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage: JOT

Description du test

Test standard	EPA
Run #	2
Date	06-02-2020
Technicien	M.M
Project #	PI 20216

Description de l'unité

Manufacturier	JOTUL	
Modèle	F55	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	2,7	cu ft.
Appliance weight empty	n.a	lbs
Fan (no, Standard, Option)	optional	

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	n.a	BTU/h Donnée fournie par le manufacturier
Targeted category	1	
Targeted output	n.a	BTU/h
Cp steel	n.a	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,995	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	0,990	Dimensionless
Equipment number (DGM #2):	EM 179	
Calibration Factor (DGM #3):	0,997	Dimensionless
Equipment number (DGM #3):	EM 070	Dimensionless

Tunnel

Targeted tunnel flow rate	300	scfm
Tunnel diameter	8	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu. PI 20216
Date 06-02-2020
Technicien m.m

Fuel data

Fuel type	Cord
Fuel specie	Oak
HHV	20207,0 kJ/kg
%C	49,5
%H	6,6
%O	43,7
%Ash	0,2
HHV	8689,9 Btu/lb
LHV	7600,4 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	20 207
%C	48,73	49,5
%H	6,87	6,62
%O	43,9	43,7
%Ash	0,5	0,2
HHV (Btu/lb)	8519	8690
LHV (Btu/lb)	7451	7600

Adjusted to ASTM E 300X Wood Heater Cordwood Test Method - May 10, 2017 Version
Cordwood Fuel Load Calculators - 12 lbm³ Nominal Load Density
Core 45-68% of Total Load Weight, Remainder 35-55% of Total Load Weight

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For Usable Firebox Volumes up to 1.0 ft ³ - Low and Medium Fire		
Nominal Required Load Density (wet basis)	12.0 lb/ft ³	
Usable Firebox Volume	2.70 ft ³	
Total Nom. Load Wt. Target	32.4 lb	
Total Load Wt. Allowable Range	30.78 to 34.02 lb	
Core Target Wt. Allowable Range	14.58 to 21.08 lb	
Remainder Load Wt. Allowable Range	11.34 to 17.82 lb	
Core Load Fuel P.c. Wt. Allowable Range	4.86 to 8.10 lb	
Remainder Load P.c. Wt. Allowable Range	3.24 to 9.72 lb	
Core Load Piece Wt. Actual	P.c. #	
Core Load Total Wt. Actual	1 8.52 lb	In Range
	2 3.03 lb	In Range
	3 5.64 lb	In Range
	17.25 lb	In Range
Remainder Load Piece Wt. Actual	P.c. #	
Remainder Load Total Wt. Actual	1 7.33 lb	In Range
(2 or 3 Pcs.)	2 5.31 lb	In Range
	3 3.71 lb	In Range
	51%	In Range
Remainder Load Piece Weight Ratio - Small/Large	16.35 lb	In Range
Remainder Load Tot. Wt. Act.	33.63 lb	In Range
Total Load Wt. Actual	51%	In Range
Core % of Total Wt.	49%	In Range
Remainder % of Total Wt.	104%	In Range
Actual Load % of Nominal Target	12.4 lb/ft ³	In Range
Actual Fuel Load Density	3.4 to 6.7	Mid-Point
Allowable Charcoal Bed Wt. Range (lb)	4.0 lb	In Range
Actual Charcoal Bed Wt.	0.0 lb	Valid Test
Actual Fuel Load Ending Wt.	33.8 lb	± 90%
Total Wt. of Fuel Burned During Test Run lb.	16 lb	
Load piece Length in.		

For Usable Firebox Volumes above 3.0 ft ³ , Low and Medium Fire			
Nominal Required Load Density (wet basis)	12 lb/ft ³		
Usable Firebox Volume	ft ³		
Total Nom. Load Wt. Target	0 lb		
Total Load Wt. Allowable Range	0.00 to 0.00	lb	
Core Target Wt. Allowable Range	0.00 to 0.00	lb	
Remainder Load Wt. Allowable Range	0.00 to 0.00	lb	
Core Load Fuel P.C. Wt. Allowable Range	0.00 to 0.00	lb	Mid-Point 0.00
Remainder Load P.C. Wt. Allowable Range	0.00 to 0.00	lb	0.00
Core Load Piece Wt. Actual	P.C. #		
	1	lb	In Range
	2	lb	In Range
	3	lb	In Range
Core Load Total Wt. Actual	P.C. #	0.00 lb	In Range
Remainder Load Piece Wt.			
(3 or 4 Pcs.)	1	lb	In Range
	2	lb	In Range
	3	lb	In Range
	4	lb	In Range
Remainder Load Piece Weight Ratio - Small/Large	#NUMBER	NA	#NUMBER
Remainder Load Tot. Wt. Act.			In Range
Total Load Wt. Actual		0.00 lb	In Range
Core % of Total Wt.	#DIV/0!		In Range
Remainder % of Total Wt.	#DIV/0!		#DIV/0!
Actual Load % of Nominal Target	#DIV/0!		#DIV/0!
Actual Fuel Load Density	#DIV/0!	lb/ft ³	#DIV/0!
Allowable Charcoal Bed Wt. Range (lb)	0.1 to <0.1	lb	Mid-Point 0.0
Actual Charcoal Bed Wt.		lb	Out of Range
Actual Fuel Load Burned Wt.		lb	Valid Test
Total Wt. of Fuel Burned During Test Run.		0.0 lb	2.90%

Fuel Piece Moisture Reading (%-dry basis)		Ave.		Pc. Wt. Dry Basis	
1.	2.	3.			
			#DIV/0! #DIV/0! #DIV/0!	#DIV/0! #DIV/0! #DIV/0! lb kg	#DIV/0! #DIV/0! #DIV/0! kg kg
			#DIV/0! #DIV/0! #DIV/0! NA #DIV/0!	#DIV/0! #DIV/0! #DIV/0! lb kg	#DIV/0! #DIV/0! #DIV/0! kg kg
			#DIV/0! #DIV/0!	#DIV/0! #DIV/0! lb kg	#DIV/0! #DIV/0! kg kg
Total Load Ave. MC % (dry basis)					
Total Load Ave. MC % (wet basis)					
Total Test Load Weight (dry basis)					
Total Fuel Weight Burned During Test Run (dry basis)					

	Start	End
Barometer (kPa):	100,6	99,9
Barometer (in.Hg):	29,707169	29,5004589
Dry Bulb (F):	74,2	76,6
Humidity (%):	21,2	21,9
Air velocity (ft/min)	0	0

High fire test				
DGM #1	Final:	#VALEUR!	cuft	Final: na Liter
	Initial:	#VALEUR!	cuft	Initial: na Liter
DGM #2	Final:	#VALEUR!	cuft	Final: na Liter
	Initial:	#VALEUR!	cuft	Initial: na Liter
DGM room				Final: na cuft
				Initial: na cuft

min or med burnrate				
DGM #1	Final:	5270,140	cuft	Final: 149233,740 Liter
	Initial:	5210,482	cuft	Initial: 147544,420 Liter
DGM #2	Final:	3155,033	cuft	Final: 89340,580 Liter
	Initial:	3104,683	cuft	Initial: 87914,820 Liter
DGM room				Final: 210,040 cuft
				Initial: 128,720 cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du test commence

206

Numéro de la ligne dans "Raw data" à partir duquel les données du highfire test commence

NA

Numéro de la ligne dans "Raw data" à partir duquel les données du min ou medium fire test commence

206

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Project nu.	PI 20216
Date	06-02-2020
Technicien	M.M

Filter set weight Low/ medium fire

Number	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	gasket	front / Back	gasket	probe	front / Back	gasket	Filter
Before (1)	17	26	27	3	28	29	33	28	29	457	458	34	457	45	459
Before (2)															
Before (3)															
Before (4)															
Before (5)															
Before (6)															
After (1)	108,9530	0,1730	34,3782	109,3630	0,1731	34,3541	110,1052	0,1844	34,2510	0,0914	0,0914	110,1052	0,1844	34,2509	0,0914
After (2)	108,9531	0,1729	34,3783	109,3631	0,1732	34,3541	110,1052	0,1845	34,2509	0,0914	0,0914	110,1052	0,1845	34,2509	0,0914
After (3)	108,9535	0,1739	34,3785	109,3637	0,1738	34,3543	110,1056	0,1864	34,2518	0,0915	0,0915	110,1054	0,1863	34,2509	0,0915
After (4)	108,9532	0,1739	34,3784	109,3632	0,1738	34,3541	110,1053	0,1863	34,2509	0,0915	0,0915	110,1053	0,1863	34,2509	0,0915
After (5)															
After (6)	108,9532	0,1739	34,3784	109,3632	0,1738	34,3542	110,1053	0,1863	34,2509	0,0915	0,0915	110,1053	0,1863	34,2509	0,0915
Difference	0,0001	0,0010	0,0000	0,0001	0,0006	0,0000	0,0001	0,0018	0,0000	0,0000	0,0000	0,0001	0,0001	0,0000	0,0001
Total (mg)	1,2				2				1,9				0,1		
Total ajusté (mg)	1,10				1,90				1,80						

Project nu. PI 20216
 Date 06-02-2020
 Technicien M.M

Elapsed Time min	Raw data row	Weight Remaining lbs	CO %	O ₂ %	*1	*2	*3	*4	*5	*6	*7	*8	Mass flow 1	DQM 1	DQM 2	Mass flow 2	Filter 1	Filter 2
					Flt	Room Temp	Tunnel Dry Bulb	Unit Top	Unit Back	Unit R-Size	Unit L-Size	Unit Bottom	Unit	Inlet T	Outlet T	Unit	Inlet T	Outlet T
					°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
0.00	206.00	33.5	0.6	3.4	126.6	75.5	119.9	367.4	395.1	252.2	237.5	461.6	0.18	78.48	79.21	85.58	79.18	78.74
1.0	207.0	33.4	0.4	2.0	373.1	75.5	111.1	369.6	389.6	250.9	236.4	461.9	0.18	78.72	79.18	85.43	79.18	78.74
2.0	208.0	33.3	0.6	3.2	409.0	75.5	109.5	360.6	382.0	249.2	235.0	462.5	0.18	78.83	79.14	85.30	79.14	78.75
3.0	209.0	33.1	0.6	4.7	465.0	75.5	112.6	364.7	373.5	247.8	233.4	461.8	0.18	78.89	79.17	85.12	79.17	78.75
4.0	210.0	32.9	0.5	6.4	526.1	75.5	117.9	376.3	364.3	245.8	232.0	460.8	0.18	78.95	79.16	85.01	79.16	78.80
5.0	211.0	32.6	0.3	8.7	594.2	75.5	125.6	399.1	355.5	244.1	230.5	459.3	0.18	79.05	79.16	84.88	79.16	78.60
6.0	212.0	32.4	0.3	11.0	662.9	75.5	133.3	431.1	347.4	242.6	229.2	458.7	0.18	79.13	79.13	84.62	79.13	78.64
7.0	213.0	32.1	0.3	12.6	732.2	75.5	140.8	471.0	339.7	240.9	227.9	457.5	0.18	79.24	79.14	84.60	79.14	78.66
8.0	214.0	31.5	0.2	14.5	801.5	75.5	148.5	510.0	332.5	239.7	227.0	456.3	0.18	79.40	79.15	84.82	79.15	78.68
9.0	215.0	31.2	0.2	16.2	870.8	75.5	156.2	548.6	325.2	238.6	226.5	455.3	0.18	79.58	79.15	84.81	79.15	78.68
10.0	216.0	30.8	0.2	18.0	940.8	75.5	164.0	587.9	318.9	237.5	225.8	454.2	0.18	79.76	79.15	84.82	79.15	78.68
11.0	217.0	30.5	0.2	19.8	1010.8	75.5	171.8	627.2	312.5	236.4	225.1	453.1	0.18	79.91	79.15	84.81	79.15	78.68
12.0	218.0	30.2	0.2	21.6	1080.8	75.5	179.6	666.5	306.0	235.3	224.4	452.0	0.18	80.08	79.15	84.80	79.15	78.68
13.0	219.0	29.9	0.2	23.4	1150.8	75.5	187.4	705.8	300.7	234.2	223.7	450.9	0.18	80.26	79.15	84.79	79.15	78.68
14.0	220.0	29.6	0.2	25.2	1220.8	75.5	195.2	745.1	295.4	233.1	223.0	449.8	0.18	80.45	79.15	84.78	79.15	78.68
15.0	221.0	29.3	0.3	27.0	1290.8	75.5	203.0	784.4	290.3	232.0	222.3	448.7	0.18	80.64	79.15	84.77	79.15	78.68
16.0	222.0	29.0	0.3	28.8	1360.8	75.5	210.8	823.7	285.2	230.9	221.6	447.6	0.18	80.83	79.15	84.76	79.15	78.68
17.0	223.0	28.7	0.3	30.6	1430.8	75.5	218.6	863.0	280.1	229.8	220.9	446.5	0.18	81.02	79.15	84.75	79.15	78.68
18.0	224.0	28.4	0.2	32.4	1500.8	75.5	226.4	902.3	274.9	228.7	220.2	445.4	0.18	81.21	79.15	84.74	79.15	78.68
19.0	225.0	28.2	0.2	34.2	1570.8	75.5	234.2	941.6	269.8	227.6	219.5	444.3	0.18	81.40	79.15	84.73	79.15	78.68
20.0	226.0	27.9	0.2	36.0	1640.8	75.5	242.0	980.9	264.7	226.5	218.8	443.2	0.18	81.59	79.15	84.72	79.15	78.68
21.0	227.0	27.6	0.2	37.8	1710.8	75.5	249.8	1020.2	259.6	225.4	218.1	442.1	0.18	81.78	79.15	84.71	79.15	78.68
22.0	228.0	27.3	0.2	39.6	1780.8	75.5	257.6	1059.5	254.5	224.3	217.4	441.0	0.18	81.97	79.15	84.70	79.15	78.68
23.0	229.0	27.0	0.2	41.4	1850.8	75.5	265.4	1098.8	249.4	223.2	216.7	439.9	0.18	82.16	79.15	84.69	79.15	78.68
24.0	230.0	26.8	0.2	43.2	1920.8	75.5	273.2	1138.1	244.3	222.1	216.0	438.8	0.18	82.35	79.15	84.68	79.15	78.68
25.0	231.0	26.5	0.2	45.0	1990.8	75.5	281.0	1177.4	239.3	221.0	215.3	437.7	0.18	82.54	79.15	84.67	79.15	78.68
26.0	232.0	26.2	0.2	46.8	2060.8	75.5	288.8	1216.7	234.2	219.9	214.6	436.6	0.18	82.73	79.15	84.66	79.15	78.68
27.0	233.0	25.9	0.1	48.6	2130.8	75.5	296.6	1256.0	229.1	218.8	213.9	435.5	0.18	82.92	79.15	84.65	79.15	78.68
28.0	234.0	25.6	0.1	50.4	2200.8	75.5	304.4	1295.3	224.0	217.7	213.2	434.4	0.18	83.11	79.15	84.64	79.15	78.68
29.0	235.0	25.3	0.1	52.2	2270.8	75.5	312.2	1334.6	218.9	216.6	212.5	433.3	0.18	83.30	79.15	84.63	79.15	78.68
30.0	236.0	25.0	0.1	54.0	2340.8	75.5	320.0	1373.9	213.8	215.5	211.8	432.2	0.18	83.49	79.15	84.62	79.15	78.68
31.0	237.0	24.8	0.1	55.8	2410.8	75.5	327.8	1413.2	208.7	214.4	211.1	431.1	0.18	83.68	79.15	84.61	79.15	78.68
32.0	238.0	24.4	0.1	57.6	2480.8	75.5	335.6	1452.5	203.6	213.3	210.4	430.0	0.18	83.87	79.15	84.60	79.15	78.68
33.0	239.0	24.2	0.0	59.4	2550.8	75.5	343.4	1491.8	198.5	212.2	209.7	428.9	0.18	84.06	79.15	84.59	79.15	78.68
34.0	240.0	23.9	0.0	61.2	2620.8	75.5	351.2	1531.1	193.4	211.1	209.0	427.8	0.18	84.25	79.15	84.58	79.15	78.68
35.0	241.0	23.6	0.0	63.0	2690.8	75.5	359.0	1570.4	188.3	210.0	208.3	426.7	0.18	84.44	79.15	84.57	79.15	78.68
36.0	242.0	23.3	0.0	64.8	2760.8	75.5	366.8	1609.7	183.2	208.9	207.6	425.6	0.18	84.63	79.15	84.56	79.15	78.68
37.0	243.0	23.1	0.0	66.6	2830.8	75.5	374.6	1649.0	178.1	207.8	206.9	424.5	0.18	84.82	79.15	84.55	79.15	78.68
38.0	244.0	22.8	0.0	68.4	2900.8	75.5	382.4	1688.3	173.0	206.7	206.2	423.4	0.18	85.01	79.15	84.54	79.15	78.68
39.0	245.0	22.6	0.0	70.2	2970.8	75.5	390.2	1727.6	167.9	205.6	205.5	422.3	0.18	85.20	79.15	84.53	79.15	78.68
40.0	246.0	22.3	0.0	72.0	3040.8	75.5	398.0	1766.9	162.8	204.5	204.8	421.2	0.18	85.39	79.15	84.52	79.15	78.68
41.0	247.0	22.1	0.0	73.8	3110.8	75.5	405.8	1806.2	157.7	203.4	204.1	420.1	0.18	85.58	79.15	84.51	79.15	78.68
42.0	248.0	21.8	0.0	75.6	3180.8	75.5	413.6	1845.5	152.6	202.3	203.4	419.0	0.18	85.77	79.15	84.50	79.15	78.68
43.0	249.0	21.4	0.0	77.4	3250.8	75.5	421.4	1884.8	147.5	201.2	202.7	417.9	0.18	85.96	79.15	84.49	79.15	78.68
44.0	250.0	21.1	0.0	79.2	3320.8	75.5	429.2	1924.1	142.4	200.1	202.0	416.8	0.18	86.15	79.15	84.48	79.15	78.68
45.0	251.0	20.8	0.0	81.0	3390.8	75.5	437.0	1963.4	137.3	199.0	201.3	415.7	0.18	86.34	79.15	84.47	79.15	78.68
46.0	252.0	20.5	0.0	82.8	3460.8	75.5	444.8	2002.7	132.2	197.9	200.6	414.6	0.18	86.53	79.15	84.46	79.15	78.68
47.0	253.0	20.3	0.0	84.6	3530.8	75.5	452.6	2042.0	127.1	196.8	200.3	413.5	0.18	86.72	79.15	84.45	79.15	78.68
48.0	254.0	20.0	0.0	86.4	3600.8	75.5	460.4	2081.3	122.0	195.7	200.0	412.4	0.18	86.91	79.15	84.44	79.15	78.68
49.0	255.0	19.7	0.0	88.2	3670.8	75.5	468.2	2120.6	116.9	194.6	200.0	411.3	0.18	87.10	79.15	84.43	79.15	78.68
50.0	256.0	19.4	0.0	90.0	3740.8	75.5	476.0	2159.9	111.8	193.5	200.0	410.2	0.18	87.29	79.15	84.42	79.15	78.68
51.0	257.0	19.2	0.1	91.8	3810.8	75.5	483.8	2199.2	106.7	192.4	200.0	409.1	0.18	87.48	79.15	84.41	79.15	78.68
52.0	258.0	18.9	0.1	93.6	3880.8	75.5	491.6	2238.5	101.6	191.3	200.0	408.0	0.18	87.67	79.15	84.40	79.15	78.68
53.0	259.0	18.6	0.1	95.4	3950.8	75.5	500.0	2277.8	96.5	190.2	200.0	406.9	0.18	87.86	79.15	84.39	79.15	78.68
54.0	260.0	18.4	0.1	97.2	4020.8	75.5	507.8	2317.1	91.4	189.1	200.0	405.8	0.18	88.05	79.15	84.38	79.15	78.68
55.0	261.0	18.1	0.1	99.0	4090.8	75.5	515.6	2356.4	86.3	188.0	200.0	404.7	0.18	88.24	79.15	84.37	79.15	78.68
56.0	262.0	17.8	0.1	100.8	4160.8	75.5	523.4	2395.7	81.2	186.9	200.0	403.6	0.18	88.43	79.15	84.36	79.15	78.68
57.0	263.0	17.5	0.1	102.6	4230.8	75.5	531.2	2435.0	76.1	185.8	200.0	402.5	0.18	88.62	79.15	84.35	79.15	78.68
58.0	264.0	17.3	0.1	104.4	4300.8	75.5	539.0	2474.3	71.0	184.7	200.0	401.4	0.18	88.81	79.15	84.34	79.15	78.68
59.0	265.0	17.0	0.1	106.2	4370.8	75.5	546.8	2513.6	65.9	183.6	200.0	400.3	0.18	89.00	79.15	84.33	79.15	78.68
60.0	266.0	16.8	0.1	108.0	4440.8	75.5	554.6	2552.9	60.8	182.5	200.0	399.2	0.18	89.19	79.15	84.32	79.15	78.68
61.0	267.0	16.5	0.1	109.8	4510.8	75.5	562.4	2592.2	55.7	181.4	200.0	398.1	0.18	89.38	79.15	84.31	79.15	78.68
62.0	268.0	16.3	0.1	111.6	4580.8	75.5	570.2	2631.5	50.6</									

82.0	285.0	11.7	0.0	12.3	687.4	77.1	136.3	725.1	366.3	335.7	309.9	456.7	0.18	83.45	81.68	83.16	0.15	83.65	81.39	89.67
83.0	289.0	11.5	0.0	12.2	685.9	77.3	136.3	722.8	367.9	336.9	310.0	458.0	0.18	83.43	81.67	83.14	0.15	83.64	81.32	89.68
84.0	293.0	11.3	0.0	12.0	684.2	77.3	136.1	719.3	369.2	337.9	310.4	459.1	0.18	83.49	81.72	83.36	0.15	83.68	81.35	89.69
85.0	291.0	11.1	0.0	11.9	680.9	77.4	135.5	717.3	370.3	338.4	310.9	460.1	0.18	83.58	81.75	83.43	0.15	83.70	81.36	89.71
86.0	292.0	10.9	0.0	11.8	677.6	77.4	134.8	715.7	371.4	339.3	311.4	461.7	0.18	83.58	81.75	83.43	0.15	83.70	81.36	89.71
87.0	293.0	10.7	0.0	11.7	675.3	77.4	134.9	709.9	372.5	339.3	311.8	462.6	0.18	83.59	81.77	83.46	0.15	83.68	81.38	89.72
88.0	294.0	10.5	0.0	11.4	667.1	77.5	135.0	707.6	372.9	339.3	312.0	463.7	0.18	83.59	81.77	83.46	0.15	83.68	81.38	89.72
89.0	294.0	10.4	0.0	11.4	664.5	77.5	134.2	699.4	374.0	339.4	312.2	464.3	0.18	83.44	81.81	83.45	0.15	83.65	81.38	89.72
90.0	296.0	10.2	0.0	11.3	658.5	77.4	133.6	695.1	375.0	339.4	312.4	465.4	0.18	83.44	81.81	83.45	0.15	83.65	81.38	89.72
91.0	297.0	10.1	0.0	11.0	652.1	77.6	133.0	688.1	376.1	339.4	312.4	466.4	0.18	83.44	81.81	83.45	0.15	83.65	81.38	89.72
92.0	298.0	9.9	0.0	10.8	646.1	77.6	132.3	682.3	377.2	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
93.0	299.0	9.7	0.1	10.4	644.8	77.6	131.1	668.3	377.2	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
94.0	300.0	9.6	0.1	10.3	638.9	77.6	131.0	664.1	378.4	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
95.0	301.0	9.4	0.1	10.1	634.2	77.5	130.0	662.1	380.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
96.0	302.0	9.3	0.1	9.9	630.6	77.6	129.9	655.2	382.4	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
97.0	303.0	9.2	0.1	9.7	626.6	77.6	129.3	648.3	384.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
98.0	304.0	9.0	0.1	9.6	620.3	77.6	128.9	642.7	387.2	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
99.0	305.0	8.9	0.1	9.5	615.3	77.7	128.1	638.4	389.1	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
100.0	306.0	8.7	0.1	9.4	612.4	77.7	127.9	633.7	387.2	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
101.0	307.0	8.6	0.1	9.3	608.0	77.5	127.4	627.9	388.4	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
102.0	308.0	8.5	0.1	9.2	604.0	77.3	127.0	622.8	389.1	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
103.0	309.0	8.4	0.1	9.1	602.8	77.4	125.3	618.1	390.6	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
104.0	310.0	8.2	0.1	9.1	600.7	77.4	125.2	615.9	391.7	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
105.0	311.0	8.1	0.1	9.1	599.1	77.3	126.7	610.2	392.5	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
106.0	312.0	8.1	0.1	9.1	598.0	77.6	125.2	607.2	393.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
107.0	313.0	7.8	0.1	9.0	595.5	77.7	125.1	604.5	394.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
108.0	314.0	7.6	0.1	9.1	594.5	77.5	123.2	601.6	395.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
109.0	315.0	7.5	0.1	9.1	593.5	77.5	123.1	599.3	397.0	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
110.0	316.0	7.5	0.1	8.8	591.5	77.5	123.1	595.0	398.6	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
111.0	317.0	7.5	0.1	8.7	589.8	77.3	122.6	591.0	399.6	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
112.0	318.0	7.3	0.1	8.7	586.1	77.7	122.6	588.2	400.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
113.0	319.0	7.2	0.1	8.7	584.6	77.7	121.6	585.5	400.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
114.0	320.0	7.0	0.2	8.5	581.8	77.6	121.6	582.7	401.2	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
115.0	321.0	6.9	0.2	8.4	579.2	77.4	121.6	579.9	401.5	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
116.0	322.0	6.8	0.2	8.3	574.7	77.5	121.5	577.9	401.5	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
117.0	323.0	6.7	0.3	8.0	567.1	77.2	120.9	574.3	401.7	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
118.0	324.0	6.6	0.3	7.5	559.5	77.4	120.4	568.1	401.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
119.0	325.0	6.6	0.3	7.5	548.0	77.3	119.4	563.6	401.7	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
120.0	326.0	6.5	0.3	7.3	541.9	77.4	118.5	557.7	401.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
121.0	327.0	6.5	0.3	7.3	539.3	77.4	117.9	552.7	401.7	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
122.0	328.0	6.3	0.3	7.2	537.6	76.9	117.8	548.0	401.6	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
123.0	329.0	6.3	0.3	6.9	526.2	77.0	116.3	544.2	401.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
124.0	330.0	6.2	0.4	6.7	526.2	77.2	116.3	544.2	401.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
125.0	331.0	6.2	0.4	6.6	521.4	77.4	116.3	544.2	401.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
126.0	332.0	6.1	0.4	6.5	518.5	77.2	115.4	540.4	398.5	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
127.0	333.0	6.1	0.4	6.5	515.2	77.5	115.4	535.2	397.5	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
128.0	334.0	6.0	0.4	6.5	510.6	77.2	115.4	530.4	398.5	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
129.0	335.0	5.9	0.5	6.4	506.9	76.2	114.1	515.2	396.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
130.0	336.0	5.9	0.5	6.4	503.4	74.5	114.7	511.0	396.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
131.0	337.0	5.8	0.5	6.3	501.0	74.5	114.7	511.0	396.9	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
132.0	338.0	5.7	0.5	6.4	496.9	74.5	113.8	502.8	396.6	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
133.0	339.0	5.7	0.5	6.3	494.8	74.1	113.0	499.3	396.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
134.0	340.0	5.6	0.5	6.3	491.8	74.0	112.5	494.1	397.0	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
135.0	341.0	5.5	0.5	6.3	489.3	73.7	112.3	491.5	397.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
136.0	342.0	5.3	0.5	6.3	485.3	73.8	112.3	484.2	397.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
137.0	343.0	5.3	0.5	6.3	483.0	73.7	112.3	484.2	397.3	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
138.0	344.0	5.4	0.5	6.2	480.8	73.1	111.2	479.1	400.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
139.0	345.0	5.3	0.5	6.2	480.8	73.1	111.2	479.1	400.8	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
140.0	346.0	5.2	0.4	6.2	479.6	72.5	109.6	472.7	404.6	338.6	312.7	466.2	0.18	83.42	81.88	83.48	0.15	83.70	81.48	89.68
141.0	347.0	5.2	0.4	6.2	479.6	72.5	109.6	472.7	404.6	338.6	312.7	466.2	0.18	8						

168.0	374.0	4.1	0.6	4.8	417.2	70.3	102.9	402.8	402.7	235.6	241.9	447.2	0.18	716.58	80.22	84.04	0.15	79.94	80.59	83.08
169.0	375.0	4.0	0.7	4.7	415.0	70.1	102.0	399.3	401.2	234.5	241.0	446.0	0.18	715.8	80.67	83.82	0.15	79.89	80.46	82.91
170.0	376.0	4.0	0.6	4.7	413.7	70.7	102.0	396.6	400.0	233.5	240.1	445.1	0.18	716.58	80.61	83.63	0.15	79.88	80.43	82.85
171.0	377.0	4.0	0.6	4.7	411.9	71.0	102.4	395.9	398.8	232.7	239.3	444.2	0.18	716.02	80.64	83.53	0.15	79.86	80.43	82.77
172.0	378.0	3.9	0.6	4.7	410.0	71.4	102.5	393.7	397.9	231.7	238.4	443.2	0.18	716.75	80.61	83.34	0.15	79.82	80.40	82.58
173.0	379.0	3.9	0.6	4.7	407.6	71.4	102.6	389.6	394.6	230.8	235.8	442.4	0.18	716.02	80.60	83.21	0.15	79.95	80.40	82.17
174.0	380.0	3.8	0.6	4.6	405.8	71.9	102.6	385.6	390.6	229.1	236.8	441.6	0.18	716.90	80.60	83.16	0.15	79.95	80.39	81.62
175.0	381.0	3.8	0.6	4.6	403.1	72.1	102.6	382.5	387.5	228.4	235.9	440.6	0.18	716.02	80.57	83.16	0.15	79.98	80.38	81.44
176.0	382.0	3.8	0.6	4.6	400.4	72.4	102.7	385.4	389.4	227.7	235.9	439.9	0.18	716.02	80.58	83.14	0.15	80.03	80.38	81.44
177.0	383.0	3.8	0.6	4.6	397.7	72.1	102.7	382.6	386.6	226.9	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
178.0	384.0	3.8	0.6	4.5	395.0	72.1	102.7	385.6	389.6	226.2	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
179.0	385.0	3.8	0.6	4.5	392.3	72.2	102.7	382.6	386.6	225.5	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
180.0	386.0	3.7	0.6	4.5	389.6	72.2	102.7	379.5	383.5	224.8	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
181.0	387.0	3.7	0.6	4.5	386.9	72.1	102.7	376.4	380.4	224.1	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
182.0	388.0	3.7	0.6	4.5	384.2	72.1	102.7	373.3	377.3	223.4	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
183.0	389.0	3.6	0.6	4.5	381.5	72.6	102.9	370.2	374.2	222.7	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
184.0	390.0	3.6	0.6	4.5	378.8	73.0	102.9	367.1	371.1	222.0	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
185.0	391.0	3.6	0.6	4.5	376.1	73.4	102.9	364.0	368.0	221.3	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
186.0	392.0	3.6	0.6	4.6	373.4	73.6	102.9	360.9	364.9	220.6	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
187.0	393.0	3.5	0.6	4.6	370.7	73.6	102.9	357.8	361.8	219.9	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
188.0	394.0	3.5	0.6	4.6	368.0	73.5	102.9	354.7	358.7	219.2	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
189.0	395.0	3.5	0.5	4.6	365.3	73.2	102.9	351.6	355.6	218.5	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
190.0	396.0	3.4	0.6	4.6	362.6	73.3	102.9	348.5	352.5	217.8	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
191.0	397.0	3.4	0.6	4.6	359.9	73.1	102.9	345.4	349.4	217.1	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
192.0	398.0	3.4	0.6	4.6	357.2	73.2	102.9	342.3	346.3	216.4	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
193.0	399.0	3.3	0.5	4.6	354.5	73.1	102.9	339.2	343.2	215.7	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
194.0	400.0	3.3	0.5	4.6	351.8	72.5	102.9	336.1	340.1	215.0	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
195.0	401.0	3.3	0.5	4.6	349.1	72.5	102.9	333.0	337.0	214.3	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
196.0	402.0	3.3	0.5	4.6	346.4	72.2	102.9	329.9	333.9	213.6	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
197.0	403.0	3.2	0.5	4.6	343.7	72.4	102.9	326.8	330.8	212.9	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
198.0	404.0	3.2	0.5	4.6	341.0	72.3	102.9	323.7	327.7	212.2	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
199.0	405.0	3.1	0.5	4.6	338.3	72.5	102.9	320.6	324.6	211.5	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
200.0	406.0	3.1	0.5	4.6	335.6	72.3	102.9	317.5	321.5	210.8	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
201.0	407.0	3.1	0.5	4.5	332.9	72.5	102.9	314.4	318.4	210.1	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
202.0	408.0	3.1	0.5	4.5	330.2	72.2	102.9	311.3	315.3	209.4	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
203.0	409.0	3.0	0.5	4.5	327.5	72.3	102.9	308.2	312.2	208.7	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
204.0	410.0	3.0	0.6	4.5	324.8	72.7	102.9	305.1	309.1	208.0	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
205.0	411.0	3.0	0.6	4.5	322.1	72.6	102.9	302.0	306.0	207.3	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
206.0	412.0	2.9	0.6	4.5	319.4	72.2	102.9	298.9	302.9	206.6	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
207.0	413.0	2.9	0.6	4.5	316.7	72.1	102.9	295.8	299.8	205.9	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
208.0	414.0	2.9	0.5	4.5	314.0	72.1	102.9	292.7	296.7	205.2	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
209.0	415.0	2.9	0.5	4.5	311.3	72.1	102.9	289.6	293.6	204.5	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
210.0	416.0	2.8	0.5	4.5	308.6	72.1	102.9	286.5	290.5	203.8	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
211.0	417.0	2.8	0.5	4.5	305.9	72.2	102.9	283.4	287.4	203.1	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
212.0	418.0	2.8	0.5	4.5	303.2	72.2	102.9	280.3	284.3	202.4	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
213.0	419.0	2.7	0.5	4.5	300.5	72.2	102.9	277.2	281.2	201.7	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
214.0	420.0	2.7	0.5	4.5	297.8	72.3	102.9	274.1	278.1	201.0	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
215.0	421.0	2.7	0.5	4.5	295.1	72.1	102.9	271.0	275.0	200.3	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
216.0	422.0	2.7	0.5	4.5	292.4	72.3	102.9	267.9	271.9	199.6	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
217.0	423.0	2.7	0.5	4.5	289.7	72.3	102.9	264.8	268.8	198.9	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
218.0	424.0	2.6	0.5	4.5	287.0	72.3	102.9	261.7	265.7	198.2	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
219.0	425.0	2.6	0.5	4.5	284.3	71.8	102.9	258.6	262.6	197.5	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
220.0	426.0	2.6	0.5	4.5	281.6	71.9	102.9	255.5	259.5	196.8	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
221.0	427.0	2.5	0.5	4.5	278.9	71.8	102.9	252.4	256.4	196.1	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
222.0	428.0	2.5	0.5	4.5	276.2	71.9	102.9	249.3	253.3	195.4	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
223.0	429.0	2.5	0.5	4.5	273.5	71.6	102.9	246.2	250.2	194.7	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
224.0	430.0	2.4	0.5	4.5	270.8	71.6	102.9	243.1	247.1	194.0	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
225.0	431.0	2.4	0.5	4.5	268.1	71.6	102.9	240.0	244.0	193.3	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
226.0	432.0	2.4	0.5	4.5	265.4	71.6	102.9	236.9	240.9	192.6	235.9	439.9	0.18	716.02	80.57	83.14	0.15	80.06	80.37	81.44
227.0	433.0	2.3	0.5	4.5	262.7	71.6	102.9													

254.0	460.0	1.6	0.5	4.3	364.9	71.5	96.7	329.4	421.6	204.8	191.8	404.4	0.18	77.60	79.19	87.42	0.15	76.66	79.16	82.97
255.0	461.0	1.5	0.5	4.3	364.9	71.2	96.3	329.6	419.5	204.5	191.4	404.4	0.18	77.58	79.20	87.02	0.15	76.66	79.14	82.97
256.0	462.0	1.5	0.6	4.3	364.4	71.0	96.2	329.8	417.4	204.4	191.3	404.1	0.18	77.52	79.20	86.57	0.15	76.63	79.14	82.93
257.0	463.0	1.5	0.5	4.3	363.3	71.3	96.6	329.1	415.8	204.3	191.1	403.6	0.18	77.49	79.17	86.06	0.15	76.52	79.12	82.83
258.0	464.0	1.5	0.5	4.3	363.0	71.4	96.4	327.9	413.8	204.0	190.9	403.2	0.18	77.47	79.16	85.50	0.15	76.58	79.08	82.79
259.0	465.0	1.4	0.5	4.2	363.0	71.4	96.2	328.1	413.2	203.9	190.7	402.9	0.18	77.47	79.16	85.12	0.15	76.52	79.08	82.79
260.0	466.0	1.4	0.5	4.2	362.5	71.6	95.7	327.6	410.6	203.8	190.3	402.5	0.18	77.38	79.11	84.81	0.15	76.48	79.06	82.68
261.0	467.0	1.4	0.5	4.2	362.5	71.6	95.9	326.9	409.2	203.8	190.1	402.1	0.18	77.37	79.11	84.47	0.15	76.46	79.03	82.63
262.0	468.0	1.4	0.6	4.2	362.3	71.8	96.0	327.4	407.6	203.5	190.0	401.7	0.18	77.31	79.07	84.19	0.15	76.40	79.00	82.63
263.0	469.0	1.3	0.5	4.3	362.4	71.5	96.1	327.0	405.6	203.4	189.7	401.5	0.18	77.22	79.02	83.97	0.15	76.38	79.01	82.65
264.0	470.0	1.3	0.5	4.3	362.4	71.5	96.5	327.2	404.0	203.4	189.5	401.1	0.18	77.21	79.00	83.74	0.15	76.34	78.97	82.61
265.0	471.0	1.3	0.5	4.3	362.4	71.2	96.0	326.5	402.0	203.4	189.3	400.6	0.18	77.19	78.95	83.58	0.15	76.32	78.96	82.58
266.0	472.0	1.2	0.5	4.2	362.3	71.3	95.6	326.2	400.0	203.0	189.2	400.2	0.18	77.18	78.95	83.37	0.15	76.29	78.93	82.54
267.0	473.0	1.2	0.6	4.2	362.5	71.7	96.8	325.9	399.4	202.8	189.1	399.8	0.18	77.12	78.93	83.22	0.15	76.30	78.94	82.58
268.0	474.0	1.2	0.6	4.3	362.4	71.8	97.0	325.6	397.4	202.6	189.1	399.8	0.18	77.12	78.93	83.08	0.15	76.33	78.92	82.59
269.0	475.0	1.2	0.6	4.3	362.8	72.1	96.6	326.4	395.5	202.6	189.1	399.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
270.0	476.0	1.2	0.6	4.3	362.8	72.1	96.6	326.4	395.5	202.6	189.1	399.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
271.0	477.0	1.1	0.5	4.2	362.5	72.2	96.5	326.1	393.2	202.3	189.0	397.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
272.0	478.0	1.1	0.5	4.2	361.8	72.2	96.5	326.1	393.2	202.3	189.0	397.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
273.0	479.0	1.1	0.5	4.2	361.8	72.2	96.6	327.1	390.9	202.6	189.0	397.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
274.0	480.0	1.0	0.5	4.2	360.8	72.2	97.2	326.8	385.9	203.0	189.1	394.5	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
275.0	481.0	1.0	0.5	4.2	360.4	72.0	96.9	326.8	383.3	203.2	189.0	395.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
276.0	482.0	1.0	0.5	4.2	360.2	71.3	96.6	326.4	381.0	203.4	188.8	394.4	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
277.0	483.0	0.9	0.5	4.1	359.3	71.4	96.4	326.7	378.6	203.6	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
278.0	484.0	0.9	0.5	4.1	358.3	70.9	95.4	325.7	374.0	203.8	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
279.0	485.0	0.9	0.5	4.1	357.2	70.9	95.6	325.4	371.6	203.9	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
280.0	486.0	0.8	0.5	4.0	357.2	70.9	95.6	325.4	371.6	203.9	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
281.0	487.0	0.8	0.5	4.0	357.2	70.9	95.6	325.4	371.6	203.9	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
282.0	488.0	0.8	0.5	4.0	357.2	70.9	95.6	325.4	371.6	203.9	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
283.0	489.0	0.8	0.5	4.0	357.2	70.9	95.6	325.4	371.6	203.9	188.6	393.8	0.18	77.12	78.93	82.93	0.15	76.36	78.96	82.59
284.0	490.0	0.8	0.5	3.9	355.6	70.5	95.0	325.2	364.2	204.0	187.2	389.4	0.18	77.06	78.77	85.88	0.15	76.21	78.79	86.69
285.0	491.0	0.8	0.5	3.9	355.5	70.2	95.1	324.4	362.5	204.0	187.2	389.4	0.18	77.06	78.77	85.88	0.15	76.21	78.79	86.69
286.0	492.0	0.7	0.5	3.9	352.2	70.6	94.2	322.9	360.2	204.0	187.2	389.4	0.18	77.06	78.77	85.88	0.15	76.21	78.79	86.69
287.0	493.0	0.7	0.5	3.9	352.1	69.6	94.3	322.9	359.4	203.8	186.7	388.8	0.18	76.72	78.60	84.30	0.15	76.03	78.72	85.25
288.0	494.0	0.7	0.5	3.8	350.9	69.0	95.1	320.9	357.8	203.5	186.1	387.4	0.18	76.72	78.60	84.30	0.15	76.03	78.72	85.25
289.0	495.0	0.7	0.5	3.8	349.6	69.5	94.3	319.8	356.3	203.2	185.7	387.4	0.18	76.72	78.60	84.30	0.15	76.03	78.72	85.25
290.0	496.0	0.6	0.5	3.8	347.9	69.8	94.6	319.2	354.0	203.2	185.2	385.9	0.18	76.36	78.46	83.05	0.15	77.60	78.47	83.02
291.0	497.0	0.6	0.5	3.8	346.5	69.8	94.8	318.3	352.9	203.2	185.2	385.9	0.18	76.36	78.46	83.05	0.15	77.60	78.47	83.02
292.0	498.0	0.6	0.5	3.7	346.2	70.1	94.4	317.9	351.7	202.9	184.8	385.3	0.18	76.41	78.40	82.32	0.15	77.61	78.42	82.73
293.0	499.0	0.6	0.5	3.7	345.4	69.9	94.3	316.9	350.8	202.6	184.2	384.3	0.18	76.41	78.40	82.32	0.15	77.61	78.42	82.73
294.0	500.0	0.6	0.5	3.7	345.4	69.7	94.0	315.7	350.8	202.6	184.2	384.3	0.18	76.41	78.40	82.32	0.15	77.61	78.42	82.73
295.0	501.0	0.5	0.5	3.7	343.8	69.7	93.6	315.2	349.7	202.1	183.4	382.9	0.18	76.39	78.36	81.41	0.15	77.54	78.37	83.95
296.0	502.0	0.5	0.5	3.7	342.8	69.7	93.3	314.1	348.9	201.7	183.4	382.9	0.18	76.39	78.36	81.41	0.15	77.54	78.37	83.95
297.0	503.0	0.5	0.5	3.7	342.3	69.7	93.3	314.1	348.9	201.7	183.4	382.9	0.18	76.39	78.36	81.41	0.15	77.54	78.37	83.95
298.0	504.0	0.5	0.5	3.7	342.3	69.7	93.3	314.1	348.9	201.7	183.4	382.9	0.18	76.39	78.36	81.41	0.15	77.54	78.37	83.95
299.0	505.0	0.5	0.5	3.7	342.3	69.7	93.3	314.1	348.9	201.7	183.4	382.9	0.18	76.39	78.36	81.41	0.15	77.54	78.37	83.95
300.0	506.0	0.4	0.5	3.7	341.2	69.6	93.7	312.4	346.4	200.6	181.7	380.5	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
301.0	507.0	0.4	0.5	3.7	340.3	70.0	93.4	310.9	345.8	199.6	180.7	379.7	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
302.0	508.0	0.4	0.5	3.7	339.5	70.3	93.1	309.7	344.8	199.6	180.7	379.7	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
303.0	509.0	0.4	0.5	3.7	338.3	70.3	93.1	308.4	344.3	199.6	180.7	379.7	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
304.0	510.0	0.4	0.5	3.7	337.8	70.5	93.3	307.7	343.9	199.2	179.7	378.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
305.0	511.0	0.3	0.5	3.7	337.7	70.5	93.3	307.7	343.9	199.2	179.7	378.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
306.0	512.0	0.3	0.5	3.7	337.8	70.1	93.0	307.1	343.2	198.4	179.7	378.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
307.0	513.0	0.3	0.5	3.7	336.7	70.7	93.5	305.8	343.1	197.9	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
308.0	514.0	0.2	0.5	3.6	335.9	69.4	92.3	304.2	342.8	197.7	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
309.0	515.0	0.2	0.5	3.6	335.4	69.4	92.3	304.2	342.8	197.7	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
310.0	516.0	0.2	0.5	3.6	335.4	69.4	92.3	304.2	342.8	197.7	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
311.0	517.0	0.2	0.5	3.6	335.4	69.4	92.3	304.2	342.8	197.7	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
312.0	518.0	0.2	0.5	3.6	335.4	69.4	92.3	304.2	342.8	197.7	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03
313.0	519.0	0.2	0.5	3.6	335.4	69.4	92.3	304.2	342.8	197.7	178.3	376.6	0.18	76.38	78.35	82.53	0.15	77.50	78.32	83.03

APPENDIX 2: Proportionality results

Average	Average	Average	Proportional	Highfire				Average
17,98	Inlet +	Inlet +						0,264
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	103,35	99,38	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
17,599	531,7	532,0			0,180	0,147	0	0,2753612
18,078	531,8	532,1	90,87	87,39	0,180	0,147	1	0,2823163
17,626	532,0	532,1	92,97	89,31	0,180	0,147	2	0,2757354
17,766	532,0	532,2	92,13	88,68	0,180	0,147	3	0,2779592
17,787	532,1	532,2	92,06	88,55	0,180	0,147	4	0,2783283
17,573	532,1	532,2	93,56	89,89	0,180	0,147	5	0,2744286
18,301	532,1	532,2	90,08	86,64	0,180	0,147	6	0,285405
17,572	532,1	532,2	93,56	89,98	0,180	0,147	7	0,2744292
17,803	532,1	532,2	92,19	88,62	0,180	0,147	8	0,2783273
17,577	532,1	532,2	93,57	89,99	0,180	0,147	9	0,2744293
17,612	532,2	532,3	94,38	90,78	0,180	0,147	10	0,2735088
17,757	532,2	532,3	95,32	91,59	0,180	0,147	11	0,2734049
17,880	532,2	532,3	97,03	93,40	0,180	0,147	12	0,2717974
17,918	532,2	532,3	99,58	95,79	0,180	0,147	13	0,2685704
18,030	532,2	532,4	100,94	97,05	0,180	0,147	14	0,2676127
18,341	532,3	532,5	100,48	96,60	0,180	0,147	15	0,2705183
18,031	532,4	532,6	103,70	99,74	0,180	0,147	16	0,263948
18,327	532,6	532,7	102,92	98,88	0,180	0,147	17	0,2672238
18,065	532,7	532,8	104,35	100,35	0,180	0,147	18	0,2634425
18,323	532,8	532,9	103,10	99,13	0,180	0,147	19	0,2669033
17,973	533,0	533,1	104,77	100,77	0,180	0,147	20	0,2621883
17,879	533,1	533,2	105,30	101,20	0,180	0,147	21	0,2608143
17,947	533,3	533,3	104,18	100,28	0,180	0,147	22	0,2625783
17,848	533,4	533,4	104,36	100,30	0,180	0,147	23	0,2616912
17,977	533,5	533,6	103,57	99,62	0,180	0,147	24	0,2636065
17,981	533,6	533,6	103,63	99,67	0,180	0,147	25	0,2635542
17,953	533,7	533,7	103,70	99,74	0,180	0,147	26	0,2632271
18,137	533,8	533,9	102,76	98,84	0,180	0,147	27	0,265749
18,075	533,9	534,0	102,74	98,82	0,180	0,147	28	0,2653
18,120	534,0	534,0	101,80	97,91	0,180	0,147	29	0,2668436
17,997	534,0	534,1	101,82	97,93	0,180	0,147	30	0,2658804
17,986	534,1	534,2	101,97	98,18	0,179	0,147	31	0,2655842
17,986	534,2	534,3	101,68	97,84	0,179	0,147	32	0,2658801
17,633	534,2	534,4	109,24	105,06	0,179	0,146	33	0,2540413
18,269	534,3	534,4	104,12	100,09	0,179	0,146	34	0,2649132
17,665	534,4	534,5	104,99	100,97	0,179	0,146	35	0,2593415
17,985	534,4	534,5	103,31	99,25	0,179	0,146	36	0,2639262
18,016	534,5	534,6	103,44	99,43	0,180	0,146	37	0,2639443
18,049	534,6	534,7	103,83	99,85	0,179	0,146	38	0,263556
18,076	534,6	534,8	104,02	99,96	0,179	0,146	39	0,2635857
18,316	534,6	534,9	102,88	98,82	0,179	0,146	40	0,2668447
18,130	534,7	534,9	104,36	100,26	0,179	0,146	41	0,2635575
18,419	534,8	535,0	102,73	98,88	0,179	0,146	42	0,2676125
18,253	534,9	535,1	104,01	99,92	0,179	0,146	43	0,2648749
18,193	535,0	535,2	104,37	100,36	0,179	0,146	44	0,2639458
17,894	535,1	535,3	106,41	102,27	0,179	0,146	45	0,2592367
18,356	535,2	535,4	103,66	99,70	0,179	0,146	46	0,2658813
18,293	535,3	535,5	103,91	99,85	0,179	0,146	47	0,265211
18,313	535,4	535,6	103,90	99,88	0,179	0,146	48	0,2653016
18,227	535,4	535,6	104,80	100,77	0,179	0,146	49	0,2635544
18,250	535,6	535,7	104,82	100,86	0,179	0,146	50	0,2635261
18,239	535,7	535,8	105,07	101,04	0,179	0,146	51	0,2632531
18,307	535,7	535,9	104,89	100,85	0,179	0,146	52	0,2639429
18,289	535,9	536,0	105,01	101,05	0,179	0,146	53	0,2635562

18,333	536,0	536,1	105,18	101,15	0,179	0,146	54	0,2637125
18,418	536,1	536,2	104,70	100,58	0,179	0,146	55	0,2649034
18,319	536,2	536,3	105,18	101,12	0,179	0,146	56	0,2635557
18,551	536,3	536,4	103,90	99,92	0,179	0,146	57	0,2668262
18,146	536,4	536,6	106,42	102,33	0,179	0,146	58	0,2607351
18,037	536,4	536,6	107,19	103,07	0,179	0,146	59	0,2588667
18,237	536,4	536,7	106,13	102,04	0,179	0,146	60	0,2616006
17,938	536,5	536,7	107,88	103,72	0,179	0,146	61	0,2574508
17,694	536,6	536,8	109,27	105,07	0,179	0,146	62	0,2540401
18,121	536,7	536,9	106,64	102,53	0,179	0,146	63	0,2602222
18,258	536,8	537,0	105,49	101,45	0,179	0,146	64	0,2625807
18,254	537,0	537,1	105,47	101,43	0,179	0,146	65	0,2625451
18,224	537,1	537,2	105,20	101,17	0,179	0,146	66	0,2626385
17,812	537,2	537,3	107,89	103,80	0,179	0,146	67	0,2564505
17,807	537,3	537,4	107,78	103,71	0,179	0,146	68	0,2564521
17,521	537,4	537,5	109,80	105,56	0,179	0,146	69	0,2521273
18,209	537,4	537,6	105,30	101,25	0,179	0,146	70	0,2623217
18,017	537,4	537,7	106,20	102,11	0,179	0,146	71	0,2598281
17,754	537,5	537,7	107,75	103,66	0,179	0,146	72	0,2560527
18,015	537,5	537,7	106,18	102,10	0,179	0,146	73	0,2598317
18,133	537,5	537,8	104,96	100,90	0,179	0,146	74	0,2621893
18,153	537,6	537,8	105,16	101,11	0,179	0,146	75	0,2621911
17,678	537,8	538,0	107,85	103,60	0,179	0,146	76	0,255449
17,735	538,0	538,1	107,24	103,19	0,179	0,146	77	0,2564753
17,787	538,0	538,2	107,01	102,90	0,178	0,146	78	0,2570527
17,719	538,1	538,2	107,18	103,08	0,178	0,146	79	0,2564561
17,655	538,1	538,3	107,61	103,44	0,179	0,146	80	0,2554521
17,843	538,1	538,3	106,17	102,09	0,178	0,146	81	0,2584468
17,873	538,1	538,3	106,13	101,94	0,178	0,146	82	0,2588431
17,835	538,1	538,4	106,12	102,03	0,178	0,146	83	0,2584456
17,741	538,1	538,4	106,69	102,58	0,178	0,146	84	0,2570615
17,892	538,2	538,4	105,89	101,80	0,178	0,146	85	0,25924
17,711	538,3	538,5	107,11	102,99	0,179	0,146	86	0,2564557
17,835	538,4	538,5	106,15	102,05	0,178	0,146	87	0,2584512
17,817	538,5	538,6	105,99	101,98	0,178	0,146	88	0,25845
17,786	538,5	538,6	106,67	102,55	0,178	0,146	89	0,2574552
18,186	538,6	538,7	104,01	100,05	0,178	0,146	90	0,263606
17,885	538,7	538,8	105,23	101,13	0,178	0,146	91	0,2598658
17,927	538,7	538,8	105,15	101,07	0,178	0,145	92	0,2602294
17,622	538,7	538,9	106,79	102,71	0,178	0,145	93	0,2560566
17,786	538,9	539,0	105,21	101,13	0,178	0,145	94	0,2590926
17,686	539,0	539,0	105,99	101,84	0,178	0,145	95	0,2574599
18,104	538,9	539,1	103,50	99,57	0,178	0,145	96	0,2635625
17,825	539,0	539,1	104,86	100,74	0,178	0,145	97	0,2598607
17,903	539,1	539,1	104,17	100,11	0,178	0,145	98	0,2612159
17,828	539,1	539,2	104,54	100,56	0,178	0,145	99	0,2602298
17,796	539,0	539,1	104,63	100,59	0,178	0,145	100	0,2598365
18,057	539,1	539,1	102,93	99,06	0,178	0,145	101	0,2638165
18,323	539,0	539,1	101,33	97,40	0,178	0,145	102	0,267922
17,989	539,0	539,1	103,17	99,16	0,178	0,145	103	0,2631725
18,010	539,0	539,1	102,90	99,09	0,178	0,145	104	0,2635621
18,120	539,1	539,1	102,37	98,42	0,178	0,145	105	0,2651322
17,877	539,0	539,2	103,75	99,67	0,178	0,145	106	0,2616082
18,082	539,0	539,2	102,04	98,11	0,178	0,145	107	0,2653101
17,599	538,9	539,1	104,56	100,64	0,178	0,145	108	0,2584517
17,816	539,0	539,1	102,98	99,05	0,178	0,145	109	0,2620047
17,666	538,9	539,1	103,63	99,65	0,178	0,145	110	0,2602348
17,715	539,0	539,1	103,44	99,37	0,178	0,145	111	0,2608227
17,795	539,0	539,2	102,81	98,77	0,178	0,145	112	0,2621969
17,998	539,1	539,2	101,57	97,69	0,178	0,145	113	0,2652595
17,953	539,1	539,2	101,29	97,37	0,178	0,145	114	0,2653104

17,937	539,2	539,3	101,39	97,56	0,178	0,145	115 0,2649223
17,485	539,2	539,3	103,94	99,92	0,178	0,145	116 0,2584528
18,239	539,2	539,3	99,67	95,83	0,178	0,145	117 0,2695437
17,929	539,3	539,3	101,06	97,25	0,178	0,145	118 0,2653113
17,779	539,3	539,4	101,91	98,01	0,178	0,145	119 0,2631749
18,271	539,3	539,4	99,15	95,31	0,178	0,145	120 0,2704835

Average	Average	Average	Proportional Rates Medium/low fire					Average
17,64	Inlet +	Inlet +						0,270
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	103,32	100,69	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
17,894	538,0	538,3			0,178	0,145	0	0,2676229
17,910	538,1	538,3	104,59	101,89	0,178	0,145	1	0,2704849
18,089	538,1	538,3	104,31	101,58	0,178	0,145	2	0,2721866
17,884	538,1	538,3	106,99	104,17	0,178	0,145	3	0,2672313
17,889	538,1	538,3	108,57	105,78	0,178	0,145	4	0,2653118
17,919	538,1	538,3	109,87	107,05	0,178	0,145	5	0,2639534
17,942	538,2	538,4	111,15	108,25	0,178	0,145	6	0,262584
18,118	538,3	538,5	111,06	108,22	0,178	0,145	7	0,2639533
18,103	538,4	538,6	111,60	108,75	0,178	0,145	8	0,2631742
18,010	538,5	538,7	110,80	107,96	0,178	0,145	9	0,2635658
18,211	538,6	538,8	109,15	106,37	0,178	0,145	10	0,2668556
17,992	538,8	538,9	110,52	107,69	0,178	0,145	11	0,2635652
17,982	538,8	539,0	110,49	107,74	0,178	0,145	12	0,2635661
17,883	538,9	539,0	111,10	108,21	0,178	0,145	13	0,2621998
18,304	539,0	539,1	106,77	104,10	0,178	0,145	14	0,2704961
17,652	539,1	539,2	109,54	106,77	0,178	0,145	15	0,2622664
17,531	539,1	539,2	109,69	106,88	0,178	0,145	16	0,26122
17,670	539,0	539,2	108,98	106,18	0,178	0,145	17	0,2631209
18,123	539,0	539,3	105,48	102,81	0,178	0,145	18	0,2708657
17,815	539,0	539,3	107,28	104,52	0,178	0,145	19	0,266277
18,157	539,1	539,3	105,00	102,30	0,178	0,145	20	0,2717195
17,956	539,1	539,3	105,99	103,24	0,178	0,145	21	0,268953
17,912	539,1	539,3	106,02	103,29	0,178	0,145	22	0,2685801
17,822	539,0	539,3	106,87	104,10	0,178	0,145	23	0,2668554
18,147	539,0	539,3	104,81	102,06	0,178	0,145	24	0,2719563
17,676	539,0	539,3	107,63	104,76	0,178	0,145	25	0,2649241
17,877	539,0	539,3	106,20	103,47	0,178	0,145	26	0,2681972
17,922	539,0	539,3	106,11	103,35	0,178	0,145	27	0,2685672
18,028	539,1	539,4	105,28	102,55	0,178	0,145	28	0,270406
17,558	539,1	539,4	107,98	105,13	0,178	0,145	29	0,2635662
17,822	539,1	539,4	106,56	103,72	0,178	0,145	30	0,2672394
17,725	539,1	539,4	106,75	103,98	0,178	0,145	31	0,2662598
17,457	539,1	539,4	108,50	105,61	0,178	0,145	32	0,2622041
17,857	539,1	539,4	106,09	103,25	0,178	0,145	33	0,268198
18,025	539,1	539,4	105,02	102,18	0,178	0,145	34	0,2708637
17,708	539,1	539,4	106,94	104,16	0,178	0,145	35	0,2659154
17,781	539,1	539,4	106,62	103,85	0,178	0,145	36	0,2668548
17,743	539,1	539,4	106,85	104,08	0,178	0,145	37	0,2662771
17,792	539,1	539,4	106,70	103,87	0,178	0,145	38	0,2668982
17,674	539,1	539,4	107,23	104,41	0,178	0,145	39	0,2653238
17,731	539,2	539,5	107,14	104,30	0,178	0,145	40	0,2658924
17,862	539,3	539,5	106,56	103,78	0,178	0,145	41	0,2676236
17,913	539,3	539,5	106,04	103,26	0,178	0,145	42	0,26858
18,122	539,3	539,5	104,79	101,99	0,178	0,145	43	0,2718094
17,988	539,3	539,5	105,50	102,66	0,178	0,145	44	0,2699149
17,941	539,4	539,6	105,66	102,92	0,178	0,145	45	0,2692167
17,885	539,4	539,6	106,09	103,47	0,178	0,145	46	0,2682043
17,712	539,4	539,6	106,90	104,25	0,178	0,145	47	0,2658942
17,692	539,4	539,6	107,28	104,48	0,178	0,145	48	0,2653218
17,671	539,4	539,6	107,44	104,77	0,178	0,145	49	0,2649493
17,605	539,5	539,6	107,91	105,05	0,178	0,145	50	0,2639549
18,039	539,5	539,7	105,31	102,58	0,178	0,145	51	0,2704842
18,037	539,6	539,7	105,27	102,48	0,178	0,145	52	0,2705001
18,027	539,6	539,7	105,22	102,54	0,178	0,145	53	0,2704827
17,667	539,6	539,7	107,37	104,63	0,178	0,145	54	0,2649244

17,975	539,7	539,7	105,65	102,92	0,178	0,145	55	0,2695337
17,930	539,7	539,7	105,90	103,09	0,178	0,145	56	0,268866
17,995	539,7	539,8	105,43	102,76	0,178	0,145	57	0,2699335
17,806	539,8	539,8	106,01	103,37	0,178	0,145	58	0,2676238
18,171	539,8	539,8	103,98	101,31	0,178	0,145	59	0,2731263
17,719	539,9	539,9	107,01	104,18	0,178	0,145	60	0,2658507
17,468	539,9	539,9	108,43	105,57	0,178	0,145	61	0,2622026
17,675	540,1	540,0	107,11	104,44	0,178	0,145	62	0,2653133
17,605	540,1	540,0	107,38	104,65	0,178	0,145	63	0,2644324
17,658	540,1	540,0	106,93	104,33	0,178	0,145	64	0,2653131
17,450	540,1	540,0	108,20	105,56	0,178	0,145	65	0,2622018
17,717	540,2	540,1	106,48	103,80	0,178	0,145	66	0,2662781
17,696	540,3	540,1	106,58	103,83	0,178	0,145	67	0,2660668
17,534	540,3	540,1	107,65	104,89	0,178	0,145	68	0,2635671
17,526	540,4	540,2	107,48	104,78	0,178	0,145	69	0,2635686
17,521	540,4	540,2	107,55	104,66	0,178	0,145	70	0,2635602
17,410	540,4	540,3	107,93	105,16	0,178	0,145	71	0,2622015
17,521	540,4	540,3	107,54	104,80	0,178	0,145	72	0,2635684
17,620	540,5	540,3	107,03	104,25	0,178	0,145	73	0,2649268
17,531	540,6	540,4	107,17	104,55	0,178	0,145	74	0,2639214
18,142	540,6	540,4	103,60	101,07	0,178	0,145	75	0,2731294
17,761	540,7	540,5	106,00	103,34	0,178	0,145	76	0,2672412
17,986	540,7	540,5	104,42	101,83	0,178	0,145	77	0,2708646
18,204	540,7	540,6	103,19	100,62	0,178	0,145	78	0,2740674
17,682	540,8	540,6	106,19	103,56	0,178	0,145	79	0,2662792
17,494	540,9	540,6	107,21	104,62	0,178	0,145	80	0,2635689
17,480	540,9	540,7	107,52	104,72	0,178	0,145	81	0,263179
17,747	541,0	540,7	105,43	102,85	0,178	0,145	82	0,26763
17,632	541,0	540,7	106,23	103,58	0,178	0,145	83	0,2658941
17,763	541,0	540,7	105,51	102,82	0,178	0,145	84	0,2677778
17,449	541,1	540,8	107,30	104,62	0,178	0,145	85	0,2631794
17,806	541,1	540,8	105,03	102,51	0,178	0,145	86	0,2685837
17,760	541,1	540,8	105,43	102,80	0,178	0,145	87	0,2678432
17,629	541,1	540,9	106,28	103,63	0,178	0,145	88	0,2657858
17,646	541,1	540,9	105,98	103,23	0,178	0,145	89	0,2662775
17,642	541,2	540,9	105,88	103,37	0,178	0,145	90	0,2662806
17,688	541,2	541,0	105,60	102,90	0,177	0,145	91	0,267068
18,010	541,2	541,0	103,79	101,21	0,178	0,145	92	0,271809
17,575	541,3	541,0	106,28	103,65	0,178	0,145	93	0,2653162
17,812	541,3	541,0	104,80	102,18	0,177	0,145	94	0,2689596
18,086	541,4	541,1	103,07	100,52	0,177	0,145	95	0,2731379
17,626	541,5	541,1	105,68	103,07	0,177	0,145	96	0,2662817
17,545	541,4	541,1	106,28	103,65	0,177	0,145	97	0,2649276
17,550	541,5	541,2	106,31	103,61	0,177	0,145	98	0,2650253
17,606	541,4	541,2	105,87	103,31	0,177	0,145	99	0,2658956
17,752	541,5	541,2	105,03	102,34	0,177	0,145	100	0,2682023
17,753	541,5	541,2	105,03	102,42	0,177	0,145	101	0,2682009
17,399	541,5	541,2	106,85	104,19	0,177	0,145	102	0,2632518
17,655	541,5	541,2	105,51	102,83	0,177	0,145	103	0,2668592
17,551	541,5	541,2	106,10	103,43	0,177	0,145	104	0,2653328
17,728	541,5	541,2	104,96	102,38	0,177	0,145	105	0,2680541
17,852	541,5	541,2	104,18	101,58	0,177	0,145	106	0,2699333
17,504	541,5	541,2	106,20	103,49	0,177	0,145	107	0,2649284
17,618	541,5	541,3	105,28	102,55	0,178	0,145	108	0,2668595
17,634	541,5	541,3	105,37	102,63	0,177	0,145	109	0,2668661
17,981	541,5	541,3	103,50	100,88	0,177	0,145	110	0,2718268
17,786	541,5	541,3	104,51	101,95	0,177	0,145	111	0,2689666
17,740	541,5	541,3	104,75	102,22	0,177	0,145	112	0,2683403
17,764	541,5	541,3	104,52	101,91	0,177	0,145	113	0,2689227
17,659	541,6	541,3	105,20	102,56	0,177	0,145	114	0,2672442
17,694	541,6	541,4	104,94	102,22	0,177	0,145	115	0,2678435
17,426	541,6	541,4	106,42	103,72	0,177	0,145	116	0,2639596

17,717	541,6	541,4	104,80	102,18	0,177	0,145	117	0,268201
17,626	541,6	541,4	105,32	102,65	0,177	0,145	118	0,2668595
17,768	541,6	541,4	104,00	101,45	0,177	0,145	119	0,2695389
17,562	541,5	541,4	105,15	102,59	0,177	0,145	120	0,2664885
17,777	541,5	541,4	104,02	101,52	0,177	0,145	121	0,2695393
17,753	541,6	541,4	104,13	101,45	0,177	0,145	122	0,2693412
17,902	541,6	541,4	103,16	100,59	0,177	0,145	123	0,2717156
17,777	541,7	541,4	103,69	101,22	0,177	0,145	124	0,2699206
17,373	541,7	541,4	106,37	103,74	0,177	0,145	125	0,2635726
17,729	541,7	541,5	104,12	101,59	0,177	0,145	126	0,2690078
18,155	541,6	541,4	101,85	99,21	0,177	0,145	127	0,2753788
17,667	541,6	541,4	104,49	101,80	0,177	0,145	128	0,2682033
17,681	541,6	541,4	104,26	101,68	0,177	0,145	129	0,2685851
17,721	541,5	541,4	103,99	101,38	0,177	0,145	130	0,2692889
18,212	541,5	541,4	100,86	98,38	0,177	0,145	131	0,2770605
17,715	541,5	541,3	103,77	101,16	0,177	0,145	132	0,2695377
17,444	541,5	541,3	105,46	102,81	0,177	0,145	133	0,2653192
17,501	541,5	541,3	104,98	102,40	0,177	0,145	134	0,266283
17,633	541,5	541,3	104,32	101,63	0,177	0,145	135	0,2682035
17,656	541,5	541,3	104,16	101,55	0,177	0,145	136	0,2685864
17,856	541,5	541,3	102,85	100,25	0,177	0,145	137	0,2718184
17,666	541,5	541,3	103,92	101,28	0,177	0,145	138	0,2689681
17,577	541,5	541,3	104,43	101,78	0,177	0,145	139	0,2676294
17,302	541,5	541,3	105,88	103,34	0,177	0,145	140	0,2635716
17,773	541,5	541,3	103,09	100,47	0,177	0,145	141	0,270869
17,609	541,4	541,3	104,19	101,49	0,177	0,145	142	0,2682021
17,724	541,4	541,3	103,54	100,94	0,177	0,145	143	0,2699201
17,784	541,5	541,3	103,16	100,58	0,177	0,145	144	0,2708685
17,713	541,5	541,3	103,38	100,88	0,177	0,145	145	0,2699206
17,760	541,4	541,3	103,02	100,43	0,177	0,145	146	0,2708693
17,536	541,4	541,3	104,51	101,88	0,177	0,145	147	0,2672448
17,650	541,4	541,3	103,84	101,12	0,177	0,145	148	0,2689679
17,951	541,4	541,3	102,13	99,57	0,177	0,145	149	0,2735111
17,823	541,5	541,3	102,73	100,16	0,177	0,145	150	0,2717362
17,635	541,5	541,3	103,75	101,19	0,177	0,145	151	0,2689683
17,416	541,4	541,3	105,24	102,52	0,177	0,145	152	0,2654029
17,591	541,4	541,2	103,80	101,10	0,177	0,145	153	0,268586
17,596	541,3	541,2	103,84	101,12	0,178	0,145	154	0,2685868
17,736	541,3	541,2	103,19	100,58	0,178	0,145	155	0,2705221
17,724	541,3	541,2	103,24	100,54	0,178	0,145	156	0,270486
17,525	541,4	541,2	104,45	101,83	0,178	0,145	157	0,2672458
17,854	541,3	541,2	102,37	99,80	0,178	0,145	158	0,2724705
17,584	541,4	541,2	104,05	101,44	0,177	0,145	159	0,2682047
17,632	541,4	541,2	103,73	101,14	0,177	0,145	160	0,2689687
17,674	541,5	541,2	103,47	100,85	0,177	0,145	161	0,2695395
17,651	541,5	541,2	103,40	100,82	0,177	0,145	162	0,2695396
17,618	541,5	541,2	103,64	101,06	0,177	0,145	163	0,2689684
17,883	541,4	541,2	102,03	99,49	0,177	0,145	164	0,2731289
17,780	541,4	541,2	102,42	99,87	0,177	0,145	165	0,2718156
17,671	541,4	541,2	103,32	100,64	0,178	0,145	166	0,2699483
17,538	541,4	541,2	103,77	101,18	0,178	0,145	167	0,2682039
17,571	541,4	541,2	103,32	100,80	0,177	0,145	168	0,2689687
18,337	541,5	541,2	99,14	96,68	0,177	0,145	169	0,2805502
17,628	541,5	541,2	103,01	100,41	0,177	0,145	170	0,2698735
17,464	541,4	541,2	104,08	101,48	0,177	0,145	171	0,2672456
17,524	541,4	541,2	103,69	101,11	0,177	0,145	172	0,2682036
17,765	541,4	541,2	102,35	99,79	0,177	0,145	173	0,2718155
17,556	541,4	541,1	103,67	101,00	0,178	0,145	174	0,2685866
17,223	541,3	541,1	105,53	102,91	0,178	0,145	175	0,2635738
17,650	541,3	541,1	103,10	100,55	0,177	0,145	176	0,2699214
17,867	541,3	541,1	101,79	99,24	0,177	0,145	177	0,2733576
17,438	541,2	541,1	104,27	101,61	0,178	0,145	178	0,2668436

17,570	541,2	541,1	103,40	100,81	0,178	0,145	179	0,2689694
17,840	541,2	541,0	101,82	99,25	0,178	0,145	180	0,2731331
17,623	541,2	541,0	102,94	100,36	0,178	0,145	181	0,2699935
17,587	541,2	541,0	103,01	100,49	0,177	0,145	182	0,2695394
17,682	541,2	541,0	102,60	100,04	0,177	0,145	183	0,2708696
17,607	541,2	541,0	102,91	100,32	0,178	0,145	184	0,2699209
17,482	541,2	541,0	103,75	101,10	0,178	0,145	185	0,2679281
17,816	541,2	541,0	101,61	99,14	0,178	0,145	186	0,2731352
17,524	541,2	541,0	103,43	100,77	0,177	0,145	187	0,2685864
17,312	541,2	541,0	104,71	102,10	0,178	0,145	188	0,265319
17,724	541,2	541,0	102,14	99,60	0,178	0,145	189	0,2718156
17,499	541,2	541,0	103,58	100,99	0,178	0,145	190	0,2682056
17,632	541,1	540,9	102,63	100,14	0,178	0,145	191	0,2704907
17,500	541,0	540,9	103,17	100,58	0,178	0,145	192	0,2687904
17,579	541,0	540,9	102,72	100,19	0,178	0,145	193	0,2699223
17,533	541,0	540,9	103,23	100,64	0,178	0,145	194	0,2689694
17,625	541,0	540,9	102,49	99,92	0,178	0,145	195	0,2706449
17,730	541,0	540,9	101,85	99,32	0,178	0,145	196	0,2722945
17,611	541,0	540,9	102,53	99,97	0,178	0,145	197	0,2704725
17,610	541,0	540,9	102,52	99,93	0,178	0,145	198	0,2704908
17,865	541,0	540,9	100,93	98,30	0,178	0,145	199	0,2745689
17,896	541,0	540,9	100,94	98,38	0,178	0,145	200	0,2748059
17,489	541,0	540,9	103,28	100,68	0,178	0,145	201	0,268572
17,417	541,0	540,8	103,60	100,98	0,178	0,145	202	0,2676304
17,947	541,0	540,8	100,53	97,95	0,178	0,145	203	0,2757537
17,598	541,0	540,8	102,37	99,83	0,178	0,145	204	0,2704908
17,565	541,0	540,8	102,71	100,12	0,178	0,145	205	0,2699224
17,597	541,0	540,8	102,44	99,80	0,178	0,145	206	0,2704921
17,558	541,0	540,9	102,65	100,07	0,178	0,145	207	0,2699217
17,933	541,0	540,9	100,48	98,02	0,178	0,145	208	0,275626
17,471	541,0	540,8	103,15	100,57	0,178	0,145	209	0,2685874
17,688	541,0	540,8	101,98	99,41	0,178	0,145	210	0,2718147
17,501	541,0	540,8	102,79	100,27	0,178	0,145	211	0,2692298
17,704	541,0	540,9	101,68	99,22	0,177	0,145	212	0,2721916
17,844	541,1	540,9	100,87	98,33	0,177	0,145	213	0,2744456
17,490	541,1	540,9	102,92	100,39	0,178	0,145	214	0,2689697
17,375	541,1	540,9	103,64	101,04	0,177	0,145	215	0,267067
17,594	541,0	540,9	102,31	99,75	0,177	0,145	216	0,2704802
17,533	541,1	540,9	102,67	100,10	0,177	0,145	217	0,2695399
17,456	541,0	540,8	102,99	100,49	0,177	0,145	218	0,2685868
17,591	541,0	540,8	102,40	99,74	0,178	0,145	219	0,2705057
17,825	541,0	540,8	101,07	98,50	0,178	0,145	220	0,2740738
17,700	541,0	540,8	101,75	99,13	0,178	0,145	221	0,2721925
17,526	541,1	540,8	102,72	100,16	0,178	0,145	222	0,2695613
17,733	541,1	540,8	101,52	98,88	0,178	0,145	223	0,2727544
17,542	540,9	540,8	102,52	99,98	0,178	0,145	224	0,2699103
17,516	540,9	540,7	102,72	100,14	0,178	0,145	225	0,2695403
17,850	540,9	540,7	100,63	98,13	0,178	0,145	226	0,2748202
17,711	540,9	540,7	101,62	99,03	0,178	0,145	227	0,2725639
17,747	540,9	540,7	101,31	98,77	0,178	0,145	228	0,2731342
17,479	540,9	540,7	102,93	100,35	0,178	0,145	229	0,2689693
17,663	540,9	540,7	101,74	99,21	0,178	0,145	230	0,2718141
17,605	540,9	540,7	102,20	99,61	0,178	0,145	231	0,2709102
17,583	540,9	540,7	102,29	99,78	0,178	0,145	232	0,2705457
17,556	540,9	540,7	102,29	99,77	0,178	0,145	233	0,2702484
17,601	540,9	540,7	102,20	99,65	0,178	0,145	234	0,2708695
17,774	540,9	540,7	101,09	98,62	0,178	0,145	235	0,2735389
17,536	540,9	540,7	102,46	99,86	0,177	0,145	236	0,2699194
17,450	540,9	540,7	103,02	100,38	0,178	0,145	237	0,2685863
17,662	540,9	540,7	101,80	99,29	0,178	0,145	238	0,271815
17,574	540,9	540,7	102,33	99,68	0,178	0,145	239	0,2704906
17,659	540,9	540,7	101,83	99,19	0,178	0,145	240	0,2718143

17,601	540,9	540,7	102,14	99,64	0,178	0,145	241	0,2708706
17,517	540,9	540,7	102,66	100,05	0,178	0,145	242	0,2696148
17,687	540,9	540,7	101,58	99,09	0,178	0,145	243	0,2721958
17,448	540,9	540,7	103,03	100,34	0,178	0,145	244	0,2686004
17,791	540,9	540,7	100,88	98,38	0,178	0,145	245	0,2740717
17,590	540,9	540,7	102,14	99,49	0,178	0,145	246	0,2708697
17,606	540,8	540,7	102,09	99,53	0,178	0,145	247	0,2710726
17,506	540,8	540,7	102,60	100,09	0,178	0,145	248	0,2695392
17,657	540,8	540,7	101,74	99,24	0,178	0,145	249	0,2718138
17,651	540,7	540,7	101,83	99,26	0,178	0,145	250	0,2717919
17,408	540,7	540,7	103,13	100,58	0,178	0,145	251	0,2682016
17,525	540,8	540,7	102,50	99,93	0,178	0,145	252	0,2699194
17,723	540,8	540,7	101,22	98,58	0,178	0,145	253	0,2731337
17,808	540,8	540,6	100,65	98,22	0,178	0,145	254	0,274446
17,507	540,7	540,6	102,66	100,07	0,178	0,145	255	0,2695388
17,504	540,7	540,6	102,67	100,02	0,178	0,145	256	0,2695619
17,801	540,7	540,6	101,00	98,47	0,178	0,145	257	0,2740708
17,509	540,7	540,5	102,71	100,05	0,178	0,145	258	0,2695364
17,679	540,7	540,5	101,59	99,12	0,178	0,145	259	0,272186
17,668	540,7	540,5	101,91	99,36	0,178	0,145	260	0,2718149
17,510	540,7	540,5	102,64	100,11	0,178	0,145	261	0,2695394
17,674	540,8	540,5	101,70	99,19	0,178	0,145	262	0,2720585
17,686	540,7	540,5	101,68	99,19	0,178	0,145	263	0,2721906
17,441	540,7	540,5	103,03	100,46	0,178	0,145	264	0,2685859
17,564	540,7	540,5	102,31	99,70	0,178	0,145	265	0,2704793
17,728	540,7	540,5	101,34	98,78	0,178	0,145	266	0,2730483
17,372	540,7	540,5	103,41	100,80	0,178	0,145	267	0,2675839
17,511	540,7	540,5	102,72	100,04	0,178	0,145	268	0,269541
17,554	540,7	540,5	102,20	99,60	0,178	0,145	269	0,2704895
17,498	540,7	540,5	102,65	100,07	0,178	0,145	270	0,2695388
17,894	540,6	540,5	100,26	97,69	0,178	0,145	271	0,2757519
17,733	540,6	540,5	101,32	98,78	0,178	0,145	272	0,2731325
17,565	540,6	540,5	102,28	99,72	0,178	0,145	273	0,2705534
17,505	540,6	540,5	102,66	100,08	0,178	0,145	274	0,2695936
17,674	540,6	540,5	101,66	99,10	0,178	0,145	275	0,272192
17,556	540,6	540,5	102,28	99,72	0,178	0,145	276	0,2704894
17,565	540,5	540,4	102,20	99,62	0,178	0,145	277	0,2706856
17,864	540,5	540,4	100,43	97,90	0,178	0,145	278	0,2753792
17,493	540,5	540,4	102,61	99,96	0,178	0,145	279	0,2695347
17,343	540,5	540,4	103,49	100,88	0,178	0,145	280	0,267244
18,108	540,5	540,4	98,97	96,40	0,178	0,145	281	0,2792653
17,515	540,4	540,4	102,38	99,88	0,178	0,145	282	0,269947
17,822	540,4	540,4	100,56	98,08	0,178	0,145	283	0,2748196
17,655	540,4	540,4	101,50	98,93	0,178	0,145	284	0,2721927
17,625	540,4	540,4	101,66	99,09	0,178	0,145	285	0,2717485
17,449	540,5	540,4	102,78	100,24	0,178	0,145	286	0,2689785
17,636	540,5	540,4	101,66	99,21	0,178	0,145	287	0,271814
17,649	540,5	540,4	101,56	98,90	0,178	0,145	288	0,2721925
17,526	540,5	540,4	102,42	99,84	0,178	0,145	289	0,2701044
17,739	540,4	540,3	101,12	98,61	0,178	0,145	290	0,2735085
17,564	540,4	540,3	102,08	99,51	0,178	0,145	291	0,2708683
17,630	540,4	540,3	101,76	99,19	0,178	0,145	292	0,2718131
17,879	540,4	540,3	100,19	97,66	0,178	0,145	293	0,2757074
17,548	540,3	540,3	102,21	99,57	0,178	0,145	294	0,2705941
17,452	540,3	540,3	102,88	100,17	0,178	0,145	295	0,2689679
17,571	540,3	540,3	102,09	99,47	0,178	0,145	296	0,2708683
17,735	540,4	540,3	101,10	98,55	0,178	0,145	297	0,2735079
17,557	540,4	540,3	102,04	99,47	0,178	0,145	298	0,2708706
17,534	540,4	540,3	102,20	99,62	0,178	0,145	299	0,2704893
17,564	540,4	540,3	102,09	99,40	0,178	0,145	300	0,2708684
17,655	540,4	540,3	101,62	99,02	0,178	0,145	301	0,2721914
17,446	540,4	540,3	102,84	100,27	0,178	0,145	302	0,2689666

17,498	540,3	540,3	102,40	99,83	0,178	0,145	303	0,269922
17,500	540,3	540,2	102,44	99,84	0,178	0,145	304	0,2699193
17,339	540,3	540,3	103,22	100,59	0,178	0,145	305	0,2675481
17,530	540,3	540,2	102,17	99,61	0,178	0,145	306	0,270488
17,466	540,3	540,2	102,54	99,95	0,178	0,145	307	0,2695382
17,419	540,3	540,2	102,96	100,38	0,178	0,145	308	0,2685848
17,471	540,2	540,2	102,60	100,01	0,178	0,145	309	0,2695042
17,563	540,2	540,2	102,05	99,45	0,178	0,145	310	0,2708871
17,466	540,2	540,2	102,48	99,87	0,178	0,145	311	0,2695383
17,647	540,1	540,2	101,51	98,93	0,178	0,145	312	0,2721913
17,383	540,2	540,2	103,05	100,51	0,178	0,145	313	0,2681249
17,260	540,2	540,1	103,73	101,06	0,178	0,145	314	0,266282
17,533	540,1	540,1	102,12	99,54	0,178	0,145	315	0,2704924
17,647	540,1	540,1	101,51	98,94	0,178	0,145	316	0,2721917
17,468	540,1	540,1	102,47	99,88	0,178	0,145	317	0,2695386
17,704	540,1	540,0	101,15	98,59	0,178	0,145	318	0,2731219
17,627	540,0	540,0	101,69	99,11	0,178	0,145	319	0,2718129
18,079	540,0	540,0	99,19	96,70	0,178	0,145	320	0,2788961
17,647	540,0	540,0	101,66	99,05	0,178	0,145	321	0,2721727
17,437	539,9	540,0	102,81	100,25	0,178	0,145	322	0,2689737
17,616	539,9	540,0	101,76	99,13	0,178	0,145	323	0,271814
17,303	539,9	539,9	103,70	101,06	0,178	0,145	324	0,2668597
17,612	539,9	539,9	101,75	99,16	0,178	0,145	325	0,2718119
17,502	539,9	539,9	102,46	99,76	0,178	0,145	326	0,2700089
17,385	539,9	539,9	103,15	100,54	0,178	0,145	327	0,2682038
17,448	539,9	539,9	102,74	100,09	0,178	0,145	328	0,269217
17,500	539,9	539,8	102,50	99,84	0,178	0,145	329	0,2698939
17,459	539,9	539,8	102,46	99,76	0,178	0,145	330	0,2695326
17,634	539,8	539,8	101,58	99,02	0,178	0,145	331	0,2721914
17,702	539,8	539,8	101,28	98,72	0,178	0,145	332	0,2731306
17,626	539,8	539,8	101,84	99,24	0,178	0,145	333	0,2718125
18,189	539,8	539,8	98,64	96,15	0,178	0,145	334	0,280543
17,540	539,8	539,8	102,23	99,64	0,178	0,145	335	0,2704885
17,712	539,7	539,7	101,36	98,79	0,178	0,145	336	0,2731311
17,359	539,7	539,7	103,39	100,77	0,178	0,145	337	0,2676941
17,646	539,7	539,7	101,70	99,09	0,178	0,145	338	0,2721903
17,230	539,6	539,7	104,06	101,35	0,178	0,145	339	0,2658958
17,349	539,6	539,7	103,33	100,70	0,178	0,145	340	0,2676264
18,018	539,6	539,6	99,59	96,95	0,178	0,145	341	0,277968
17,559	539,6	539,6	102,20	99,61	0,178	0,145	342	0,2708663
18,104	539,6	539,6	99,13	96,62	0,178	0,145	343	0,2792635
17,440	539,6	539,6	102,95	100,23	0,178	0,145	344	0,2689663
17,438	539,6	539,6	102,95	100,22	0,178	0,145	345	0,2689665
17,354	539,6	539,6	103,48	100,85	0,178	0,145	346	0,2676266
17,502	539,5	539,6	102,60	99,88	0,178	0,145	347	0,269918
17,507	539,5	539,6	102,59	100,02	0,178	0,145	348	0,2699181
17,652	539,5	539,5	101,77	99,18	0,178	0,145	349	0,2721904
18,104	539,5	539,6	99,15	96,63	0,178	0,145	350	0,2792563
17,556	539,5	539,5	102,12	99,61	0,178	0,145	351	0,2708671
17,704	539,5	539,6	101,36	98,78	0,178	0,145	352	0,2731301
17,783	539,5	539,5	100,95	98,28	0,178	0,145	353	0,2743006
17,932	539,5	539,5	100,03	97,44	0,178	0,145	354	0,276678
17,530	539,5	539,5	102,32	99,63	0,178	0,145	355	0,2704869
17,468	539,4	539,5	102,60	99,98	0,178	0,145	356	0,2695393
17,729	539,4	539,5	101,12	98,56	0,178	0,145	357	0,2735615
17,722	539,5	539,5	101,18	98,62	0,178	0,145	358	0,2735074
17,700	539,5	539,5	101,29	98,66	0,178	0,145	359	0,2731304
17,489	539,5	539,5	102,53	99,90	0,178	0,145	360	0,2699181
17,467	539,5	539,5	102,58	100,08	0,178	0,145	361	0,269546
17,495	539,4	539,5	102,48	99,96	0,178	0,145	362	0,2699291
17,532	539,4	539,4	102,31	99,66	0,178	0,145	363	0,2704878
17,195	539,4	539,4	104,28	101,59	0,178	0,145	364	0,2653155

17,532	539,4	539,4	102,38	99,77	0,178	0,145	365	0,2704865
17,621	539,4	539,4	101,87	99,20	0,178	0,145	366	0,2718121
17,700	539,4	539,4	101,34	98,79	0,178	0,145	367	0,2731297
17,874	539,4	539,4	100,37	97,85	0,178	0,145	368	0,2757844
17,408	539,4	539,4	102,99	100,46	0,178	0,145	369	0,2685823
17,558	539,3	539,4	102,13	99,58	0,178	0,145	370	0,2708686
17,614	539,3	539,4	101,75	99,16	0,178	0,145	371	0,2718114
17,771	539,3	539,4	100,91	98,30	0,178	0,145	372	0,274213
17,589	539,3	539,4	101,96	99,36	0,178	0,145	373	0,2713371
17,317	539,3	539,3	103,57	100,96	0,178	0,145	374	0,2672438
17,643	539,3	539,3	101,64	99,05	0,178	0,145	375	0,2721892
17,727	539,3	539,3	101,25	98,68	0,178	0,145	376	0,2733528
17,469	539,3	539,3	102,66	100,04	0,178	0,145	377	0,2695365
17,558	539,3	539,3	102,16	99,61	0,178	0,145	378	0,270867
17,644	539,2	539,3	101,77	99,07	0,178	0,145	379	0,2721895
17,549	539,2	539,3	102,20	99,60	0,178	0,145	380	0,2707532
17,622	539,2	539,2	101,89	99,34	0,178	0,145	381	0,2718103
17,705	539,2	539,2	101,39	98,74	0,178	0,145	382	0,2731297
17,704	539,2	539,2	101,31	98,73	0,178	0,145	383	0,2731287
17,694	539,2	539,2	101,25	98,68	0,178	0,145	384	0,2731289
17,507	539,2	539,2	102,38	99,87	0,178	0,145	385	0,2701861
17,613	539,1	539,2	101,89	99,24	0,178	0,145	386	0,2718112
17,617	539,1	539,2	101,82	99,30	0,178	0,145	387	0,2718115
17,506	539,1	539,2	102,51	99,90	0,178	0,145	388	0,2701717
17,399	539,1	539,1	103,06	100,48	0,178	0,145	389	0,2685702
17,758	539,1	539,2	101,00	98,37	0,178	0,145	390	0,2740665
17,487	539,0	539,1	102,52	99,94	0,178	0,145	391	0,2699164
17,438	538,9	539,0	102,87	100,22	0,178	0,145	392	0,2690999
17,429	538,9	539,0	102,90	100,25	0,178	0,145	393	0,2689845
17,550	538,9	539,0	102,27	99,58	0,178	0,145	394	0,2708653
17,726	538,9	539,0	101,20	98,62	0,178	0,145	395	0,2735054
17,618	539,0	539,0	101,85	99,34	0,178	0,145	396	0,2718107
17,554	539,0	539,0	102,21	99,51	0,178	0,145	397	0,2708345
17,533	539,0	539,0	102,35	99,74	0,178	0,145	398	0,2704854
17,554	539,0	539,0	102,18	99,58	0,178	0,145	399	0,2708647
17,612	538,9	539,0	101,78	99,26	0,178	0,145	400	0,2718529
17,725	538,9	539,0	101,21	98,63	0,178	0,145	401	0,2734971
17,635	538,9	539,0	101,67	99,08	0,178	0,145	402	0,2721887
17,552	538,9	539,0	102,19	99,58	0,178	0,145	403	0,2708641
17,838	538,9	538,9	100,54	98,06	0,178	0,145	404	0,2752847
17,609	538,9	538,9	101,85	99,21	0,178	0,145	405	0,2718082
17,631	538,8	538,9	101,66	99,10	0,178	0,145	406	0,2721875
17,633	538,8	538,9	101,67	99,08	0,178	0,145	407	0,2721881
17,429	538,9	538,9	102,88	100,34	0,178	0,145	408	0,2690135
17,430	538,9	538,9	102,90	100,29	0,178	0,145	409	0,2689773
17,339	538,8	538,9	103,53	100,78	0,178	0,145	410	0,2676247
17,698	538,8	538,9	101,37	98,88	0,178	0,145	411	0,273128
17,333	538,8	538,8	103,49	100,86	0,178	0,146	412	0,2675247
17,463	538,8	538,8	102,75	100,10	0,178	0,145	413	0,2695353
17,553	538,8	538,8	102,21	99,61	0,178	0,145	414	0,2708643
17,486	538,7	538,8	102,59	99,97	0,178	0,145	415	0,269858
17,700	538,7	538,8	101,47	98,81	0,178	0,145	416	0,2731561
17,778	538,7	538,8	100,85	98,37	0,178	0,146	417	0,2744404
17,629	538,7	538,8	101,68	99,19	0,178	0,146	418	0,2721878
17,475	538,6	538,7	102,57	99,98	0,178	0,146	419	0,2699157
17,465	538,6	538,7	102,60	99,96	0,178	0,145	420	0,2697116
17,447	538,6	538,7	102,64	100,01	0,178	0,145	421	0,2695201
17,596	538,6	538,7	101,78	99,22	0,178	0,145	422	0,2718122
17,627	538,5	538,7	101,69	99,09	0,178	0,145	423	0,2721872
17,508	538,6	538,7	102,29	99,67	0,178	0,145	424	0,2704683
17,601	538,5	538,7	101,83	99,22	0,178	0,145	425	0,2718091
17,421	538,5	538,6	102,93	100,23	0,178	0,145	426	0,2689637

17,667	538,5	538,6	101,42	98,83	0,178	0,145	427	0,2728641
18,117	538,5	538,6	98,93	96,38	0,178	0,145	428	0,2798111
17,919	538,5	538,6	100,06	97,50	0,178	0,145	429	0,276674
17,457	538,5	538,6	102,70	100,08	0,178	0,145	430	0,2695343
17,687	538,5	538,6	101,37	98,78	0,178	0,145	431	0,2730973
17,302	538,5	538,6	103,62	100,97	0,178	0,145	432	0,2671601
18,004	538,4	538,6	99,62	97,06	0,178	0,145	433	0,2779705
17,516	538,4	538,5	102,35	99,73	0,178	0,145	434	0,2704847
17,485	538,4	538,5	102,57	99,95	0,178	0,145	435	0,2699537
17,684	538,4	538,5	101,34	98,75	0,178	0,145	436	0,2731328
17,683	538,4	538,5	101,34	98,75	0,178	0,145	437	0,2731265
17,598	538,4	538,5	101,87	99,34	0,178	0,146	438	0,2718089
17,543	538,4	538,5	102,24	99,67	0,178	0,146	439	0,2708507
17,411	538,3	538,5	103,01	100,19	0,178	0,145	440	0,2689623
17,745	538,4	538,5	101,00	98,37	0,178	0,145	441	0,2704658
17,505	538,4	538,4	102,29	99,68	0,178	0,145	442	0,2704843
17,619	538,3	538,4	101,66	99,05	0,178	0,146	443	0,2722319
17,531	538,3	538,4	102,10	99,50	0,178	0,146	444	0,2709435
17,534	538,3	538,4	102,19	99,58	0,178	0,146	445	0,270863
17,619	538,3	538,4	101,68	99,13	0,178	0,146	446	0,2721303
17,387	538,3	538,4	103,06	100,43	0,178	0,146	447	0,2685825
17,677	538,3	538,4	101,39	98,73	0,178	0,146	448	0,2731267
17,612	538,3	538,4	101,66	99,06	0,178	0,146	449	0,272187
17,202	538,2	538,3	104,16	101,39	0,178	0,146	450	0,2658923
17,388	538,2	538,4	102,96	100,33	0,178	0,146	451	0,2687383
17,582	538,2	538,3	101,83	99,17	0,178	0,146	452	0,2718103
17,739	538,2	538,3	101,00	98,42	0,178	0,146	453	0,2740652
17,590	538,2	538,3	101,93	99,27	0,178	0,146	454	0,2717396
17,410	538,2	538,3	102,97	100,43	0,178	0,146	455	0,268938
17,598	538,1	538,3	101,83	99,33	0,178	0,146	456	0,2718752
17,323	538,1	538,2	103,45	100,81	0,178	0,146	457	0,2676225
17,618	538,1	538,2	101,75	99,15	0,178	0,146	458	0,2721484
17,246	538,1	538,3	104,10	101,42	0,178	0,146	459	0,2663527
17,738	538,1	538,2	101,02	98,43	0,178	0,146	460	0,2740643
17,383	538,1	538,2	103,08	100,50	0,178	0,146	461	0,26858
17,524	538,0	538,2	102,23	99,67	0,178	0,146	462	0,2708629
17,408	538,1	538,2	102,93	100,29	0,178	0,146	463	0,2689749
17,766	538,1	538,2	100,90	98,42	0,178	0,146	464	0,2744426
17,413	538,0	538,2	103,03	100,34	0,178	0,146	465	0,2689623
17,386	538,1	538,2	103,14	100,57	0,178	0,146	466	0,268579
17,676	538,1	538,2	101,43	98,77	0,178	0,146	467	0,2731254
17,679	538,1	538,2	101,40	98,79	0,178	0,146	468	0,273127
17,326	538,0	538,2	103,49	100,89	0,178	0,146	469	0,2676212
17,507	538,0	538,1	102,38	99,78	0,178	0,146	470	0,270484
17,354	538,0	538,1	103,25	100,65	0,178	0,146	471	0,2681567
17,676	538,0	538,1	101,49	98,90	0,178	0,146	472	0,2731112
17,382	538,0	538,1	103,20	100,62	0,179	0,146	473	0,2685789
17,534	538,0	538,1	102,30	99,79	0,179	0,146	474	0,2708624
17,408	538,0	538,1	103,10	100,35	0,179	0,146	475	0,2689176
17,617	538,0	538,1	101,82	99,15	0,179	0,146	476	0,2721833
17,700	538,0	538,1	101,36	98,65	0,179	0,146	477	0,2735022
17,308	537,9	538,1	103,41	100,86	0,179	0,146	478	0,2676222
17,302	537,9	538,1	103,48	100,83	0,178	0,146	479	0,2675425
17,457	537,9	538,0	102,63	99,93	0,179	0,146	480	0,2699132
17,432	537,9	538,0	102,68	100,05	0,179	0,146	481	0,2695327
17,397	537,9	538,0	103,02	100,27	0,179	0,146	482	0,2689617
17,583	537,8	538,0	101,90	99,24	0,179	0,146	483	0,2717979
17,404	537,8	538,0	103,04	100,34	0,179	0,146	484	0,2689611
17,269	537,8	538,0	103,86	101,12	0,179	0,146	485	0,2668537
17,361	537,8	537,9	103,23	100,69	0,179	0,146	486	0,2682889
17,233	537,8	537,9	104,08	101,36	0,179	0,146	487	0,266279
17,469	537,8	537,9	102,63	100,00	0,179	0,146	488	0,2699126

17,590	537,8	538,0	101,94	99,39	0,179	0,146	489	0,2718076
17,506	537,8	538,0	102,40	99,87	0,179	0,146	490	0,270483
17,673	537,8	537,9	101,42	98,80	0,178	0,146	491	0,2731257
17,465	537,8	537,9	102,61	99,98	0,178	0,146	492	0,2699099
17,585	537,8	537,9	101,90	99,33	0,178	0,146	493	0,2718067
17,697	537,8	538,0	101,38	98,67	0,179	0,146	494	0,2734843
17,618	537,8	537,9	101,85	99,17	0,179	0,146	495	0,2721851
17,614	537,8	538,0	101,75	99,17	0,179	0,146	496	0,2721853
17,487	537,8	537,9	102,58	99,85	0,179	0,146	497	0,270241
17,669	537,8	537,9	101,46	98,92	0,179	0,146	498	0,2730022
17,668	537,8	537,9	101,36	98,77	0,178	0,146	499	0,2731274
17,724	537,8	537,9	101,08	98,46	0,179	0,146	500	0,2740639
17,321	537,8	537,9	103,50	100,86	0,179	0,146	501	0,2676216
17,434	537,8	537,9	102,83	100,20	0,178	0,146	502	0,2693627
17,720	537,8	537,9	101,14	98,67	0,178	0,146	503	0,273824
17,440	537,8	537,9	102,75	100,09	0,178	0,146	504	0,2695312
17,375	537,7	537,9	103,22	100,46	0,179	0,146	505	0,268579
17,384	537,8	537,9	103,02	100,39	0,179	0,146	506	0,2687452
17,726	537,8	537,9	101,01	98,42	0,178	0,146	507	0,2740634
17,454	537,7	537,9	102,54	99,92	0,178	0,146	508	0,2699143
17,434	537,8	537,9	102,71	100,08	0,178	0,146	509	0,269532
17,507	537,8	537,9	102,20	99,59	0,178	0,146	510	0,270766
17,490	537,8	537,9	102,32	99,81	0,178	0,146	511	0,2704838
17,282	537,8	537,9	103,57	100,93	0,178	0,146	512	0,2672364

Average	Average	Average	Proportional Rates Medium/low fire					Average
17,47	Inlet +	Inlet +						0,264
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	101,74	101,96	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
			PR1	PR2			Time	
Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
17,533	538,8	539,1			0,170	0,143	0	0,2635682
17,856	538,9	539,1	99,20	99,47	0,170	0,143	1	0,2704863
17,617	539,0	539,1	100,29	100,54	0,170	0,143	2	0,2672415
17,421	539,0	539,1	101,84	102,21	0,170	0,143	3	0,2635678
17,503	539,1	539,1	102,42	102,68	0,170	0,143	4	0,2635695
17,463	539,1	539,2	104,03	104,29	0,170	0,143	5	0,261222
18,055	539,1	539,2	101,92	102,23	0,170	0,143	6	0,2683408
17,784	539,2	539,2	104,77	105,13	0,170	0,143	7	0,2626621
17,819	539,3	539,3	105,07	105,29	0,170	0,143	8	0,2625917
17,771	539,4	539,4	105,14	105,30	0,170	0,143	9	0,2622022
18,059	539,5	539,4	103,55	103,91	0,170	0,143	10	0,2662075
17,852	539,6	539,5	104,47	104,77	0,170	0,143	11	0,263571
17,995	539,7	539,6	103,39	103,73	0,170	0,143	12	0,2658936
17,984	539,8	539,7	103,05	103,28	0,170	0,143	13	0,2662787
18,046	539,8	539,7	102,50	102,79	0,170	0,143	14	0,2674967
18,027	539,9	539,8	102,58	102,86	0,170	0,143	15	0,267241
17,558	539,9	539,8	105,35	105,64	0,170	0,143	16	0,2602379
17,716	540,0	539,9	104,35	104,66	0,170	0,143	17	0,2625926
18,017	540,1	539,9	102,49	102,75	0,170	0,143	18	0,2672407
17,922	540,1	540,0	102,98	103,27	0,170	0,143	19	0,2658949
17,956	540,1	540,0	102,94	103,16	0,170	0,143	20	0,2662789
17,817	540,2	540,0	103,86	104,15	0,170	0,143	21	0,2639732
17,982	540,2	540,1	102,98	103,30	0,170	0,143	22	0,2662791
18,013	540,3	540,2	102,76	103,09	0,170	0,143	23	0,2668566
17,937	540,3	540,2	103,48	103,76	0,170	0,143	24	0,2653145
17,798	540,4	540,3	104,03	104,32	0,170	0,143	25	0,2635679
17,827	540,4	540,3	103,88	104,15	0,170	0,143	26	0,2639575
17,868	540,5	540,3	104,11	104,40	0,170	0,143	27	0,2639557
17,825	540,5	540,4	104,21	104,45	0,170	0,143	28	0,2635675
17,646	540,5	540,4	105,31	105,58	0,170	0,143	29	0,2608279
18,102	540,6	540,5	102,58	102,99	0,170	0,143	30	0,2676252
17,841	540,7	540,5	104,29	104,53	0,170	0,143	31	0,2635672
17,771	540,7	540,6	104,69	104,88	0,170	0,143	32	0,2625931
17,877	540,8	540,6	104,20	104,44	0,170	0,143	33	0,2639225
18,041	540,8	540,7	103,22	103,64	0,170	0,143	34	0,2662822
17,880	540,9	540,7	104,11	104,52	0,170	0,143	35	0,2639557
17,684	540,9	540,7	105,16	105,54	0,170	0,143	36	0,2612205
17,675	541,0	540,8	105,38	105,69	0,170	0,143	37	0,2608274
17,940	541,0	540,8	103,71	104,01	0,170	0,143	38	0,2648698
17,874	541,1	540,9	104,34	104,65	0,170	0,143	39	0,263569
17,858	541,2	540,9	104,25	104,54	0,170	0,143	40	0,2635679
17,633	541,3	541,0	105,72	106,03	0,170	0,143	41	0,2600435
17,547	541,3	541,0	106,26	106,48	0,170	0,143	42	0,2588584
18,057	541,3	541,0	103,34	103,57	0,170	0,143	43	0,2662784
17,745	541,3	541,1	105,14	105,48	0,170	0,143	44	0,2616552
17,900	541,4	541,2	104,13	104,47	0,170	0,143	45	0,2639565
17,860	541,4	541,2	104,30	104,50	0,170	0,143	46	0,2635675
17,907	541,5	541,3	104,14	104,57	0,170	0,143	47	0,2639558
17,571	541,6	541,3	106,04	106,36	0,170	0,143	48	0,2592492
17,853	541,6	541,4	104,30	104,50	0,170	0,143	49	0,2634737
17,780	541,7	541,4	104,80	105,11	0,170	0,143	50	0,2622998
17,644	541,8	541,5	105,63	105,96	0,170	0,143	51	0,2602365
17,993	541,8	541,5	103,55	103,86	0,169	0,143	52	0,2652967
17,529	541,9	541,6	106,33	106,68	0,169	0,143	53	0,2584561
17,782	542,0	541,7	104,83	105,10	0,169	0,143	54	0,2622036

17,981	542,0	541,7	103,54	103,81	0,170	0,143	55	0,2652861
17,819	542,1	541,8	104,36	104,68	0,169	0,143	56	0,2630395
17,859	542,1	541,8	104,11	104,46	0,169	0,143	57	0,2635681
17,844	542,2	541,9	103,96	104,38	0,169	0,143	58	0,2635777
17,705	542,2	541,9	104,81	105,13	0,169	0,143	59	0,2616141
17,703	542,2	542,0	105,06	105,33	0,169	0,143	60	0,261254
18,103	542,3	542,0	102,61	102,99	0,169	0,143	61	0,2672401
17,828	542,3	542,0	104,14	104,46	0,169	0,143	62	0,2632847
17,613	542,3	542,1	105,27	105,66	0,169	0,143	63	0,2601774
17,960	542,4	542,1	103,28	103,65	0,169	0,143	64	0,2653131
17,522	542,4	542,2	105,84	106,22	0,169	0,143	65	0,2588559
17,814	542,4	542,2	104,15	104,35	0,169	0,143	66	0,2631771
17,710	542,5	542,2	104,77	105,10	0,169	0,143	67	0,2616133
18,021	542,5	542,3	102,92	103,22	0,169	0,143	68	0,2662787
17,928	542,5	542,3	103,43	103,74	0,169	0,143	69	0,2649255
17,608	542,6	542,3	105,27	105,58	0,169	0,143	70	0,2602417
17,400	542,6	542,4	106,52	106,92	0,169	0,143	71	0,2570644
17,518	542,6	542,4	105,76	106,16	0,169	0,143	72	0,2588562
17,515	542,6	542,4	105,82	106,13	0,169	0,143	73	0,2588542
17,426	542,6	542,4	106,48	106,67	0,169	0,143	74	0,2574638
17,519	542,6	542,5	105,71	106,12	0,169	0,143	75	0,2588921
17,513	542,6	542,5	105,71	106,11	0,169	0,143	76	0,258855
17,531	542,6	542,5	105,59	105,78	0,169	0,142	77	0,2592494
17,659	542,6	542,5	104,76	104,99	0,169	0,142	78	0,2612222
17,649	542,6	542,5	104,61	104,82	0,169	0,142	79	0,2613468
17,529	542,5	542,5	105,59	105,76	0,169	0,142	80	0,2592572
17,643	542,6	542,5	104,69	104,97	0,169	0,142	81	0,2612222
17,790	542,6	542,5	103,67	103,85	0,169	0,143	82	0,2637224
17,897	542,6	542,5	102,94	103,22	0,169	0,143	83	0,2653163
17,710	542,6	542,5	103,98	104,26	0,169	0,143	84	0,2625932
17,702	542,6	542,5	103,93	104,16	0,169	0,142	85	0,262593
17,452	542,7	542,5	105,27	105,57	0,169	0,142	86	0,2590586
17,534	542,7	542,5	104,80	105,10	0,169	0,143	87	0,2602385
17,601	542,7	542,5	104,41	104,68	0,169	0,143	88	0,2612231
17,524	542,7	542,5	104,69	105,03	0,169	0,143	89	0,2602559
17,928	542,6	542,5	102,28	102,56	0,169	0,143	90	0,2663847
17,386	542,6	542,6	105,36	105,64	0,169	0,143	91	0,2584566
17,469	542,6	542,6	104,73	105,01	0,169	0,143	92	0,259845
17,711	542,7	542,6	103,25	103,53	0,169	0,143	93	0,2635027
17,452	542,7	542,6	104,61	104,90	0,169	0,143	94	0,2598606
17,501	542,7	542,6	104,06	104,38	0,169	0,142	95	0,2608325
17,559	542,7	542,6	103,85	104,13	0,169	0,142	96	0,2616156
17,592	542,7	542,7	103,58	103,85	0,169	0,142	97	0,2622036
17,358	542,7	542,7	104,85	105,13	0,169	0,142	98	0,2588564
17,683	542,7	542,7	102,71	102,99	0,169	0,142	99	0,2639597
17,771	542,7	542,7	102,29	102,53	0,169	0,143	100	0,2653158
17,479	542,7	542,7	103,74	103,99	0,169	0,143	101	0,2611727
17,383	542,7	542,7	103,94	104,15	0,169	0,142	102	0,2602393
17,391	542,6	542,7	103,98	104,21	0,169	0,142	103	0,2602359
17,390	542,6	542,7	103,95	104,21	0,169	0,142	104	0,2602384
17,654	542,6	542,7	102,65	102,83	0,169	0,142	105	0,2639594
17,390	542,6	542,7	103,95	104,14	0,169	0,142	106	0,2602397
17,482	542,6	542,7	103,41	103,63	0,169	0,142	107	0,2616159
17,833	542,6	542,7	101,37	101,62	0,169	0,142	108	0,2668597
17,458	542,7	542,7	103,57	103,77	0,169	0,143	109	0,2613247
17,344	542,7	542,7	103,98	104,36	0,169	0,143	110	0,2598459
17,556	542,6	542,7	102,65	102,86	0,169	0,143	111	0,2631797
17,285	542,6	542,6	104,12	104,32	0,169	0,142	112	0,2592525
17,376	542,6	542,6	103,31	103,62	0,169	0,142	113	0,26083
17,349	542,5	542,6	103,77	103,89	0,169	0,142	114	0,260304
17,271	542,5	542,6	104,06	104,32	0,169	0,143	115	0,2592523
17,466	542,5	542,6	102,87	103,10	0,169	0,143	116	0,2622049

17,566	542,5	542,6	102,22	102,41	0,169	0,142	117	0,2638436
17,293	542,5	542,6	103,70	103,91	0,169	0,142	118	0,2598555
17,435	542,5	542,6	102,66	102,89	0,169	0,142	119	0,2622045
17,511	542,5	542,6	102,08	102,31	0,169	0,142	120	0,2635711
17,810	542,5	542,6	100,26	100,45	0,169	0,142	121	0,2682033
17,502	542,5	542,6	101,91	102,19	0,169	0,142	122	0,2635716
17,424	542,4	542,6	102,33	102,59	0,169	0,142	123	0,2625953
17,388	542,4	542,6	102,43	102,61	0,169	0,143	124	0,2622044
17,569	542,4	542,6	101,18	101,41	0,169	0,142	125	0,2650332
17,449	542,4	542,6	102,02	102,25	0,169	0,142	126	0,2631812
17,685	542,4	542,6	100,66	100,92	0,169	0,143	127	0,2667352
17,544	542,3	542,6	101,37	101,49	0,169	0,142	128	0,2647658
17,292	542,3	542,5	102,51	102,85	0,169	0,142	129	0,2612515
17,299	542,2	542,5	102,64	102,80	0,169	0,142	130	0,2612259
17,599	542,2	542,4	100,83	101,06	0,169	0,142	131	0,2658985
17,421	542,1	542,3	101,84	102,06	0,169	0,143	132	0,2632695
17,543	542,0	542,2	101,01	101,21	0,170	0,143	133	0,2653184
17,447	541,8	542,2	101,52	101,72	0,170	0,143	134	0,2639615
17,609	541,8	542,1	100,55	100,79	0,170	0,143	135	0,266468
17,657	541,7	542,0	100,35	100,52	0,170	0,143	136	0,2672437
17,571	541,7	542,0	100,79	100,98	0,170	0,143	137	0,2658955
17,480	541,6	541,9	101,02	101,20	0,170	0,143	138	0,2649316
17,276	541,6	541,9	102,33	102,53	0,170	0,143	139	0,2616826
17,808	541,5	541,8	99,16	99,35	0,170	0,143	140	0,2699211
17,402	541,3	541,7	101,47	101,54	0,170	0,143	141	0,2639599
17,362	541,2	541,6	101,68	101,86	0,170	0,143	142	0,2632611
17,399	541,1	541,6	101,39	101,48	0,170	0,143	143	0,2639594
17,367	541,1	541,5	101,49	101,78	0,170	0,143	144	0,2635714
17,181	541,0	541,4	102,59	102,72	0,170	0,143	145	0,2608325
17,465	541,0	541,3	100,74	101,04	0,170	0,143	146	0,2653177
17,350	540,9	541,3	101,47	101,65	0,170	0,143	147	0,2635716
17,278	540,8	541,3	101,66	101,94	0,170	0,143	148	0,2626037
17,336	540,7	541,2	101,37	101,54	0,170	0,143	149	0,2635717
17,479	540,6	541,1	100,45	100,61	0,170	0,143	150	0,2658967
17,492	540,6	541,1	100,49	100,66	0,170	0,143	151	0,2659505
17,571	540,5	541,0	99,99	100,26	0,170	0,143	152	0,2672443
17,597	540,5	540,9	99,88	100,09	0,170	0,143	153	0,2676285
17,139	540,4	540,9	102,55	102,64	0,170	0,143	154	0,2607429
17,189	540,4	540,8	102,09	102,27	0,170	0,143	155	0,261616
17,320	540,3	540,8	101,36	101,54	0,170	0,143	156	0,2635698
17,285	540,2	540,7	101,42	101,64	0,170	0,143	157	0,2631797
17,176	540,2	540,7	102,01	102,17	0,170	0,143	158	0,2616733
17,291	540,2	540,6	101,49	101,69	0,170	0,143	159	0,2631798
17,303	540,1	540,6	101,29	101,45	0,170	0,143	160	0,2635653
17,216	540,1	540,5	101,84	102,13	0,170	0,143	161	0,2622032
17,328	540,0	540,5	101,06	101,23	0,170	0,143	162	0,2640933
17,500	539,9	540,4	100,06	100,13	0,170	0,143	163	0,2668634
17,044	539,9	540,4	102,57	102,81	0,170	0,143	164	0,2599218
17,271	539,8	540,4	101,29	101,39	0,170	0,143	165	0,2634105
17,278	539,7	540,3	101,18	101,33	0,170	0,143	166	0,2636274
17,183	539,7	540,3	101,75	101,80	0,170	0,143	167	0,2622044
17,273	539,6	540,2	101,26	101,36	0,170	0,143	168	0,2635694
17,260	539,6	540,2	101,13	101,29	0,170	0,143	169	0,2635686
17,260	539,6	540,2	101,14	101,30	0,170	0,143	170	0,2635636
17,419	539,6	540,1	100,29	100,43	0,170	0,143	171	0,2658944
17,293	539,7	540,2	100,96	101,19	0,170	0,143	172	0,2639585
17,244	539,7	540,2	101,32	101,46	0,170	0,143	173	0,2631924
17,117	539,7	540,2	102,07	102,14	0,170	0,143	174	0,2612346
17,244	539,8	540,2	101,31	101,44	0,170	0,143	175	0,2631784
17,245	539,8	540,2	101,25	101,59	0,170	0,143	176	0,2631787
17,339	539,9	540,2	100,68	100,90	0,170	0,143	177	0,2647022
17,233	539,9	540,2	101,23	101,42	0,170	0,143	178	0,263177

17,471	539,9	540,2	99,82	100,01	0,170	0,143	179	0,2668572
17,511	539,8	540,2	99,46	99,64	0,170	0,143	180	0,2676451
17,509	539,8	540,2	99,47	99,65	0,170	0,143	181	0,2676273
16,997	539,7	540,2	102,39	102,60	0,170	0,143	182	0,2598445
17,243	539,7	540,2	100,94	101,19	0,170	0,143	183	0,2635692
17,154	539,7	540,2	101,48	101,71	0,170	0,143	184	0,2622128
17,358	539,8	540,2	100,30	100,38	0,170	0,143	185	0,2653576
17,270	539,8	540,3	100,85	100,98	0,170	0,143	186	0,2639576
17,231	539,9	540,3	100,92	101,11	0,170	0,143	187	0,2635688
17,170	539,9	540,3	101,30	101,49	0,170	0,143	188	0,2625933
17,333	539,9	540,3	100,36	100,62	0,170	0,143	189	0,264927
17,568	539,9	540,3	99,00	99,27	0,170	0,143	190	0,2685826
17,502	539,9	540,3	99,42	99,60	0,170	0,143	191	0,2676251
17,205	539,9	540,3	100,96	101,15	0,170	0,143	192	0,2631793
17,227	539,8	540,3	100,90	100,96	0,170	0,143	193	0,2635732
17,491	539,8	540,3	99,37	99,44	0,170	0,143	194	0,2676254
17,384	539,8	540,3	100,03	100,10	0,170	0,143	195	0,265926
17,395	539,7	540,2	99,85	99,85	0,170	0,143	196	0,2662777
17,527	539,7	540,2	99,11	99,22	0,170	0,143	197	0,2682
17,216	539,6	540,2	100,82	101,08	0,170	0,143	198	0,2634986
17,329	539,6	540,1	100,13	100,34	0,170	0,143	199	0,2653138
17,460	539,6	540,1	99,48	99,67	0,170	0,143	200	0,2672417
17,741	539,5	540,1	97,70	97,93	0,170	0,143	201	0,2717938
17,144	539,4	540,0	101,17	101,32	0,170	0,143	202	0,2625385
17,575	539,4	540,0	98,89	98,96	0,170	0,143	203	0,2689829
17,387	539,4	539,9	99,77	99,93	0,170	0,143	204	0,2662798
17,749	539,4	539,9	97,73	97,99	0,170	0,143	205	0,2718103
17,683	539,4	539,9	98,15	98,26	0,170	0,143	206	0,2708647
17,772	539,3	539,9	97,70	97,75	0,170	0,143	207	0,2721858
17,603	539,3	539,8	98,58	98,76	0,170	0,143	208	0,2695349
17,421	539,3	539,8	99,53	99,75	0,170	0,143	209	0,2668561
17,387	539,3	539,8	99,77	99,94	0,170	0,143	210	0,2662741
17,139	539,3	539,8	101,12	101,29	0,170	0,143	211	0,2625927
17,141	539,2	539,7	101,26	101,34	0,170	0,143	212	0,262592
17,677	539,2	539,7	98,04	98,20	0,170	0,143	213	0,2708634
17,207	539,3	539,7	100,79	101,01	0,170	0,143	214	0,2635623
17,264	539,3	539,7	100,52	100,68	0,170	0,143	215	0,2644995
17,203	539,2	539,7	100,90	101,10	0,170	0,143	216	0,2634791
17,821	539,3	539,7	97,31	97,37	0,170	0,143	217	0,2731327
17,171	539,2	539,7	100,87	101,06	0,170	0,143	218	0,263178
17,170	539,3	539,7	100,95	101,12	0,170	0,143	219	0,2632115
17,310	539,2	539,7	100,06	100,28	0,170	0,143	220	0,2653339
17,351	539,2	539,7	99,86	100,03	0,170	0,143	221	0,2658927
17,199	539,1	539,6	100,82	101,04	0,170	0,143	222	0,2635677
17,280	539,1	539,6	100,29	100,43	0,170	0,143	223	0,2649262
17,545	539,1	539,6	98,77	98,94	0,170	0,143	224	0,2690018
17,215	539,0	539,5	100,66	100,85	0,170	0,143	225	0,2639575
17,390	539,0	539,5	99,71	99,97	0,170	0,143	226	0,2664623
17,533	538,9	539,5	98,84	99,10	0,170	0,143	227	0,2687368
17,400	538,9	539,4	99,56	99,74	0,170	0,143	228	0,2668573
17,332	538,9	539,4	99,87	99,97	0,170	0,143	229	0,2658933
17,516	538,9	539,4	98,87	99,11	0,170	0,143	230	0,2685792
17,272	538,8	539,4	100,21	100,37	0,170	0,143	231	0,2649258
17,425	538,8	539,3	99,39	99,56	0,170	0,143	232	0,2672391
17,400	538,8	539,3	99,51	99,66	0,170	0,143	233	0,2668556
17,196	538,8	539,3	100,86	101,01	0,170	0,143	234	0,2636538
17,331	538,7	539,3	99,88	100,00	0,170	0,143	235	0,2658928
17,179	538,6	539,2	100,85	100,89	0,171	0,143	236	0,2635654
17,241	538,6	539,2	100,38	100,55	0,171	0,143	237	0,2645431
17,507	538,6	539,1	98,96	99,12	0,171	0,143	238	0,268596
17,150	538,6	539,1	100,98	101,11	0,171	0,143	239	0,2631771
17,152	538,5	539,1	100,95	101,12	0,171	0,143	240	0,263177

17,399	538,5	539,1	99,66	99,80	0,171	0,143	241	0,2668489
17,215	538,5	539,1	100,72	100,89	0,171	0,143	242	0,2639598
17,634	538,6	539,1	98,28	98,36	0,171	0,143	243	0,2704851
17,597	538,6	539,1	98,46	98,62	0,170	0,143	244	0,2698367
17,174	538,6	539,1	100,81	101,05	0,170	0,143	245	0,2635001
17,205	538,6	539,0	100,69	100,80	0,171	0,143	246	0,2639543
17,100	538,6	539,0	101,44	101,51	0,171	0,143	247	0,2622007
17,295	538,5	539,0	100,16	100,29	0,171	0,143	248	0,2653146
17,577	538,5	539,0	98,70	98,75	0,171	0,143	249	0,2695301
17,195	538,5	539,0	100,94	101,06	0,171	0,143	250	0,2635679
17,200	538,4	538,9	100,71	100,87	0,171	0,143	251	0,263955
17,384	538,4	538,9	99,79	99,88	0,171	0,143	252	0,266541
17,531	538,4	538,9	98,75	98,92	0,171	0,143	253	0,2689638
17,178	538,4	538,9	100,86	100,94	0,171	0,143	254	0,2635656
17,159	538,4	538,9	100,92	100,98	0,171	0,143	255	0,2633672
17,348	538,4	538,9	99,71	99,87	0,171	0,143	256	0,2662822
17,713	538,3	538,8	97,73	97,88	0,170	0,143	257	0,2717995
17,388	538,3	538,8	99,53	99,69	0,170	0,143	258	0,266854
17,285	538,2	538,8	100,17	100,25	0,171	0,143	259	0,265312
17,138	538,2	538,8	100,87	101,03	0,171	0,143	260	0,2631751
17,166	538,2	538,7	100,85	101,01	0,171	0,143	261	0,2635653
17,382	538,1	538,7	99,52	99,73	0,171	0,143	262	0,2668552
17,168	538,1	538,7	100,77	100,92	0,171	0,143	263	0,2635663
17,282	538,1	538,7	100,10	100,31	0,171	0,143	264	0,2653183
17,443	538,1	538,6	99,31	99,47	0,171	0,143	265	0,2676217
17,257	538,1	538,6	100,27	100,42	0,171	0,143	266	0,2649239
17,266	538,1	538,6	100,32	100,54	0,171	0,143	267	0,2649399
17,115	538,1	538,6	101,22	101,48	0,171	0,144	268	0,2625817
17,334	538,1	538,6	100,04	100,24	0,171	0,144	269	0,2658907
17,152	538,2	538,6	100,96	101,23	0,171	0,144	270	0,2631753
17,264	538,2	538,6	100,34	100,57	0,171	0,144	271	0,2649255
17,290	538,2	538,6	100,18	100,42	0,171	0,144	272	0,2653125
17,177	538,2	538,6	100,92	101,10	0,171	0,144	273	0,2635651
17,513	538,2	538,7	99,06	99,25	0,171	0,144	274	0,268579
17,333	538,2	538,7	100,05	100,22	0,171	0,144	275	0,2658884
17,177	538,2	538,7	100,80	100,98	0,171	0,143	276	0,2635655
17,345	538,2	538,7	99,74	100,01	0,171	0,143	277	0,266276
17,366	538,2	538,6	99,53	99,76	0,171	0,144	278	0,2667198
17,484	538,1	538,6	98,84	99,03	0,171	0,143	279	0,2685657
17,274	538,0	538,6	100,08	100,23	0,171	0,143	280	0,2653119
17,339	537,9	538,6	99,76	99,88	0,171	0,143	281	0,2662983
17,546	537,9	538,5	98,51	98,75	0,171	0,143	282	0,2695326
17,281	537,9	538,5	100,16	100,31	0,171	0,144	283	0,2653099
17,308	537,8	538,5	99,97	100,02	0,171	0,143	284	0,2658904
16,936	537,7	538,4	102,04	102,29	0,171	0,144	285	0,2602332
17,154	537,7	538,4	100,77	100,91	0,171	0,144	286	0,2635651
17,166	537,6	538,3	100,56	100,79	0,171	0,144	287	0,2639544
17,241	537,5	538,2	100,31	100,47	0,171	0,144	288	0,2649227
17,135	537,4	538,1	100,77	100,91	0,171	0,144	289	0,2634727
17,120	537,4	538,0	100,93	101,11	0,171	0,144	290	0,2631741
17,128	537,4	538,0	100,95	101,13	0,171	0,144	291	0,2632388
17,142	537,4	538,0	100,75	100,90	0,171	0,144	292	0,2635639
17,078	537,4	538,0	101,20	101,38	0,171	0,144	293	0,2625884
17,162	537,4	538,0	100,57	100,75	0,171	0,144	294	0,2639543
17,479	537,4	537,9	98,65	98,91	0,171	0,144	295	0,2689603
17,346	537,4	537,9	99,47	99,66	0,171	0,144	296	0,266837
17,155	537,3	537,9	100,54	100,67	0,171	0,144	297	0,2639526
17,390	537,3	537,9	99,17	99,30	0,171	0,144	298	0,2676208
17,284	537,3	537,8	99,84	100,01	0,171	0,144	299	0,2658889
17,175	537,2	537,8	100,34	100,50	0,171	0,144	300	0,2643925
17,748	537,2	537,8	97,17	97,32	0,171	0,144	301	0,2731244
17,361	537,2	537,8	99,38	99,44	0,171	0,144	302	0,2672364

17,299	537,3	537,7	99,66	99,91	0,171	0,144	303	0,2662742
17,239	537,2	537,7	100,03	100,19	0,171	0,144	304	0,2652972
16,969	537,3	537,7	101,55	101,80	0,171	0,144	305	0,2612205
17,129	537,3	537,7	100,69	100,87	0,171	0,144	306	0,2635593
17,494	537,3	537,8	98,49	98,67	0,171	0,144	307	0,2693057
17,135	537,3	537,7	100,43	100,67	0,171	0,144	308	0,2639569
16,990	537,2	537,7	101,40	101,57	0,171	0,144	309	0,2616106
17,349	537,1	537,6	99,35	99,40	0,171	0,144	310	0,2672361
17,455	537,0	537,6	98,60	98,74	0,171	0,144	311	0,2689592
17,129	536,9	537,5	100,58	100,64	0,171	0,144	312	0,2639521
17,129	536,9	537,5	100,47	100,62	0,171	0,144	313	0,2639521
17,102	536,9	537,5	100,70	100,76	0,171	0,144	314	0,2635631
17,135	536,8	537,4	100,55	100,61	0,171	0,144	315	0,2640211
17,040	536,9	537,4	100,99	101,25	0,171	0,144	316	0,2625855
17,216	536,9	537,4	99,95	100,12	0,171	0,144	317	0,2653095
17,545	536,9	537,4	97,99	98,19	0,171	0,144	318	0,2705022
17,093	536,9	537,4	100,55	100,75	0,171	0,144	319	0,2635635
17,102	536,9	537,4	100,71	100,88	0,171	0,144	320	0,2635624
17,279	536,9	537,4	99,58	99,75	0,171	0,144	321	0,266275

APPENDIX 3: Calibration data

St-jean-sur-Richelieu, February 16th 2020

Client: Jotul

Project: PI-20206

Model: F55 V2

APPENDIX 4: Unit pre burn

Pre-conditioning Log

[illegible]

Dragonflyre LLC

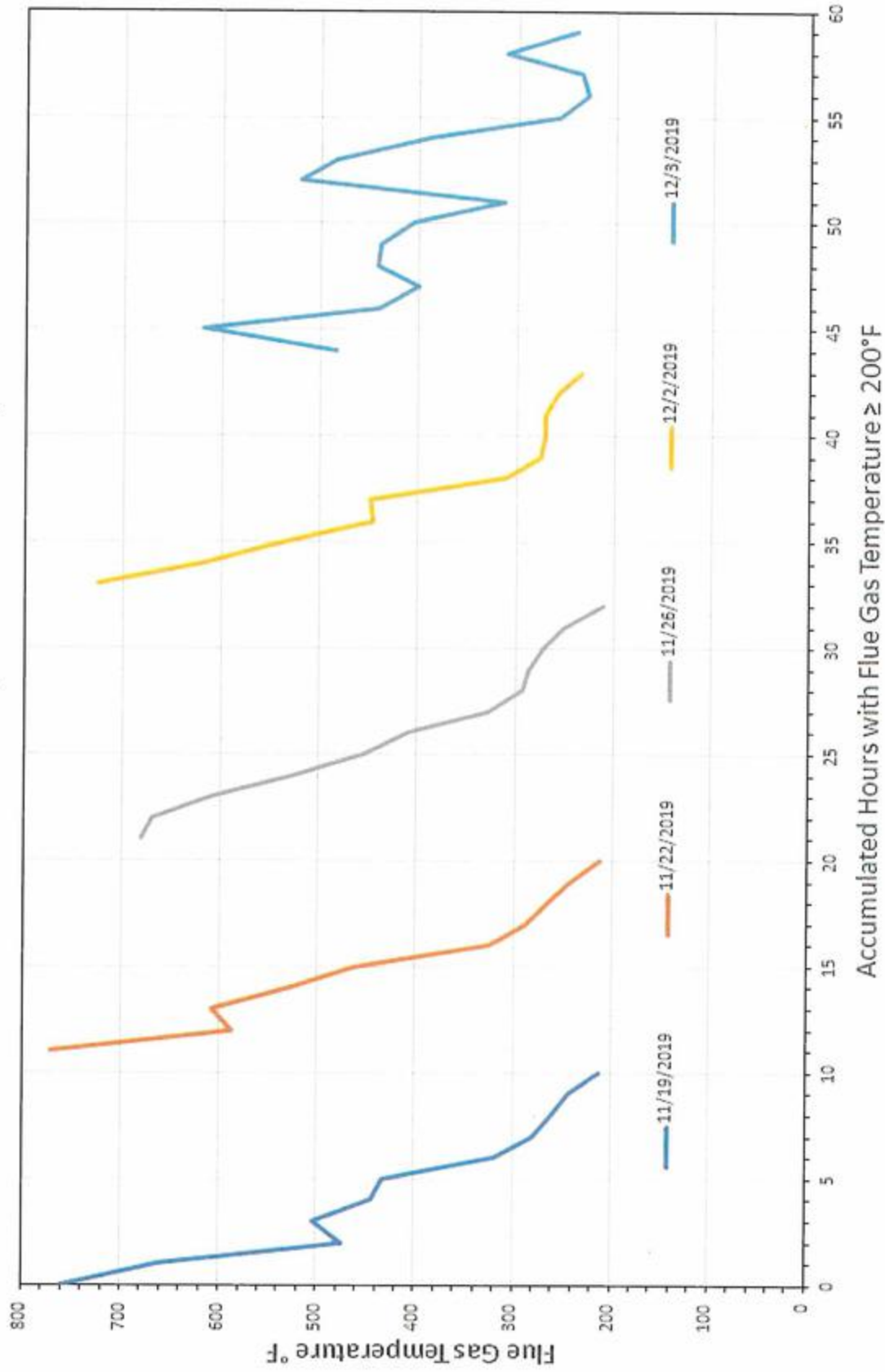
Jøtul F55 Preconditioning Data (extracted from datalogger)

Dragonflyre LLC

Date mm/dd/yy	Time hh/mm/ss	Accumulated Hours	Flue Gas Temp °F	Date mm/dd/yy	Time hh/mm/ss	Accumulated Hours	Flue Gas Temp °F
11/19/2019	9:39:41	0	759	12/2/2019	9:56:36	33	726
	10:39:41	1	662		10:56:36	34	619
	11:39:41	2	475		11:56:36	35	536
	12:39:41	3	504		12:56:36	36	446
	13:39:41	4	445		13:56:36	37	448
	14:39:41	5	433		14:56:36	38	311
	15:39:41	6	318		15:56:36	39	275
	16:39:41	7	280		16:56:36	40	270
	17:39:41	8	260		17:56:36	41	271
	18:39:41	9	243		18:56:36	42	257
11/22/2019	19:39:41	10	212	12/3/2019	19:56:36	43	233
	10:00:02	11	771		11:04:04	44	485
	11:00:02	12	588		12:04:04	45	620
	12:00:02	13	608		13:04:04	46	441
	13:00:02	14	526		14:04:04	47	400
	14:00:02	15	462		15:09:16	48	442
	15:00:02	16	325		16:09:16	49	440
	16:00:02	17	287		17:09:16	50	405
	17:00:02	18	266		18:09:16	51	313
	18:00:02	19	243		19:09:16	52	522
11/26/2019	19:00:02	20	212		20:09:16	53	485
	10:55:06	21	680		21:09:16	54	390
	11:55:06	22	670		22:09:16	55	258
	12:55:06	23	608		23:09:16	56	229
	13:55:06	24	527		0:09:16	57	235
	14:55:06	25	453		1:09:16	58	312
	15:55:06	26	409		2:09:16	59	240
	16:55:06	27	328				
	17:55:06	28	293				
	18:55:06	29	287				
	19:55:06	30	272				
	20:55:06	31	251				
	21:55:06	32	210				

Attachment 2

Jøtul NA F55 Stove Preconditioning Per ASTM and EPA Requirements



Preconditioning conducted by Dragonfire Inc. on 11/19/2019

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

Jerick Andors
Gerguson, Andors & Company

APPENDIX 6: Drawings and specifications

St-jean-sur-Richelieu, February 16th 2020

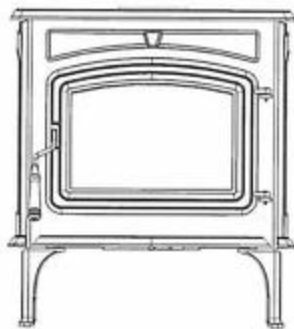
Client: Jotul

Project: PI-20206

Model: F55 V2

APPENDIX 7: Operator's manual

Jøtul F 55 V2 Carrabassett
Wood Stove



Jøtul F 55 V2 Carrabassett

Installation and Operating Instructions
for the United States and Canada

- The Jøtul F 55 V2 Carrabassett heater is listed to burn solid wood only. Do not burn any other fuels.
- Read this entire manual before you install and use this appliance.
- Save these instructions for future reference and make them available to anyone using or servicing the fireplace insert.
- This wood heater requires periodic inspection and repair for proper operation. See this manual for specific maintenance information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in this owner's manual.

**This heater meets the 2020 U.S.
Environmental Protection Agency's
emission limits for wood heaters
manufactured after May 15, 2020.**



*Une version française de ce manuel est disponible au
téléchargement sur www.jotul.ca*

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Installation and Operation Instructions for USA/Canada

Safety Notice: If this solid fuel room heater is not properly installed, a house fire may result. For your safety, follow the installation directions. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Save these instructions for future reference.

Accessories

Stove Gloves, pair - #157363

Heavy-duty, flame-retardant with full gauntlet

Stove-Top Thermometer - #5002

We recommend the use of a magnetic stove-top thermometer to monitor the surface temperature of the stove. The optimum surface temperature range for the most efficient performance is between 400° F - 700° F (205° C - 316° C).

Outside Air Kit - #158208

This kit includes a plenum assembly which attaches to the stove bottom. It permits connection of duct work from an outside source directly to the air intake of the stove. A direct outside air connection is required for mobile home installations. *This kit cannot be used with the Short Leg Kit.*

Mobile Home Floor Bracket Kit - #157321

This kit includes two brackets used to fulfill the mobile home requirement that the stove be secured directly to the floor.

Blower Kit - #156431

This kit includes components for mounting a thermostatically controlled 120 cfm blower to the back of the stove to enhance heat convection into the living area.

Gasket Kit - #157680

Includes enough gasket material to replace the glass and door seals.

Short Leg Kit - #158209

This kit includes four, 4 1/4" (108 mm) steel legs and a Bottom Heat Shield which allow stove installation into a fireplace opening height as low as 27 1/4". *Approved only for code-approved, masonry fireplace hearth mount installation.*

Standards

The Jøtul F 55 V2 Carrabassett solid fuel heater has been tested and listed to:

U.S.: ANSI/UL 1482-2011

Canada: CAN/ULC-S627-00 and ULC-S628-93

Certified Safety Tests performed by:

ITS, Intertek Testing Services
Middleton, WI

Manufactured by:

Jøtul North America
55 Hutcherson Drive
Gorham, Maine 04038-2644

Combustion Specifications

Jøtul F 55 V2 Carrabassett

Heat Output Range:¹ 18,962 to 84,311 BTU/hr.

Heating Capacity:² Up to 2,300 sq. ft.

Maximum Burn Time:² Up to 10 hours

Combustion Efficiency:³ HHV: 67.97% LHV: 73.13 %

CO Emissions:⁴ 1.06 g/min

Pariculate Emissions:⁵ 1.31 g/hr - Cord Wood

Fuel: Up to 18" Logs (457 mm) Front to Back

See the Operation section of this manual for important information regarding the safe, proper, and most efficient operation of your stove.

¹ **Heat Output Range** results are determined during specific emissions tests established by the EPA.

The **Maximum Heat Output** value is representative of a more frequent re-fueling cycle than specified in the EPA High Heat Output test method.

² **Heating Capacity and Maximum Burn Time** will vary depending on design of home, climate, wood type and operation

³ **High Heat Value and Low Heat Value** are obtained per CSA B415.1-10 test method. HHV calculation encompasses all products of combustion, including H₂O condensation. Simply put, HHV assumes all the water component is in a liquid state (condensed) at the end of combustion and that heat recovered from condensation can be put to use. LHV efficiency calculation does not consider heat recovered from water vapor condensation.

⁴ **Carbon Monoxide Emissions** rate results from Test Method CSA B415.1-10.

⁵ **Particulate Emissions** rate is obtained using EPA test methods:

ALT-125 (Cordwood Fuel)

ASTM E2515-11

ASTM E3053-17

WARNING !

THIS WOOD HEATER HAS A MANUFACTURER-SET MINIMUM LOW BURN RATE THAT MUST NOT BE ALTERED. IT IS AGAINST FEDERAL REGULATIONS TO ALTER THIS SETTING OR OTHERWISE OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

Check Building Codes

When installing, operating and maintaining your Jøtul F 55 V2 Carrabassett woodstove, follow the guidelines presented in these instructions, and make them available to anyone using or servicing the stove.

Your city, town, county or province may require a building permit to install a solid fuel burning appliance.

For installation requirements not specifically addressed in this manual, refer to the standards listed below:

In the U.S., the National Fire Protection Association's Code, NFPA 211, *Standards for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*, or similar regulations, may apply to the installation of a solid fuel burning appliance in your area.

In Canada, the guideline is established by the CSA Standard, CAN/CSA-B365-M93, *Installation Code for Solid-Fuel-Burning Appliances and Equipment*.

Always consult your local building inspector or authority having jurisdiction to determine what regulations apply in your area.

The Jøtul F 55 V2 Carrabassett is approved for use in mobile homes. Install in accordance with 24 CFR, Part 3280 (HUD). Follow the instructions in this manual.



We suggest that our woodburning hearth products be installed and serviced by professionals who are certified in the U.S. by the National Fireplace Institute® (NFI) as NFI Woodburning Specialists or who are certified in Canada by Wood Energy Technical Training (WETT).



Safety Notices

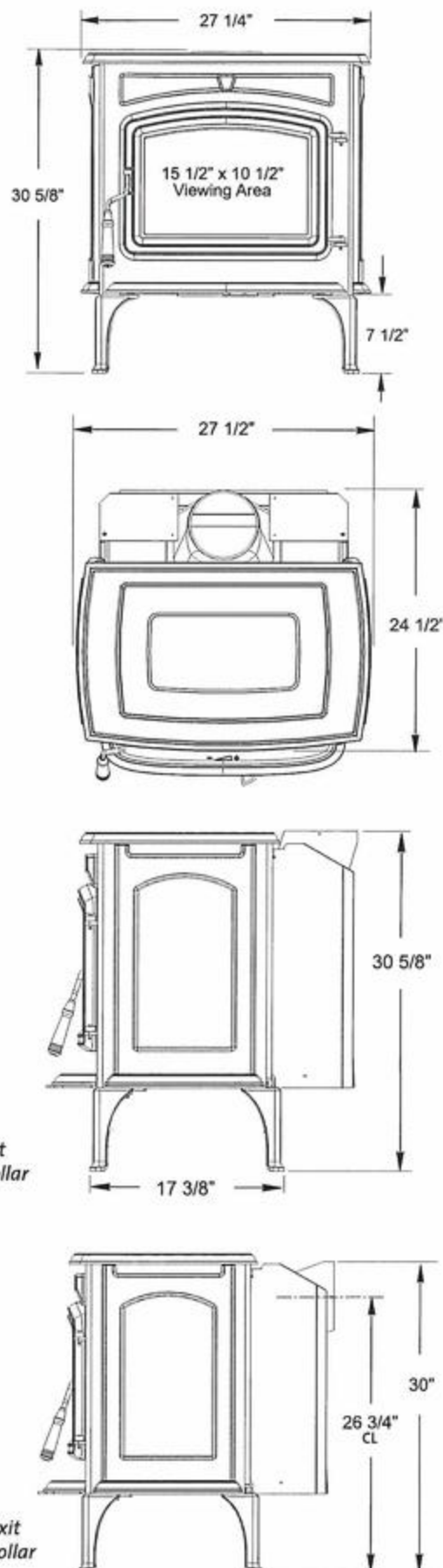
- BURN SOLID, NATURAL WOOD FUEL ONLY. DO NOT BURN ANY OTHER FUEL.
- DO NOT USE CHEMICALS OR FLUIDS TO START A FIRE. DO NOT BURN GARBAGE OR FLAMMABLE FUELS.
- DO NOT USE A GRATE OR ELEVATE THE FIRE. BUILD THE FIRE DIRECTLY ON THE HEARTH.
- IF THIS ROOM HEATER IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT. TO REDUCE THE RISK OF FIRE, FOLLOW THE INSTRUCTIONS IN THIS MANUAL. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR LOSS OF LIFE.
- CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.
- ANY EXISTING CHIMNEY SYSTEM MUST BE INSPECTED BEFORE INSTALLATION OF THIS APPLIANCE.
- DO NOT CONNECT THIS STOVE TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.
- EXTREMELY HOT WHILE IN OPERATION! KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT WILL CAUSE SKIN BURNS. USE A CHILD GUARD SCREEN TO PREVENT ACCIDENTAL CONTACT BY SMALL CHILDREN.
- INSTALL SMOKE DETECTORS IN THE LIVING AREA AND BEDROOMS OF YOUR HOME. TEST THEM REGULARLY AND INSTALL FRESH BATTERIES TWICE ANNUALLY.
WHEN INSTALLED IN THE SAME ROOM AS THE STOVE, A SMOKE OR CARBON MONOXIDE DETECTOR SHOULD BE LOCATED AS FAR FROM THE STOVE AS POSSIBLE TO PREVENT THE ALARM SOUNDING WHEN ADDING FUEL.
- Avoid creating a low pressure condition in the room where the stove is operating. Be aware that operation of an exhaust fan or clothes dryer can create a low pressure area and consequently promote flow reversal through the stove and chimney system. In some cases, the optional Outside Air Kit #158208 can be used to alleviate this condition. The chimney and building, however, always work together as a system - provision of outside air, directly or indirectly to an atmospherically vented appliance will not guarantee proper chimney performance. Consult your local Jøtul authorized dealer regarding specific installation/performance issues.
- Jøtul strongly recommends that this stove be installed by a professional solid fuel technician, or that you consult one if you do the work yourself. Also, consult your insurance company regarding any other specific requirements.

Installation Tools Required, but not limited to:

- | | |
|-----------------------------------|------------------|
| • Measuring Tape | • Work Gloves |
| • Phillips screwdriver | • Safety Glasses |
| • 10 mm open-end or socket wrench | • 4 mm hex key |

PLEASE NOTE:

IT IS NORMAL FOR SMOKE AND ODOR TO OCCUR DURING THE INITIAL STAGES OF OPERATION, DEPENDING UPON TEMPERATURES GENERATED OVER TIME. THIS "CURING" CONDITION CAN BE ALLEVIATED BY PROMOTING FRESH AIR CIRCULATION WITHIN THE IMMEDIATE VICINITY OF THE APPLIANCE.



1.0 Pre-installation Assembly

1.1 Unpack the Stove

Inspect the stove for damage. Contact your dealer immediately if any damage is found. Do not install the stove if any damage is evident. Contact your dealer.

Contents:

- Flue Collar Heat Shield
- #8 x 12 mm sheet metal screws, 4
- Leg Leveller Screws, 2

NOTE: The integral Rear Shroud acts as a heat shield. There is no accessory rear heat shield.

1.2 Flue Collar Orientation

The Flue Collar is oriented in the Top Exit position. To change orientation to Rear Exit:

1. Twist and remove the perforated cut-out section from the top edge of the rear shroud.
2. While holding the M6 flange nuts on the inside of the flue collar, to keep them from falling into the stove, use a 10 mm open end wrench or socket wrench to remove the two M6 x 20 bolts that attach the flue collar to the stove. Orient the flue collar to the rear and use the same hardware to re-attach it to the stove.

1.3 Flue Collar Heat Shield

Not applicable for rear exit configuration.

1. Fold the heat shield on the perforations to conform to the shape as illustrated in fig.2.
2. Secure it to the rear stove shroud using the four #8 x 12 sheet metal screws from the hardware bag.

1.4 Short Leg Installation

NOTE! Install the optional Blower Kit **BEFORE** the short legs. Follow the instructions provided with that kit. See pg. 22.

Use Short Leg Kit #158209 to reduce stove height by $3\frac{1}{4}''$. Hearthmount installation only.

1.5 Leg Levellers

Two leg leveller screws are included in the hardware bag. **Install the screws in the appropriate legs BEFORE locating the stove in the final position.** See fig. 25, page 23 for Mobile Home Kit installation.

1.6 Chimney Connector

Use 6" single wall or listed 6" double-wall stovepipe to connect the stove to the chimney. Single wall stovepipe must be black steel or stainless steel and have a minimum thickness of 24 gauge. Do not use aluminum or galvanized steel pipe for chimney connection - these materials are not suitable for use with solid fuel. Attach the flue collar to the chimney connection using 2 self-drilling screws found in the miscellaneous kit.

Follow these guidelines:

- Do not use chimney connector as a chimney. It is intended only as a connection device.
- Each connector section must be oriented with the male (crimped) end pointing toward the stove. See fig. 3.
- Secure all connector joints with three sheet metal screws.
- For the best performance, the chimney connector should be as short and direct as possible, including no more than two 90° elbows.
- The maximum vertical run of single wall stovepipe should not exceed 10 ft.
- The maximum horizontal run should not exceed 3 ft. with a 1/4" rise per foot. Under no circumstance should horizontal pipe be allowed to slant down toward the chimney.
- No part of the chimney connector may pass through an attic or roof space, closet or other concealed space, or through a floor or ceiling. All sections of the chimney connectors must be accessible for cleaning. Where passage through a wall or partition of combustible construction is desired, the installation must conform with NFPA 211 or CAN/CSA-B365, and is also addressed in this manual.
- **Do not connect this stove to a chimney flue serving another appliance.**

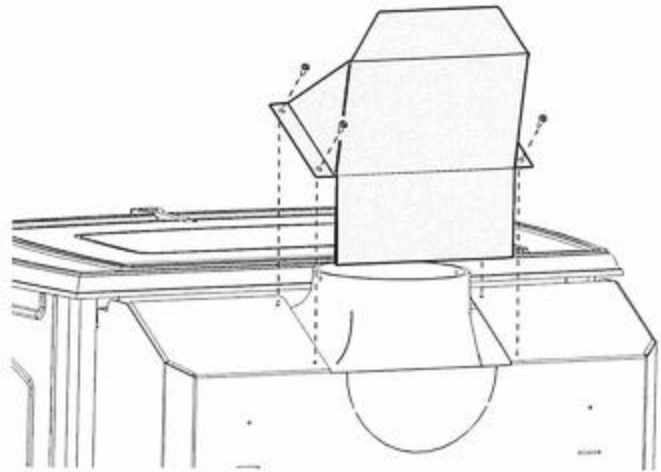


Figure 2. Flue Collar heat shield attachment.

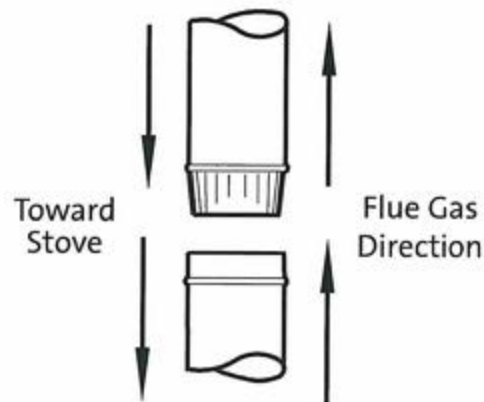


Figure 3. Chimney connector orientation.

2.0 Chimney Requirements

There are two types of approved chimneys:

1. A code-approved masonry chimney with a ceramic tile or listed steel flue liner.
2. A prefabricated chimney complying with the requirements for Type HT (2100°F) chimneys per UL 103 or ULC S629.

Use of an existing chimney requires that the entire system pass a UL 1482 Level II inspection by a qualified solid fuel technician or building official.

The chimney size should not be less than the cross-sectional area of the flue collar, and not more than three times greater than the cross-sectional area of the flue collar. If the chimney flue is outdoors, its cross-sectional area may not exceed two times greater than the stove flue collar. See also Sect. 3.2.

When selecting a chimney type and the location for the chimney in the house, keep this in mind: **It is the chimney that makes the stove work - not the stove that makes the chimney work.** This is because a chimney actually creates a suction, called "draft" which pulls air through the stove.

Several factors affect draft: chimney height, cross-sectional area (size), and temperature of the chimney, as well as the proximity of surrounding trees or buildings.

A short exterior masonry chimney will give the poorest performance because it will be difficult to warm the flue and sustain the temperatures necessary to maintain draft strength. In extremely cold climates, it may be necessary to reline the chimney or extend the height to help establish draft.

A tall, interior masonry chimney is easier to keep warm and will perform the best under a variety of weather and environmental conditions.

The following guidelines give the necessary chimney requirements based on the national code (ANSI-NFPA 211 for the US. And CSA CAN-B365 for Canada). However, many local codes differ from the national code to take into account climate, altitude, or other factors. Your local building inspector is the final approving authority. Consult them prior to installation.

Do not connect the stove to any air distribution duct or system.

2.1 Masonry Chimneys

Follow these guidelines when installing the Jøtul F 55 V2 into a masonry fireplace:

- The masonry chimney must have a fireclay liner or equivalent, with a minimum thickness of 5/8" and must be installed with refractory mortar. There must be at least 1/2" air space between the flue liner and chimney wall.
- The fireclay flue liner must have a nominal size of 8" X 8", and should not be larger than 8" X 12". A round fireclay liner must have a minimum inside diameter of 6" and maximum inside diameter of 8". A larger chimney should be relined with an appropriate code approved liner.
- Brick or modular block must be a minimum of 4" nominal thickness. Stone construction must be at least 12" thick.
- A newly-built chimney must conform to local codes, or, in their absence, must comply with national regulations.
- An existing chimney must be inspected by a professional, licensed chimney sweep, fire official, or code officer to ensure that the chimney is in proper working order. Any repairs must be completed before installing the stove.
- No other appliance may be vented into the same flue.
- An airtight clean-out door should be located at the base of the chimney.

2.2 Prefabricated Chimneys

A prefabricated metal chimney must be tested and listed for use with solid fuel burning appliances. High Temperature (HT) Chimney Standard UL 103 for the U.S. and High Temperature Standard ULC S-629 for Canada.

The manufacturer's installation instructions must be followed precisely. Always maintain the proper clearance to combustibles as established by the pipe manufacturer. This clearance is usually a minimum of 2", although it may vary by manufacturer or for certain chimney components.

2.3 Chimney Height

The Jøtul F 55 V2 woodstove requires a minimum chimney height of 15 feet. The chimney must be at least 3 feet higher than the highest point where it passes through the roof and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally. See fig. 4.

Chimneys shorter than 14 feet (4.27 m) may not provide adequate draft. Inadequate draft can result in smoke spillage when loading the stove, or when the door is open. Poor draft can also cause back puffing (ignition of gas build-up inside the firebox) and sluggish performance. The minimum height does not, in itself, guarantee proper chimney performance. Optimum draft force should be in the .05 - .10 in. w.c. range measured by a Magnahelic gauge. Draft at .07 w.c. is ideal.

Excessive chimney height can promote over-strong draft resulting in high stove temperatures and short burn times. Excessive draft can be corrected by installing a butterfly damper. Your Jøtul dealer is an expert resource to consult regarding draft issues or other performance-related questions.

2.4 Wall Pass-Throughs

Note: In addition to the methods described here, any listed, prefabricated wall pass-through components available from chimney manufacturers may be used.

In the U.S.

The National Fire Protection Association's publication, NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances* permits four methods for passing through a combustible wall. Before proceeding with any method, be sure to consult with your local building officials to discuss any local code requirements.

Common Method:

See fig. 5. Remove all combustible materials from the pass-through area (around the chimney connector), a minimum 12". A 6" diameter connector will require a 31" x 31" square opening.

The opening must be filled with at least 12" of brick around a fireclay liner. The liner must be ASTM C35 or equivalent, having a minimum wall thickness of 5/8".

The Pass-through must be at least 18" from combustible ceiling materials.

It will be necessary to cut wall studs, install headers, and construct a sill frame to maintain the proper dimensions and to support the weight of the brick.

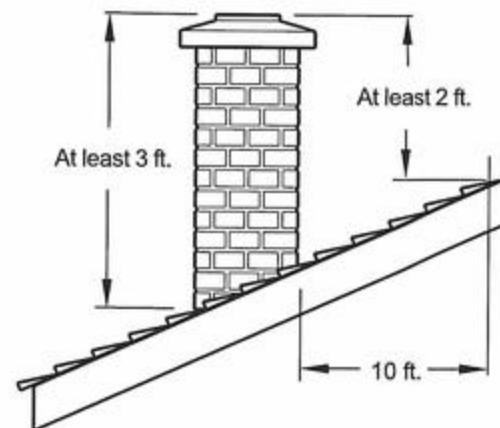


Figure 4. Chimney Height Requirement.

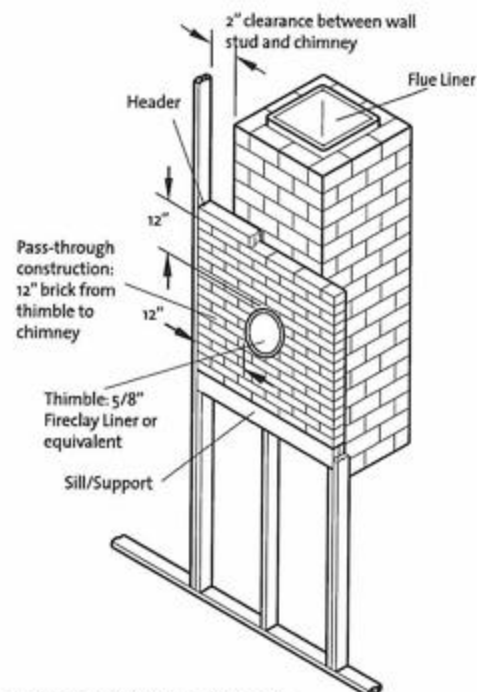


Figure 5. Masonry Wall Pass-through.

The bricks must be solid brick with a minimum of 3 inches thick (nominal 4").

Refractory mortar must be used at the junction of the chimney and the pass-through liner. The pass-through liner must not penetrate the chimney liner beyond the inner surface of the chimney liner. Use extreme care when constructing the hole in the chimney liner as the tiles can shatter easily.

In Canada

The installation must conform to CAN/CSA-B365, Installation Code for Solid Fuel Burning Appliances and Equipment. Before proceeding be sure to consult your local building inspector.

Common Method:

This method requires the removal of all combustible materials from at least 18" around the chimney connector's proposed location. A 6" round liner requires a minimum opening 43" x 43" square.

Locate the pass-through at least 18" from combustible ceiling materials.

The space that is cleared of combustible materials must remain empty. Sheet metal panels can be used to cover the area. However, when using a panel on both sides of the wall, each cover must be installed on noncombustible spacers at least 1" from the wall. If one panel of sheet metal is to be used it may be installed flush to the wall.

See section 5.3.1 and 5.3.2 of CAN/CSA - B365-M91. Consult your local building inspector, authorized Jøtul Dealer, NFPA 211 in the U.S. or CAN/CSA-B635 in Canada for other approved wall pass-through methods.

3.0 Connecting to the Chimney

3.1 Masonry Chimney

When installing a Jøtul F 55 V2 into a masonry chimney through a "thimble" (the opening through the chimney wall to the flue), the thimble must consist of ceramic tile or steel and be securely cemented in place.

The chimney connector/stove pipe must slide completely inside the thimble to the inner surface or the flue liner. It may be necessary to make use of a thimble sleeve (a pipe with a slightly smaller diameter than standard stove pipe). See fig. 6.

The connector pipe or thimble sleeve must not protrude into the flue liner or otherwise restrict draft.

Use refractory cement to seal the seam between the chimney connector, sleeve, and thimble.

Do not connect this stove to a chimney flue servicing another appliance of any kind.

3.2 Hearthmount into a Masonry Fireplace

The Jøtul F 55 V2 may be installed into a masonry fireplace with a minimum opening height of 30 1/2" for standard legs.

Use Short Leg Kit #158209 to install into a fireplace with a minimum opening height of 27 1/4". **Short legs are approved only for use on a code-approved, masonry fireplace hearth. The Outside Air Kit cannot be used with the Short Leg Kit. The Bottom Heat Shield must be used with the Short Leg Kit.**

Building code requires that the fireplace damper plate be removed or securely fixed in the open position.

A connector pipe must then extend from the stove's flue exit through the damper area of the fireplace and into the chimney tile liner. See fig. 7. In any case, we recommend that a full liner be installed through any masonry chimney to ensure good performance.

The cross-sectional area of the flue of a chimney with no walls exposed to the outside below the roofline may be no more than three times the cross-sectional area of the stove flue collar.

The cross-sectional area of the flue of a chimney with one or more walls exposed to the outside below the roofline may be no more than two times the cross-sectional area of the stove flue collar.

If the chimney liner is too large to accommodate the stove, an approved relining system must be installed to resize the flue.

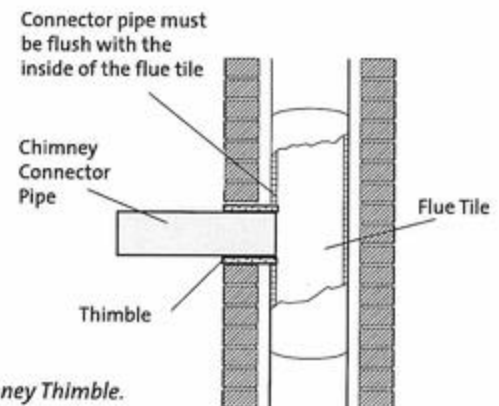


Figure 6..
Masonry Chimney Thimble.

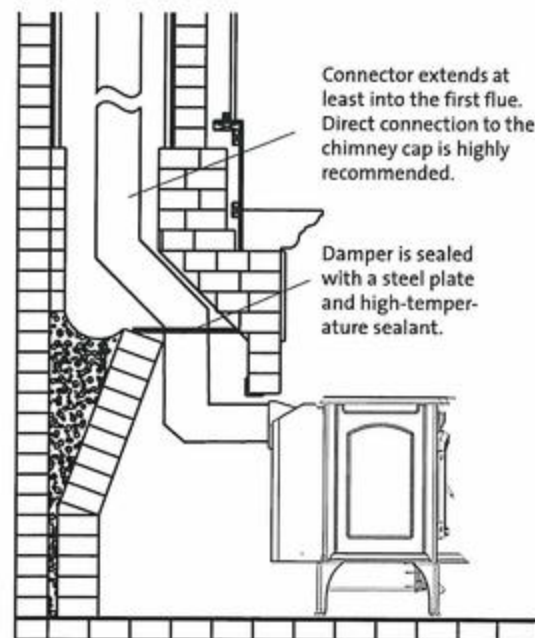


Figure 7. Hearthmount Installation.

A new sheet metal damper block-off plate must be installed around the connector pipe at the damper frame and sealed with the proper sealant (usually High-Temp Silicone).

3.3 Prefabricated Chimneys

When connecting the Jøtul F 55 V2 to a prefabricated metal chimney always follow the pipe manufacturer's instructions and be sure to use the all components that are required. This usually includes a chimney adaptor that is secured to the bottom section of the metal chimney and allows the chimney pipe to be secured to it with two sheet metal screws. See fig. 8.

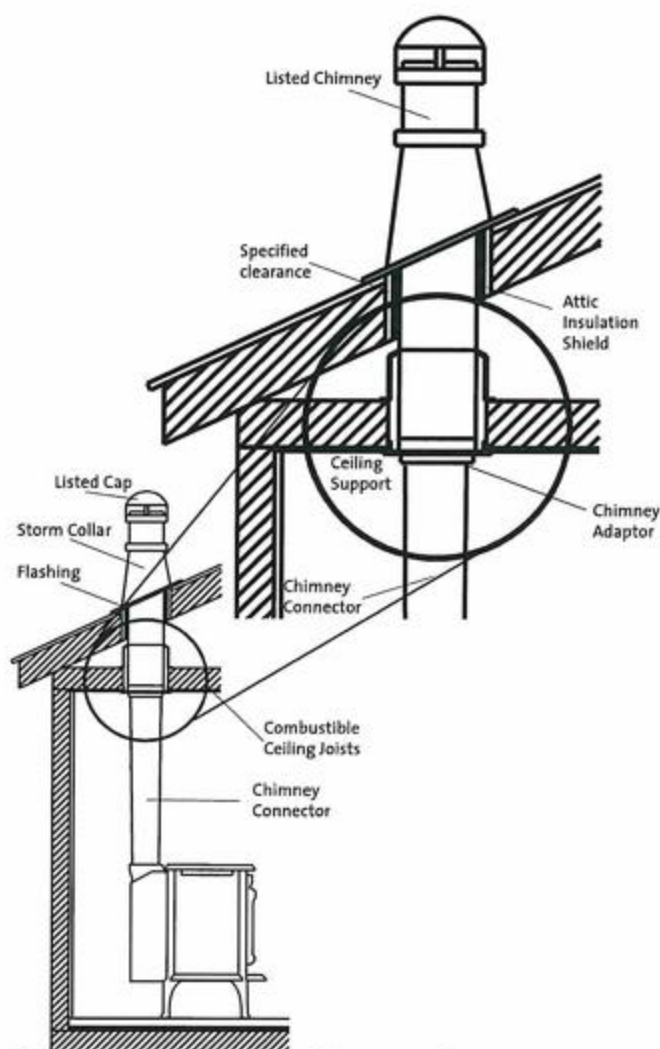


Figure 8. Prefabricated Listed Type HT Chimney.

3.4 Mobile Home Installation

The Jøtul F 55 V2 is approved for installation in manufactured mobile homes provided the following requirements are met:

1. All chimney components, including chimney sections, supports, spark arrestor, etc., shall comply with the Standard for Factory-built Chimneys for Residential Type and Building Heating Appliances, UL 103 and/or CAN/ULC-S629 Standard for 650°C Factory-built Chimneys.
2. The chimney shall be attached directly to the stove and extend at least 3 ft. above the roof. Termination must be at least 2 ft. (0.6m) above the highest elevation of any part of the mobile home within 10 ft..
3. In order to allow for transportation of the mobile home, the chimney termination shall be readily removed at or below an elevation of 13.5 ft. above ground level and reinstalled without use of special tools or instructions.
4. A spark arrestor must be installed at the termination. The net free area of the arrester above the chimney outlet must not be less than four times the net area of the chimney outlet, and the vertical height of the arrester must not be less than one-half the diameter of the chimney flue. Openings shall not permit the passage of a sphere having a diameter larger than 1/2", and shall permit the passage of a sphere having a diameter of 3/8".
5. Direct connection of the stove to an outside air source is required. Use Outside Air Kit #158208. Do not substitute any other connection method or device. See Appendix, Section 7.0. Duct termination must not be installed at a level that is higher than the air inlet located at the bottom of the stove.
6. The stove must be secured to the mobile home floor. Use Floor Bracket Kit 157321. See fig. 25, pg. 23.
7. When the chimney exits the mobile home at a location other than through the roof and exits at a point 7 ft. or less above the ground level, a guard or other method of enclosing the chimney must be provided at the point of exit for a height up to 7 ft. Openings of this chimney guard shall not permit penetration of a 3/4 in. diameter rod or contact with the chimney by a 1/2 inch diameter rod inserted through the opening a distance of 4 inches.
8. Provision must be made for electrical grounding of the chimney, chimney connector, and stove in accordance with local building codes.

WARNING: Do not install this appliance in a sleeping room.

CAUTION: The structural integrity of the mobile home floor, walls, and ceiling/roof must be maintained.

4.0 Clearance to Combustibles

4.1 Floor Protection

The Jøtul F 55 V2 requires one of the following forms of hearth protection if not installed directly on concrete poured on earth:

- 1) Any UL, ULC, or Warnock Hersey Listed Type 1 hearth board.
- 2) Any non-combustible material.

No Bottom Heat Shield is required in either case unless using Short Leg Kit #158209. **Short legs are approved only for use on a code-approved, masonry fireplace hearth.**

IN THE U.S.: Floor protection must extend continuously forward from the door opening at least 16 in. and 8 in. from the sides of the door opening. Protection must also extend 2 in. under the chimney connector. This will result in a minimum floor protector 33" wide x 40 3/4" deep. See fig 9.

IN CANADA: Floor protection must extend continuously 18" from the front of the stove and 8 in. from the sides and rear. It must also extend 2 in. under the chimney connector. This results in a floor protector 43 1/2 in. x 50 1/2 in. See fig.10.

4.2 Clearances to Walls and Ceilings

The clearances listed and diagramed in this manual have been tested to UL and ULC standards and are the minimum clearances to combustible materials specifically established for the Jøtul F 55 V2.

A combustible surface is anything that can burn (i.e. sheet rock, wall paper, wood, fabrics etc.). These surfaces are not limited to those that are visible and also include materials that are behind noncombustible materials.

If you are not sure of the combustible nature of a material, consult your local fire officials.

Remember: "Fire Resistant" materials are considered combustible; they are difficult to ignite, but will burn. Also "Fire-rated" sheet rock is also considered combustible.

Contact your local building officials about restrictions and installation requirements in your area.

See pages 12-13 for clearance requirements and diagrams.

4.2.1 Alternate Floor Protection

All floor protection materials must be non-combustible (i.e., metals, brick, stone, mineral fiber boards, etc.). Any organic materials (i.e., plastics, wood, paper products, etc.) are combustible and must not be used. Local codes may specify some form of thermal designation such as R-value (thermal resistance), k-factor (thermal conductivity), or C-factor (thermal conductance).

See 7.4 Appendix for the procedure to determine alternate floor protection materials that meet the thermal requirements for this stove.

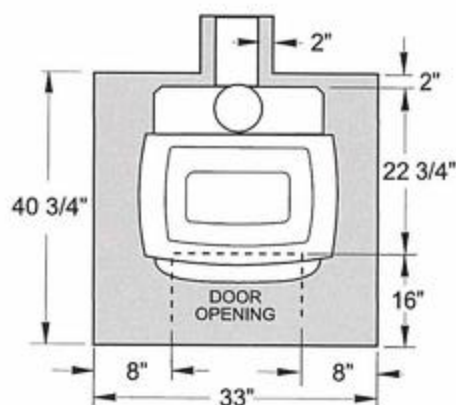


Figure 9. Floor Protection minimum dimensions, U.S.

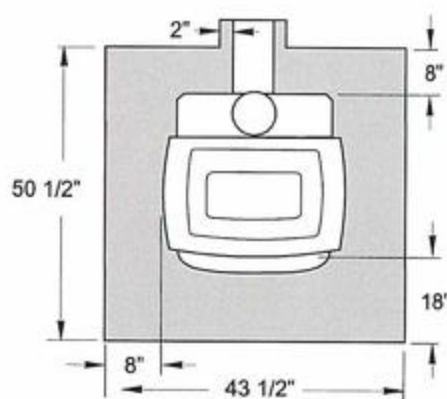


Figure 10. Floor Protection minimum dimensions, Canada.

4.3 Using Shields to Reduce Clearances

Double Wall Connector: Listed double wall pipe is an acceptable alternative to connector pipe heat shields.

Wall-Mounted Protection: When reducing clearances through the use of wall-mounted protection:

In the U.S. refer to NFPA 211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances, for acceptable materials, proper sizing and construction guidelines.

In Canada, refer to CAN/CSA-B365, Installation Code for Solid-Fuel Burning Appliances and Equipment, also for acceptable materials, proper sizing and construction guidelines.

Notice: Many manufacturers have developed woodstove accessories that permit clearance reduction. Use only those accessories that have been tested by an independent laboratory and carry the laboratory's testing mark. Be sure to follow all of the manufacturer's instructions.

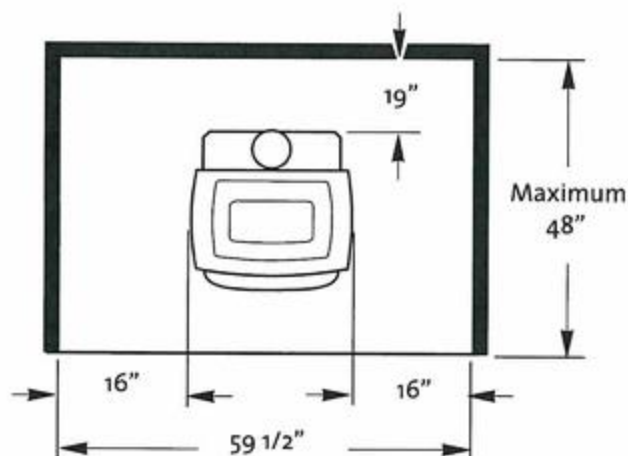


Figure 11. Alcove with Unprotected Walls.

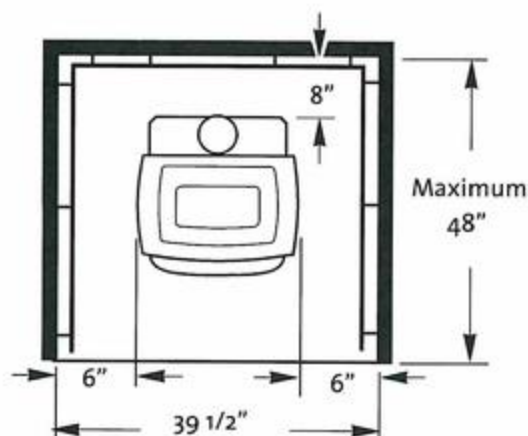


Figure 12. Alcove with Wall Protection.

4.4 Alcove Installation

The Jøtul F 55 V2 can be installed in an alcove as diagrammed in figs. 11.-12.

1. The stove must be installed only with double-wall chimney connector.
2. Wall and ceiling protection, if used, must extend over the entire area.
3. Alcove floor protection must consist of a UL/ULC or WHI listed hearth pad or a non combustible material.
4. Minimum Alcove Ceiling Height:
Unprotected Surface - 72"
Protected Surface - 59"

The Short Leg option is not approved for use in Alcove installations.

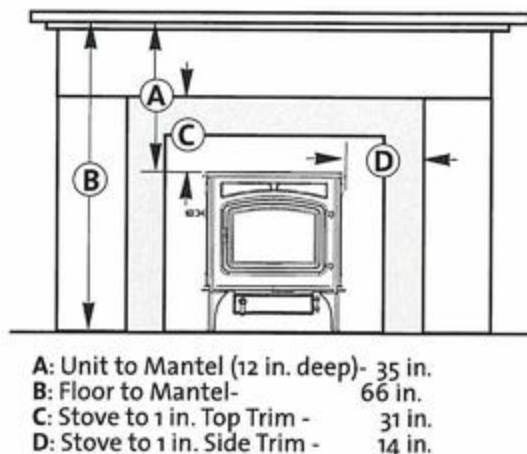


Figure 13. Mantel and Trim Clearances.

4.5 Clearances to Fireplace Mantels and Surrounding Trim

See fig. 13 and the Clearance Chart on page 12 for approved clearances to combustible materials that may be part of fireplace construction.

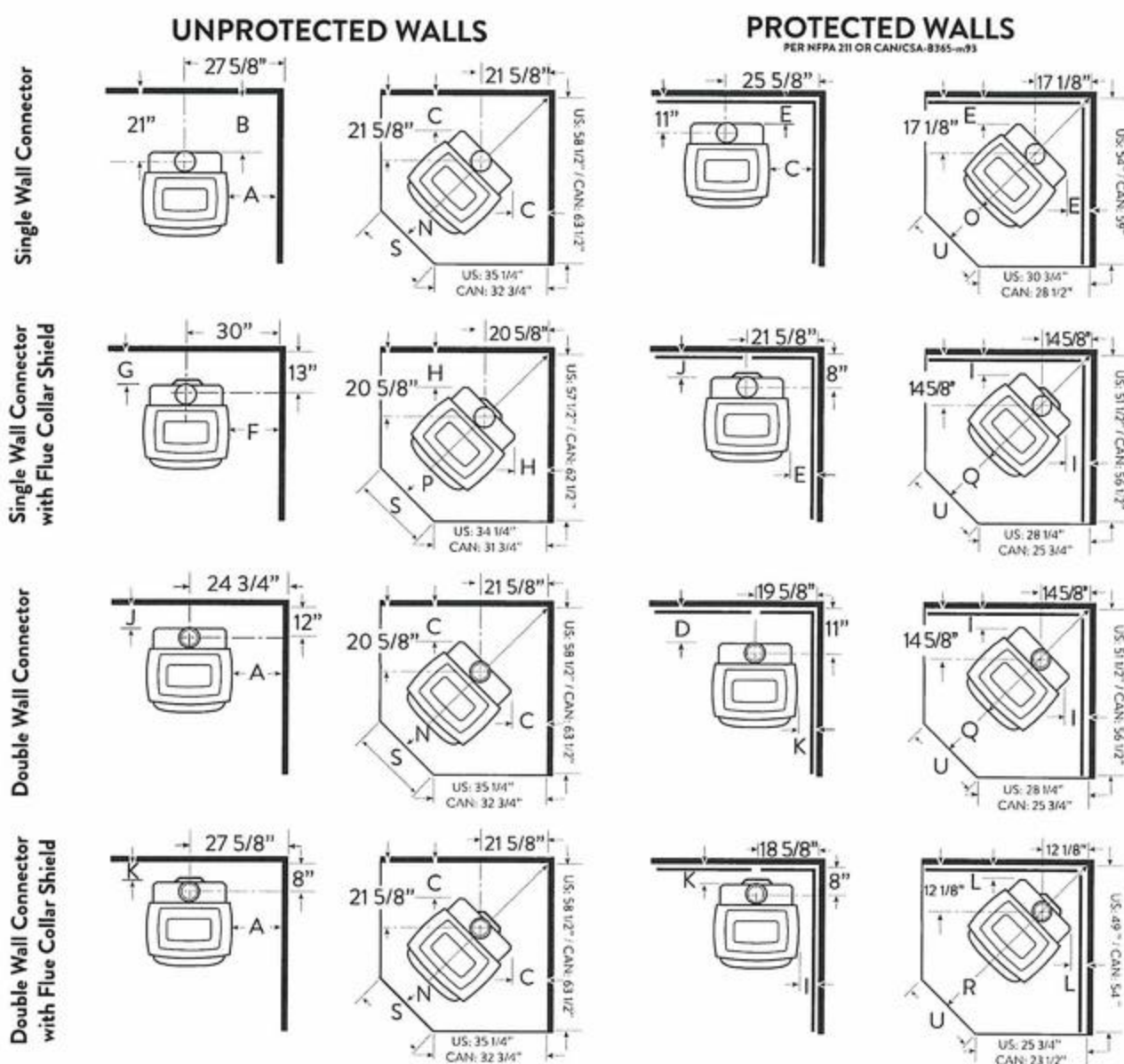
Mantel and Trim clearances may be reduced by 50% with use of shielding constructed in accordance with NFPA 211 specifications.

4.6 Jøtul F 55 V2 Carrabassett Clearance Specifications

	UNPROTECTED WALLS					PROTECTED WALLS PER NFPA211 OR CAN/CSA- B365-M93				
	SIDE	REAR	CORNER	CORNER TO FRONT FLOOR PROTECTION**	FRONT FLOOR PROTECTION WIDTH**	SIDE	REAR	CORNER	CORNER TO FRONT FLOOR PROTECTION**	FRONT FLOOR PROTECTION WIDTH**
Single Wall Connector	A 14"	B 18"	C 12"	N US: 66 1/8" CAN: 68 1/8"	S US: 32 7/8" CAN: 43 1/2"	C 12"	D 8"	E 7 1/2"	O US: 59 3/4" CAN: 61 3/4"	U US: 32 7/8" CAN: 43 1/2"
Single Wall Connector w/Flue Collar Heat Shield	F 16"	G 10"	H 11"	P US: 64 3/4" CAN: 66 3/4"	S US: 32 7/8" CAN: 43 1/2"	D 8"	I 5"	I 5"	Q US: 56 1/4" CAN: 58 1/4"	U US: 32 7/8" CAN: 43 1/2"
Double Wall Connector	A 14"	J 9"	C 12"	N US: 66 1/8" CAN: 68 1/8"	S US: 32 7/8" CAN: 43 1/2"	K 6"	D 8"	I 5"	Q US: 56 1/4" CAN: 58 1/4"	U US: 32 7/8" CAN: 43 1/2"
Double Wall Connector w/Flue Collar Heat Shield	A 14"	K 6"	C 12"	N US: 66 1/8" CAN: 68 1/8"	S US: 32 7/8" CAN: 43 1/2"	I 5"	K 6"	L 2.5"	R US: 52 3/4" CAN: 54 3/4"	U US: 32 7/8" CAN: 43 1/2"

**US and CAN measurements are not the same and are not interchangeable.

Figure 14. Clearance Diagrams. All specifications applicable to both top and rear exit configurations.



5.0 Operation

Please read the following section before building the first fire in your new Jøtul F 55 V2.

5.1 Combustion Efficiency

The Jøtul F 55 V2 has an EPA tested High Heating Value (HHV) efficiency rate of 67.97%. There are, however, aspects of efficiency that you should be aware of in order to get the most from your stove.

Operation habits and fuel moisture can have a significant effect on efficiency. Poorly seasoned wood having a higher than optimum moisture content, can reduce the amount of energy transferred to the living area as a result of the energy expended to evaporate the excess fuel moisture in order for the wood to burn. Operational aspects, such as not building a robust kindling fire to readily ignite the larger fuel pieces, can result in an inefficient smoldering fire. Additionally, most modern wood heaters' optimum performance and efficiency are at the medium to medium-low burn rates.

The location of the stove can have a significant effect on heating efficiency, primarily in regard to distribution of heat. For example, a wood heater centrally located in the residence in an open living area will likely provide better circulation of heat than will a stove located in a room adjacent to the larger living area.

5.2 Minimize Carbon Monoxide Emissions

Testing the F 55 V2 to CSA B414.1-10 measured carbon monoxide emissions at 1.06 g/min. Most means of combustion produce CO, including wood fires. Maintaining a well-established fire and avoiding operation that produces a smoldering, smoky fire, will greatly reduce CO levels.

It is highly recommended that a CO monitor (detector) be installed in the same room as the stove. The monitor, however, should be located as far away as possible from the stove to avoid alert soundings when adding fuel to the fire.

5.3 Wood Fuel and Performance

The F 55 V2 is designed to burn natural wood only. Higher efficiencies and lower emissions generally result when burning air-dried, seasoned hardwoods, as opposed to softwoods, green or freshly cut hardwoods. Wood that has been air-dried for a period of 6 to 14 months will provide the cleanest, most efficient heat. Wood seasoned more than 2 years will burn too quickly to take advantage of the stove's low end efficiency strength.

A seasoned log will have check marks on the ends and be lighter than an unseasoned log which will show little or no check marks.

We recommend using a moisture meter to determine the moisture content of your wood. For purposes of home heating, your fuel should have a moisture content between 12 - 20%. Wood with higher moisture content will burn, however, very inefficiently. Most of its heat value will be lost to driving water out of the wood. Worse, that moisture will condense as creosote in the relatively cool chimney flue, increasing the potential for a chimney fire. *Use of unseasoned wood defeats the purpose of any modern wood-burning stove.*

BURN UNTREATED WOOD ONLY. DO NOT BURN:

- Coal;
 - Garbage;
 - Synthetic fuel or logs;
 - Material containing rubber, including tires;
 - Material containing plastics;
 - Waste petroleum products, asphalt products, paints, paint thinners or solvents;
 - Materials containing asbestos;
 - Construction or demolition debris;
 - Railroad ties or pressure-treated wood;
 - Manure or animal remains;
 - Lawn clippings or yard waste;
 - Salt water driftwood or other previously salt-water saturated materials;
 - Unseasoned wood;
 - Colored paper, or
 - Paper products, cardboard, plywood, or particle board.
- (The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax or similar substances for the purpose of starting a fire.)*

• Burning of any of the materials listed above can result in the release of toxic fumes, cause smoke, or render the heater ineffective and cause smoke

• NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID OR SIMILAR LIQUIDS TO START OR "FRESHEN-UP" THE FIRE. ALWAYS KEEP SUCH LIQUIDS AWAY FROM THE HEATER AT ALL TIMES.

NOTE: Avoid letting logs rest directly on the glass panel. The logs should be spaced off of the glass enough to allow for proper air flow within the firebox.

WARNING

ALWAYS WEAR STOVE GLOVES WHILE TENDING THE FIRE.

NEVER ALLOW THE FIRE TO REST DIRECTLY ON THE GLASS. KEEP THE LOGS SPACED AT LEAST ONE INCH FROM THE GLASS TO ALLOW FOR PROPER AIR FLOW WITHIN THE STOVE. AVOID STRIKING THE GLASS WITH LOGS.

OPERATE THIS STOVE ONLY WITH THE FRONT DOOR FULLY CLOSED. OPERATION WITH THE DOOR PARTIALLY OPEN MAY RESULT IN OVER-FIRING. IF THE DOOR IS LEFT PARTIALLY OPEN, GAS AND FLAME MAY BE DRAWN OUT OF THE STOVE CREATING SAFETY RISKS FROM BOTH FIRE AND SMOKE.

5.4 How your Jøtul F 55 V2 works

When used with dry wood and a well-drafting chimney system, modern non-catalytic wood stoves burn fuel efficiently by the precise control and delivery of primary and secondary air to the fire.

Primary Air is drawn into a front inlet in the stove bottom and directed through a regulator shutter under the front door before entering the lower fire chamber. Additional primary air is directed to the top of the load door to act as an air wash to help prevent extreme soot build-up on the glass panel. The amount of primary air available to the fire determines the intensity of heat output and rate of fuel combustion; the greater the amount of air, the greater the heat output, the faster the wood burns. The primary air setting also determines air wash effectivity over the glass; the higher the setting, the cleaner the glass.

Additional air is separately directed into the top of the fire chamber to support combustion of exhaust gas before passing out into the chimney. This unregulated **Secondary Air** enters through the stove bottom and is heated as it passes through the rear of the stove into a double-tiered manifold at the top of the firechamber. Additional secondary air is directed through a stainless steel baffle plate.

Volatile gases, released unburned from the fuel bed, rise to the baffle where they are turbulently mixed with hot, fresh oxygen. Secondary combustion then occurs before the gases pass into the heat exchange chamber. See fig. 15.

5.5 Controlling the Fire

Combustion intensity is controlled by the position of an air shutter located under the front door. You adjust its position using the handle located under the ash lip. Slide the handle to the left to decrease air to the fire. Sliding it to the right increases air delivery and fire intensity. See fig. 16. The shutter regulates and directs primary air to the front of the burn chamber. Push it to the right to allow maximum air to support combustion. It should be fully open when first starting or rekindling a fire, or when greater heat output is desired.

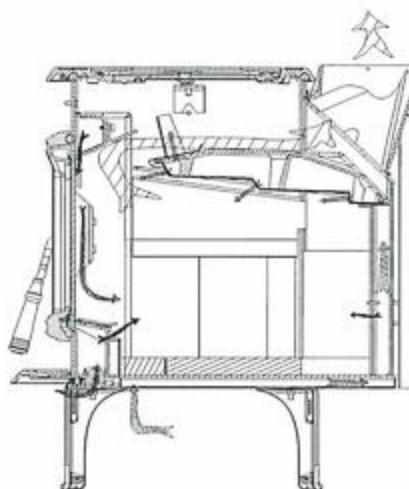
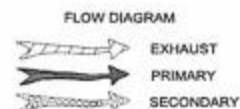


Figure 15. Combustion air paths

5.6 Air Control / Blower Settings

Use the following guide for best performance.

Burn Rate	Air Control Setting	Blower Speed
Low	Min. Open	Low / On at 30 min.
Med.	3/8" Open	Low / On at 30 min.
High	Max. Open	High / On

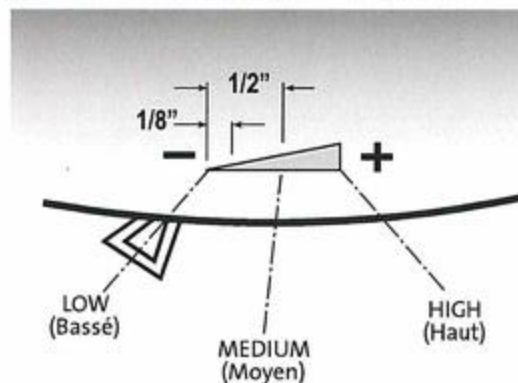


Figure 16. Air Control Settings

5.7 Break-In Procedure

Although your Jøtul F 55 V2 is constructed of welded, 3/16" steel plate, it also incorporates cast iron components. This material requires the stove to be "broken-in" gradually so that heat expansion does not occur too quickly and cause damage. The following steps describe the proper break-in procedure for your stove. Use a magnetic stove-top thermometer to monitor stove temperature, placed directly on the cookplate.

Set the Primary Air Shutter fully open, all the way to the right.

1. Light a small fire of newspaper and kindling at the front of the stove. Gradually add small pieces of wood, but only allow the stove to reach a maximum surface temperature of 200°F (93°C). Continue burning at this low rate for approximately 1 hour.
2. Allow the stove to cool to room temperature.
3. Light a second fire, allowing the stove to reach a maximum temperature of 300°F (149°C) for 1 hour.
4. Cool the stove to room temperature.
5. Light a third fire and gradually allow the stove to reach a surface temperature of 400°F (204°C).
6. Cool the stove to room temperature. This completes the "break-in" procedure.

Note: If the temperature exceeds the limit during any break-in fire, move the Air Shutter all the way to the left to shut off the air supply completely. It is normal that the stovetop temperature will continue to climb until the fuel burns down somewhat. Once the fire is out and the stove has cooled to room temperature, continue the break-in procedure. Never attempt to reduce the temperature by removing burning logs from the fire.

Break-in Odors: It is normal for a newly-painted stove to emit odor and smoke during the first few fires, and these may set off smoke alarms. This condition is caused by curing of the high temperature paint and will diminish with each subsequent fire. It is advisable to open windows or doors to provide plenty of fresh air and cross-ventilation during the break-in period.

WARNING:

NEVER OVER-FIRE THE STOVE. IF ANY PART OF THE STOVE OR CHIMNEY GLOWS, YOU ARE OVER-FIRING. A HOUSE FIRE OR SERIOUS DAMAGE TO THE STOVE OR CHIMNEY COULD RESULT. IF THIS CONDITION OCCURS, IMMEDIATELY CLOSE THE AIR CONTROL.

ATTEMPTS TO ACHIEVE HEAT OUTPUT RATES THAT EXCEED HEATER DESIGN SPECIFICATIONS CAN RESULT IN PERMANENT DAMAGE TO THE HEATER.

5.8 Starting and Maintaining a Fire

Burn only solid wood directly on the bottom of the stove firechamber. Do not elevate the fire in any way.

We recommend use of a magnetic stovetop thermometer to monitor the surface temperature of the stove. Locate the thermometer directly on one of the corners of the top plate. The optimum surface temperature range for most efficient combustion is between 400° and 700° (204°C - 371°C). Chimney draft should be in the .05 - 1.0 w.c. range.

Section 7.7 of the Appendix shows the cordwood test method fire building procedure for a high fire with a cold start.

Traditional Fire Building

1. Set the air control lever in the full open position (*to the right*), place several sheets of crumpled paper directly on the grate. On top of the newspaper, place a dozen or more pieces of small dry kindling (approx. 1" in square) with two to three larger logs (approx. 3" to 5" in square) on top.
2. Light the fire and close the door, slowly building the fire by adding larger and larger logs. Be sure to follow the break-in procedure before creating a hot fire that might damage the stove.
3. Once the stove has reached a surface temperature range of between 400° and 600°, (204°C - 316°C), adjust the primary air control lever as necessary to generate the heat output and burn time desired.

Top-Down Fire Building

Many people find this method to be superior to the traditional method. It quickly establishes a clean-burning fire.

1. Set the air control lever in the full open position (*to the right*), and place two short 1/4-split logs on the firebox floor, perpendicular to the rear wall, about 6 inches apart.
2. Place three or four smaller splits across the base logs.
3. Place several thin kindling sticks on top of the small logs.
4. Place newspaper and wood scraps on top of the kindling, light the paper and close the door. The burning paper will help heat the flue to establish draft while the kindling ignites and falls onto the fuel below. Keep the air control fully open until the fire is well-established.
5. Add more logs as the fuel bed become fully involved and use the stove-top thermometer to monitor progress. When the stove has reached a surface temperature range of between 400° and 600°, (204°C - 316°C), adjust the primary air control lever as necessary to generate the heat output and burn time desired.

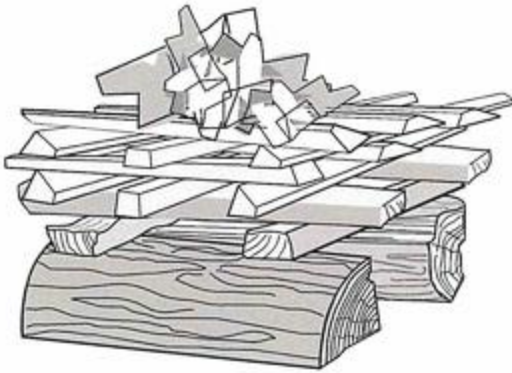


Figure 17. Top-down fire starting structure.

You can also monitor stove performance through the window. Peak combustion efficiency occurs when exhaust gas is burned at the baffle in the top of the firebox. This is apparent as rolling yellow-orange flames appearing at the secondary air ports in the underside of the baffle plate and forward tube. At this stage, little or no smoke will be visible exiting the chimney.

5.9 Adding Fuel

Follow this procedure when reloading the stove while it is still hot and a bed of hot embers remains:

- **Always wear gloves when tending to the stove.**
- **Adjust the Primary Air Shutter Lever to the fully open position.** Wait a few seconds to re-establish strong draft before opening the load door. This will allow fresh air to flush the firebox and prevent smoke escaping when the door is opened.
- **Minimize CO exposure:** Open the door slightly, and hesitate a moment to allow exhaust purge, then open the door fully.
- Use a stove tool or poker to evenly distribute coals and embers around the firebox.
- Load the fuel, usually with smaller logs first.
- Close the door, being sure to latch the door tightly.
- Wait 5 – 10 minutes to re-establish the fire before setting the air controls for the desired heat output and burn time. (If there is at least a 2" thick ember bed when reloading, it may be possible to close the door and immediately adjust the air control setting).
- Set the Air Shutter for the desired heat output.

WARNING: Operate the stove only with the front door fully closed except for refueling. Operation with the door partially open may result in overfiring. Also, if the door is left partially open, combustion gas and flame may be drawn out of the stove, creating risks from both fire and smoke.

5.10 Creosote Formation and the Need for Removal

When wood is burned slowly, it produces tar and other vapors that combine with moisture to form creosote. Creosote vapors condense in the relatively cool chimney flue, and creosote residue accumulates on the flue lining. When ignited, this creosote fuels an extremely hot fire.

The chimney connector and chimney flue should be inspected at least every other month during the heating season to determine if creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the chance of a chimney fire.

In the event that creosote ignites in the flue, the resulting fire is often accompanied by a roaring noise and crackling sound as flakes of burning creosote break loose. If you suspect you are having a chimney fire, immediately close the air controls and make sure the door is closed securely. Call the fire department and have everyone leave the house.

Do not attempt to extinguish the fire. Opening the door will only supply additional oxygen and intensify the fire. When the fire in the flue has subsided, resist the temptation to open the door to check on the fire. The fire may have suffocated, but could re-ignite with a supply of fresh air. After a chimney fire, do not use the stove until the chimney connector and flue have been cleaned and inspected to ensure no damage has been sustained.

See Section 6.6 of this manual regarding chimney cleaning.

5.11 Ash Removal

Remove ashes whenever accumulation nears the primary air port located inside the firechamber just under the door opening. Keep a 1 inch layer of ashes in the stove to help maintain a hot coal bed.

Always wear safety gloves when handling the ashes.

Ashes should only be placed in a metal container equipped with a tight sealing lid. The container should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are to be disposed of by burial in soil or otherwise locally dispersed, they should be kept in the closed container until all cinders have thoroughly cooled.

6.0 Maintenance

6.1 Door Latch Adjustment

Over time, as the door gasket becomes compressed, it may be necessary to adjust the door latch in order to maintain the integrity of the door seal. To check the seal of the front door, close and latch the door on a dollar bill and slowly try to pull the bill free. You should feel resistance as you pull. If it can be easily removed, the seal is too loose. Follow this procedure to tighten the latch mechanism.

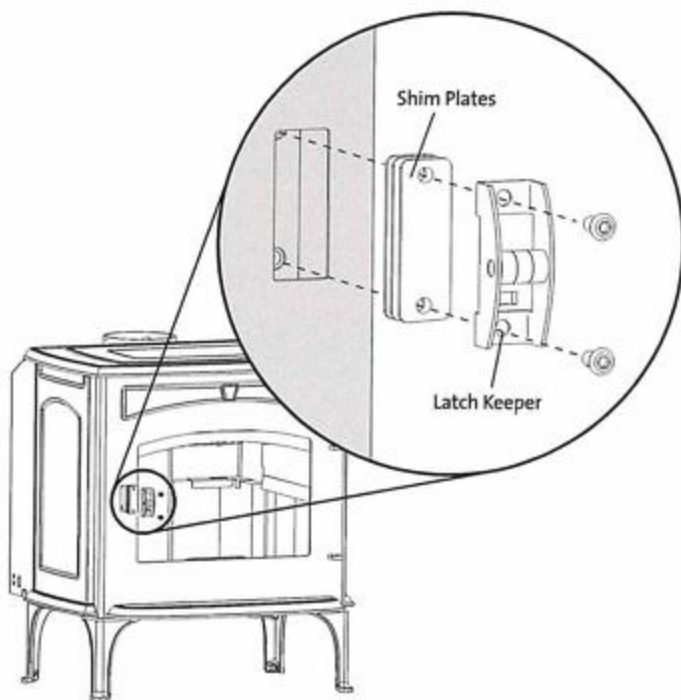


Figure 17. Latch adjustment.

Tools Required: 4 mm hex key

1. Remove the two socket head screws and latch keeper from the stove. See fig. 17.
2. Remove one of the shim plates from the latch cavity and re-install the latch keeper. Retain the shim plate(s) removed for future use.
3. Test the seal integrity using the dollar bill.

The door gasket will compress over time. When the latch can no longer be tightened by shim removal, install a new gasket and replace the shim plates.

6.2 Glass Care

Cleaning

On occasion, it will be necessary to clean the carbon deposits and fly ash off of the glass. If these deposits are allowed to remain on the glass for an extended period of time, the surface may become etched and cloudy. Any creosote that might develop on the glass will burn off during the next hot fire.

Follow this glass cleaning procedure:

1. Glass must be completely cool.
2. Only use a cleaner that is specifically designed for this purpose. **The use of abrasives will damage the glass and ultimately leave the glass frosted. DO NOT USE AMMONIA-BASED GLASS CLEANERS.**
3. Rinse and dry glass completely before burning the stove. Polish with a piece of newspaper.

Caution! Open and close the door slowly and carefully to avoid cracking or breaking the glass. Never use the door to push wood into the firebox. If the glass becomes cracked or broken follow the replacement procedure below.

Do not operate the stove with a cracked or broken glass panel.

Important: Replace glass only with ceramic glass panel PN 224158 specifically designed for the Jøtul F 55. Do not use substitutes. Replacement glass is available from your local Jøtul dealer.

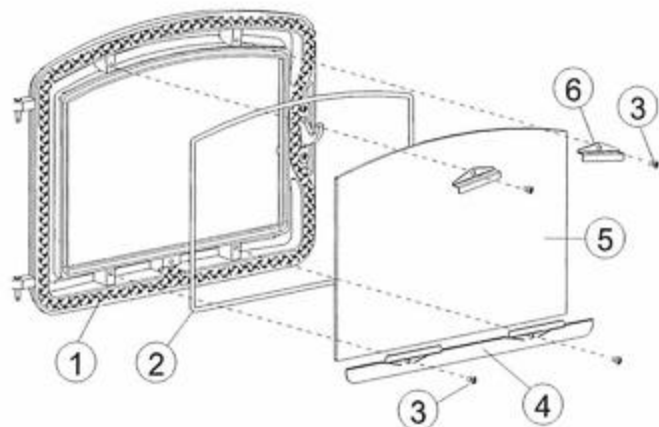
6.3 General Care

Regular maintenance will assure good performance and prolong the life of your stove. The following procedures do not take long and are generally inexpensive. When done consistently, they will increase the life of your stove and in turn provide years of enjoyment.

- Regularly empty the stove of all soot and ashes. Only use a vacuum for this job if the vacuum is specifically designed to handle ashes. **CAUTION: Ashes can contain live embers. Be certain the ash bed contains no live embers before using a vacuum.**
- Inspect the stove: Using a strong light inspect the stove inside and out for cracks or leaks.
- Replace any broken bricks. See fig. 28, page 26. **DO NOT OPERATE THE STOVE WITH BROKEN OR MISSING BRICKS.**

6.4 Gasket Replacement

1. Use pliers and a putty knife to remove the old gasket and adhesive from the door.
2. Thoroughly clean the channel with a wire brush.
3. Apply a small bead of cement to the channel.
4. Gently press the new gasket into the cement to seat it in the channel. Wrap the two ends around and join the ends at the center of the bottom as in fig. 18. Close and latch the door and then reopen. Wipe away any excess cement that may have squeezed out from around the gasket.



Description	Part Number
1. Door Gasket (6 ft.)	223858
2. Glass Gasket (4 1/2 ft.)	200024
3. Screw, M6x10 Button Hd.	117978
4. Lower Glass Clip Ass'y.	157641
5. Glass Panel	224158
6. Upper Glass Clip Ass'y.	157352

Figure 18. Glass and Gasket Replacement

6.5 Glass Removal or Replacement

See fig. 18

1. Place the door face down on a protected surface.
2. First just loosen each M6 x 10 mm button head glass clip screw and then remove the clips.
3. Lift the glass panel out of the door. Use pliers and a putty knife to remove the old glass gasket. Replace with PN 200024, .025 dia. LD2 gasket. Apply a small bead of cement in the channel and gently press the gasket into place.
4. Replace the glass and glass clips. Tighten the clips gradually, avoiding placing uneven pressure on the glass.

6.6 Chimney System

The Jøtul F 55 V2 is designed to burn cleanly and efficiently when used according to the guidelines in this manual. In order to maintain proper performance, you should inspect the chimney and chimney connector at the beginning of each heating season and then every other month during the heating season. Clean the chimney whenever creosote and fly ash accumulation exceeds 1/4 inch in any part of the system.

Chimney brushes are available from your local Jøtul dealer or hardware supply store. Your dealer can also refer you to a reputable, professional chimney sweep who will have all the equipment to ensure a complete and proper job.

WARNING: FAILURE TO KEEP THE CHIMNEY CONNECTOR AND FLUE FREE OF CREOSOTE BUILD-UP CAN RESULT IN A CHIMNEY FIRE.

6.7 Replace Firebricks

DO NOT OPERATE THE STOVE WITH BROKEN OR MISSING BRICKS.

See fig. 28, page 26 and the parts listing on page 27 for the configuration and part number of any firebricks that require replacement. Order through your local Jøtul Authorized Dealer.

7.0 Appendix

7.1 Optional Blower 156431

Tools Required

- 10 mm wrench or socket driver
- pliers
- 1/4" socket driver or flat head screwdriver
- 4 mm hex key
- work gloves

CAUTION:

Avoid injury- always wear work gloves when handling sheet metal parts. Read through these instructions to familiarize yourself with these parts before beginning the installation.

- 115 VAC, 60 HZ, Max. 40 Watts
- This blower must be electrically grounded in accordance with local codes or, in the absence of local codes, with the current ANSI/NFPA 70, National Electrical Code or CSA C22.1-Canadian Electrical Code.
- This unit is supplied with a three-prong (grounding) plug for protection against shock hazard and should be plugged directly into a properly grounded three-prong receptacle. **DO NOT CUT OR REMOVE THE GROUNDING PRONG FROM THE PLUG.**
- Do not connect to power supply until all electrical connections have been made.
- Always disconnect the power supply when performing any service.

Installation

Install the blower kit before moving the stove into its final position. If the stove is already installed, you may need to pull it out to install this blower.

For Freestanding stove installations, where access to the back of the stove is unrestricted, the Control Box may be mounted to either corner of the rear shroud.

For Alcove or Hearthmount installations into fireplaces, the Switch Box must be mounted under the stove, attached to the stove using the left front leg stud. Determine the location most appropriate to your needs and follow the installation steps outlined below.

1. Remove the Rear Shroud:

Use the 4 mm hex key to remove the socket head screws and nuts at the bottom of each side of the Rear Shroud. See fig. 21, (A).

Loosen the two hex nuts at the upper rear of the stove and lift the shroud up off of the stove. See fig. 21, (B). Keep all shroud fasteners for reassembly.

2. Attach the Air Deflector: See figs. 19 and 21 /#3.

Use pliers to bend the deflector tabs at the perforation lines as shown. Attach the deflector to the interior side of the rear shroud using two #8 X 12 sheet metal screws from the exterior side.

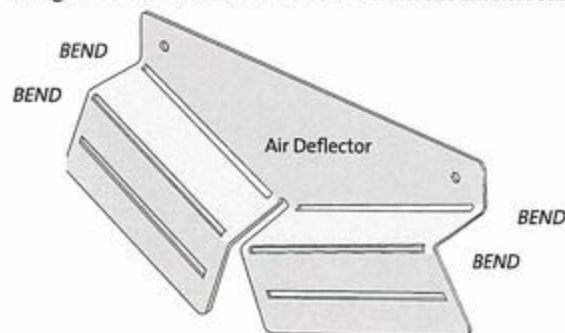


Figure 19. Air Deflector orientation.

3. Attach the Blower Mounting Bracket.

Use pliers to bend back the long, vertical flange to allow the bracket to fit flush against the back of the stove. (Fig. 19 and 21 /#2) to the two center studs on the back of the stove, oriented as shown. Secure with two M6 flange nuts.

4. Attach the Blower to the Mounting Bracket using the two wing nuts (Fig. 21 /#9).

5. Attach the Snapstat Bracket to the lower stud on the back of the stove, oriented as shown in fig. 21 /#7.

Slide the small Snapstat (#6, marked F110-20) all the way into the bracket slot between the stove and the bracket. Connect either snapstat lead to either snapstat terminal.

6. Install the Control Box, fig. 21 /#4:

The Control Box may be mounted to the side of the stove closest to the nearest electrical outlet.

Freestanding Installation-

Attach the control box to either side of the rear shroud using a 1/4" socket driver and one #8 x 12 sheet metal screw as shown in fig. 21.

Alcove or Hearthmount Installation -

Attach the Control Box Mounting Bracket (#5) to the back of the Control Box (#4) using two #8 x 12 sheet metal screws.

Install the M8 hex nut on the left front leg stud and engage the slotted Mounting Bracket/Control Box assembly between that nut and the leg nut. See fig. 21.

Figure 20. Blower Bracket adjustments.

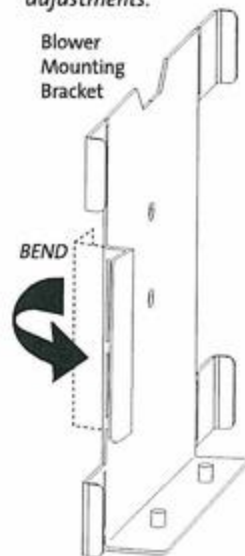
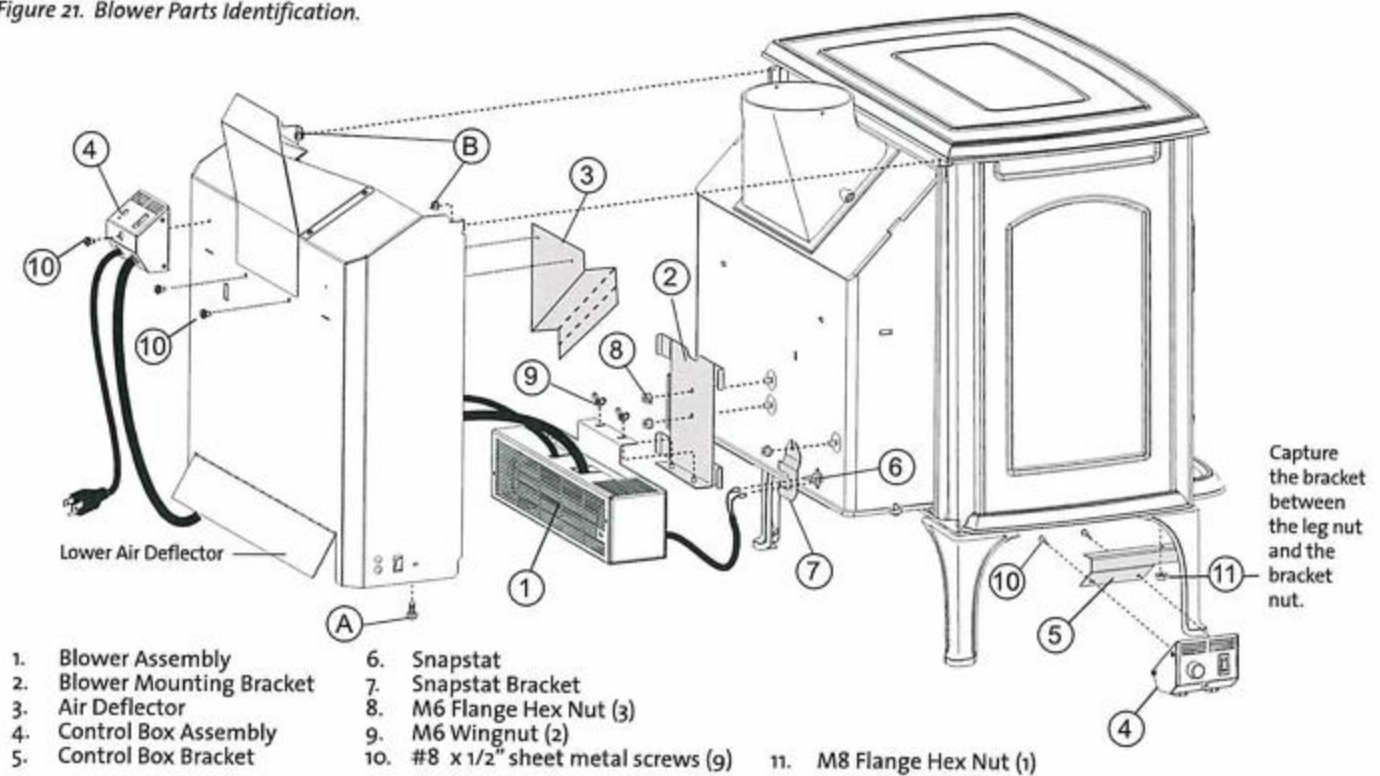


Figure 21. Blower Parts Identification.



7. Bend back the Lower Air Deflector panel on the rear shroud. Reinstall the shroud by reversing the procedure in Step 1. Engage the shroud with the upper hex nuts on the back of the stove and then reinstall the socket head screws at the bottom of each side.

8. Route the power cord to the nearest electrical outlet.

Operation

The blower is controlled by the heat-activated snapstat that will only function when the control switch is set in AUTO. After the fire is established, the snapstat will react to the heat and activate the blower. Fan speed may be manually adjusted with the rheostat knob. The blower will shut off automatically as the stove cools down. If automatic blower circulation is not desired, place the blower control switch in the MANUAL position.

Maintenance

Disconnect the blower from its power source before cleaning or servicing.

Regular cleaning will help ensure you obtain maximum life from the blower. Use a vacuum with a soft brush attachment to clean the blower fans and motor housing at least monthly, or more frequently if there are pets in the home. Keep the area under the stove free of dust and debris.

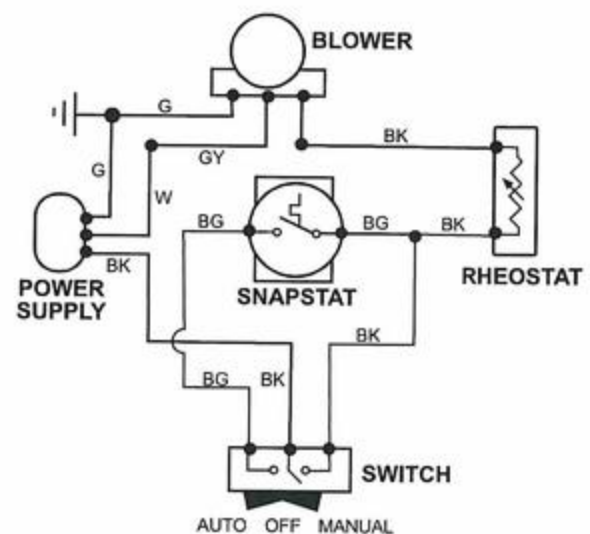


Figure 22.
Blower Wiring diagram.

7.2 Outside Air Kit #158208

NOTE: This kit cannot be used with the Short Leg Kit.

Contents:

- Outside Air Manifold (fig. 23)

Tools Required:

- 10 mm socket driver or wrench
- safety glasses
- work gloves

You will need to acquire the following additional components available at any hardware supplier:

- Exterior Air Inlet Cover
- 4" Aluminum Duct
- Rodent Screen
- 4" Duct Clamps, 2

The exterior air inlet should not be installed at a level higher than the stove bottom.

1. Use the 10 mm socket driver or wrench to remove the four nuts that secure the steel secondary air manifold to the stove bottom and remove the manifold (Fig. 28, #32).
2. Replace the secondary manifold with the Outside Air Manifold and secure it to the stove bottom using the original M6 nuts.
3. Connect the outside air duct, (not provided) to the collar using a duct clamp. Secure the other end of the duct to the interior collar of the Air Inlet using the remaining clamp.

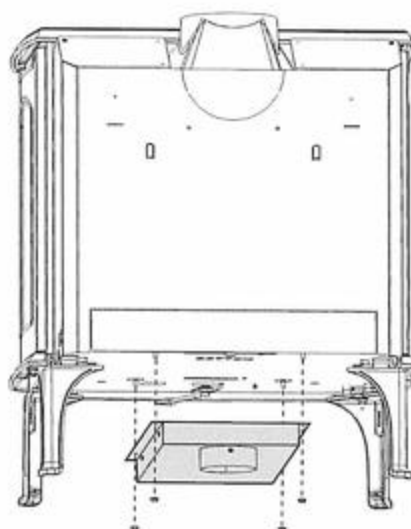


Figure 23. Outside Air Adaptor installation.

7.3 Short Leg Kit #158209

Approved for use only in fireplace hearth mount code-approved installations.

Contents:

- 4 1/4" Steel Legs (4)
- M8 Flange Nuts (4)
- Bottom Heat Shield

Tools Required:

- 13 mm Wrench or Socket/Ratchet
- Work Gloves
- Safety Glasses
- Assistant

DO NOT LIFT THE STOVE UP BY THE ASH LIP.

1. Have an assistant tilt the stove up on one side enough to remove the cast iron legs. Fully remove the nuts from the leg studs.
2. Engage the steel leg with the mounting stud. Be certain the two locating tabs on each leg seat with the corner pockets in the stove bottom. Tighten the nuts using the 13 mm wrench and carefully set the stove back down. See fig. 24a.
3. Repeat the leg installation on the opposite side.
4. With the stove on the ground, place the Bottom Heat Shield over the leg studs. Use the M8 flange nuts in the kit to secure the shield to the leg studs. See figure 24b.

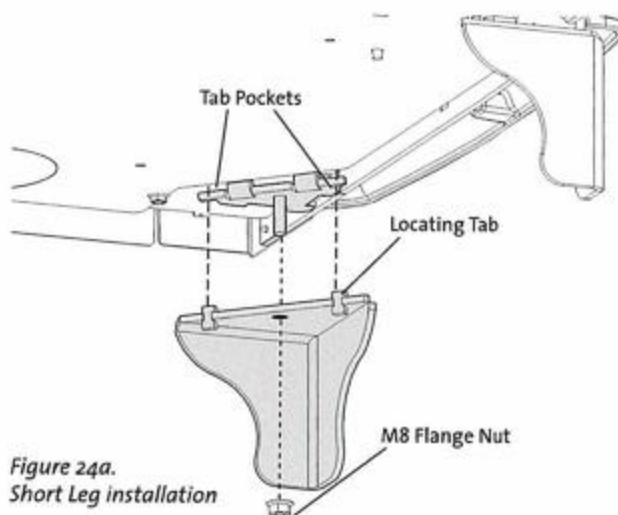


Figure 24a.
Short Leg installation

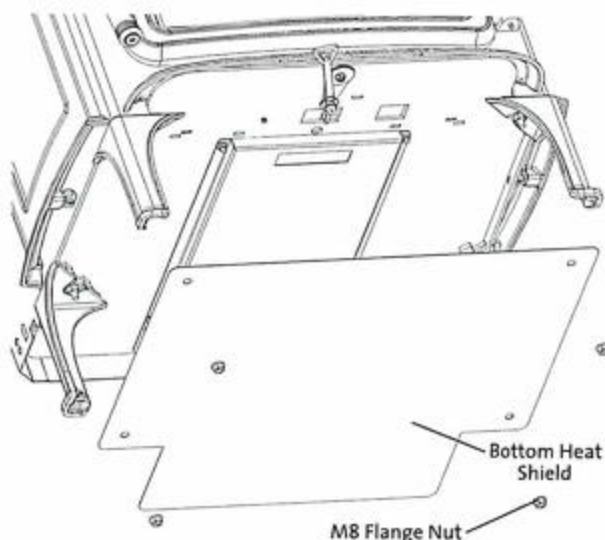


Figure 24b.
Bottom Heat Shield
installation

7.4 Mobile Home Floor Bracket Kit 157321

Contents: Floor Brackets, 2

Fasteners Required: 3/8" dia. lag screws, 2

1. Determine the final location of the stove and use the levelling bolts to plumb and level the stove.
2. Mount the floor brackets over levelling screws at rear and front locations at opposite corners and secure each to the floor using a 3/8" dia. length lag screw of appropriate length (not supplied).

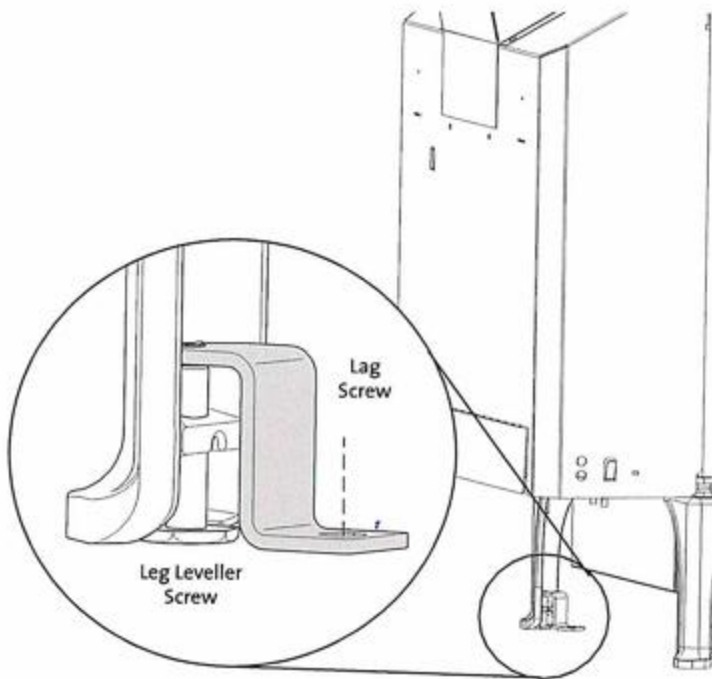


Figure 25. Floor Bracket Detail

7.5 Alternate Floor Protection

All floor protection materials must be non-combustible ie. Metal, brick, stone, mineral fiber boards). Any combustible material may not be used.

The easiest means of determining if a proposed alternate floor material meets requirements listed in this manual is to follow this procedure.

R-value = thermal resistance

K-value = thermal conductivity

C-value = thermal conductance

1. Convert the specification to r-value;
 - a. If r-value is given, no conversion is needed.
 - b. If k-value is given with a required thickness (t) in inches: $R = 1/k \times T$.
 - c. If c-value is given: $R = 1/C$.
2. Determine the r-value of the proposed alternate floor protector.
 - a. Use the formula in step 1 to convert values not expressed as "R".
 - b. For multiple layers, add r-values of each layer to determine overall r-value.
3. If the overall R-value of the system is greater than the R-value of the specified floor protector, the alternate is acceptable.

Example:

The specified floor protector should be 3/4" thick material with a k-factor of 0.84. The proposed alternate is 4" brick with a c-factor of 1.25 over 1/8" mineral board with k-factor of 0.29.

Step A. Use formula above to convert specifications to R-value. $R = 1/k \times t = 1/.84 \times .75 = .893$

Step B. Calculate r of proposed system.

4" brick of c-1.25, therefore

$R \text{ brick} = 1/c = 1/1.25 = 0.80$

1/8" mineral board of K = 0.29 therefore

$R \text{ mineral board} = 1/.29 \times 0.125 = 0.431$

Total R = R brick + R mineral board = $0.8 + 0.431 = 1.231$

Step C. Compare proposed system R = 1.231 to specified R of 0.893. Since R is greater than required, the system is acceptable.

Definitions:

Thermal conductance =

$$C = \frac{\text{btu}}{(\text{Hr})(\text{ft}^2)(\text{f})} = \frac{W}{(\text{m}^2)(\text{k})}$$

Thermal conductivity =

$$K = \frac{\text{btu}}{(\text{Hr})(\text{ft}^2)(\text{f})} = \frac{W}{(\text{m}^2)(\text{k})} = \frac{(\text{btu})}{(\text{hr})(\text{ft})(\text{f})}$$

Thermal resistance =

$$R = \frac{\text{btu}}{(\text{Hr})(\text{ft}^2)(\text{f})} = \frac{(\text{m}^2)(\text{k})}{W} = \frac{(\text{btu})(\text{inch})}{(\text{hr})(\text{ft}^2)(\text{f})}$$

7.6 Secondary Air Manifold Maintenance

Tools Required:

- 10 mm 9 lbs. ft. torque gun or open-end or socket wrench
- 13 mm 16 lbs. ft torque gun open-end or socket wrench
- Small 3mm allen head tool
- Drill with 1/4" hex socket bit
- Helper
- Soft brush or shop vacuum
- Safety Glasses
- Work Gloves

During inspection as instructed in section 6.3 General Care, the secondary air manifold may need to be replaced due to warping, cracking or any functional defect. Call your authorized Jøtul dealer for service.

Follow these instructions for cleaning or replacement of the the secondary air manifold:

1. Disconnect chimney connector from smoke outlet and move the stove away from walls for ease of access to the rear. Use an assistant to move the stove and reduce potential injury.
2. Use a 10 mm open-end or socket wrench to remove the two flange nuts on studs that hold the rear shroud onto the stove.
3. Use a small 3mm allen head tool to remove the two allen heads on the bottom brackets.
4. Use a 10mm open-end or socket wrench to remove the (1) M6x20 bolt from the secondary air manifold on rear of stove.
5. With one hand on the inside of the smoke outlet holding the M6 flange nut, use a 10mm open-end or socket wrench to remove the (2) M6x20 bolts from smoke outlet. Place the smoke outlet out of the way.
6. Use a 13 mm open-end or socket wrench to remove the (2) M8 flange nuts with M8 fender washers retaining the top plate assembly. Access through smoke outlet opening is adequate.
7. Wearing gloves and using both hands or assistance from another person, lift the top plate assembly off of stove. Locate the plate out of the way on a protected surface.
8. Using both hands and avoiding skin contact, lift the insulation blanket up and off top of baffle and out the top opening. Place it on a flat surface taking care to retain its shape. Inspect the blanket for damage and replace it if necessary.
9. Lift the exhaust deflector up and off the two shoulder bolts inside the front plate.
10. Using both hands, remove the secondary air manifold with turbulator through the top opening.
11. Use a soft brush or shop vacuum to remove any fly ash or other loose debris from turbulator and secondary air manifold. Inspect and confirm that the turbulator is secure to the manifold top.
12. Inspect and replace damaged gaskets at the smoke outlet and secondary air manifold.
13. Resecure the secondary air manifold with turbulator to the stove. Use the 10mm open-end or socket wrench to install the (1) M6x20 bolt into rear of stove.
14. Looking through the front door, verify the lip of the manifold is inside firebox air channel and that the manifold is contacting the gasket evenly. Ensure that the gasket is not hanging down. The manifold should rest evenly on both side supports. Readjust manifold if necessary.
15. Using both hands and avoiding skin contact, reinstall the insulation blanket. Fold the blanket over the sides of the air manifold and position the front edge of the blanket even with front edge of the baffle ensuring the turbulator is not obstructed.
16. Using both hands, or assistance from another person, position the set screws on the top plate through the top brackets of firebox.
17. Ensure that the gasket is even around firebox top. Using the 13mm open-end or socket wrench, reinstall the M8 flange nut with M8 fender washer onto each set screw on top plate.
18. Hang the exhaust deflector onto the two shoulder bolts.
19. Reinstall rear shroud to stove. Hang serial plate onto the rear shroud.
20. Prior to reattaching the chimney connector to the smoke outlet, confirm the correct placement of the stove on the floor. See Section 4.6, Clearance to Combustibles.

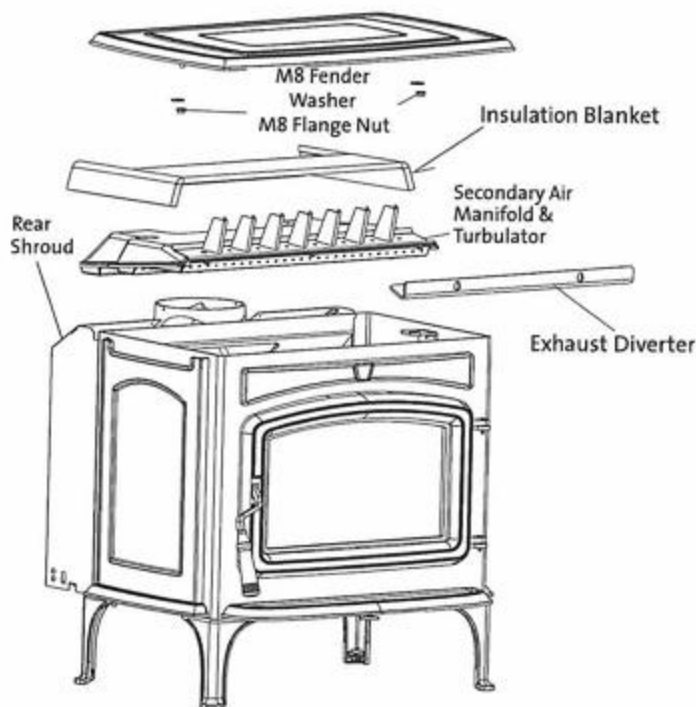


Figure 26. Overview of secondary air manifold removal

7.7 F 55 V2 Start-Up and Refueling

Follow these directions to get the best emissions performance from your F 55 V2:

Cold Start

Use the following technique for the best start from a "cold" stove:

1. Cut and split kindling pieces approximately 16" long. The recommended piece size is 1/2" - 3/4" in cross section. The kindling should be very dry and the total weight would be about 4-1/2 lbs. if hardwood. A recommended stacking arrangement of the fuel pieces is shown in Figure 27.
2. The next fuel increment size for the "start up" pieces should be the same length but a bit larger between 1" to 1-1/2" in cross section. The start-up fuel should total about twice as much in weight as the kindling. Again, the criss-cross loading technique will provide ample air flow through the pieces resulting in a robust start-up.
3. When using a "top down" starting method the start-up pieces will be on the bottom of the firebox with the kindling pieces arranged on top of the start-up pieces.
4. Make sure the air control is fully positioned to the right in which the air control will be full open.
5. For quick and easy ignition a propane torch can be used for about 60 seconds. If doing the top down start-up, light the top front of the pile.
6. Close the door until the latch hits. This will leave the door in a slightly open position.
7. After one minute, close the door fully and secure the door latch.
8. Make sure the air control is still in the maximum open position.

Medium Fire

1. At the end of the previous burn cycle, rake and arrange the remaining coals until they are equally distributed and level across the firebox.
2. Load with all pieces in a front to back (north / south) orientation. Load the larger pieces in the center and make sure there is some space on each side for good air flow.
3. Immediately close the load door and set the air control to maximum open (fully to the right).
4. After 5 minutes, set the air control to the medium position which is in the center of the travel range.

Low Fire

1. At the end of the previous burn cycle, rake and arrange the remaining coals until they are equally distributed and level across the firebox.
2. Load with all pieces in a front to back (north / south) orientation. Load the larger pieces in the center and make sure there is some space on each side for good air flow.
3. Immediately close the load door and set the air control to maximum open (fully to the right).
4. After 15 minutes, adjust the air control handle to the center position and leave it there until the fire is well established on the top of the wood below the baffle. Gradually reduce the air setting over a period of up to 15 minutes until the air control is all the way to the left (minimum air position).

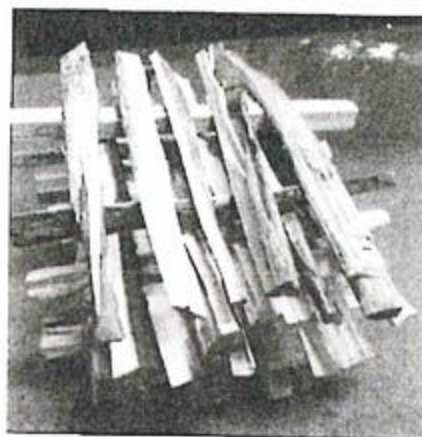


Figure 27. Criss-Cross Pattern

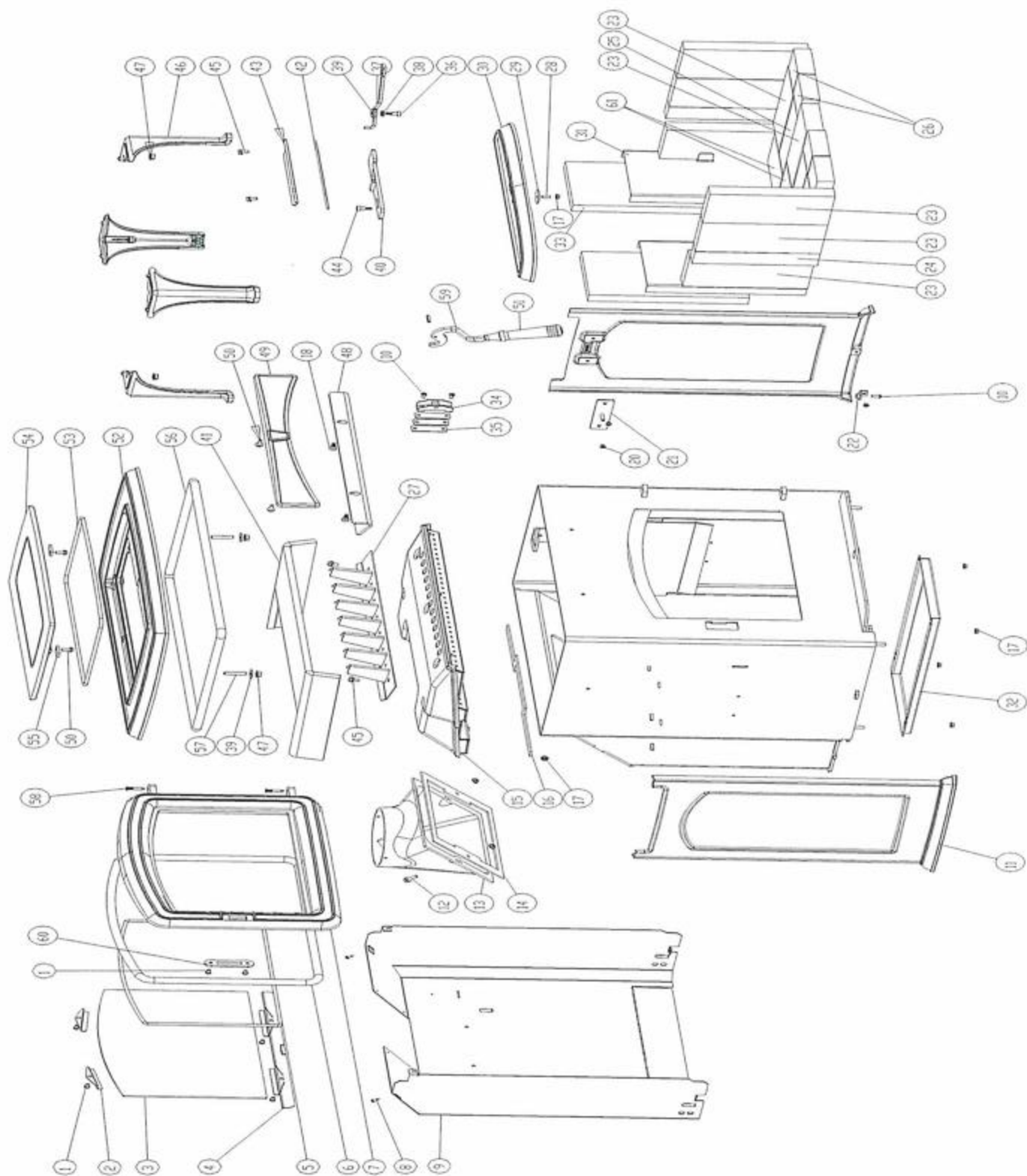


Figure 28.
F55 V2 Carrabassett Illustrated Parts

8.o Jøtul F 55 V2 Carrabassett Parts List

No.	Part Number	Description
1	117978	Screw, Button Head Socket M6X10 Blk
2	157352	Glass Clip w/Gasket, Top, Steel Stoves
3	224158	Glass, Ceramic, Door, 50 TL
4	157641	Glass Clip w/Gasket, Bottom F55
5	200024	Gasket, LD 250 Fiberglass Rope
6	223858	Gasket, MD, .625 Ø Fiberglass Rope
7	157351	Door, Front, w/Gasket, Steel Stoves, MB
8	117917	Screw, HWH SMA 8 x 1/2 SL Blk Oxide
9	22531892	Rear Shroud, 50 TL, MB
10	118215	Screw, Button Head Socket, M6 X 14, Blk
11	157354	Convection Panel, Right, MB, D&T
12	117117	Bolt, Hex Serrated Flange M6 x 20 Blk
13	103326	Smoke outlet, MB
14	224350	Gasket, Flue Collar, 50 TL
15	158194	Secondary Air Manifold Assy.
16	224778	Gasket, Rear Secondary Air Manifold
17	117968	Nut, M6 Serrated Flange plain
18	118244	Screw, Shoulder, M6 Thd, 8mmØx6mm
20	118170	Screw, Button Head Socket, M6 X 6, Blk
21	226582	Bracket, Top, Cast Convection Panel, 50 TL
22	224197	Bracket, Bottom, Cast Convection Panel,
23	129082	Brick, Refractory, 4.50" x 9" x 1.25"
24	220390	Brick, Refractory, 9" x 1.88" x 1.25"
25	222226	Brick, Refractory, 9" x 3.375" x 1.25"
26	224175	Brick, Refractory, 4.0" x 3.0" x 1.25"
27	226681	Turbulator assembly
28	118031	Screw, Socket Set M6 x 16
29	118029	Washer, Fender .250 x 1.500 dia.
30	157348	Ashlip, 50 TL, MB, D&T
31	226730	Cover, Vermiculite Panel
32	226680	Manifold, Bottom Secondary Intake
33	226729	Vermiculite Panel

No.	Part Number	Description
34	224733	Latch Receiver, Front Door
35	224734	Shim, Latch Receiver
36	117982	Screw, Shoulder, M6x10 Thd, 8mmØx-10mm Shld, Hex Drv, Plain
37	225391	Air Valve Handle Ass'y, Nickel Plated
38	118249	Disc Spring,
39	117949	Washer, Fender 8mm Zinc
40	226650	Air Valve Weldment, F55 V2
41	226682	Blanket, Ceramic
42	224355	Gasket, Inspection Cover, 50 TL
43	224924	Inspection Cover
44	117982	Screw, Shoulder, M6x10 Thd, 8mmØx10mm Shld, Hex Drv, Plain
45	117130	Bolt, Hex Head Serr Flange M6x12 Blk
46	157346	Leg, Steel Stoves, MB, D&T
47	117881	Nut, M8, Serrated Flange, DIN 6923 St8.8 / ANSI B 18.2
48	224458	Exhaust Deflector, F 55
49	157353	Eyebrow Steel Stoves, MB, D&T
50	99625	Bolt, Hex Head Serr Flange M6x16 8.8 Blk
51	157262	Front Door Tool, Nickel Plate
52	157356	Top Plate, TL Stoves, MB, D&T
53	100038	Gasket, .360 LD2
54	104627	Top Cover, F 55
55	128401	Side Clip, (Hang Tab)
57	118245	Set Screw, M8 x 40, Hex Socket, Steel, Black, DIN 916
58	225098	Hinge pin, slotted, Nickel Plate
59	157457	Latch, Front Door, Black
60	224159	Retainer, Front Door Latch, 50 TL
61	224723	Brick, 6.625 x 4.5 x 1.25

Only use replacement parts provided through your authorized Jøtul dealer.

9.0 Jøtul F 55 V2 Carrabassett Limited Warranty

This warranty policy applies to wood-burning products identified by Jøtul trade names, as set forth below.

A. LIMITED LIFETIME WARRANTY, parts only -

Jøtul North America Inc. (JØTUL) warrants, to the original retail purchaser, that those baffle and air manifold components of the Jøtul or Scan Stove or Fireplace Insert specified above will be free of defects in material and workmanship for the life of the product. This warranty is subject to the terms, exclusions and limitations set forth below.

B. LIMITED FIVE YEAR WARRANTY - Cast Iron and Steel Components:

JØTUL warrants, to the original retail purchaser, that those components of the Jøtul or Scan Stove or Fireplace Insert specified above will be free of defects in material and workmanship for a period of five (5) years from the date of purchase. This warranty is subject to the terms, exclusions and limitations set forth below.

C. LIMITED TWO YEAR WARRANTY - Enamel Finish:

JØTUL warrants, to the original retail purchaser, the enamel finish on cast iron components of the Jøtul Stove or Fireplace Insert specified above against peeling or fading for a period of two (2) years from the date of purchase. This warranty is subject to the terms, exclusions and limitations set forth below.

D. LIMITED ONE YEAR WARRANTY - Electrical Components (blowers, thermostatic switches):

JØTUL warrants, to the original retail purchaser, that those components of the Jøtul or Scan Stove or Fireplace Insert specified above will be free of defects in material and workmanship for a period of one (1) year from the date of purchase. This warranty is subject to the terms, exclusions, and limitations set forth below:

JØTUL will repair or replace at its option, any of the above components determined by JØTUL to be covered by this warranty. You must, at your own expense, arrange to deliver or ship the component to an authorized Jøtul dealer and arrange for pickup or delivery of the component after repairs have been made. If, upon inspection, JØTUL determines that the component is covered by this warranty, the repair or replacement will be made as set forth above. This warranty is not transferable and is extended only to, and is solely for the benefit of, the original retail purchaser of the Jøtul Stove or Fireplace Insert. This paragraph sets forth the sole remedy available under this warranty in the event of any defect in the Jøtul Stove or Fireplace Insert.

The warranty period for any replaced component will be the remaining unexpired portion of the warranty period for the original component. Please retain your dated sales receipt in your records as proof of purchase.

EXCLUSIONS AND LIMITATIONS

NOTICE: This warranty is void if installation or service is performed by someone other than an authorized installer or service agency, or if installation is not in conformance with the installation and operating instructions contained in this owners manual or local and/or national fire and building regulations. A listing of local authorized installers, service agencies and gas suppliers can be obtained from the National Fireplace Institute at <http://www.nficertified.org/>.

This warranty does not cover the following:

- 1) Repair or replacement of parts that are subject to normal wear and tear during the warranty period or to parts that may require replacement in connection with normal maintenance. These parts include paint, gaskets, burn plates, firebricks, fire grates, ceramic insulation blankets or glass (glass is only warranted against thermal breakage).
- 2) Damage due to incorrect installations not in conformance with the installation instructions contained in this owners manual or local and/or national fire and building regulations.

- 3) Damage, including damage to enamel surfaces, caused by improper operation, over-firing, and/or misuse. Improper operation, such as burning the stove with the ash door open, can damage the stove. Over-firing occurs when any part of the stove glows red. Over-firing can also be identified by warped plates, rust-colored cast iron, paint pigment that has turned dusty white, or bubbling, cracking and discoloration of the enamel finish. Misuse includes, without limitation, use that is not in conformance with the operating instructions contained in this owners manual.
- 4) Damage due to, or repair of, rust. Use of stove-top steamers may cause rust.
- 5) Damage due to service performed by an installer or service agency, unless otherwise agreed to in writing by JØTUL.
- 6) Damage caused by unauthorized modification, use or repair.
- 7) Costs incurred by travel time and/or loss of service.
- 8) Labor or other costs associated with the repair of components beyond the warranty period.
- 9) Damage incurred while the Jøtul Stove or Fireplace Insert is in transit.

IN NO EVENT SHALL JØTUL, ITS PARENT COMPANY, SHAREHOLDERS, AFFILIATES, OFFICERS, EMPLOYEES, AGENTS OR REPRESENTATIVES BE LIABLE OR RESPONSIBLE TO YOU FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR OTHER SIMILAR DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, OR DAMAGES TO A STRUCTURE OR ITS CONTENTS, ARISING UNDER ANY THEORY OF LAW WHATSOEVER. ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, ARE LIMITED IN DURATION TO THE LENGTH OF THIS WRITTEN WARRANTY. EXCEPT AS EXPRESSLY SET FORTH HEREIN, JØTUL MAKES NO ORAL, WRITTEN OR OTHER WARRANTY WITH RESPECT TO JØTUL OR SCAN STOVES OR FIREPLACES.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on the length of implied warranties. Therefore, the above exclusions or limitations may not apply to you. This warranty gives you specific legal rights, and you may have other rights, which vary from state to state.

JØTUL reserves the right to discontinue, modify or change the materials used to produce the Jøtul Stove or Fireplace. JØTUL shall have the right to replace any defective component with substitute components determined by JØTUL to be of substantially equal quality and price.

The dollar value of JØTUL's liability for breach of this warranty shall be limited exclusively to the cost of furnishing a replacement component. JØTUL shall not in any event be liable for the cost of labor expended by others in connection with any defective component. Any costs or expenses beyond those expressly assumed by JØTUL under the terms of this warranty shall be the sole responsibility of the owner(s) of the Jøtul Stove or Fireplace Insert.

No dealer, distributor, or other person is authorized to modify, augment, or extend this limited warranty on behalf of JØTUL. NO MODIFICATION OR CHANGE TO THIS WARRANTY WILL BE EFFECTIVE UNLESS IT IS MADE IN A WRITTEN DOCUMENT MANUALLY SIGNED BY AN AUTHORIZED OFFICER OF JØTUL.

An authorized installer may have been provided with certain information related particularly to the Jøtul Stove or Fireplace Insert; however, no authorized installer or other person who may service the appliance is an agent of JØTUL. No inference should be made that JØTUL has tested, certified, or otherwise pronounced any person as qualified to install or service the appliance. JØTUL shall not be liable or otherwise responsible for any error or omission by a person installing or servicing a Jøtul Stove or Fireplace Insert.

If you believe your Jøtul or Fireplace Insert is defective, you should contact your nearest authorized Jøtul dealer, who will process a warranty claim. IN ORDER TO QUALIFY FOR WARRANTY COVERAGE, JØTUL MUST RECEIVE NOTICE OF A POSSIBLE DEFECT WITHIN SIXTY (60) DAYS OF THE DATE THE DEFECT IS FIRST DISCOVERED, OR REASONABLY COULD HAVE BEEN DISCOVERED.

This warranty is given by Jøtul North America, Inc.,
55 Hutcherson Drive, Gorham, Maine 04038 USA

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February, 2020
139009

We appreciate your trust in welcoming our product into your home and invite your comment and appraisal of our efforts to provide you with the finest in home hearth products.

Jøtul pursues a policy of continuous product development. Products supplied may therefore differ in specification, colour and type of accessories from those illustrated and described in this manual.



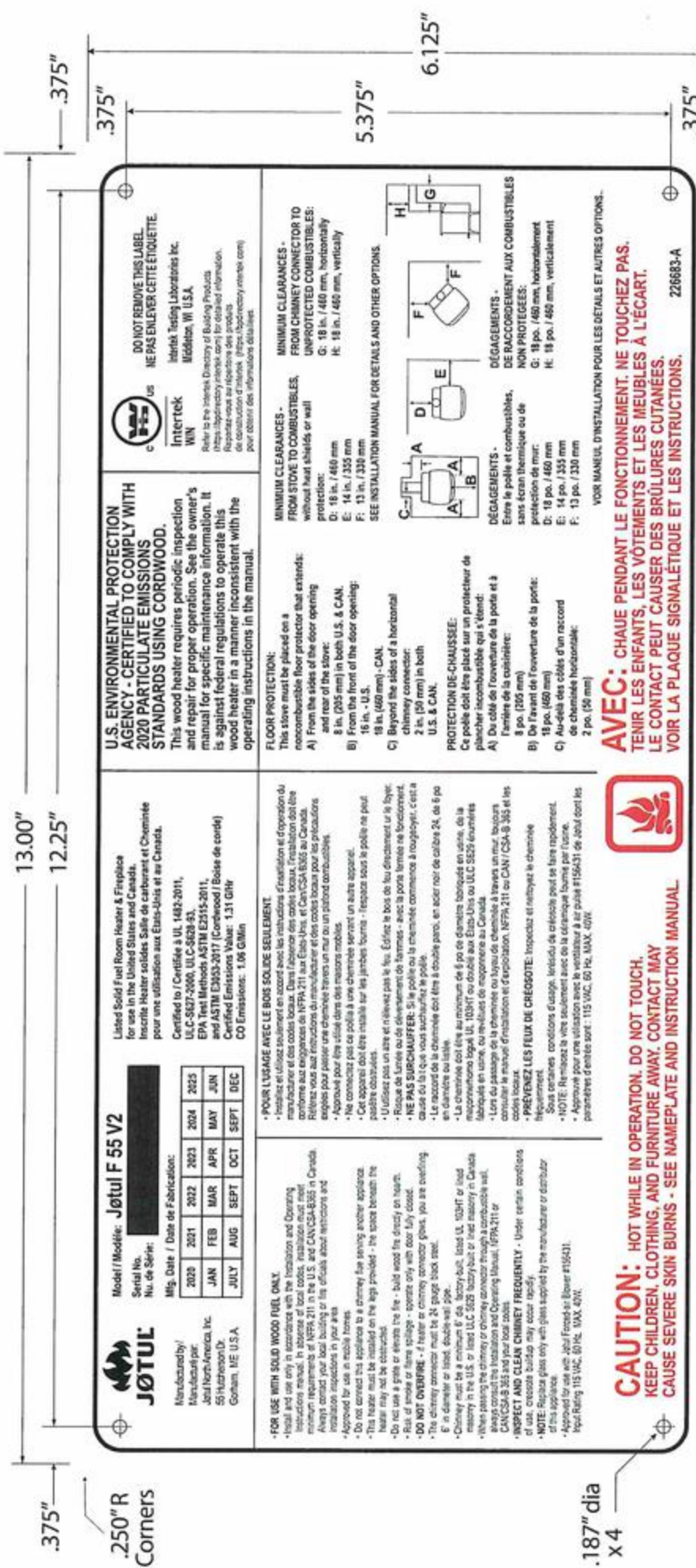
Jøtul North America Inc.

P.O. Box 1157
55 Hutcherson Drive
Gorham, Maine 04038
USA

Jøtul AS

P.O. Box 1411
N-1602 Fredrikstad,
Norway

www.jotul.us



Model / Modèle: Jøtul F 55 V2
Serial No. / No. de Série: [Redacted]
Mfg. Date / Date de Fabrication: [Redacted]

Year	2020	2021	2022	2023	2024	2025
Jan						
Feb						
Mar						
Apr						
May						
Jun						
Jul						
Aug						
Sept						
Oct						
Nov						
Dec						

Manufactured by / Manufacturé par:
Jøtul North America, Inc.
55 Hutchinson Dr.
Gorham, ME U.S.A.

U.S. ENVIRONMENTAL PROTECTION AGENCY - CERTIFIED TO COMPLY WITH 2020 PARTICULATE EMISSIONS STANDARDS USING CORDWOOD.

This wood heater requires periodic inspection and repair for proper operation. See the owner's manual for specific maintenance information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the manual.

U.S. ENVIRONMENTAL PROTECTION AGENCY - CERTIFIED TO COMPLY WITH 2020 PARTICULATE EMISSIONS STANDARDS USING CORDWOOD.

This wood heater requires periodic inspection and repair for proper operation. See the owner's manual for specific maintenance information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the manual.

DO NOT REMOVE THIS LABEL. NE PAS ENLEVER CETTE ÉTIQUETTE.

Intertek
WIN
Intertek Testing Laboratories Inc.
Middleton, WI U.S.A.

Refer to the Intertek Directory of Building Products (<https://directory.intertek.com>) for detailed information. Répertoire des produits de construction d'Intertek (<https://directory.intertek.com>) pour obtenir des informations détaillées.

MINIMUM CLEARANCES - FROM CHIMNEY CONNECTOR TO UNPROTECTED COMBUSTIBLES:
G: 18 in. / 460 mm, horizontally
H: 18 in. / 460 mm, vertically

SEE INSTALLATION MANUAL FOR DETAILS AND OTHER OPTIONS.

MINIMUM CLEARANCES - FROM STOVE TO COMBUSTIBLES, without heat shields or wall protection:
D: 18 in. / 460 mm
E: 14 in. / 350 mm
F: 13 in. / 330 mm

FLOOR PROTECTION:
This stove must be placed on a noncombustible floor protector that extends:
A) From the sides of the door opening and rear of the stove:
8 in. (203 mm) in both U.S. & CAN.
B) From the front of the door opening:
18 in. (460 mm) - U.S.
18 in. (460 mm) - CAN.
C) Beyond the sides of a horizontal chimney connector:
2 in. (50 mm) in both U.S. & CAN.

PROTECTION DE CHAUSSE:
Ce poêle doit être placé sur un protecteur de plancher incombustible qui s'étend:
A) Du côté de l'ouverture de la porte et à l'arrière du poêle:
8 po. (203 mm)
B) De l'avant de l'ouverture de la porte:
18 po. (460 mm)
C) Au-delà des côtés d'un raccord de cheminée horizontale:
2 po. (50 mm)

DÉGAGEMENTS - DE RACCORDEMENT AUX COMBUSTIBLES NON PROTÉGÉS:
G: 18 po. / 460 mm, horizontalement
H: 18 po. / 460 mm, verticalement

DÉGAGEMENTS - sans écran thermique ou de protection de mur:
D: 18 po. / 460 mm
E: 14 po. / 350 mm
F: 13 po. / 330 mm

PROTECTION DE CHAUSSE:
Ce poêle doit être placé sur un protecteur de plancher incombustible qui s'étend:
A) Du côté de l'ouverture de la porte et à l'arrière du poêle:
8 po. (203 mm)
B) De l'avant de l'ouverture de la porte:
18 po. (460 mm)
C) Au-delà des côtés d'un raccord de cheminée horizontale:
2 po. (50 mm)

PREVENIR LES FEUX DE CROISSE: Inspectez et nettoyez la cheminée fréquemment.
Under certain conditions of use, creosote buildup may occur rapidly.
NOTE: Repair glass only with glass supplied by the manufacturer or distributor of this appliance.
Approved for use with Jøtul F-series stoves by Intertek #156431.
Repair Rating 119 W.C. 6796, 100% 40H.

VOIR MANUEL D'INSTALLATION POUR LES DÉTAILS ET AUTRES OPTIONS.

VOIR MANUEL D'INSTALLATION POUR LES DÉTAILS ET AUTRES OPTIONS.

VOIR MANUEL D'INSTALLATION POUR LES DÉTAILS ET AUTRES OPTIONS.

VOIR MANUEL D'INSTALLATION POUR LES DÉTAILS ET AUTRES OPTIONS.

CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SEVERE SKIN BURNS - SEE NAMEPLATE AND INSTRUCTION MANUAL.

CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SEVERE SKIN BURNS - SEE NAMEPLATE AND INSTRUCTION MANUAL.

CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SEVERE SKIN BURNS - SEE NAMEPLATE AND INSTRUCTION MANUAL.

CAUTION: HOT WHILE IN OPERATION. DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SEVERE SKIN BURNS - SEE NAMEPLATE AND INSTRUCTION MANUAL.

AVEC: CHAUE PENDANT LE FONCTIONNEMENT. NE TOUCHEZ PAS. TENIR LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES À L'ÉCART. LE CONTACT PEUT CAUSER DES BRULURES CUTANÉES. VOIR LA PLAQUE SIGNALÉTIQUE ET LES INSTRUCTIONS.

AVEC: CHAUE PENDANT LE FONCTIONNEMENT. NE TOUCHEZ PAS. TENIR LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES À L'ÉCART. LE CONTACT PEUT CAUSER DES BRULURES CUTANÉES. VOIR LA PLAQUE SIGNALÉTIQUE ET LES INSTRUCTIONS.

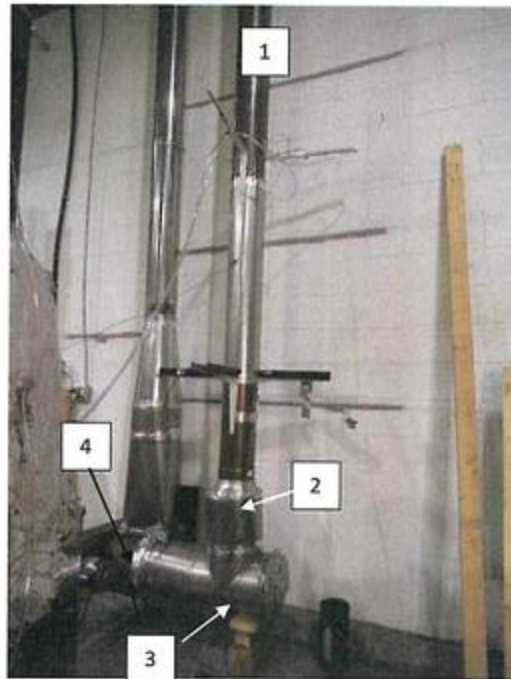
AVEC: CHAUE PENDANT LE FONCTIONNEMENT. NE TOUCHEZ PAS. TENIR LES ENFANTS, LES VÊTEMENTS ET LES MEUBLES À L'ÉCART. LE CONTACT PEUT CAUSER DES BRULURES CUTANÉES. VOIR LA PLAQUE SIGNALÉTIQUE ET LES INSTRUCTIONS.

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APPENDIX 8: Photographs of test set up

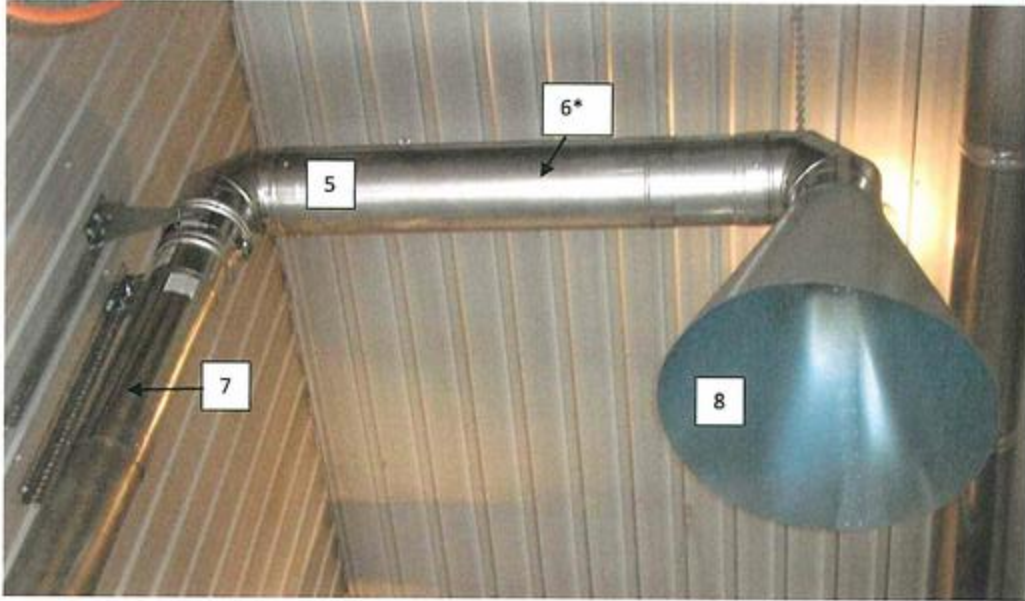
Dilution picture Dia 8

Picture 1: Sampling system



- 1** : 8 in dia Stainless steel pipe
- 2** : 16 in. Between sampling probe and lower elbow
- 3** : Air intake with damper to adjust flow rate
- 4** : Exhaust blower

Picture 2: Hood and mixing baffle



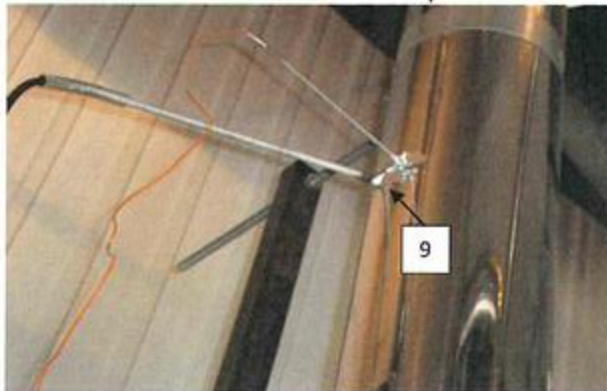
*The arrow point the deflectors inside of the pipe

- 5 : 8 in. dia. Stainless steel pipe
- 6 : Mixing baffle (2) location 1 foot between baffles
- 7 : 10 feet long between velocity port and upper elbow
- 8 : 48 in. dia. Galvanizing steel smoke captures hood

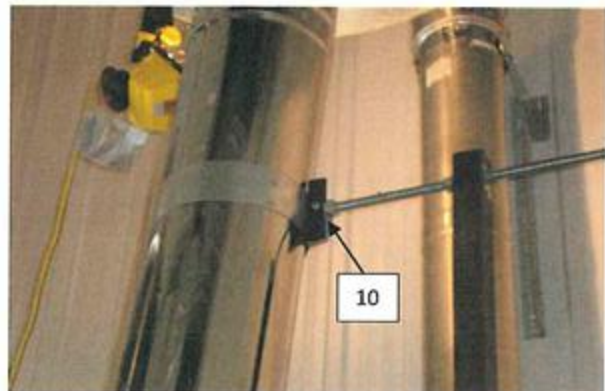
Picture 3: Stack sampling



Picture 3.1: Gas analysis and temperature probe

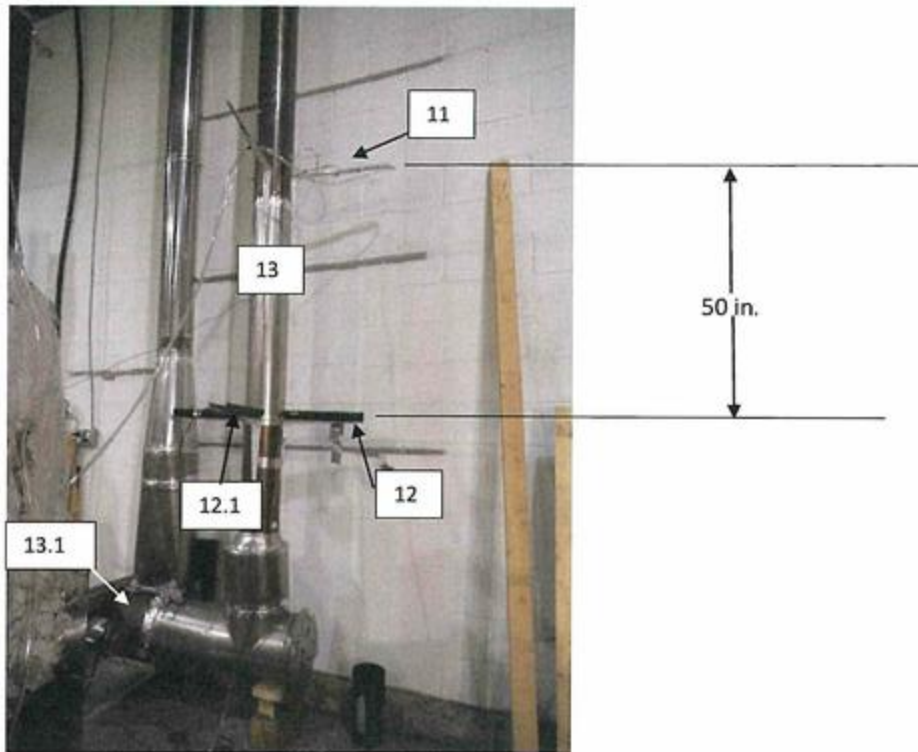


Picture 3.2: chimney support



- 9 : Temperature and gas analyser sampling ports located 9 feet above platform
- 10 : Exhaust system support bracket

Picture 4: Tunnel flow measurement and sampling probe



11 : Velocity port

12 :Sampling port, 2 sampling probes with 2x48 mm. dia.filter each. Filter used:
Millipore AP4004700

12.1 :Sampling port, sampling probes with 2x48 mm. dia.filter each. Filter used:
Millipore AP4004700, for first hour sampling

13 :18 feet long dilution tunnel

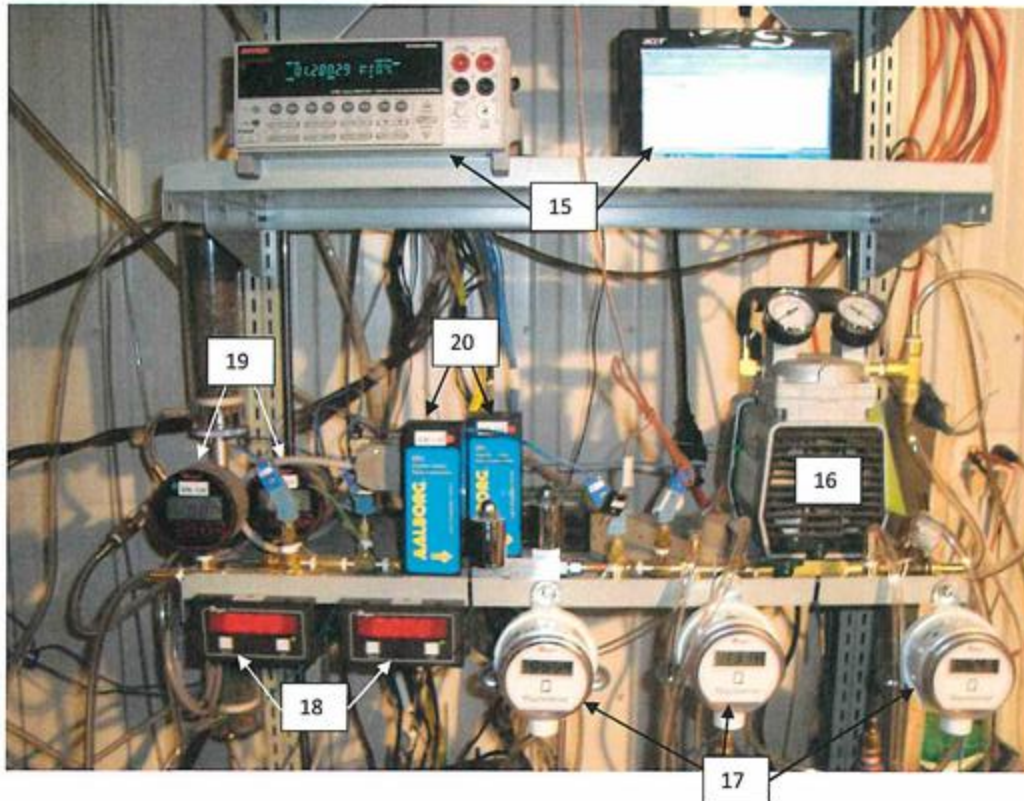
13.1 :Extraction blower

Picture 5: Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Picture 6: Equipments



- 15 : Acquisition system
- 16 : Vacuum pump
- 17 : Digital manometer
- 18 : Digital read out for mass flow meter
- 19 : Digital vacuum gage
- 20 : Mass flow meter

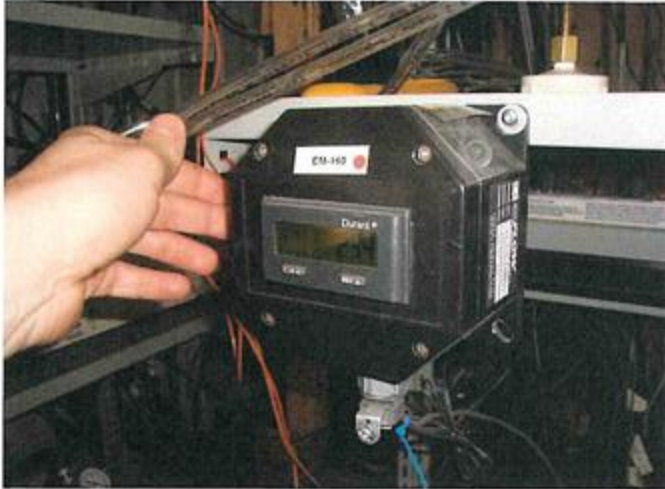
Picture 7: Gaz analyser



Picture 8: Reference dry gas meter



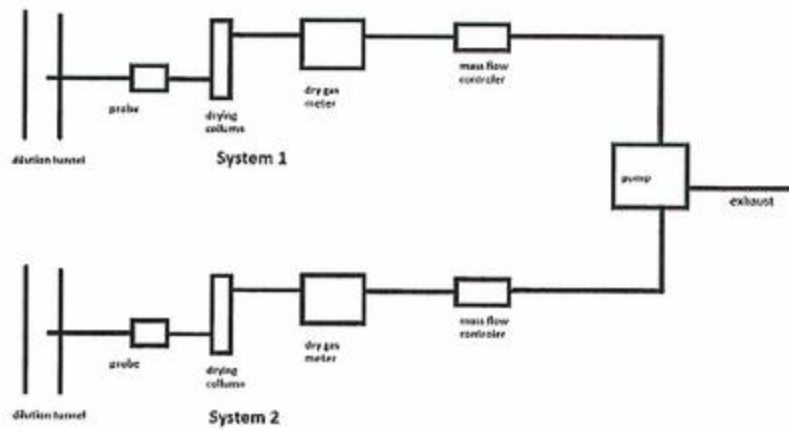
Picture 10: Water flow meter



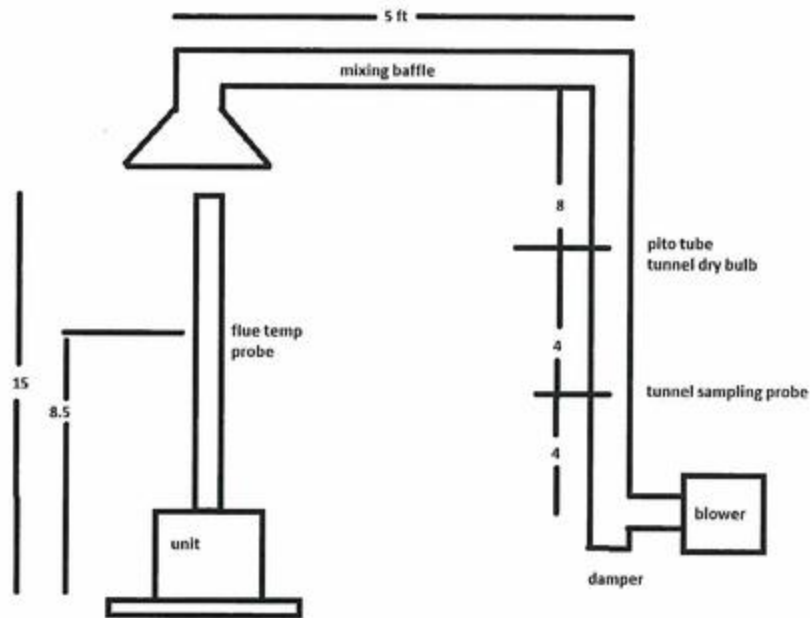
Picture 11: Dry gas meter



Picture 12 : Dilution tunnel sample system



Picture 13: Dilution tunnel

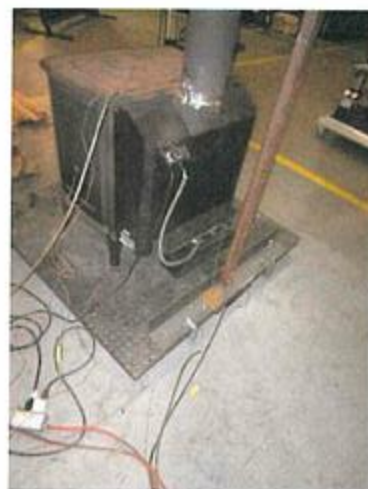


APPENDIX 9: Test load photographs

Run 1.1



Run 1.2

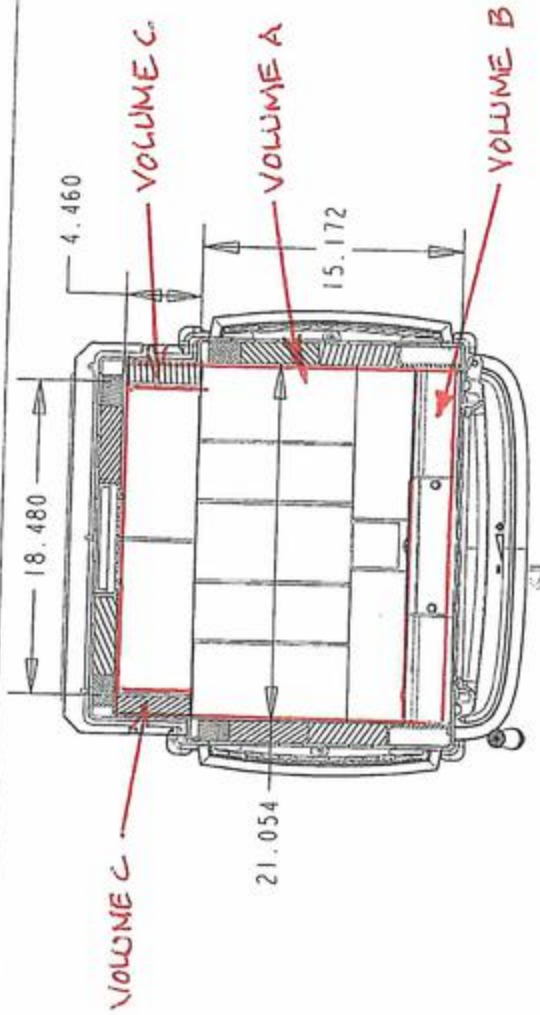
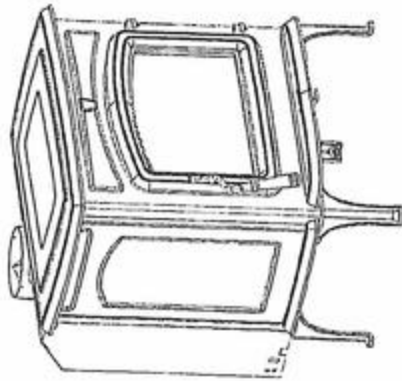


Run 2.1

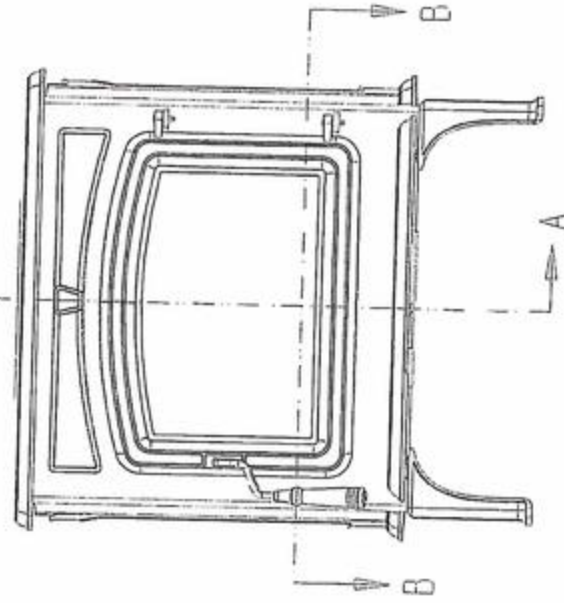
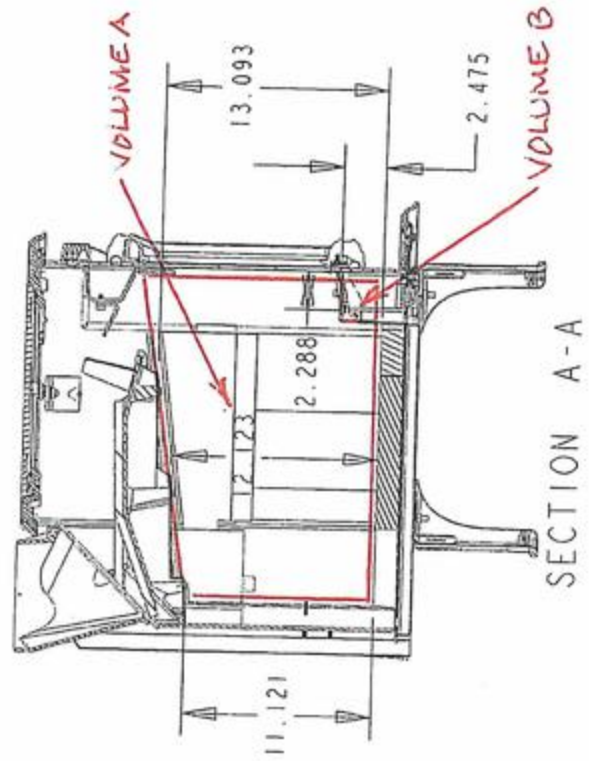


APPENDIX 10: Laboratory Operating Procedures

APPENDIX 12: Volume calculations



SECTION B-B



FIREBOX DETAIL VIEW, JØTUL F55 V2, DWG. 351437D



F 55 V2 Useable Firebox Volume Calculation

Volume	Width	Depth	Height	Multiplier	Total	Notes
A	21.054	19.632	12.107		5,004.212	Base volume
B	21.054	2.288	2.475		119.225	Subtracted volume
C	1.25	4.46	11.121	2	123.99915	Subtracted volume
					4,760.988	cu. in.
					2.76	cu .ft.
						Total useable firebox volume

St-jean-sur-Richelieu, February 16th 2020

Client: Jotul

Project: PI-20206

Model: F55 V2

APPENDIX 13: Operating instruction

High Fire with a Cold Start

To start the fire from a "cold" stove:

1. Cut and split approximately 19 kindling pieces 16 inches long. Half of them should be approximately $\frac{3}{4}$ inch square, the rest $\frac{1}{2}$ inch square. The kindling should be very dry and weigh approximately 4.8 lbs.
2. Cut and split approximately 15 start-up fuel pieces 16 inches long. Half of the pieces should be larger cross-section (approximately $1\frac{1}{2}$ inches square) and the rest smaller cross-section (approximately 1 inches square). These can be split from larger fuel pieces that are in the range of 19-25% moisture (Dry-basis). The total weight of the start-up fuel should be approximately 7.2 lbs.
3. Arrange the start-up fuel pieces in a grid on the bottom of the firebox. Place 2 of the larger pieces running side to side and 8 to 10 inches apart to form the base of the grid. Next place a row of the 4 of the larger pieces running front to back and evenly spaced. Next place 2 of the smaller pieces running side to side and spaced 8 to 10 inches apart. Next add the 5 of the smaller pieces running front to back. Next, add two pieces of the smaller start-up pieces running side to side.
4. Next arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of two pieces acting as spacers for the 5 pieces layers. See Photos.



Start-



up Fuel

Kindling

Kindling on top, start up fuel on bottom, stacked in fire box from largest cross-section on the bottom to smallest on the top.

5. Make sure the air control is fully open to the right.
6. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.
7. Close the door until it hits the latch. This will leave the door in a slightly open position.
8. After one minute, close the door fully and secure the door latch.
9. Make sure the air control is still in the maximum open position.

Adding the High Fire fuel load:

1. When the kindling and start up fuel have burned down by approximately 2/3, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the largest fuel piece in the center of the firebox with two smaller pieces on the either side packed tightly together and making sure there is space on both sides of the load for good air flow. Place the remaining pieces on top of the bottom pieces. All fuel pieces should be in a front to-back orientation. Air control should be set to maximum open (fully to the right).

Low Fire Fueling and Operation (loading on coals after High Fire operation):

1. At the end of the high fire rake the remaining coals forward until they are equally distributed and level across the firebox.
2. Place the largest fuel piece in the center of the firebox with two smaller pieces on either side packed tightly together making sure there is space in both sides of the load for good airflow. Place the remaining pieces on top. All fuel pieces should be in a front-to-back orientation.
3. Immediately close the door and open the air control to maximum open (fully to the right).
4. After 5 minutes, adjust the air control handle to the center position and leave it there until the fire is well established on the top of the wood. Gradually reduce the air setting over a period of up to 15 minutes after the fuel was loaded until the air control handle is all the way to the left (minimum air position).

Medium Fire Fueling and Operation (loading on coals after High Fire operation):

1. At the end of the high fire rake the remaining coals forward until they are equally distributed and level across the firebox.
2. Place the largest piece in the center of the firebox with two smaller pieces on either side, packed tightly together making sure there is space on both sides of the load for good air flow, place the remaining pieces on top. All fuel pieces should be in a front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (fully to the right).
4. After 5 minutes set the control to the medium air flow position which is the center of its range of travel.

Blower Settings for all tests

High Fire Cold Start: Blower on HIGH in automatic on mode

Medium Fire: Blower on MEDIUM in automatic on mode

Low Fire: Blower on LOW in automatic on mode

APPENDIX 14: Drawing Air flow pattern

APPENDIX 15: Application for wood stove program

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
2015 Standards of Performance for New Residential Wood Heaters, New Residential
Hydronic Heaters and Forced-Air Furnaces Application
40 CFR PART 60 SUBPARTS AAA AND QQQQ

Disclaimer: The statutory provisions and the EPA regulations described in this document contain legally binding requirements. This document is not a substitute for those provisions or regulations, nor is it a regulation itself. In the event of a discrepancy, please refer to 40 CFR PART 60 Subparts AAA AND QQQQ, Sections 60.533(b), 60.5475(b), and Appendix A-8. This document may be revised periodically without public notice. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

Contents

Application for us epa wood heater certification pursuant to 40 cfr PART 60 Subparts AAA and QQQQ	1
Application for A Certificate of Compliance pursuant to 40 cfr PART 60 Subparts AAA and QQQQ.....	2
2015 Standards of Performance for New Residential Wood Heaters, new residential hydronic heaters and forced-air furnaces.....	2
General Information.....	2
Manufacturer's Authorized Representative INFORMATION.....	2
EPA-Approved Test Laboratory	3
Compliance Statements and Acknowledgements – Sections 60.533(b) and 60.5475(b)	4
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For emissions data summary tables see attachments	4
Wood Burning Heaters	6
I. Test ALT-125 for Certification and Auditing of Wood Heaters	6
A. Summary Results – Adjustable Wood Burning Heaters	6
Weighted average summary	6
Weighted average Final results.....	6

**APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR
PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW
RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES**

GENERAL INFORMATION

Manufacturer's Name: Jotul North America

Heater Type (Circle One):	Adjustable Burn Rate Wood Heater	Pellet Stove	Single Burn Rate Heater	Hydronic Heater	Forced Air Furnace	Other:
Hydronic Heater Type (Circle One):	Traditional	Full Storage	Partial Storage	Indoor/Outdoor	Other:	
Forced-Air Furnace Type (Circle One):	Small (less than 65,000 BTU/hr heat output)		Large (greater than 65,000 BTU/hr heat output)		Other:	
Fuel Tested:	Crib	Pellet	Cordwood	Wood Chips	Other:	

Test Method(s) ALT-125
ASTM E3053-17 ASTM E2515-11 CSA B415.1-10 **Catalyst:** No

Model Name and Design Number (The model name and design number must clearly distinguish one model from another. The name and design number cannot include the EPA symbol or logo or name or derivatives such as "EPA): F 55 V2

Physical Address (Street number and Address, not P.O. Box):

55 Hutcherson Drive

Mailing Address:

55 Hutcherson Drive

City: Gorham

State: Maine

ZIP Code: 04038

Phone: 207-591-6601

Email:

Website: Jotul.com/us

EPA Submission Date of 30 day Notice:

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name: Roger W. Purinton

Position/Title: Research & Development Manager

Address: 55 Hutcherson Drive

City: Gorham

State: Maine

ZIP Code: 04038

Phone: 207-591-6621

E-mail:
rpurinton@jotulnoamer.com

Website: Jotul.com/us

Remarks:

**APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR
PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW
RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES**

EPA-APPROVED TEST LABORATORY

Name of Test Laboratory: Polytests Services Inc.

Name of Person Authorized or Responsible for Conducting Compliance Test: Danick Power

Position/Title: VP operation

Address: 695-B Gaudette,

City: St-Jean-sur-Richelieu

State: Quebec, Canada

ZIP Code: J3B 7S7

Phone: 450 741-3636

Email: dpower@polytests.com

Website: www.polytests.com

Remarks:

EPA-Approved Third Party Certifier

Name of Certifier Entity: Intertek Testing Services

Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity:
Charles Myers

Position/Title: Certification Manager

Address: 545 E. Algonquin Road

City: Arlington Heights

State: Illinois

ZIP Code: 60005

Phone: 312-906-7783

Email:
Charles.meyers@intertek.com

Website:

Remarks:

COMPLIANCE STATEMENTS AND ACKNOWLEDGEMENTS – SECTIONS 60.533(B) AND 60.5475(B)

INSTRUCTIONS: PLEASE READ THE BELOW STATEMENTS AND AFFIRMATIONS AND ADDRESS ACCORDINGLY.

FOR EMISSIONS DATA SUMMARY TABLES SEE ATTACHMENTS

1. Engineering Drawings Statement

Complete engineering drawings and specifications of components that may affect emissions (including specifications for each component listed in paragraphs (k)(2), (3) and (4) of 60.533(b) and 60.5475(b) are provided as part of the certification test report. Manufacturers may use assembly or design drawings that have been prepared for other purposes, but must designate on the drawings the dimensions of each component listed in paragraph (k) of this section. No tolerances of components listed in paragraph (k)(2) of 60.533(b) and 60.5475(b) that are different from those specified in that paragraph, and show that such tolerances cannot reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits. The drawing xxxxxx is provided that identifies how the emission-critical parts, such as the secondary combustion baffle, can be readily inspected and replaced.

2. Firebox Statement Requirement

Neither the firebox or any firebox component (including the materials listed in paragraph (k)(3) of 60.533(b) and 60.5475(b) will be composed of material different from the material used for the firebox or firebox component in the wood heater on which certification testing was performed.

3. CBI

No information is claimed as CBI in EPA submittal.

4. Valid Certification Statement

All documentation is provided pertaining to a valid certification test, including the complete test report and, for all test runs: Raw data sheets, laboratory technician notes, calculations and test results. Documentation includes the items specified in the applicable test methods. Documentation includes discussion of each test run and its appropriateness and validity, and detailed discussion of all anomalies, whether all burn rate categories were achieved, any data not used in the calculations and, for any test runs not completed, the data collected during the test run and the reason(s) that the test run was not completed and why. The burn rate for the low burn rate category was no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer. The test report includes a summary table that clearly presents the individual and overall emission rates, efficiencies and heat outputs. The test report and all associated required information, are submitted according to the procedures for electronic reporting specified in § 60.537(f) and 60.5475(f). **Full CBI and NON-CBI report will be provided to the EPA to issue the certificate. NON-CBI report will be available on manufacturer's website.**

5. Warranties

Warranty information will be provided in the Owner's manual that will accompany the product. The Owner's manual contains information expressing that the warranties are void if the unit is used to burn materials for which the unit is not certified by the EPA and void if not operated according to the owner's manual.

6. Q/A Statement

A quality assurance program for the model line will be created that satisfies the requirements of paragraph (m) of this section.

7. Laboratory Sealing of Unit

The unit will be sealed by the laboratory following test series and will be kept for at least 5 years by the manufacturer.

8. Statements that the wood heaters manufactured under this certificate will be—

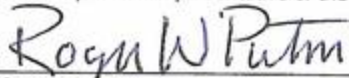
- (i) The model will be similar in all material respects that would affect emissions as defined in § 60.531 to the wood heater submitted for certification testing, and labeled as prescribed in § 60.536 and 60.5478.
- (ii) Each unit produced will be accompanied by an owner's manual that meets the requirements in § 60.536 and 60.5478. In addition, a copy of the owner's manual will be submitted to the Administrator and be available to the public on the manufacturer's web site.

9. Third Party Certification Statement

Jøtul North America has entered into contracts Polytests Services Inc, an approved test laboratory, and Intertek Testing Services, a third-party certifier in order to satisfy the requirements of paragraph (f) of section 60.533.

10. Approved laboratory/third party Statement

The approved laboratory and approved third-party certifier are allowed to submit information on behalf of Jøtul North America, including any claimed to be CBI.

11. Manufacturer's Website Certification Test Reports Availability Statement Jøtul North America will place a copy of the certification test report and summary on its web site available to the public within 30 days after the Administrator issues a certificate of compliance.	
12. Transferability Acknowledgement Statement Jøtul North America acknowledges that the certificate of compliance cannot be transferred to another manufacturer or model line without written approval by the Administrator.	
13. Statement about Selling Wood Heaters without an EPA Certificate Jøtul North America acknowledges that it is unlawful to sell, distribute or offer to sell or distribute an affected wood heater without a valid certificate of compliance.	
ROGER W. PURINTON RESEARCH & DEVELOPMENT MANAGER	Date: 02/25/2020
Print Name and Title:	
Signature of responsible representative of the manufacturer certifying the accuracy of the above statements: 	
The authorized or responsible party whose signature is above is certifying that the manufacturer has complied with and will continue to comply with all requirements of the 2015 NSPS for compliance certification and that the manufacturer remains responsible for compliance regardless of any error by the test laboratory or third-party certifier.	

Attachments

Instructions: Please complete the section applicable to your certification request. You may substitute your own data tables in lieu of the ones shown below provided that all the information is captured.

WOOD BURNING HEATERS

I. Test ALT-125 for Certification and Auditing of Wood Heaters

A. SUMMARY RESULTS – ADJUSTABLE WOOD BURNING HEATERS

WEIGHTED AVERAGE SUMMARY

Model name / number	F 55 V2		
Usable Firebox volume	2.76		
Convection air Fan (no, Standard, option)	optional		
average for each test run category	L	M	H
burn rate kg/h DB	1,47	2,38	6,51
PM Emission rate - g/h	1,47	0,72	2,15
Co emission rate - g/h	86,87	77,47	27,15
Overall Efficiency - CSA B 415,1			
% HHV Basis	68,4%	67,8%	67,4%
% LHV Basis	73,6%	72,9%	72,5%
Heat output - Btu/hr	18962	30818	84311
Category weighting	0,4	0,4	0,2

WEIGHTED AVERAGE FINAL RESULTS

ASTM E 3053 Weighted averages			
PM Emission Rate - g/h	1,31		
CO Emission Rate g/h	71,2		
Overall Efficiency - CSA B415,1			
% HHV Basis	67,97%		
% LHV Basis	73,13%		
Heat output range - Btu/h	18 962	to	84311
Co Arithmetic average g/min	1,06		



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

FEB 28 2018

Mr. Justin White
Hearthstone QHPP, Inc.
#17 Stafford Ave.
Morrisville, VT 05661

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Dear Mr. White,

I am writing in response to your letter dated January 12, 2018, regarding wood heaters manufactured by Hearthstone QHPP, Inc. (Hearthstone). This response, dated February 28, 2018, supercedes our previous response (dated February 26, 2018) to correct an inaccuracy regarding required changes to ASTM E3053-17.

You are requesting to use an alternative test method, using cord wood, as referenced in section 60.532(c) of 40 CFR part 60, Subpart AAA, Standards of Performance for New Residential Wood Heaters (Subpart AAA) to meet the 2020 cord wood alternative compliance option. The 2020 cord wood alternative compliance option states that each affected wood heater manufactured or sold at retail for use in the United States on or after May 15, 2020, must not discharge into the atmosphere any gases that contain particulate matter in excess of 2.5 g/hr. Compliance must be determined by a cord wood test method approved by the Administrator along with the procedures in 40 CFR 60.534. You have requested approval to use the procedures and specifications found in ASTM Method E3053-17, a cord wood test method titled, "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters using Cordwood Test Fuel," in conjunction with ASTM E2515-11 and Canadian Standards Administration (CSA) Method CSA-B415.1-10, which are specified in 40 CFR 60.534.

We understand that Hearthstone is also requesting that the alternative method proposed above be approved to apply broadly to all wood heaters manufactured by Hearthstone meeting the requirements of Subpart AAA, from the approval date of this request until such time that Subpart AAA is revised or replaced to require a different cord wood certification method, providing all requirements of section 60.533 of Subpart AAA are met.

With the caveats set forth below, we approve your alternative test method request for certifying wood heaters using ASTM E3053-17 in conjunction with section 60.534 of Subpart AAA to meet the 2020 cord wood compliance option until such time that Subpart AAA is revised or replaced to require a different cord wood certification method. We also approve application of this alternative method to all wood heaters manufactured by Hearthstone meeting the requirements of Subpart AAA.

As required in Subpart AAA, section 60.354(d), you or your approved test laboratory must also measure the first hour of particulate matter emissions for each test run using a separate filter in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required by Subpart AAA, section 60.534(e), you must have your approved laboratory measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA-B415.1-10. For measurement of particulate matter emission concentrations, ASTM 2515-11 must be used.

The following change to ASTM E3053-17 must be followed:

1. Coal bed conditions prior to loading test fuel. The coal bed shall be a level plane without valleys or ridges for all test runs in the high, low, and medium burn rate categories.

The following changes to ASTM E2515-11 must be followed:

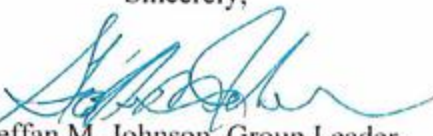
1. The filter temperature must be maintained between 80 and 90 degrees F during testing.
2. Filters must be weighed in pairs to reduce weighing error propagation; see ASTM 2515-11, Section 10.2.1 Analytical Procedure.
3. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber, and of 47 mm, 90 mm, 100 mm, or 110 mm in diameter.
4. Only one point is allowed outside the +/- 10 percent proportionality range per test run.

A copy of this letter must be included in each certification test report where this alternative test method is utilized.

It is reasonable that this alternative test method approval be broadly applicable to all wood heaters subject to the requirements of 40 CFR part 60, Subpart AAA. For this reason, we will post this letter as ALT-125 on our website at <http://www3.epa.gov/ttn/emc/approalt.html> for use by other interested parties. As noted earlier in this letter, this alternative method approval is valid until such time that Subpart AAA is revised or replaced to require a different cord wood certification method, and at such time, this alternative will be reconsidered and possibly withdrawn.

If you have additional questions regarding this approval, please contact Michael Toney of my staff at 919-541-5247 or toney.mike@epa.gov.

Sincerely,



Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID
Adam Baumgart-Getz, EPA/OAQPS/OID
Rafael Sanchez, EPA/OECA
Michael Toney, EPA/OAQPS/AQAD