POLYTESTS
TESTING THROUGH YOUR REALITY

TEST REPORT

TEST OF A NON-CATALYTIC WOOD HEATER FOR EMISSIONS AND EFFICIENCY

PER EPA ATM dated March 24th 2026, ASTM E 2515, ASTM E 3053, CSA B415.1-10 & ALT-154.

Client:
Enerco Group Inc.
45660W, 160th St,
Cleveland OH
44135

Model name:
WS110, C110; D110; H110; J110; N110; R110; T110; V110

Attention: Rafael Sanchez

TESTED BY:
Services Polytests inc.
695-B Gaudette
St-Jean-sur-Richelieu, QC, J3B 7S7

TEST DATES: April 21st to 23rd 2026
REPORT DATE: April 28th 2026
Project number: PI-20350

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Tested:
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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
- Test dates: April 21st to 23rd 2026
- Test methods used:
    - Particulate emissions: ATM dated March 24th 2026; ASTM E2515-11, ASTM E 3053-18, 40 CFR Part 60 Subpart AAA
    - Efficiency: CSA B415.1-10
    - ALT-154 for weighting filters in pair.

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Enerco Group inc.
- Product type: wood heater,
- Combustion system: non-catalytic
- Unit tested: WS110

Particularities

- Alternative names: C110; D110; H110; J110; N110; R110; T110; V110
- There are NO DIFFERENCES with the Wood Stoves, all the same, only names change.

In Summary:

- A medium north /south loading adjustable-rate free standing non-catalytic wood heater employing three secondary tubes as combustion technology. The unit is composed of primarily steel with firebricks lining for the fire box.

1.3 RESULTS

Emission results obtained

- Weighted Average Emissions Rate: 2,1 g/hr
- Weighted Average Overall Efficiency: 72 %

Conformity: NSPS Phase 2020, CSA B-415.1-22

1.4 PRETEST INFORMATION

- Unit condition: The unit was received by carrier in good condition in March 2026. This was the original sealed stove form the original certification test series in 2021. We used the same 50hrs of aging data and ran couple of additional aging hours at medium and low setting as requested by the EPA to comply to the requirement of the ATM prior to testing in march 2026.
- Fuel: Red Oak untreated wood with moisture content between 19% and 25%. (All data in Appendix 4).

Set up

- Venting system type: 6-inch steel pipe and insulated chimney
- System height from floor: 15 feet
- Particularities: none

2 SUMMARY OF TEST RESULTS

2.1 MODEL IDENTIFICATION

Model name number	WS110
Manufacturer	ENERCO GROUP INC.
address	45660W, 160th St, Cleveland OH 44135
appliance category	WOODSTOVE
Usable Firebox Volume – ft3	2.28
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	April 21st & 23rd 2026
Test Methods / Standard	ALT-125
Dilution Tunnel Inside diameter – in	12
Filter diameter	47
Filter material	Gelman A/E 61631 binder free, 47 mm diameter filters

2.3 TEST CONDITION SUMMARY

Model Name(s) / number(s)	WS110			
Usable firebox Volume-ft3	2.28			
Convection Air Fan (No, Standard, Optional)	Optional			
Test runs #	1,1 (max output)	1,2 (minimum output)	run 2.1 (max output)	2.1 (medium output)
Date tested	April 21st 2026	April 21st 2026	April 23rd 2026	April 23rd 2026
test run category (L, M, H)	H	L	H	M
average barometric pressure – in Hg	30,05	30,05	29,72	29,72
Max observe Ambient temp. °F	74,17	73,98	72,59	74,94
Min observe Ambient Temp °F	69,69	72,05	69,23	71,69
Max observes Filter temp °F	86,65	86,53	88,21	89,83
Run air settings				
Primary (measured up from minimum)	full open	full close	full open	half way
Secondary (measured up from minimum)	NA	NA	NA	NA
Convection air setting	high	High	high	High
Test fuel load				
Cordwood fuel species	Oak	Oak	Oak	Oak
specific Gravity (from Table 1)	0,66	0,66	0,66	0,66
Higher heating value - Btu/lb (from Annex A1)	8690	8690	8690	8690
Nom. Test fuel piece length - in	15	15	15	15
Number of test fuel pieces	6	6	6	6
Test fuel Weight				
Kindling - as fired lb.	4,51	NA	4,30	NA
Kindling Wt. - as % of test fuel load	20,0%	NA	18,7%	NA
Kindling Moisture % Db	9,0	NA	9,0	NA
Kindling Kg DB	1,88	NA	1,79	NA
SU Fuel Wt- as fired lb	6,60	NA	6,62	NA
SU Fuel wt. - as % of test fuel load	29,2%	NA	28,8%	NA
SU Fuel moisture - % DB	20,0	NA	20,0	NA
SU fuel- Kg DB	2,49	NA	2,50	NA
Test Fuel Load - As Fired lb	22,59	28,58	22,98	28,07
Ave. Test Fuel Load MC % DB	20,64	19,93	20,94	21,33
Test Fuel Load - kg DB	8,50	10,81	8,62	10,49
Test fuel Loading density lb./ft3	9,91	12,54	10,08	12,31
Residual SU fuel wt. - as fired lb.	2,9	NA	2,9	NA
Residual SU fuel wt.- as % of test fuel load	12,8%	NA	12,6%	NA
Test run duration - minutes	160	583	146	244
Test run duration - h	2,67	9,72	2,43	4,07
Test fuel load wt at the end of the test - as fired lb	2,1	0	2,1	0
total fuel burned kg Db	10,60	10,81	10,64	10,49
% test fuel load wt at end of the test	9,3%	0,0%	9,1%	0,0%

*Run1.1 rejected from weighted average for loading density under 10,0lb/cuft (9.91lbs/cuft). Weighted average done with one maximum, one medium and one low burn

2.4 TEST RUN RESULTS SUMMARY

Model name / number	WS110			
Usable Firebox volume	2.28			
Convection air Fan (no, Standard, option)	Optional			
Test runs nu.	1,1	1,2	2,1	2,2
Date tested (dd/mm/yyyy)	April 21st 2026	April 21st 2026	April 23rd 2026	April 23rd 2026
Test run category	H	L	H	M
Burn rate - Kg/hr DB	3,77	1,11	4,22	2,58
Burn rate as % of low to high Midpoint	NA	29,5%	NA	61,1%
Burn duration - h	2,67	9,72	2	4
Heat output btu/hr	52 724	15 536	58 030	31 131
Average Dilution Tunnel Flow Rate - dscfm	720,9	736,6	731,3	737,9
Average Sample Flow Rates - dscfm				
Train 1	0,1865	0,1896	0,1874	0,1885
train 2	0,1897	0,1927	0,1909	0,1910
Total PM Emissions - g				
Train 1 g	8,89	12,06	5,48	11,36
train 2 g	8,74	11,48	5,76	11,60
Average	8,82	11,77	5,62	11,48
PM emission train precision %	0,85%	2,46%	2,47%	1,03%
PM emission g/kg	0,83	1,09	0,53	1,09
PM emission rate g/h	3,31	1,21	2,31	2,82
Total Co Emission g	0,081	0,074	0,05	0,09
Co emission Rate g/h	213,6	920,8	137,3	436,1
1st hour emission rate g/h	108,6	94,8	76,3	107,2
Overall Efficiency - CSA B415,1				
% HHV Basis	70,91%	72,82%	71,26%	72,43%
% LHV Basis	76,30%	78,35%	76,68%	77,94%

2.5 WEIGHTED AVERAGE SUMMARY

Model name / number	WS110		
Usable Firebox volume	2.28		
Convection air Fan (no, Standard, option)	Optional		
average for each test run category	L	M	H
burn rate kg/h DB	1,11	2,58	4,22
PM Emission rate - g/h	1,21	2,82	2,31
PM Emission rate - output gr/Mj	0,074	0,086	0,051
Co emission rate - g/h	94,77	107,23	76,28
PM Emission 1-hr Rate - g/h	5,63	9,52	5,66
Overall Efficiency - CSA B 415,1			
% HHV Basis	72,8%	72,4%	71,3%
% LHV Basis	78,4%	77,9%	76,7%
Heat output - Btu/hr	15 536	31 131	58 030
Category weighting	0,4	0,4	0,2

2.6 WEIGHTED AVERAGE FINAL RESULTS

ASTM E 3053 Weighted averages			
PM Emission Rate - g/h	2,1		
Emission Rate - g/Mj	0,074		
CO Emission Rate g/h	96		
PM Emission 1-hr Rate - g/h	7,2		
Overall Efficiency - CSA B415,1			
% HHV Basis	72%		
% LHV Basis	78%		
Heat output range - Btu/h	15 536	to	58 030
Co Arithmetic average g/min	0,95		

2.7 TEST FACILITY CONDITIONS

Run Number	*Room Temperature*		*Barometric pressure*		*Relative humidity*		*Air Velocity*	
	Before (F)	*After (F)*	*Before (in.Hg)*	*After (in.Hg)*	*Before (%)*	*After (%)*	*Before (ft/min)*	*After (ft/min)*
1,1 & 1,2	70	72	30,06	30,03	27,1	24,3	0	0
2,1 & 2,2	69	73	29,77	29,68	27,2	20,8	0	0

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

Average dilution tunnel measurements				*Sample Data*			
				Volume sampled (DSCF)		*Particulate catch (mg)*	
Run Number	*Burn Rate (Min)*	Tunnel Velocity (ft/min)	*Total Temperatures (°R)*	*1*	*2*	*1*	*2*
1,1 High burn	160	978	553,97	29,837	30,347	2,30	2,30
1,2 Low burn	583	978	541,85	110,564	112,336	3,20	3,10
2,1 High burn	146	1002	553,15	27,362	27,867	1,50	1,60
2,2 Medium burn	244	1013	553,86	46,001	46,598	3,00	3,10

2.9 DILUTION TUNNEL DUAL TRAIN PRECISION

	Sample Ratio		*Total Emission (g)*			
Run Number	*Train 1*	*Train 2*	*Train 1*	*Train 2*	*% Deviation*	Deviation g/kg
1,1 High burn	3865,63	3800,69	8,89	8,74	0,85%	0,014
1,2 Low burn	3884,17	3822,89	12,06	11,48	2,46%	0,054
2,1 High burn	3902,11	3831,38	5,48	5,76	2,47%	0,026
2,2 Medium burn	3913,88	3863,76	11,36	11,60	1,03%	0,022

2.10 BLANK SAMPLING FLOW RATE

Run Number	Initial flow rate blank sampling (cuft/min)	Average flow rate blank sampling (cuft/min)
1,1 High burn	0,20	0,19
1,2 Low burn	0,20	0,20
2,1 Hogh burn	0,20	0,20
2,2 medium burn	0,20	0,20

3 PROCESS DESCRIPTION

3.1 DISCUSSION

The heater has been received in a good shape by a carrier in March 2026. We used the 50hrs Pre-burn from the original certification from 5 years ago, since we used the sealed stove from the previous certification in 2021, we burned a couple of aging hours at medium and low burn as requested By Rafael Sanchez from the EPA. all data can be found in appendix 4.

3.2 UNIT DIMENSIONS

Baffle

- Location: between top of combustion chamber and hearth
- Restriction: 18,250 X 2,125 inches at the front of unit
- Dimensions: covers the hearth area minus the restriction at front
- Material: Material: ½" Ceramic Board, 23lb/cu ft, 3/4" ceramic wool blanket

Firebox material

- Firebrick 1 ¼ thick lining cover all sides and bottom

Flue gas exhaust

- Location: Top
- Dimensions: 6 inches
- Material: Steel

Gasket

- Door: Fiberglass rope. 9/16" dia. Low density
- Glass: Fiberglass 3mm X 16mm Flat
  Refer to appendix 6 for all details and location

Overall unit dimension

- Usable volume: 2.28 cuft.
- Refer to appendix 12 for volume calculation
- Overall heater dimension: 22,75-inch-wide 28,00-inch-deep 31,50 inch high

Convection fan

- Manufacturer: US Stove
- Model: CB36
- CFM: 100CFM

Catalyst

- None

3.3 AIR SUPPLY SYSTEM

Description

- Primary air: from the back through an air wash above the door.
- Secondary air: From the back of the stove to the sides, into the secondary channels and distributed by three tubes into 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	0,39	2,35	Yes	2,08
B *	Secondary	1,875	1,875	No	8,651
C *	Pilot	0,37	0,37	No	0,81

* 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 have been rejected from the average calculation due to wood loading density under 10.0lb/cuft (9.9 lbs/cuft) requested by the ATM. All other runs have been found appropriate, no anomalies happened and all runs below have been validate and found compliant. All pieces have been loaded front to back (longest dimension), none of them have been squared and no pieces have any fungus. Filters have been weighted in pair as per the ALT-154.

Run #1.1
This run was performed on April 21st 2026. It lasted 160 minutes and the maximum burn rate was obtained at 3,77 kg/hr & emission at 3,31 gr/hr. The air inlet damper was fully open at the maximum setting and the convection fan at maximum setting during all the burn. This run is not part of the weighted average du to wood loading density under lbs/cuft.

Run #1.2
This run was performed on April 21st 2026. It lasted 583 minutes and the minimum burn rate was obtained at 1,11 kg/hr & emission at 1,21 gr/hr. The air inlet damper was fully closed at the minimum setting. the burn rate for the low burn rate category is no greater than the rate that an operator can achieve in home use. The convection fan was at high setting during all burn.

Run #3
This run was performed on April 23rd 2026. It lasted 146 minutes and the maximum burn rate was obtained at 4,22 kg/hr & emission at 2,31 gr/hr. The air inlet damper was fully open at the maximum setting and the convection fan at maximum setting during all the burn.

Run #4
This run was performed on April 23rd 2026. It lasted 244 minutes and the medium burn rate was obtained at 2,58 kg/hr & emission at 2,82 gr/hr. The air inlet damper was half way between minimum and maximum setting and the convection fan at maximum setting during all the burn.

- 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 cribs

- Type of wood: Red Oak, 19% to 25% dry basis moisture content measurement done within 4 of the tests, all wood keeps in storage room at 21°C all the time, maintain by central heating system.
- Description: for each test, description of the fuel is found on the front page of each test run data sheet together with photograph in appendix 9.

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. The tunnel has two elbows ahead of the sampling section. The sampling section is a continuous 12-inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube; thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 2%. Tunnel samplers are located downstream of the pitot tube and upstream from the end of this section. All detail of dilution tunnel can be found in appendix 8.

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, 47 mm diameter 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.

APPENDIX 1: Raw data, forms and results

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Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PI2350 Run: 1 Tech: MA Reviewer: NP

- Kindling - start-up 11,1 LBS start fire
- 1 min torche
- close Door immediatly
- Fan ON High
- At 29 LBS insert Load
- close Door immediatly
- At 500 LBS Stop pompe
- At 411 LBS insert Load and keep Fan (High)
- close Door immediatly
- At 244 LBS (14 min) close air inlet

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 116

Project #: PT 26350 Run: 1 Tech: MM Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
EM-334 MM	8:00	ok	ok

Pre-Test Post-Test

Facility Conditions:

Smoke Capture Check (tunnel velocity)	ok	NA
Picture	4 sides ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	2026-04-21
Date Dilution Tunnel Cleaned	2026-04-21
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok

Temperature System:

Ambient (65°-90°F) Y/N	ok

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok
Pictures for report	
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok
Load Length 5/6 of firebox Length +- 1inch	ok

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SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: pI 20350 Run: 1 Tech: M.M Reviewer: BP

Leakage Checks Tunnel Samplers high burn

	Train 1		Train 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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	382 106 15	383 005 40	132 992 54	133 882 90
Initial 1minute DGM (Liter)	382 106 15	383 005 40	132 992 52	133 882 86
Change (Liter)	Ø	Ø	0.02	0.04
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	Ok	ok	ok	ok

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SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-21 Manufacturer: ENERCO Model: WSL10

Project #: pt 2350 Run: 1 Tech: M.M Reviewer: SP

Leakage Checks Tunnel Samplers High burn

	System 1st hour		Ambient	
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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	3217.28	3229.21	800815.85	801714.59
Initial 1minute DGM (Liter)	3217.28	3229.21	800815.85	801714.59
Change (Liter)	Ø	Ø	Ø	Ø
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	o/c	o/c	o/c	o/c

POLYTESTS
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SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PI 2050 Run: 1 Tech: M.P Reviewer: RP

Leakage Checks Tunnel Samplers Medium / Low burn

	Train 1		Train 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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	383 006 08	38.335 57	133884 11	137179 92
Initial 1minute DGM (Liter)	383 006 08	38.335 55	133884 08	137179 89
Change (Liter)	0	0.02	0.03	0.03
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	ok	ok	ok	ok

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SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-21 Manufacturer: ENVEA Model: WS110

Project #: pI 2035 Run: 1 Tech: M.H Reviewer: DP

Leakage Checks Tunnel Samplers Medium / Low burn

	System 1st hour		Ambient	
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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	3229,30	3241,48	801715,00	805033,72
Initial 1minute DGM (Liter)	3229,30	3241,48	801715,00	805033,66
Change (Liter)	∅	∅	∅ ~~801715,00~~ MS	0,06
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 20-04-21 Manufacturer: ENERCO Model: WS110

Project #: PT 2350 Run: 1 Tech: M.M Reviewer: DP

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-6	-6
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 H2o static	Pre-Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	0.4	3	0,5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PI 2350 Run: 1 Tech: M.M Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM 090	44 lbs, Class F	4,4 lbs
Platform	EM 205	10,0 Kg, Class F	10,00 Kg
Wood	EM 090	44. lbs, Class F	44,0 lbs
Analytical	EM 335	100,0 mg, Class S	108,0 mg
Analytical	EM 129	200 000g, Class S	200,0000 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%

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PT 2050 Run: 1 Tech: M.M Reviewer: [illegible]

FOR 12 in TUNNELS

Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____(inches w.c.)
Pitot tube type: Standard

Traverse Point	Position (inches)	Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
A Center	6	0071	73 04
B Center	6	0070	72 88
A-1	0.53	0057	73 04
A-2	1.75	0064	73 01
A-3	3.55	0070	73 01
A-4	8.45	0072	73 04
A-5	10.25	0069	73 04
A-6	11.47	0056	72 85
B-1	0.53	0056	72 88
B-2	1.75	0063	72 87
B-3	3.55	0067	72 87
B-4	8.45	0068	73 05
B-5	10.25	0063	7305
B-6	11.47	0057	7309

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2024-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PT 2350 Run: 1 Tech: M.M Reviewer: NP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3.079	3.000	1.030	1.000
Tolerance CO	0	+/- 0.02	0.021	+/- 0.15	0.030	+/- 0.05
CO_2	0	0	17.96	18.00	9.79	10.00
Tolerance CO2	0	+/- 0.02	0.04	+/- 0.5	0.21	+/- 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	3.081	1.024	0	0.02	0.002	0.15	0.006	0.05	✓	
CO_2	0	17.93	9.77	0	0.02	0.03	0.5	0.02	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2026-04-21 Manufacturer: ENERCO Model: WS11

Project #: PJ 20350 Run: 1 Tech: MM Reviewer: DO

RAW DRY GAS METER READINGS

		System 1st hour	System 1	System 2	Blank
High fire test	Final (Liter)	329,18	383 004,93	133 881,88	801 714,32
	Initial (Liter)	321,35	382 107,60	132 993,94	800 818,54
Low medium fire test	Final (Liter)	341,43	386 335,08	137 178,82	805 029,92
	Initial (Liter)	329,37	383 007,42	133 885,46	801 717,32

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,8	101,7
Humidity (%):	27,1	24,3
Air Velocity (max 50ft/Min)	0	0

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PT 20350 Run: 1 Tech: M.M Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

KINDLING AND START-UP LOAD

	Piece Size	Weight	Meter Moisture Content (% dry)				
	x x in.	lbs.					
kindling	x x 15 in.	4.51 lbs.	9		9		9
	x x in.	lbs.					
	x x in.	lbs.					
start-up	x x 15 in.	6.6 lbs.	20		20		20
	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)				
450	x400 x 15 in.	4.43 lbs.	18.9		19.6		20.0
500	x400 x 15 in.	4.04 lbs.	20.4		20.9		21.9
425	x400 x 15 in.	3.722 lbs.	19.6		19.8		19.3
	x x in.	lbs.					
300	x300 x15 in.	2.63 lbs.	19.1		19.8		19.9
325	x325 x 15 in.	2.926 lbs.	23.4		23.6		24
450	x425 x 15 in.	4.85 lbs.	19.9		21.4		21.6
	x x in.	lbs.					
	x x in.	lbs.					

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2026 04 21 Manufacturer: ENERCO Model: WS 110

Project #: PE 2350 Run: 1 Tech: M. M Reviewer: GP

FUEL DESCRIPTION:

Type of wood:

LOW OR MEDIUM TEST LOAD

Piece Size				Weight		Meter Moisture Content (% dry)					
4.50	x 4.25	x 4.96	in.	4.976	lbs.	19.9		20.0		19.4	
4.78	x 4.75	x 5.22	in.	5.228	lbs.	21.6		22.3		22.8	
4.50	x 4.50	x 4.65	in.	4.650	lbs.	19.1		19.0		19.1	
	x	x	in.		lbs.						
3.00	x 3.50	x 3.11	in.	3.11	lbs.	20.1		19.3		19.9	
4.00	x 4.75	x 4.57	in.	4.576	lbs.	19.1		19.3		19.6	
4.00	x 5.00	x 6.04	in.	6.04	lbs.	19.8		19.0		19.1	
	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.						

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: pt 2350 Run: 1 Tech: M. M Reviewer: [illegible]

		HIGH FIRE TEST FILTERS							
		SYSTEM 1 – 1st 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
Date	Time	K	700 - 701		17	30	702 - 703		64
2026-04-20	17:00	108 7493	0 2515		4 2026	110 2125	0 2536		4 1798
2026-04-21	9:00	108 7494	0 2516		4 2026	110 2125	0 2536		~~4~~ 4 1799

		SYSTEM 1 – 1st 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
Date	Time	K	700 - 701		17	30	702 - 703		64
2026 04-21	12:45	108 7497	0 2533		4 2040	110 2127	0 2556		4 1809
2026 04-27	8:00	108 7496	0 2533		4 2032	110 2125	0 2555		4 1803
2026 04-28	8:00	108 7496	0 2533		4 2032	110 2125	0 2555		4 1803

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PT 2350 Run: 1 Tech: M.M Reviewer: DO

		HIGH FIRE TEST FILTERS			
		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter
Date	Time	36	704. 705	106	706
2026-04-20	17:01	107 7231	0 2535	4 1136	0 1286
2026 04 21	9:00	107 7231	0 2536	4 1135	0 1286

		HIGH FIRE TEST FILTERS				
		SYSTEM 2				
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time	36	704. 705	106	706	2026-04-21 12:30
2026. 04 21	12:45	107 7235	0 2555	4 1145	0 1287	
2026-04-27	8:00	107 7232	0 2553	4 1140	0 1286	
2026 04-28	8:00	107 7232	0 2553	4 1140	0 1286	

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PT 20350 Run: 1 Tech: M.M Reviewer: [illegible]

		MEDUIM / LOW FIRE TEST FILTERS							
		SYSTEM 1 – 1st 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
Date	Time	10	707-708		13	37	709-710		18
2026-04-20	17:06	94 6369	0 2535		4 1778	107 9749	0 2523		4 2065
2026-04-21	9:00	94 6368	0 2535		4 1777	107 9750	0 2523		4 2065

		SYSTEM 1 – 1st 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
Date	Time	10	707-708		13	37	709-710		18
2026-04-21	23:15	94 6372	0 2543		4 1797	107 9753	0 2547		4 2084
2026-04-27	8:00	94 6368	0 2544		4 1783	107 9751	0 2547		4 2072
2026-04-28	8:00	94 6368	0 2544		4 1783	107 9751	0 2547		4 2072

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PT 20350 Run: 1 Tech: M.M Reviewer: DO

		MEDIUM/ LOW FIRE TEST FILTERS			
		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter
Date	Time	41	711- 712	63	713
2026-04-20	17:00	110 3650	02553	4 9960	0 1260
2026-04-21	9:00	110 3649	02554	4 9961	0 1261

		MEDIUM/ LOW FIRE TEST FILTERS				
		SYSTEM 2				
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time	41	711- 712	63	713	2026-04-21 22:54
2026-04-21	23:15	110 3652	02574	4 9979	0 1263	
2026-04-27	8:00	110 3650	02574	4 9971	0 1262	
2026-04-28	8:00	110 3650	02574	4 9971	0 1262	

Paramètres

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

Code verrouillage:	ENE

Description du test

Test standard	EPA	
Run #	1	
Date	21-04-2026	
Technicien	M.M	
Project #	PI 20350	

Description de l'unité

Manufacturier	ENERCO	
Modèle	WS110	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	2,28	cu ft.
Appliance weight empty	na	lbs
Fan (no, Standard, Option)	option	

Paramètres du test

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

Échantillonnage

Blank Targeted sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,986	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,010	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM room):	0,989	
Equipment number (DGM room):	EM 179	Dimensionless
Calibration Factor (DGM 1st Hr):	1,000	
Equipment number (DGM 1st Hr):	EM 130	Dimensionless

Tunnel

Targeted tunnel flow rate	850	scfm
Tunnel diameter	12	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20350
Date	21-04-2026
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/ft^3 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	2,28	ft^3				
Total Nom. Load Wt. Target	22,80	lb				
Total Load Wt. Allowable Range	21,70	to	23,90	lb		
Core Target Wt. Allowable Range	10,30	to	14,80	lb		
Remainder Load Wt. Allowable Range	8,00	to	12,50	lb		
						Mid-Point
Core Load Pc. Wt. Allowable Range	3,40	to	5,70	lb		4,55
Remainder Load Pc. Wt. Allowable Range	2,30	to	12,50	lb		7,40
	Pc. #					
Core Load Piece Wt. Actual	1	4,43	lb	In Range		
	2	4,04	lb	In Range		
	3	3,72	lb	In Range		
Core Load Total. Wt. Actual		12,19	lb	In Range		
	Pc. #					
Remainder Load Piece Wt.	1	2,63	lb	In Range		
(1 to 3 Pcs.)	2	2,92	lb	In Range		
	3	4,85	lb	In Range		
Remainder Load Tot. Wt. Act		10,40	lb	In Range		
Total Load Wt. Actual		22,59	lb	In Range		
Core % of Total Wt.		54%		In Range	45-65%	
Remainder % of Total Wt.		46%		In Range	35-55%	
Actual Load % of Nominal Target		99%		In Range	95-105%	
Actual Fuel Load Density		9,9	lb/ft^3			
Kindling and Start-up Fuel						
Maximim Kindling Wt. (20% of Tot. Load Wt.)		4,52	lb			
Actual Kindling Wt.		4,51	lb	In Range	20,0%	
Maximum Start-up Fuel Wt. (30% of Tot. Load Wt.)		6,78	lb			
Actual Start-up Fuel Wt.		6,60	lb	In Range	29,2%	
Allowable Residual Start-up Fuel Wt. Range	2,3	to	4,5	lb		Mid-Point
Actual Residual Start-up Fuel Wt.		2,9	lb	In Range		3,4
Total Wt. All Fuel Added (wet basis)		33,70	lb			
High Fire Test Run End Point Range	Low		High			Mid-Point
Based on Fuel Load Wt. (w/tares)	2,0	to	2,5	lb		2,3
Actual Fuel Load Ending Wt.		2,1	lb	In Range		

Load pieces Length in. 15 in.

Fuel Piece Moisture Reading (%-dry basis) 1	2	3	Ave.		Pc. Wt. Dry Basis	
18,9	19,6	20	19,5	In Range	3,71 lb	1,68 kg
20,4	20,9	21,9	21,1	In Range	3,34 lb	1,51 kg
19,6	19,8	19,3	19,6	In Range	3,11 lb	1,41 kg
19,1	19,8	19,9	19,6	In Range	2,20 lb	1,00 kg
23,4	23,6	24	23,7	In Range	2,36 lb	1,07 kg
19,9	21,4	21,6	21,0	In Range	4,01 lb	1,82 kg
Total Load Ave. MC (%-dry basis)			20,6	In Range		
Total Load Ave. MC % (wet basis)			17,1			
Total Test Load Weight (dry basis)					18,73 lb	8,50 kg
Kindling Moisture (%-dry basis)						
9	9	9	9,0	In Range	4,14 lb	1,88 kg
Start-up Fuel Moisture Readings (%-dry basis)						
20	20	20	20,0	In Range	5,50 lb	2,49 kg
Total Wt. All Fuel Added (dry basis)					28,37 lb	12,87 kg
Total Wt. All Fuel Burned (dry basis)					23,4 lb	10,6 kg
Total Wt. All Fuel Burned (wet basis)					28,7 lb	13,0 kg

Load high fire

Adjunct to ASTM E XXXX Wood Heater Cordwood Test Method - May 10, 2017 Version

Cordwood Fuel Load Calculators - 12 lb/ft^3 Nominal Load Density

Core 45-65% of Total Load Weight, Remainder 35-55% of Total Load Weight

Values to be input manually

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For Usable Firebox Volumes up to 3.0 ft^3 - Low and Medium Fire

Nominal Required Load Density (wet basis)	12	lb/ft^3				
Usable Firebox Volume	2,28	ft^3				
Total Nom. Load Wt. Target	27,36	lb				
Total Load Wt. Allowable Range	25,99	to	28,73	lb		
Core Target Wt. Allowable Range	12,312	to	17,78	lb		
Remainder Load Wt. Allowable Range	9,58	to	15,05	lb		
						Mid-Point
Core Load Fuel Pc. Wt. Allowable Range	4,10	to	6,84	lb		5,47
Remainder Load Pc. Wt. Allowable Range	2,74	to	8,21	lb		5,47
	Pc. #					
Core Load Piece Wt. Actual	1	4,98	lb		In Range	
	2	5,23	lb		In Range	
	3	4,65	lb		In Range	
Core Load Total. Wt. Actual		14,85	lb		In Range	
	Pc. #					
Remainder Load Piece Wt.	1	3,11	lb		In Range	
(2 or 3 Pcs.)	2	4,58	lb		In Range	
	3	6,04	lb		In Range	
Remainder Load Piece Weight Ratio - Small/Large		51%			In Range	≤ 67%
Remainder Load Tot. Wt. Act		13,73	lb		In Range	
Total Load Wt. Actual		28,58	lb		In Range	
Core % of Total Wt.		52%			In Range	45-65%
Remainder % of Total Wt.		48%			In Range	35-55%
Actual Load % of Nominal Target		104%			In Range	95-105%
Actual Fuel Load Density		12,5	lb/ft^3			
Allowable Charcoal Bed Wt. Range (lb)	2,9	to	5,7			Mid-Point
Actual Charcoal Bed Wt.		4,0	lb		In Range	4,3
Actual Fuel Load Ending Wt.			lb		Valid Test	≥ 90%
Total Wt. of Fuel Burned During Test Run lb.		28,6	lb			
Load pieces Length in.		15	in.			

Fuel Piece Moisture Reading (%-dry basis)

1	2	3	Ave.		Pc. Wt. Dry Basis			
19,9	20	19,4	19,8	In Range	4,15	lb	1,88	kg
21,6	22,3	22,8	22,2	In Range	4,28	lb	1,94	kg
19,1	19	19,1	19,1	In Range	3,91	lb	1,77	kg
20,1	19,3	19,9	19,8	In Range	2,60	lb	1,18	kg
19,1	19,3	19,6	19,3	In Range	3,83	lb	1,74	kg
19,8	19	19,1	19,3	In Range	5,06	lb	2,30	kg
Total Load Ave. MC % (dry basis)			19,9	In Range				
Total Load Ave. MC % (wet basis)			16,6					
Total Test Load Weight (dry basis)					23,83	lb	10,81	kg
Total Fuel Weight Burned During Test Run (dry basis)					23,8	lb	10,81	kg

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		
						Mid-Point
Core Load Fuel Pc. Wt. Allowable Range	0,00	to	0,00	lb		0,00
Remainder Load Pc. Wt. Allowable Range	0,00	to	0,00	lb		0,00
	Pc. #					
Core Load Piece Wt. Actual	1		lb		In Range	
	2		lb		In Range	
	3		lb		In Range	
Core Load Total. Wt. Actual		0,00	lb		In Range	
	Pc. #					
Remainder Load Piece Wt.	1		lb		In Range	
(3 or 4 Pcs.)	2		lb		In Range	
	3		lb		In Range	
	4		lb		NA	
Remainder Load Piece Weight Ratio - Small/Large		#NOMBRE!			#NOMBRE!	≤ 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/0!			#DIV/0!	45-65%
Remainder % of Total Wt.		#DIV/0!			#DIV/0!	35-55%
Actual Load % of Nominal Target		#DIV/0!			#DIV/0!	95-105%
Actual Fuel Load Density		#DIV/0!	lb/ft^3			
Allowable Charcoal Bed Wt. Range (lb)	0,1	to	-0,1			Mid-Point
Actual Charcoal Bed Wt.			lb		Out of Range	0,0
Actual Fuel Load Ending Wt.			lb		Valid Test	≥ 90%
Total Wt. of Fuel Burned During Test Run lb.		0,0	lb			

Fuel Piece Moisture Reading (%-dry basis)

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

	Start	End
Barometer (kPa):	101,8	101,7
Barometer (in.Hg):	30,061529	30,0319987
Dry Bulb (F):	69,689179	71,7396851
Humidity (%):	27,1	24,3
Air velocity (ft/min)	0	0

High fire test						
DGM #1st hr	Final:	3229,180	cuft	Final:	3229,180	cuft
	Initial:	3217,350	cuft	Initial:	3217,350	cuft
DGM #1	Final:	13525,692	cuft	Final:	383004,930	Liter
	Initial:	13494,003	cuft	Initial:	382107,600	Liter
DGM #2	Final:	4727,994	cuft	Final:	133881,880	Liter
	Initial:	4696,637	cuft	Initial:	132993,940	Liter
DGM room	Final:	28312,275	cuft	Final:	801714,320	Liter
	Initial:	28280,640	cuft	Initial:	800818,540	Liter

min or med burnrate						
DGM #1st hr	Final:	3241,430	cuft	Final:	3241,430	cuft
	Initial:	3229,370	cuft	Initial:	3229,370	cuft
DGM #1	Final:	13643,295	cuft	Final:	386335,080	Liter
	Initial:	13525,780	cuft	Initial:	383007,420	Liter
DGM #2	Final:	4844,424	cuft	Final:	137178,820	Liter
	Initial:	4728,120	cuft	Initial:	133885,460	Liter
DGM room	Final:	28429,364	cuft	Final:	805029,920	Liter
	Initial:	28312,381	cuft	Initial:	801717,320	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du test commence	118
Numéro de la ligne dans "Raw data" à partir duquel les données du highfire test commence	158
Numéro de la ligne dans "Raw data" à partir duquel les données du min ou medium fire test commence	307

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

Project nu.	PI 20350
Date	21-04-2026
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: -0,119495327 in. H20
Barometer: 30,062 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,071	73,0	0,2665
B center	0,070	72,9	0,2646
A1	0,057	73,0	0,2387
A2	0,064	73,0	0,2530
A3	0,070	73,0	0,2646
A4	0,072	73,0	0,2683
A5	0,069	73,0	0,2627
A6	0,056	72,9	0,2366
B1	0,056	72,9	0,2366
B2	0,063	72,9	0,2510
B3	0,067	72,9	0,2588
B4	0,068	73,1	0,2608
B5	0,063	73,1	0,2510
B6	0,057	73,1	0,2387
AVERAGE	0,0645	72,9800	0,2537

Traverse Point	% of Diameter
1	4.4
2	14.6
3	29.6
Center	50.0
4	70.4
5	85.4
6	95.6

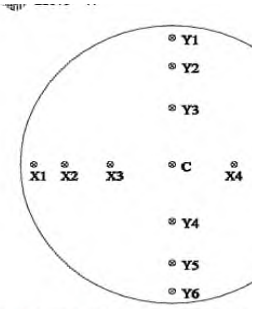


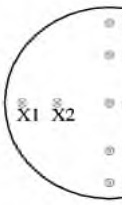
FIG. 5 Dilution Tunnel Diameter Equal To or Greater Than 0.3 m (12 in.) Traverse Point Table

PITOT CONSTANT=
0,915

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

Taverse Point	% of Diameter
1	6.7 *
2	25.0
Center	50.0
3	75.0
4	93.3 *



* No closer than 12.7 mm (0.50 in.) to tunnel wall

FIG. 6 Dilution Tunnel Diameter Less Than 0.3 m (12 in.) Traverse Point Ta

Project nu.	PI 20350
Date	21-04-2026
Technicien	M.M

Filter set weight highfire

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Time	Test End date & time
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	gasket	Filter			
Number	16	700-701	17	30	702-703	64	36	704-705	106	706			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	108,7493	0,2515	4,2026	110,2125	0,2536	4,1798	107,7231	0,2535	4,1136	0,1286	2026-04-20	17:00	
Before (6)	108,7494	0,2516	4,2026	110,2125	0,2536	4,1799	107,7231	0,2536	4,1135	0,1286	2026-04-21	09:00	
After (1)	108,7497	0,2533	4,2040	110,2127	0,2556	4,1809	107,7235	0,2555	4,1145	0,1287	2026-04-21	12:45	
After (2)	108,7496	0,2533	4,2032	110,2125	0,2555	4,1803	107,7232	0,2553	4,1140	0,1286	2026-04-27	08:00	
After (3)	108,7496	0,2533	4,2032	110,2125	0,2555	4,1803	107,7232	0,2553	4,1140	0,1286	2026-04-28	08:00	2026-04-21 12:30
After (4)													
After (5)													
After (6)	108,7496	0,2533	4,2032	110,2125	0,2555	4,1803	107,7232	0,2553	4,1140	0,1286	2026-04-28	08:00	
Difference	0,0002	0,0017	0,0006	0,0000	0,0019	0,0004	0,0001	0,0017	0,0005	0,0000			
Total (mg)		2,5			2,3			2,3		0			
Total ajusté (mg)		**2,50**			**2,30**			**2,30**					

Project nu.	PI 20350
Date	21-04-2026
Technicien	M.M

Filter set weight Low/ medium fire

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Time	Test end date & time
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	gasket	Filter			
Number	10	707-708	13	37	709-710	18	41	711-712	63	713			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	94,6369	0,2535	4,1778	107,9749	0,2523	4,2065	110,3650	0,2553	4,9960	0,1260	2026-04-20	17:00	
Before (6)	94,6368	0,2535	4,1777	107,9750	0,2523	4,2065	110,3649	0,2554	4,9961	0,1261	2026-04-21	09:00	
After (1)	94,6372	0,2543	4,1797	107,9753	0,2547	4,2084	110,3652	0,2574	4,9979	0,1263	2026-04-21	23:15	
After (2)	94,6368	0,2544	4,1783	107,9751	0,2547	4,2072	110,3650	0,2574	4,9971	0,1262	2026-04-27	08:00	
After (3)	94,6368	0,2544	4,1783	107,9751	0,2547	4,2072	110,3650	0,2574	4,9971	0,1262	2026-04-28	08:00	2026-04-21 22:54
After (4)													
After (5)													
After (6)	94,6368	0,2544	4,1783	107,9751	0,2547	4,2072	110,3650	0,2574	4,9971	0,1262	2026-04-28	08:00	
Difference	0,0000	0,0009	0,0006	0,0001	0,0024	0,0007	0,0001	0,0020	0,0010	0,0001			
Total (mg)		1,5			3,2			3,1		0,1			
Total ajusté (mg)		**1,40**			**3,10**			**3,00**					

Project nu.	PI 20350
Date	21-04-2026
Technicien	M.M

SFBA EPA EMISSION RESULTS

Test Duration: **160** min

PRESSURE FACTOR:	DGM 1st hr	0,98045	
	DGM 1	0,96497	
	DGM 2	0,97103	
	DGM room	1,00424	
TEMPERATURE FACTORS	DGM 1st hr	0,99390	
	DGM 1	0,98961	
	DGM 2	0,98679	
	DGM room	0,99126	
VOLUMES SAMPLED	DGM 1st hr	11,528	SCft
	DGM 1	29,837	SCft
	DGM 2	30,347	Scft
	DGM room	31,144	SCft
TOTAL TUNNEL VOLUME :		115340	

SAMPLE RATIOS

Sample Train 1st Hr:	3751,978
Sample Train 1:	3865,635
Sample Train 2:	3800,691

Paticulate concentration

Sample Train 1st Hr	**0,000217**	g/dscf
Sample Train 1	**0,000077**	g/dscf
Sample Train 2	**0,000076**	g/dscf
Room	**0,000000**	g/dscf

TOTAL EMISSIONS

Sample Train 1st Hr	**9,38**	g
Sample Train 1	**8,89**	g
Sample Train 2	**8,74**	g

EMISSION RATES

Sample Train 1st Hr	**9,38**	g/hr
Sample Train 1	**3,33**	g/hr
Sample Train 2	**3,28**	g/hr

	Train 1	Train 2	Train 1st Hr
Cs	7,708E-05	7,579E-05	0,0002169

RESULTS

Average emission rate: 3,31 g/hr

Burn Rate : 3,771 Dry kg/hr

BAROMETRIC PRESSURE

Average:	30,04676369	in Hg
Start:	30,06152868	in Hg
End:	30,0319987	in Hg

DGM CONTROLLER VALUES

DGM 1st hr	Final:	3229,180	Cuft
	Initial:	3217,350	Cuft
DGM 1	Final:	13525,692	Cuft
	Initial:	13494,003	Cuft
DGM 2	Final:	4727,994	Cuft
	Initial:	4696,637	Cuft
DGMroom	Final:	28312,275	Cuft
	Initial:	28280,640	Cuft

TEMPERATURES

DGM 1st hr	531,243	°R
DGM 1	533,545	°R
DGM 2	535,068	°R

CALIBRATION FACTORS

DGM 1st Hr	1,0000
DGM 1	0,9860
DGM 2	1,0100
DGM room	0,9890

TUNNEL FLOW RATE: 720,875 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	2,30	mg
Total Sample Train 2:	2,30	mg
Total Sample Train 1 1st hour:	2,50	mg

DEVIATION: 0,85%

*		*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	Mass flow	DGM 1st hour	DGM 1st hour	Filter	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft				Change in	T wet bulb
Elapsed		Weight			Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Reading	1st hour	1st hour	1st hour	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Filter 1	Filter 1	Filter 2	Surface	
Time	Raw data row	Remaining	CO	CO_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	1st hour	Inlet T	Outlet T	Temp									in wc	in wc				Temp.	
min		lbs	%	%	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	in. Hg	in. Hg	in. Hg	°F	oF
0,00	118,00	11,0	0,0	0,0	72,5	69,7	72,7	71,5	70,9	70,5	71,8	71,0	0,19	69,5	69,7	82,7	0,19	70,13	70,73	81,45	0,19	70,96	71,37	81,13	0,07	0,01	0,13	-0,42	-0,18	0	53,04
1,0	119,0	10,9	0,0	3,2	129,2	69,7	75,9	74,7	74,2	73,8	75,0	72,3	0,19	69,5	69,8	82,2	0,19	70,36	70,62	80,92	0,19	70,82	71,20	82,73	0,07	0,03	-0,70	-1,22	-0,99	2,8739105	54,87
2,0	120,0	10,7	0,0	7,3	200,4	69,8	78,1	85,2	82,7	73,9	74,4	73,6	0,19	69,6	69,8	81,7	0,19	70,39	70,58	82,49	0,19	70,70	71,17	82,73	0,07	0,06	-0,68	-1,21	-0,98	6,8215457	56,70
3,0	121,0	10,6	0,3	7,7	333,5	69,8	77,2	132,2	82,5	74,8	75,7	74,9	0,19	69,7	69,8	81,2	0,19	70,46	70,56	84,05	0,19	70,66	71,15	84,39	0,07	0,07	-0,68	-1,22	-0,98	16,879351	57,20
4,0	122,0	10,4	0,2	9,7	400,8	70,0	78,7	180,6	82,5	76,6	77,7	76,1	0,18	69,7	69,8	80,8	0,19	70,49	70,54	85,33	0,19	70,65	71,14	84,78	0,07	0,07	-0,69	-1,22	-0,98	27,564919	57,85
5,0	123,0	10,2	0,2	9,9	420,5	70,1	79,7	220,2	82,8	80,1	80,9	77,4	0,19	69,8	69,8	80,4	0,19	70,56	70,53	85,42	0,19	70,67	71,15	84,37	0,07	0,08	-0,68	-1,22	-0,99	37,141761	58,17
6,0	124,0	10,0	0,3	10,1	420,6	70,1	80,1	252,5	83,5	85,1	84,4	78,7	0,19	69,9	69,8	80,5	0,19	70,64	70,54	85,01	0,19	70,71	71,14	83,90	0,07	0,08	-0,69	-1,22	-0,99	45,690148	58,15
7,0	125,0	9,9	0,2	8,4	407,2	70,1	79,8	273,2	84,9	91,2	87,7	79,9	0,19	70,0	69,9	81,6	0,19	70,71	70,56	84,54	0,19	70,76	71,16	83,39	0,07	0,08	-0,69	-1,22	-0,98	52,250141	57,85
8,0	126,0	9,7	0,3	8,2	411,8	70,1	80,6	292,8	86,9	98,3	91,6	81,2	0,19	70,1	69,9	82,9	0,19	70,74	70,55	84,10	0,19	70,77	71,18	82,92	0,07	0,07	-0,69	-1,22	-0,99	59,035837	58,29
9,0	127,0	9,6	0,3	8,4	403,7	70,3	80,5	306,4	89,5	106,3	95,4	82,5	0,19	70,2	69,9	84,1	0,19	70,79	70,57	83,66	0,19	70,80	71,20	82,49	0,07	0,08	-0,70	-1,22	-0,98	64,90844	58,17
10,0	128,0	9,5	0,4	8,0	394,1	70,3	80,3	318,0	93,1	114,3	99,3	83,8	0,19	70,2	70,0	84,4	0,19	70,81	70,59	83,22	0,19	70,83	71,21	82,11	0,07	0,07	-0,69	-1,23	-0,99	70,560129	57,95
11,0	129,0	9,3	0,4	7,2	390,7	70,3	80,4	326,7	97,1	121,9	103,0	83,9	0,19	70,3	70,0	84,1	0,19	70,87	70,62	82,83	0,19	70,86	71,22	81,79	0,07	0,08	-0,69	-1,22	-0,99	75,398054	57,87
12,0	130,0	9,1	0,3	9,8	492,0	70,5	83,5	363,4	101,1	128,4	107,6	83,9	0,19	70,3	70,0	83,7	0,19	70,86	70,62	82,63	0,19	70,85	71,27	81,64	0,07	0,09	-0,69	-1,23	-1,00	85,769738	59,62
13,0	131,0	8,9	0,2	12,5	536,2	70,4	85,4	408,8	105,5	132,7	111,7	84,0	0,19	70,4	70,0	83,3	0,19	70,87	70,61	82,54	0,19	70,86	71,29	81,56	0,07	0,09	-0,70	-1,23	-1,01	97,415143	60,55
14,0	132,0	8,7	0,2	11,8	540,0	70,6	86,1	443,9	110,0	135,8	115,6	84,1	0,19	70,5	70,1	82,9	0,19	70,91	70,66	82,39	0,19	70,92	71,35	81,44	0,07	0,09	-0,70	-1,23	-1,01	106,74722	60,80
15,0	133,0	8,4	0,2	12,3	549,0	70,7	87,3	476,2	114,6	139,2	119,4	84,4	0,19	70,6	70,1	82,5	0,19	70,99	70,69	82,34	0,19	70,96	71,37	81,35	0,07	0,09	-0,70	-1,23	-1,02	115,6306	61,24
16,0	134,0	8,2	0,3	12,8	579,4	70,8	88,6	509,6	119,9	143,5	122,7	84,7	0,19	70,7	70,1	82,2	0,19	71,08	70,71	82,29	0,19	71,03	71,40	81,26	0,07	0,10	-0,70	-1,24	-1,01	124,96771	62,13
17,0	135,0	7,8	0,3	14,7	660,7	71,0	92,5	571,6	126,3	147,1	125,7	85,2	0,19	70,8	70,2	81,8	0,19	71,14	70,77	82,37	0,19	71,09	71,46	81,33	0,07	0,11	-0,71	-1,24	-1,02	140,05398	63,83
18,0	136,0	7,4	0,7	17,6	703,0	71,3	96,0	644,6	131,8	151,8	129,2	85,8	0,19	71,0	70,2	81,5	0,19	71,22	70,83	82,67	0,19	71,18	71,52	81,52	0,07	0,11	-0,71	-1,26	-1,03	157,51552	65,52
19,0	137,0	7,0	0,4	18,0	726,5	71,5	97,7	695,8	137,6	156,5	132,1	86,6	0,19	71,2	70,3	81,3	0,19	71,31	70,88	82,93	0,19	71,29	71,57	81,69	0,07	0,11	-0,71	-1,26	-1,03	170,58157	65,94
20,0	138,0	6,6	0,3	17,9	737,7	71,3	98,4	736,0	143,4	160,8	135,4	87,6	0,19	71,3	70,4	81,1	0,19	71,44	70,98	83,08	0,19	71,43	71,67	81,78	0,07	0,11	-0,71	-1,26	-1,03	181,49907	66,04
21,0	139,0	6,3	0,3	17,9	745,4	71,4	99,8	771,1	149,1	165,2	138,9	89,0	0,19	71,5	70,5	80,9	0,19	71,64	71,10	83,27	0,19	71,62	71,76	81,93	0,07	0,11	-0,73	-1,26	-1,03	191,52035	66,18
22,0	140,0	5,9	0,3	17,9	755,2	71,5	101,0	801,9	156,2	170,1	142,4	90,6	0,19	71,7	70,5	80,7	0,19	71,75	71,19	83,38	0,19	71,77	71,87	82,01	0,07	0,11	-0,73	-1,26	-1,03	201,09281	66,29
23,0	141,0	5,6	0,3	18,1	761,5	71,8	101,5	826,6	163,8	175,3	147,5	92,5	0,19	71,8	70,6	80,6	0,19	71,85	71,28	83,55	0,19	71,91	71,99	82,09	0,07	0,11	-0,73	-1,26	-1,03	209,99807	66,50
24,0	142,0	5,2	0,3	18,3	763,3	72,3	101,8	848,3	167,6	180,5	152,8	94,8	0,19	72,0	70,7	80,5	0,19	71,99	71,38	83,68	0,19	72,09	72,15	82,24	0,07	0,11	-0,74	-1,25	-1,04	217,66299	66,63
25,0	143,0	4,9	0,4	18,4	762,0	72,1	101,9	864,9	171,3	185,8	157,9	97,4	0,19	72,1	70,8	81,3	0,19	72,02	71,47	83,77	0,19	72,19	72,24	82,31	0,07	0,11	-0,75	-1,25	-1,03	224,32139	66,79
26,0	144,0	4,6	0,3	18,1	762,3	72,0	101,7	873,4	175,5	191,7	163,7	100,5	0,18	72,2	70,9	83,0	0,19	72,15	71,59	83,79	0,19	72,31	72,30	82,36	0,07	0,11	-0,75	-1,25	-1,04	229,83137	66,57
27,0	145,0	4,3	0,3	17,8	752,9	72,1	101,0	876,9	179,3	197,1	169,5	104,0	0,19	72,3	71,0	84,5	0,19	72,28	71,67	83,80	0,19	72,43	72,36	82,35	0,07	0,11	-0,76	-1,25	-1,03	234,23595	66,23
28,0	146,0	4,1	0,7	16,6	707,6	72,2	99,8	858,5	183,8	201,9	175,4	107,9	0,19	72,4	71,0	85,0	0,19	72,29	71,73	83,77	0,19	72,47	72,45	82,37	0,07	0,10	-0,76	-1,24	-1,03	234,38363	65,06
29,0	147,0	3,9	0,2	13,3	643,4	71,9	96,8	821,4	188,7	207,3	180,8	112,0	0,18	72,5	71,1	84,9	0,19	72,35	71,78	83,60	0,19	72,56	72,54	82,25	0,07	0,10	-0,75	-1,24	-1,02	230,91385	63,46
30,0	148,0	3,8	0,3	10,7	593,4	72,0	94,6	778,6	193,7	213,8	186,6	116,3	0,19	72,5	71,2	84,6	0,19	72,47	71,85	83,34	0,19	72,64	72,64	82,09	0,07	0,10	-0,75	-1,24	-1,02	226,66815	62,32
31,0	149,0	3,6	0,4	9,4	556,5	72,1	92,4	738,7	199,6	219,9	191,7	120,4	0,19	72,4	71,2	84,3	0,19	72,60	71,89	83,09	0,19	72,75	72,74	81,92	0,07	0,10	-0,76	-1,23	-1,03	222,92907	61,34
32,0	150,0	3,5	0,5	8,7	525,6	72,0	91,5	700,3	206,5	225,4	197,1	124,9	0,19	72,4	71,3	84,0	0,19	72,70	71,97	82,86	0,19	72,80	72,84	81,82	0,07	0,09	-0,75	-1,22	-1,01	219,7172	60,71
33,0	151,0	3,5	0,9	7,5	501,2	72,0	90,6	667,1	213,4	230,8	201,9	129,2	0,19	72,3	71,3	83,8	0,19	72,80	72,04	82,67	0,19	72,89	72,96	81,69	0,07	0,09	-0,75	-1,21	-1,00	217,38067	60,33
34,0	152,0	3,4	1,1	7,0	482,3	71,7	89,4	636,1	220,4	235,4	206,1	133,7	0,19	72,2	71,4	83,5	0,19	72,83	72,09	82,48	0,19	72,95	73,04	81,58	0,07	0,08	-0,76	-1,21	-1,00	215,21941	59,91
35,0	153,0	3,3	1,1	7,0	472,6	71,6	88,3	610,1	227,1	239,8	210,3	138,2	0,19	72,2	71,4	83,2	0,19	72,85	72,10	82,25	0,19	72,99	73,12	81,44	0,07	0,08	-0,75	-1,20	-0,99	213,94556	59,60
36,0	154,0	3,2	1,0	7,3	469,2	72,0	88,4	589,0	233,2	243,7	214,1	142,6	0,18	72,2	71,4	83,0	0,19	72,92	72,15	82,08	0,19	73,02	73,21	81,36	0,07	0,08	-0,75	-1,20	-1,00	213,37944	59,61
37,0	155,0	3,2	0,9	7,6	456,0	71,9	87,6	569,0	239,0	247,9	217,3	146,8	0,19	72,2	71,4	82,7	0,19	72,98	72,21	81,95	0,19	73,07	73,30	81,27	0,07	0,08	-0,75	-1,20	-1,00	212,88279	59,35
38,0	156,0	3,1	0,9	7,6	445,7	71,7	87,4	551,7	244,0	251,6	220,2	151,3	0,19	72,2	71,5	82,4	0,19	73,07	72,24	81,82	0,19	73,16	73,42	81,15	0,07	0,08	-0,75	-1,19	-1,00	212,64382	59,29
39,0	157,0	3,0	0,9	7,5	433,7	71,7	87,4	534,4	249,0	256,6	223,2	155,7	0,19	72,2	71,5	82,2	0,19	73,12	72,28	81,71	0,19	73,20	73,49	81,07	0,07	0,08	-0,74	-1,19	-0,98	212,27159	59,14
40,0	158,0	25,3	0,5	4,8	429,9	72,0	109,3	511,9	256,3	256,9	225,8	166,1	0,19	72,2	71,5	82,0	0,19	73,11	72,32	82,96	0,19	73,23	73,53	82,08	0,07	0,06	-0,74	-1,19	-1,00	212,27954	65,22
41,0	159,0	25,1	0,2	1,9	357,5	72,1	107,7	480,2	263,0	261,9	228,2	175,0	0,19	72,2	71,5	81,9	0,19	73,25	72,36	83,78	0,19	73,35	73,58	82,68	0,07	0,07	-0,75	-1,19	-0,99	210,53167	65,71
42,0	160,0	24,9	0,2	3,1	398,7	71,7	91,9	464,3	267,9	265,1	229,9	176,6	0,19	72,2	71,6	81,7	0,19	73,35	72,40	83,32	0,19	73,44	73,63	82,22	0,07	0,07	-0,74	-1,18	-0,98	209,64097	62,36
43,0	161,0	24,8	0,7	6,1	418,6	71,8	88,3	458,8	271,7	266,7	231,1	179,8	0,19	72,3	71,6	81,5	0,19	73,29	72,43	82,50	0,19	73,42	73,70	81,59	0,07	0,08	-0,74	-1,17	-0,98	210,48726	61,05
44,0	162,0	24,6	0,6	6,7	432,2	71,8	87,9	457,6	274,1	267,3	231,7	183,3	0,19	72,3	71,6	81,3	0,19	73,20	72,42	82,05	0,19	73,35	73,74	81,33	0,07	0,08	-0,73	-1,17	-0,98	211,67845	60,79
45,0	163,0	24,4	0,6	7,5	461,0	72,0	88,2	464,5	275,5	267,4	232,2	187,1	0,19	72,2	71,6	81,2	0,19	73,14	72,42	81,84	0,19	73,28	73,76	81,22	0,07	0,09	-0,73	-1,17	-0,97	214,21163	60,91
46,0	164,0	24,2	0,3	9,3	517,1	71,9	89,4	487,8	275,7	266,3	232,9	189,9	0,19	72,2	71,6	81,0	0,19	73,11	72,45	81,79	0,19	73,26	73,80	81,21	0,07	0,09	-0,73	-1,17	-0,97	219,39063	61,55
47,0	165,0	24,1	0,3	10,5	535,0	72,0	90,5	514,8	275,1	265,1	232,9	192,9	0,19	72,2	71,6	80,9	0,19	73,13	72,47	81,81	0,19	73,24	73,86	81,24	0,07	0,09	-0,73	-1,17	-0,97	225,01092	61,87
48,0	166,0	23,9	0,3	9,6	525,5	71,9	89,8	529,5	273,9	263,7	233,1	195,7	0,19	72,2	71,6	80,7	0,19	73,04	72,50	81,74	0,19	73,21	73,88	81,22	0,07	0,09	-0,73	-1,17	-0,97	228,05249	61,61
49,0	167,0	23,7	0,4	8,9	518,6	72,0	89,9	538,2	272,6	262,6	232,7	198,2	0,19	72,2	71,6	80,6	0,19	73,06	72,49	81,69	0,19	73,22	73,92	81,19	0,07	0,09	-0,74	-1,17	-0,97	229,72895	61,62
50,0	168,0	23,6	0,4	8,6	514,9	72,1	89,6	545,8	270,8	261,7	232,2	200,2	0,19	72,3	71,7	80,5	0,19	73,08	72,55	81,64	0,19	73,24	73,96	81,16	0,07	0,09	-0,73	-1,17	-0,97	231,0202	61,51
51,0	169,0	23,4	0,4	8,7	516,2	72,2	89,9	551,4	269,0	260,6	231,4	202,1	0,19	72,3	71,7	80,4	0,19	73,18	72,61	81,62	0,19	73,31	73,99	81,17	0,07	0,09	-0,74	-1,17	-0,97	231,76581	61,63
52,0	170,0	23,2	0,4	8,9	519,1	72,3	90,7	558,6	266,9	259,8	230,5	203,2	0,19	72,3	71,7	80,9	0,19	73,19	72,62	81,64	0,19	73,34	74,06	81,13	0,07	0,09	-0,73	-1,16	-0,96	232,64287	61,90
53,0	171,0	23,1	0,4	9,3	527,2	72,2	90,4	567,9	264,6	259,0	228,7	204,4	0,18	72,4	71,7	82,5	0,19	73,23	72,65	81,53	0,19	73,37	74,10	81,06	0,07	0,09	-0,74	-1,16	-0,97	233,78588	62,16
54,0	172,0	22,9	0,4	9,6	537,6	72,3	91,1	579,5	262,2	258,4	227,1	206,3	0,19	72,4	71,8	84,0	0,19	73,18	72,67	81,65	0,19	73,37	74,14	81,02	0,07	0,09	-0,74	-1,16	-0,97	235,54786	62,33
55,0	173,0	22,7	0,4	10,1	551,6	72,4	91,6	593,6	260,0	258,2	226,4	207,2	0,19	72,4	71,8	84,7	0,19	73,21	72,69	83,29	0,19	73,40	74,20	81,04	0,07	0,10	-0,73	-1,16	-0,97	237,94109	62,38
56,0	174,0	22,4	0,3	11,1	583,0	72,3	92,3	617,0	257,9	258,1	225,0	208,6	0,19	72,4	71,8	84,5	0,19	73,17	72,73	85,51	0,19	73,41	74,23	81,12	0,07	0,10	-0,74	-1,17	-0,98	242,17596	62,85
57,0	175,0	22,2	0,2	12,4	606,0	72,5	93,8	642,2	255,9	258,1	223,6	209,3	0,19	72,5	71,8	84,2	0,19	73,24	72,76	86,53	0,19	73,48	74,28	81,24	0,07	0,10	-0,73	-1,17	-0,98	246,69182	63,39
58,0	176,0	22,0	0,2	12,6	609,6	72,6	94,3	655,8	254,1	258,3	222,7	210,2	0,19	72,5	71,8	83,9	0,19	73,32	72,79	86,65	0,19	73,53	74,32	81,35	0,07	0,10	-0,73	-1,17	-0,98	249,10616	63,56
59,0	177,0	21,8	0,2	12,4	615,9	72,7	95,0	669,1	252,6	258,5	221,6	211,2	0,19	72,6	71,8	83,7	0,19	73,31	72,83	86,51	0,19	73,55	74,36	81,41	0,07	0,10	-0,74	-1,17	-0,98	251,48005	63,78
60,0	178,0	21,6	0,2	12,7	623,3	72,8	95,3	679,8	251,1	258,8	221,0	211,9	0,19	72,7	71,9	83,5	0,19	73,33	72,88	86,35	0,19	73,55	74,41	81,49	0,07	0,10	-0,75	-1,18	-0,97	253,40744	64,06
61,0	179,0	21,3	0,1	13,1	630,1	72,4	95,7	687,6	250,0	259,5	220,9	211,5	0,19	72,8	71,9	83,2	0,19	73,37	72,90	86,22	0,19	73,57	74,48	81,54	0,07	0,10	-0,74	-1,17	-0,97	254,77673	64,18
62,0	180,0	21,1	0,1	13,7	640,5	72,4	96,4	699,1	248,8	260,1	220,7	212,3	0,00	72,8	72,0	83,0	0,19	73,46	72,95	86,13	0,19	73,67	74,50	81,62	0,07	0,10	0,00	-1,17	-0,98	257,07149	64,52
63,0	181,0	20,9	0,2	14,5	655,7	72,5	97,1	713,6	247,7	261,0	221,2	212,0	0,00	72,5	71,9	82,6	0,19	73,56	73,03	86,00	0,19	73,78	74,78	81,73	0,07	0,11	0,10	-1,17	-0,98	259,96978	64,85
64,0	182,0	20,5	0,2	15,4	678,8	73,0	98,7	737,4	247,0	261,5	221,7	212,4	0,00	72,4	71,9	82,4	0,19	73,60	73,08	86,06	0,19	73,83	75,16	81,88	0,07	0,11	0,11	-1,17	-0,99	264,88086	65,37
65,0	183,0	20,3	0,3	16,2	703,6	72,9	99,6	763,8	246,6	262,3	222,7	213,4	0,00	72,3	71,9	82,1	0,19	73,59	73,13	86,04	0,19	73,87	75,48	82,07	0,07	0,11	0,11	-1,18	-0,99	270,61642	65,74
66,0	184,0	20,0	0,4	16,9	726,9	73,1	100,4	790,3	246,5	263,3	225,3	214,6	0,00	72,2	72,0	81,9	0,19	73,61	73,18	86,03	0,19	73,96	75,78	82,21	0,07	0,11	0,11	-1,18	-0,99	276,88036	66,16
67,0	185,0	19,7	0,6	17,4	750,7	72,9	101,1	817,0	246,8	264,8	228,9	214,7	0,00	72,2	72,0	81,8	0,19	73,71	73,25	86,10	0,19	74,04	76,01	82,42	0,07	0,11	0,11	-1,18	-1,00	283,31505	66,54
68,0	186,0	19,4	0,9	17,8	773,5	73,2	102,7	843,1	247,7	266,2	232,2	215,1	0,00	72,2	72,1	81,7	0,19	73,83	73,36	86,25	0,19	74,15	76,22	82,65	0,07	0,11	0,10	-1,19	-0,99	289,71624	66,97
69,0	187,0	19,1	0,9	18,1	776,8	73,2	103,3	861,9	248,5	267,9	235,7	215,1	0,00	72,2	72,1	81,5	0,19	73,86	73,43	86,30	0,19	74,24	76,42	82,84	0,07	0,11	0,09	-1,20	-1,00	294,69435	67,04
70,0	188,0	18,8	0,5	17,6	761,9	73,3	104,1	870,0	250,0	269,7	240,0	215,5	0,00	72,2	72,2	81,3	0,19	73,79	73,49	86,39	0,19	74,26	76,59	82,99	0,07	0,11	0,09	-1,19	-1,00	297,92366	67,07
71,0	189,0	18,5	0,3	17,1	749,5	73,2	103,0	873,7	251,8	271,6	244,6	217,6	0,00	72,2	72,2	81,2	0,19	73,82	73,53	86,37	0,19	74,30	76,73	83,13	0,07	0,11	0,09	-1,19	-1,01	300,74178	66,92
72,0	190,0	18,2	0,3	16,8	738,5	73,2	102,2	872,6	253,7	274,1	249,2	217,5	0,00	72,2	72,3	81,0	0,19	73,82	73,59	86,29	0,19	74,32	76,83	83,21	0,07	0,11	0,09	-1,18	-1,00	302,28699	66,65
73,0	191,0	17,9	0,2	16,6	730,4	73,4	103,2	871,2	255,8	276,2	253,3	218,4	0,00	72,2	72,3	80,9	0,19	73,79	73,61	86,32	0,19	74,35	76,96	83,36	0,07	0,11	0,09	-1,18	-0,99	303,85329	66,82
74,0	192,0	17,6	0,2	16,4	726,4	73,2	102,9	868,6	258,0	278,6	258,1	220,3	0,00	72,3	72,4	80,7	0,19	73,84	73,65	86,35	0,19	74,42	77,05	83,48	0,07	0,11	0,08	-1,19	-1,00	305,61993	66,89
75,0	193,0	17,4	0,2	16,4	723,4	73,3	103,5	866,7	260,6	281,0	262,7	221,5	0,00	72,3	72,4	80,6	0,19	73,87	73,69	86,36	0,19	74,44	77,15	83,58	0,07	0,11	0,08	-1,19	-0,99	307,38224	66,90
76,0	194,0	17,1	0,2	16,4	720,9	73,2	102,4	865,9	263,6	283,3	267,2	223,3	0,00	72,3	72,4	80,5	0,19	73,91	73,73	86,31	0,19	74,48	77,20	83,67	0,07	0,11	0,08	-1,18	-1,00	309,52285	66,73
77,0	195,0	16,8	0,3	16,3	718,7	73,1	102,5	864,1	266,6	285,1	271,7	224,4	0,00	72,3	72,4	80,5	0,19	74,00	73,76	86,28	0,19	74,51	77,29	83,74	0,07	0,11	0,08	-1,18	-0,99	311,33373	66,50
78,0	196,0	16,6	0,3	16,2	714,2	73,2	101,5	859,8	269,6	288,0	276,3	226,0	0,00	72,3	72,4	81,9	0,19	74,08	73,82	86,18	0,19

121,0	239,0	7,8	0,1	10,8	543,7	73,3	93,7	640,8	414,0	373,1	368,0	360,7	0,00	73,1	73,7	82,3	0,19	75,24	75,25	84,43	0,19	75,81	78,81	84,12	0,07	0,09	0,06	-1,15	-1,00	360,19257	62,59
122,0	240,0	7,7	0,1	10,8	541,8	73,2	94,3	636,4	416,3	373,9	368,1	361,9	0,00	73,1	73,7	82,1	0,19	75,23	75,29	84,42	0,19	75,79	78,81	84,11	0,07	0,09	0,06	-1,15	-0,99	360,19702	62,57
123,0	241,0	7,6	0,1	10,7	538,8	73,5	92,8	630,8	418,3	374,5	368,0	368,8	0,00	73,1	73,7	81,9	0,19	75,29	75,34	84,28	0,19	75,80	78,83	84,01	0,07	0,09	0,06	-1,15	-1,00	360,96606	62,46
124,0	242,0	7,5	0,1	10,4	534,5	73,4	92,9	627,2	420,2	375,1	367,2	373,0	0,00	73,2	73,7	81,7	0,19	75,19	75,34	84,21	0,19	75,77	78,83	83,93	0,07	0,09	0,06	-1,15	-1,00	361,38599	62,40
125,0	243,0	7,4	0,1	10,3	531,3	73,6	92,7	620,3	421,9	375,6	365,9	375,4	0,00	73,2	73,7	81,5	0,19	75,11	75,31	84,09	0,19	75,73	78,88	83,84	0,07	0,09	0,06	-1,14	-1,00	360,6809	62,37
126,0	244,0	7,3	0,1	10,3	528,1	73,3	92,8	616,8	423,6	375,9	366,8	376,5	0,00	73,2	73,7	81,3	0,19	75,06	75,29	84,04	0,19	75,70	78,89	83,75	0,07	0,09	0,06	-1,14	-1,00	360,77662	62,44
127,0	245,0	7,2	0,1	10,2	526,5	73,4	92,7	612,7	425,3	376,5	366,5	376,8	0,00	73,2	73,7	81,2	0,19	75,10	75,29	83,97	0,19	75,71	78,90	83,69	0,07	0,09	0,06	-1,14	-1,00	360,44421	62,37
128,0	246,0	7,1	0,1	10,0	520,2	73,4	92,5	607,7	426,7	377,2	366,6	377,0	0,00	73,2	73,7	81,0	0,19	75,21	75,34	83,87	0,19	75,75	78,91	83,65	0,07	0,09	0,06	-1,15	-1,00	359,90192	62,22
129,0	247,0	7,0	0,1	9,7	512,5	73,6	91,8	600,4	428,1	377,2	365,2	382,4	0,00	73,2	73,7	80,9	0,19	75,33	75,44	83,73	0,19	75,84	78,93	83,51	0,07	0,09	0,06	-1,14	-0,99	359,53495	61,97
130,0	248,0	6,9	0,2	9,6	506,8	73,7	91,6	593,7	429,2	377,5	364,9	386,5	0,00	73,2	73,7	80,7	0,19	75,26	75,44	83,64	0,19	75,80	78,94	83,44	0,07	0,09	0,06	-1,15	-0,99	359,22042	61,95
131,0	249,0	6,8	0,2	9,6	504,6	73,6	91,5	587,3	430,6	377,5	364,1	389,1	0,00	73,2	73,7	80,5	0,19	75,14	75,41	83,59	0,19	75,76	79,00	83,39	0,07	0,09	0,06	-1,15	-1,00	358,59954	61,94
132,0	250,0	6,8	0,2	9,7	502,2	73,4	91,1	582,0	431,8	377,9	363,0	391,4	0,00	73,2	73,7	80,4	0,19	75,01	75,37	83,47	0,19	75,70	78,97	83,24	0,07	0,09	0,06	-1,15	-1,00	358,06747	61,82
133,0	251,0	6,7	0,2	9,7	500,1	73,5	91,1	576,7	432,8	378,4	364,1	391,6	0,00	73,2	73,7	81,1	0,19	74,94	75,32	83,38	0,19	75,63	78,99	83,16	0,07	0,09	0,06	-1,15	-1,00	357,58525	61,93
134,0	252,0	6,6	0,2	9,6	497,5	73,3	91,0	572,0	433,7	378,5	364,0	394,5	0,00	73,2	73,7	82,9	0,19	74,83	75,26	83,26	0,19	75,57	79,01	83,02	0,07	0,09	0,06	-1,15	-1,00	357,416	61,91
135,0	253,0	6,5	0,2	9,4	490,8	73,2	91,0	566,6	434,6	378,5	362,9	396,5	0,00	73,1	73,7	84,6	0,19	74,74	75,24	83,23	0,19	75,52	78,98	82,95	0,07	0,09	0,06	-1,15	-1,00	356,6885	61,73
136,0	254,0	6,4	0,2	9,1	484,9	73,0	90,7	560,3	435,6	378,3	361,9	400,2	0,00	73,1	73,7	85,1	0,19	74,68	75,20	83,13	0,19	75,47	78,98	82,86	0,07	0,09	0,06	-1,15	-1,00	356,11521	61,50
137,0	255,0	6,4	0,2	9,0	481,1	73,1	90,2	554,4	436,2	378,3	361,3	404,3	0,00	73,1	73,7	85,0	0,19	74,66	75,17	83,03	0,19	75,43	78,96	82,78	0,07	0,09	0,06	-1,16	-1,01	355,7709	61,34
138,0	256,0	6,3	0,2	8,9	478,5	73,2	90,4	548,4	437,0	378,3	360,3	409,0	0,00	73,1	73,6	84,8	0,19	74,65	75,17	82,97	0,19	75,42	78,98	82,71	0,07	0,09	0,06	-1,16	-1,01	355,49717	61,32
139,0	257,0	6,2	0,2	9,0	476,2	73,1	90,2	543,9	437,7	378,0	359,8	410,6	0,00	73,1	73,6	84,5	0,19	74,59	75,13	82,88	0,19	75,35	78,99	82,65	0,07	0,09	0,06	-1,16	-1,00	354,87446	61,37
140,0	258,0	6,1	0,2	9,1	475,9	73,1	90,1	540,1	438,6	378,1	359,5	413,6	0,00	73,1	73,6	84,2	0,19	74,53	75,11	82,82	0,19	75,30	78,95	82,60	0,07	0,09	0,06	-1,16	-1,00	354,85133	61,26
141,0	259,0	6,1	0,2	9,2	474,7	73,1	90,0	537,1	439,1	378,1	359,0	416,8	0,00	73,1	73,6	83,9	0,19	74,50	75,07	82,76	0,19	75,26	78,97	82,52	0,07	0,09	0,06	-1,16	-1,01	354,88298	61,25
142,0	260,0	6,0	0,2	9,2	480,1	73,1	89,9	536,6	439,9	377,3	358,4	419,3	0,00	73,1	73,6	83,6	0,19	74,48	75,04	82,65	0,19	75,22	78,98	82,45	0,07	0,09	0,05	-1,16	-1,01	355,18403	61,31
143,0	261,0	5,9	0,2	9,2	482,3	73,0	90,3	536,2	440,5	377,0	358,7	420,5	0,00	73,1	73,6	83,3	0,19	74,44	75,02	82,61	0,19	75,20	78,97	82,38	0,07	0,09	0,06	-1,16	-1,00	355,44783	61,31
144,0	262,0	5,9	0,2	9,2	483,6	73,2	89,7	536,8	441,2	376,6	357,1	425,8	0,00	73,0	73,6	83,1	0,19	74,40	74,98	82,55	0,19	75,15	78,98	82,32	0,07	0,09	0,05	-1,16	-1,01	356,37102	61,24
145,0	263,0	5,8	0,2	9,2	484,2	73,1	89,6	537,5	442,1	376,6	356,5	429,0	0,00	73,0	73,5	82,8	0,19	74,32	74,94	82,45	0,19	75,10	78,96	82,24	0,07	0,09	0,06	-1,16	-1,00	357,20825	61,19
146,0	264,0	5,7	0,2	9,0	484,2	73,1	90,1	537,8	442,7	376,4	356,0	431,3	0,00	73,0	73,5	82,6	0,19	74,29	74,94	82,45	0,19	75,07	78,98	82,21	0,07	0,09	0,06	-1,15	-1,00	357,69885	61,29
147,0	265,0	5,6	0,2	8,9	481,2	73,1	89,8	537,2	443,4	376,3	354,8	434,5	0,00	73,0	73,5	82,3	0,19	74,23	74,91	82,36	0,19	75,04	78,95	82,12	0,07	0,08	0,06	-1,15	-1,01	358,11287	61,20
148,0	266,0	5,6	0,2	8,6	477,4	73,1	89,4	535,7	444,0	376,4	353,8	436,2	0,00	73,0	73,5	82,1	0,19	74,19	74,87	82,30	0,19	74,99	78,91	82,05	0,07	0,08	0,06	-1,16	-1,01	358,07885	61,09
149,0	267,0	5,5	0,2	8,4	473,4	73,0	89,5	532,9	444,4	376,3	353,2	439,0	0,00	73,0	73,5	81,9	0,19	74,19	74,86	82,24	0,19	74,98	78,95	82,02	0,07	0,08	0,06	-1,17	-1,00	358,0263	61,05
150,0	268,0	5,5	0,2	8,4	469,0	73,1	89,0	527,6	444,6	376,4	352,5	444,3	0,00	72,9	73,4	81,7	0,19	74,18	74,82	82,14	0,19	74,95	78,92	81,95	0,07	0,09	0,06	-1,15	-1,00	357,93318	60,86
151,0	269,0	5,4	0,3	8,2	462,4	73,1	88,9	521,4	444,8	376,2	351,9	446,0	0,00	72,9	73,4	81,5	0,19	74,17	74,82	82,08	0,19	74,93	78,93	81,86	0,07	0,08	0,06	-1,16	-1,01	356,93873	60,74
152,0	270,0	5,3	0,3	7,9	453,9	73,1	88,6	515,3	445,1	376,1	350,3	449,0	0,00	72,9	73,4	81,3	0,19	74,15	74,80	82,02	0,19	74,92	78,90	81,78	0,07	0,08	0,06	-1,16	-1,00	356,03427	60,62
153,0	271,0	5,3	0,4	7,6	446,9	73,0	88,4	508,3	445,3	375,8	349,6	452,9	0,00	72,9	73,4	81,2	0,19	74,12	74,77	81,91	0,19	74,91	78,90	81,71	0,07	0,08	0,06	-1,17	-1,01	355,25953	60,54
154,0	272,0	5,2	0,5	7,5	440,3	72,9	88,3	501,0	445,5	375,2	348,3	455,0	0,00	72,9	73,4	81,0	0,19	74,13	74,78	81,85	0,19	74,89	78,91	81,64	0,07	0,08	0,05	-1,17	-1,02	353,90023	60,45
155,0	273,0	5,2	0,6	7,4	434,0	73,0	88,1	493,9	445,6	374,5	347,0	457,0	0,00	72,8	73,3	80,8	0,19	74,13	74,76	81,78	0,19	74,89	78,89	81,57	0,07	0,08	0,05	-1,16	-1,01	352,4592	60,31
156,0	274,0	5,1	0,6	7,2	427,7	72,7	87,5	486,3	445,6	374,0	345,7	460,5	0,00	72,8	73,3	80,6	0,19	74,13	74,73	81,66	0,19	74,86	78,86	81,45	0,07	0,08	0,06	-1,17	-1,01	351,28764	60,08
157,0	275,0	5,1	0,5	6,8	419,5	72,7	86,7	478,7	445,5	373,2	345,8	459,0	0,00	72,8	73,3	80,5	0,19	74,13	74,72	81,54	0,19	74,83	78,88	81,34	0,07	0,08	0,06	-1,17	-1,01	349,30765	59,88
158,0	276,0	5,1	0,6	6,5	412,8	72,9	86,9	470,7	445,7	372,8	345,5	459,2	0,00	72,8	73,3	80,4	0,19	74,25	74,75	81,58	0,19	74,91	78,92	81,26	0,07	0,08	0,06	-1,17	-1,01	347,6629	59,90
159,0	277,0	5,0	0,6	6,4	406,5	72,9	86,8	462,2	445,2	371,8	344,6	458,8	0,00	72,8	73,3	81,8	0,19	74,32	74,78	83,29	0,19	74,96	78,92	81,17	0,07	0,08	0,07	-1,17	-1,01	345,39592	60,02
160,0	278,0	5,0	0,6	6,2	401,1	73,0	86,7	455,2	444,9	370,5	343,3	461,2	0,00	72,8	73,3	83,9	0,19	74,31	74,80	85,44	0,19	74,93	78,90	81,13	0,07	0,08	0,06	-1,18	-1,00	343,89478	60,05

SFBA EPA EMISSION RESULTS

Test Duration: **583** min

PRESSURE FACTOR:	DGM 1st hr	0,98025	
	DGM 1	0,96645	
	DGM 2	0,97219	
	DGM room	1,00424	
TEMPERATURE FACTORS	DGM 1st hr	0,98857	
	DGM 1	0,98733	
	DGM 2	0,98368	
	DGM room	0,99096	
VOLUMES SAMPLED	DGM 1st hr	11,687	SCft
	DGM 1	110,564	SCft
	DGM 2	112,336	Scft
	DGM room	115,137	SCft
TOTAL TUNNEL VOLUME :		429449	

SAMPLE RATIOS

Sample Train 1st Hr:	3781,842
Sample Train 1:	3884,170
Sample Train 2:	3822,885

Paticulate concentration

Sample Train 1st Hr	**0,000128**	g/dscf
Sample Train 1	**0,000029**	g/dscf
Sample Train 2	**0,000028**	g/dscf
Room	**0,000001**	g/dscf

TOTAL EMISSIONS

Sample Train 1st Hr	**5,63**	g
Sample Train 1	**12,06**	g
Sample Train 2	**11,48**	g

EMISSION RATES

Sample Train 1st Hr	**5,63**	g/hr
Sample Train 1	**1,24**	g/hr
Sample Train 2	**1,18**	g/hr

	Train 1	Train 2	Train 1st Hr
Cs	2,894E-05	2,7596E-05	0,0001284

RESULTS

Average emission rate: 1,21 g/hr

Burn Rate : 1,113 Dry kg/hr

BAROMETRIC PRESSURE

Average:	30,04676369	in Hg
Start:	30,06152868	in Hg
End:	30,0319987	in Hg

DGM CONTROLLER VALUES

DGM 1st hr	Final:	3241,430	Cuft
	Initial:	3229,370	Cuft
DGM 1	Final:	13643,295	Cuft
	Initial:	13525,780	Cuft
DGM 2	Final:	4844,424	Cuft
	Initial:	4728,120	Cuft
DGM Room	Final:	28429,364	Cuft
	Initial:	28312,381	Cuft

TEMPERATURES

DGM 1st hr	534,104	°R
DGM 1	534,778	°R
DGM 2	536,760	°R

CALIBRATION FACTORS

DGM 1st Hr	1,0000
DGM 1	0,9860
DGM 2	1,0100
DGM Room	0,9890

TUNNEL FLOW RATE: 736,619 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	3,20	mg
Total Sample Train 2:	3,10	mg
Total Sample Train 1 1st hour:	1,50	mg

TUNNEL FLOW RATE: 736,619 Dscfm

DEVIATION: 2,46%

*		*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	Mass flow	DGM 1st hour	DGM 1st hour	Filter	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft				Change in	T wet bulb
Elapsed		Weight			Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Reading	1st hour	1st hour	1st hour	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Filter 1st hr	Filter 1	Filter 2	Surface	
Time	Raw data row	Remaining	CO	CO_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	1st hour	Inlet T	Outlet T	Temp									in wc	in wc				Temp.	
min		lbs	%	%	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	in. Hg	in. Hg	in. Hg	°F	oF
0,00	307,00	28,6	0,5	2,6	262,1	72,5	91,8	328,1	414,5	336,7	315,2	485,3	0,19	72,9	73,3	84,7	0,19	73,59	75,22	84,27	0,19	75,30	76,47	83,06	0,07	0,04	-0,74	-1,13	-0,96	0	61,13
1,0	308,0	28,1	0,5	2,9	285,9	72,5	84,4	322,6	414,9	349,4	329,4	482,4	0,19	72,9	73,3	84,3	0,19	73,92	75,18	83,67	0,19	75,17	76,53	82,63	0,07	0,06	-0,71	-1,11	-0,94	3,8060426	60,10
2,0	309,0	28,0	0,7	4,6	306,0	72,5	84,1	322,1	415,2	357,9	338,5	486,3	0,19	72,9	73,3	83,8	0,19	73,99	75,11	83,18	0,19	74,99	76,49	82,32	0,07	0,07	-0,71	-1,11	-0,93	8,0699462	60,41
3,0	310,0	27,8	0,8	5,6	356,2	72,2	85,0	329,4	414,6	364,2	345,2	484,3	0,19	73,0	73,3	83,5	0,19	74,04	75,06	82,88	0,19	74,89	76,48	82,18	0,07	0,08	-0,69	-1,12	-0,93	11,597583	61,38
4,0	311,0	27,5	0,6	10,3	459,3	72,3	87,5	364,1	412,7	368,7	349,5	481,7	0,19	73,0	73,3	83,1	0,19	74,05	75,00	82,68	0,19	74,78	76,46	82,22	0,07	0,10	-0,70	-1,11	-0,93	19,403974	62,91
5,0	312,0	27,2	0,5	15,2	606,4	72,8	92,4	448,1	409,6	372,0	352,3	464,9	0,19	73,1	73,3	82,8	0,19	74,00	74,96	82,66	0,19	74,67	76,44	82,54	0,07	0,10	-0,70	-1,12	-0,94	33,446594	65,33
6,0	313,0	26,9	0,2	17,4	677,6	72,9	95,9	538,4	405,6	374,9	354,0	466,2	0,19	73,2	73,3	82,5	0,19	73,97	74,91	82,78	0,19	74,63	76,42	82,95	0,07	0,11	-0,70	-1,13	-0,95	51,875647	66,49
7,0	314,0	26,5	0,3	18,3	709,6	73,1	98,2	618,3	401,6	376,2	354,9	462,4	0,19	73,4	73,3	82,2	0,19	73,99	74,88	82,85	0,19	74,63	76,41	83,24	0,07	0,11	-0,70	-1,14	-0,96	66,738977	67,44
8,0	315,0	26,2	0,3	18,4	727,8	73,5	100,2	686,1	397,6	377,1	354,9	463,5	0,19	73,6	73,3	82,0	0,19	74,12	74,92	82,96	0,19	74,68	76,38	83,54	0,07	0,11	-0,70	-1,13	-0,95	79,909216	67,90
9,0	316,0	25,8	0,3	18,5	736,4	73,7	101,8	743,1	393,4	378,0	355,0	458,7	0,19	73,8	73,4	81,8	0,19	74,24	74,98	83,10	0,19	74,78	76,40	83,77	0,07	0,11	-0,71	-1,14	-0,95	89,704364	68,83
10,0	317,0	25,4	0,3	18,6	744,1	73,5	102,9	789,5	389,7	378,3	355,1	453,2	0,19	74,0	73,4	81,7	0,19	74,23	75,00	83,28	0,19	74,81	76,41	84,01	0,07	0,11	-0,71	-1,15	-0,97	97,215985	69,26
11,0	318,0	25,0	0,3	18,7	747,3	74,0	104,0	826,3	386,3	378,9	354,9	452,0	0,19	74,1	73,4	81,6	0,19	74,41	75,10	83,40	0,19	74,95	76,48	84,25	0,07	0,11	-0,72	-1,15	-0,97	103,74039	69,46
12,0	319,0	24,7	0,3	18,7	753,0	73,6	104,6	855,5	383,2	379,1	354,6	452,6	0,19	74,3	73,5	81,5	0,19	74,47	75,15	83,52	0,19	75,02	76,51	84,42	0,07	0,11	-0,72	-1,15	-0,98	109,05137	69,48
13,0	320,0	24,3	0,3	18,8	755,4	73,8	104,9	877,1	380,3	379,2	354,3	450,7	0,19	74,5	73,6	81,5	0,19	74,54	75,19	83,65	0,19	75,12	76,53	84,55	0,07	0,11	-0,73	-1,15	-0,98	112,40288	69,45
14,0	321,0	24,0	0,5	18,2	661,3	73,9	98,8	876,8	378,3	379,7	354,5	459,4	0,19	74,6	73,7	81,4	0,19	74,63	75,24	83,46	0,19	75,20	76,56	84,25	0,07	0,10	-0,73	-1,15	-0,97	113,81548	67,11
15,0	322,0	23,8	0,6	15,9	603,3	74,0	96,5	852,7	376,8	379,8	354,3	458,8	0,19	74,7	73,7	81,3	0,19	74,67	75,27	83,25	0,19	75,27	76,60	83,96	0,07	0,10	-0,73	-1,15	-0,98	108,55632	65,83
16,0	323,0	23,7	0,6	14,0	565,8	73,8	94,5	823,4	375,5	379,5	354,2	462,2	0,19	74,7	73,8	81,3	0,19	74,67	75,30	83,10	0,19	75,30	76,59	83,74	0,07	0,10	-0,73	-1,14	-0,97	103,0245	65,00
17,0	324,0	23,4	0,6	12,9	539,3	73,7	94,1	792,0	374,5	380,2	354,1	462,7	0,19	74,7	73,8	81,2	0,19	74,66	75,27	83,00	0,19	75,34	76,58	83,57	0,07	0,10	-0,73	-1,14	-0,95	96,76385	64,32
18,0	325,0	23,3	0,5	12,5	521,7	73,3	93,7	766,0	373,7	380,1	353,9	461,5	0,19	74,6	73,8	81,1	0,19	74,71	75,27	82,91	0,19	75,36	76,59	83,49	0,07	0,09	-0,72	-1,13	-0,96	91,091736	64,10
19,0	326,0	23,1	0,5	12,4	510,9	73,4	92,8	742,5	372,9	380,2	353,7	458,8	0,19	74,6	73,9	81,1	0,19	74,65	75,22	82,82	0,19	75,33	76,57	83,39	0,07	0,10	-0,72	-1,13	-0,96	85,673755	63,78
20,0	327,0	22,9	0,5	12,4	502,5	73,5	92,5	723,2	372,5	380,4	353,4	458,5	0,19	74,5	73,9	81,0	0,19	74,58	75,20	82,74	0,19	75,29	76,57	83,31	0,07	0,09	-0,72	-1,12	-0,96	81,638922	63,60
21,0	328,0	22,7	0,5	12,5	496,8	73,4	92,2	708,7	371,8	380,4	352,8	457,4	0,19	74,5	73,9	81,0	0,19	74,48	75,17	82,65	0,19	75,24	76,61	83,22	0,07	0,09	-0,72	-1,12	-0,95	78,311529	63,45
22,0	329,0	22,6	0,5	12,6	493,1	73,3	92,3	695,4	371,3	380,7	352,3	456,8	0,19	74,4	73,9	81,0	0,19	74,43	75,15	82,57	0,19	75,20	76,59	83,19	0,07	0,09	-0,72	-1,12	-0,95	75,359406	63,44
23,0	330,0	22,4	0,6	12,6	490,7	73,3	91,8	686,3	370,8	381,3	351,5	454,0	0,19	74,4	73,9	80,9	0,19	74,36	75,11	82,47	0,19	75,13	76,60	83,10	0,07	0,09	-0,72	-1,12	-0,96	72,850592	63,32
24,0	331,0	22,2	0,6	12,7	488,6	73,4	91,6	679,7	370,3	381,2	351,1	453,9	0,19	74,4	74,0	80,9	0,19	74,40	75,10	82,41	0,19	75,15	76,57	83,07	0,07	0,09	-0,72	-1,11	-0,95	71,296619	63,35
25,0	332,0	22,0	0,6	12,9	488,8	73,5	91,9	674,3	370,1	381,9	350,3	452,5	0,19	74,4	74,0	80,8	0,19	74,52	75,12	82,40	0,19	75,18	76,58	83,05	0,07	0,10	-0,72	-1,12	-0,95	69,873975	63,40
26,0	333,0	21,9	0,6	13,0	489,5	73,4	90,9	672,4	369,6	382,1	349,7	451,1	0,19	74,4	74,0	80,8	0,19	74,63	75,14	82,34	0,19	75,26	76,61	82,98	0,07	0,09	-0,72	-1,11	-0,94	69,036353	63,06
27,0	334,0	21,7	0,6	13,0	488,8	73,5	91,9	669,2	369,5	382,5	349,1	447,5	0,19	74,4	74,0	80,8	0,19	74,77	75,22	82,28	0,19	75,37	76,66	82,98	0,07	0,09	-0,73	-1,11	-0,95	67,622229	63,26
28,0	335,0	21,5	0,6	13,1	488,6	73,6	91,5	668,7	369,3	382,5	348,1	445,5	0,19	74,4	74,0	80,7	0,19	74,85	75,23	82,21	0,19	75,43	76,64	82,94	0,07	0,09	-0,72	-1,11	-0,94	66,852313	63,22
29,0	336,0	21,3	0,6	13,1	488,5	73,5	91,3	667,7	369,3	382,6	347,3	443,5	0,19	74,4	74,0	80,6	0,19	74,88	75,24	82,10	0,19	75,46	76,64	82,88	0,07	0,09	-0,72	-1,11	-0,95	66,122754	63,20
30,0	337,0	21,2	0,6	13,1	488,3	73,7	91,5	667,2	369,1	382,3	346,7	441,8	0,19	74,5	74,1	80,6	0,19	74,86	75,27	82,07	0,19	75,47	76,67	82,90	0,07	0,09	-0,72	-1,11	-0,95	65,455243	63,21
31,0	338,0	21,0	0,6	13,1	486,5	73,4	91,5	667,1	369,2	382,4	346,1	439,3	0,19	74,5	74,1	80,6	0,19	74,85	75,26	82,00	0,19	75,45	76,70	82,86	0,07	0,09	-0,72	-1,09	-0,94	64,883075	63,20
32,0	339,0	20,8	0,6	13,0	486,0	73,5	91,6	666,4	369,4	382,7	345,5	437,0	0,19	74,5	74,1	80,5	0,19	74,80	75,26	81,95	0,19	75,44	76,73	82,82	0,07	0,09	-0,72	-1,10	-0,94	64,255951	63,11
33,0	340,0	20,7	0,7	13,0	485,5	73,4	91,4	665,7	369,4	382,4	344,7	433,1	0,19	74,5	74,1	80,5	0,19	74,76	75,26	81,88	0,19	75,40	76,75	82,73	0,07	0,09	-0,72	-1,09	-0,94	63,133734	62,98
34,0	341,0	20,5	0,6	13,0	484,7	73,5	91,1	663,8	369,7	382,1	344,4	433,5	0,19	74,4	74,1	80,6	0,19	74,77	75,28	81,80	0,19	75,41	76,72	82,70	0,07	0,09	-0,72	-1,10	-0,95	62,754297	62,93
35,0	342,0	20,3	0,6	12,9	482,7	73,6	90,9	661,9	369,8	382,4	344,0	431,3	0,19	74,5	74,1	83,1	0,19	74,72	75,25	81,76	0,19	75,38	76,73	82,60	0,07	0,09	-0,72	-1,10	-0,94	61,932831	62,95
36,0	343,0	20,2	0,6	12,8	480,6	73,6	90,9	660,3	370,1	382,4	343,4	430,4	0,19	74,5	74,1	84,8	0,19	74,76	75,25	81,77	0,19	75,39	76,76	82,54	0,07	0,09	-0,73	-1,10	-0,95	61,370471	62,91
37,0	344,0	20,0	0,6	12,8	478,5	73,8	91,4	657,6	370,4	382,4	342,8	428,1	0,19	74,6	74,1	84,7	0,19	74,76	75,26	81,72	0,19	75,40	76,78	82,56	0,07	0,09	-0,72	-1,10	-0,95	60,303705	62,93
38,0	345,0	19,8	0,6	12,7	477,2	73,8	91,0	655,3	370,6	382,9	342,0	424,8	0,19	74,6	74,1	84,3	0,19	74,79	75,25	81,68	0,19	75,43	76,76	82,52	0,07	0,09	-0,72	-1,10	-0,94	59,18501	62,79
39,0	346,0	19,7	0,6	12,6	475,2	73,6	90,4	653,4	371,1	383,2	341,4	422,5	0,19	74,6	74,2	84,0	0,19	74,84	75,31	81,59	0,19	75,47	76,82	82,47	0,07	0,09	-0,72	-1,10	-0,94	58,365088	62,65
40,0	347,0	19,5	0,6	12,6	473,7	73,5	90,6	651,3	371,4	383,2	341,2	419,8	0,19	74,6	74,2	83,7	0,19	74,87	75,30	82,01	0,19	75,48	76,87	82,43	0,07	0,09	-0,72	-1,10	-0,94	57,4427	62,65
41,0	348,0	19,4	0,6	12,5	471,2	73,6	90,8	648,5	371,8	383,5	341,0	417,2	0,19	74,6	74,2	83,4	0,19	74,86	75,30	85,26	0,19	75,49	76,90	82,41	0,07	0,09	-0,71	-1,10	-0,94	56,452112	62,69
42,0	349,0	19,2	0,6	12,4	469,4	73,6	90,6	646,2	372,2	384,0	340,2	415,5	0,19	74,7	74,2	83,2	0,19	74,91	75,30	86,44	0,19	75,52	76,92	82,34	0,07	0,09	-0,72	-1,10	-0,93	55,664203	62,62
43,0	350,0	19,1	0,5	12,4	467,6	73,5	90,2	643,6	372,6	384,2	339,7	414,1	0,19	74,7	74,2	83,0	0,19	74,92	75,32	86,06	0,19	75,53	76,91	82,30	0,07	0,09	-0,72	-1,10	-0,95	54,904864	62,56
44,0	351,0	18,9	0,5	12,4	467,1	73,4	90,5	642,8	373,0	384,2	339,6	411,8	0,19	74,6	74,2	82,7	0,19	74,97	75,35	85,60	0,19	75,55	76,86	82,24	0,07	0,09	-0,72	-1,10	-0,95	54,33208	62,54
45,0	352,0	18,7	0,5	12,4	466,0	73,5	89,9	639,8	373,4	384,5	339,2	410,1	0,19	74,5	74,2	82,5	0,19	74,93	75,34	85,11	0,19	75,56	76,88	82,17	0,07	0,09	-0,71	-1,10	-0,94	53,445648	62,43
46,0	353,0	18,6	0,5	12,4	465,1	73,4	90,2	638,7	373,7	384,4	338,7	408,3	0,19	74,5	74,2	82,3	0,19	75,02	75,38	84,71	0,19	75,63	76,88	82,16	0,07	0,09	-0,72	-1,10	-0,94	52,816779	62,31
47,0	354,0	18,5	0,5	12,4	463,9	73,4	89,5	638,4	374,1	384,7	338,7	405,9	0,19	74,6	74,2	82,2	0,19	75,07	75,41	84,36	0,19	75,64	76,91	82,17	0,07	0,09	-0,72	-1,10	-0,93	52,403235	62,20
48,0	355,0	18,3	0,5	12,3	463,1	73,5	90,1	636,1	374,5	384,8	338,3	403,1	0,19	74,6	74,2	82,0	0,19	75,07	75,43	84,04	0,19	75,65	76,93	82,10	0,07	0,09	-0,71	-1,10	-0,94	51,431604	62,31
49,0	356,0	18,2	0,5	12,1	460,2	73,2	90,2	633,6	374,9	384,7	337,9	401,6	0,19	74,6	74,2	81,8	0,19	75,04	75,44	83,79	0,19	75,64	76,93	82,10	0,07	0,09	-0,71	-1,10	-0,94	50,603564	62,39
50,0	357,0	18,0	0,5	12,0	457,6	73,4	89,6	630,0	375,4	384,1	337,6	400,9	0,19	74,6	74,2	81,7	0,19	75,03	75,44	83,52	0,19	75,65	76,95	82,05	0,07	0,09	-0,72	-1,10	-0,94	49,654187	62,23
51,0	358,0	17,9	0,6	11,9	457,0	73,5	89,8	626,4	375,8	384,1	337,4	398,4	0,19	74,6	74,3	81,6	0,19	75,14	75,48	83,33	0,19	75,68	76,98	82,05	0,07	0,09	-0,72	-1,10	-0,94	48,446955	62,19
52,0	359,0	17,7	0,6	11,9	454,5	73,7	89,8	623,3	376,0	384,0	337,1	397,4	0,19	74,6	74,3	81,4	0,19	75,17	75,51	83,11	0,19	75,69	76,99	82,00	0,07	0,09	-0,72	-1,10	-0,94	47,62456	62,12
53,0	360,0	17,6	0,6	11,8	453,5	73,6	90,0	619,2	376,5	384,3	336,8	395,2	0,19	74,5	74,3	81,3	0,19	75,21	75,53	82,96	0,19	75,71	76,99	82,02	0,07	0,09	-0,73	-1,11	-0,93	46,464215	62,27
54,0	361,0	17,4	0,6	11,8	451,3	73,6	90,1	616,3	377,0	384,0	336,8	393,2	0,18	74,5	74,3	81,2	0,19	75,25	75,59	82,84	0,19	75,75	76,99	82,02	0,07	0,09	-0,72	-1,10	-0,95	45,523779	62,23
55,0	362,0	17,3	0,6	11,8	449,6	73,5	89,5	613,2	377,4	384,3	336,5	391,4	0,19	74,5	74,3	81,1	0,19	75,19	75,56	82,65	0,19	75,72	76,98	81,96	0,07	0,09	-0,72	-1,10	-0,94	44,614954	62,07
56,0	363,0	17,2	0,6	11,8	448,3	73,4	89,6	611,1	377,8	384,4	336,3	389,6	0,19	74,5	74,3	81,0	0,19	75,14	75,55	82,47	0,19	75,68	77,01	81,90	0,07	0,08	-0,72	-1,10	-0,93	43,905884	61,97
57,0	364,0	17,0	0,5	11,8	446,7	73,2	88,9	609,2	378,3	384,5	336,5	383,2	0,19	74,5	74,3	80,9	0,19	75,23	75,58	82,32	0,19	75,71	77,03	81,83	0,07	0,09	-0,72	-1,10	-0,94	42,410938	61,67
58,0	365,0	16,9	0,5	11,7	445,2	73,3	88,4	605,6	378,7	384,7	336,3	384,8	0,19	74,5	74,3	80,7	0,19	75,17	75,57	82,13	0,19	75,66	77,04	81,75	0,07	0,09	-0,72	-1,10	-0,95	42,082233	61,88
59,0	366,0	16,7	0,5	11,6	443,7	73,2	88,7	603,4	379,1	384,9	336,1	382,2	0,19	74,4	74,2	80,7	0,19	75,10	75,56	82,00	0,19	75,63	77,05	81,71	0,07	0,09	-0,73	-1,10	-0,93	41,200677	61,75
60,0	367,0	16,6	0,5	11,6	442,4	73,2	88,6	600,6	379,6	385,1	335,9	381,5	0,19	74,4	74,2	80,5	0,19	75,05	75,52	81,93	0,19	75,61	77,05	81,70	0,07	0,08	-0,71	-1,09	-0,94	40,902826	61,73
61,0	368,0	16,5	0,5	11,5	441,7	73,4	88,7	597,7	380,0	385,5	336,4	381,5	0,19	74,4	74,2		0,19	75,01	75,53	81,82	0,19	75,57	77,08	81,64	0,07	0,08	-0,72	-1,10	-0,93	40,290283	61,79
62,0	369,0	16,4	0,5	11,5	440,2	73,5	89,2	594,9	380,6	385,8	336,4	377,6	0,00	74,4	74,2		0,19	75,06	75,52	81,73	0,19	75,58	77,11	81,63	0,07	0,08	0,07	-1,10	-0,94	39,117853	62,02
63,0	370,0	16,2	0,5	11,5	437,7	73,3	89,0	593,3	381,0	385,6	336,3	376,4	0,00	74,3	74,1		0,19	75,13	75,56	81,71	0,19	75,63	77,33	81,57	0,07	0,09	0,09	-1,10	-0,94	38,596558	61,78
64,0	371,0	16,1	0,5	11,4	435,8	73,2	89,1	590,8	381,5	386,0	336,6	374,4	0,00	74,2	74,2		0,19	75,23	75,61	84,51	0,19	75,72	77,67	81,55	0,07	0,09	0,08	-1,11	-0,95	37,900757	61,76
65,0	372,0	16,0	0,5	11,4	435,6	73,2	88,9	588,8	382,1	386,2	336,2	372,1	0,00	74,1	74,1		0,19	75,28	75,68	86,43	0,19	75,78	77,91	81,52	0,07	0,08	0,08	-1,11	-0,94	37,131561	61,59
66,0	373,0	15,8	0,4	11,4	434,3	73,5	88,6	586,7	382,4	385,8	336,0	372,3	0,00	74,0	74,1		0,19	75,33	75,72	86,15	0,19	75,84	78,13	81,46	0,07	0,08	0,07	-1,11	-0,95	36,699628	61,53
67,0	374,0	15,7	0,4	11,3	432,3	73,4	88,7	584,7	382,9	385,9	335,8	370,9	0,00	74,0	74,2		0,19	75,35	75,77	85,60	0,19	75,86	78,33	81,46	0,07	0,09	0,08	-1,10	-0,94	36,10199	61,49
68,0	375,0	15,6	0,4	11,3	431,1	73,6	88,6	582,5	383,3	385,7	335,7	369,4	0,00	74,0	74,1		0,19	75,19	75,76	85,13	0,19	75,79	78,40	81,45	0,07	0,09	0,08	-1,11	-0,93	35,40047	61,50
69,0	376,0	15,5	0,4	11,3	429,1	73,2	88,4	579,6	383,8	385,8	335,6	368,3	0,00	73,9	74,2		0,19	75,14	75,73	84,73	0,19	75,78	78,63	81,42	0,07	0,09	0,07	-1,11	-0,94	34,666577	61,44
70,0	377,0	15,3	0,4	11,3	428,5	73,6	88,6	578,4	384,5	385,6	335,6	364,8	0,00	73,9	74,2		0,19	75,16	75,74	84,36	0,19	75,79	78,73	81,39	0,07	0,08	0,06	-1,11	-0,94	33,84975	61,36
71,0	378,0	15,2	0,3	11,3	428,4	73,5	87,9	576,4	385,0	385,9	335,7	362,8	0,00	73,9	74,2		0,19	75,24	75,76	83,97	0,19	75,82	78,84	81,35	0,07	0,08	0,06	-1,11	-0,94	33,206329	61,12
72,0	379,0	15,1	0,3	11,2	427,2	73,5	88,3	574,8	385,4	385,4	335,5	362,1	0,00	73,9	74,2		0,19	75,14	75,74	83,68	0,19	75,76	78,92	81,31	0,07	0,08	0,07	-1,11	-0,94	32,720935	61,25
73,0	380,0	14,9	0,3	11,2	426,0	73,4	87,9	573,1	385,9	385,4	335,3	361,2	0,00	73,9	74,2		0,19	74,99	75,70	83,37	0,19	75,66	78,97	81,28	0,07	0,09	0,06	-1,10	-0,93	32,491188	61,17
74,0	381,0	14,9	0,3	11,2	426,0	73,5	87,8	572,2	386,5	385,2	335,3	359,8	0,00	73,8	74,2		0,19	74,88	75,65	83,10	0,19	75,60	79,01	81,24	0,07	0,09	0,06	-1,10	-0,93	31,866693	61,10
75,0	382,0	14,7	0,4	11,2	425,7	73,3	88,0	570,3	386,8	385,1	335,4	359,0	0,00	73,8	74,2		0,19	74,89	75,65	82,88	0,19	75,59	79,05	81,24	0,07	0,09	0,07	-1,10	-0,94	31,360321	61,08
76,0	383,0	14,6	0,4	11,1	424,4	73,2	87,0	568,6	387,2	385,0	335,2	358,1	0,00	73,8	74,2		0,19	74,91	75,63	82,65	0,19	75,57	79,10	81,14	0,07	0,08	0,07	-1,10	-0,93	30,868909	60,88
77,0	384,0	14,5	0,4	11,0	422,7	73,2	87,6	566,9	387,9	385,1	335,3	356,7	0,00	73,8	74,2		0,19	75,09	75,69	82,46	0,19	75,65	79,15	81,15	0,07	0,08	0,07	-1,10	-0,94	30,439105	60,96
78,0	385,0	14,4	0,3	10,9	420,9	73,5	87,7	565,1	388,4	385,1	335,3	354,8	0,00	73,8	74,2		0,19	75,08	75,71	82,28	0,19	75,69	79,20	81,15	0,07	0,08	0,06	-1,10	-0,93	29,790655	60,93
79,0	386,0	14,3	0,3

121,0	428,0	10,4	0,7	8,7	349,2	73,4	84,6	456,0	396,6	381,3	330,5	316,9	0,00	73,4	73,9	0,19	74,91	75,56	85,21	0,19	75,42	79,51	84,98	0,07	0,07	0,06	-1,12	-0,96	0,3039914	59,37
122,0	429,0	10,3	0,7	8,7	348,9	73,5	84,7	454,7	396,8	380,8	330,1	317,0	0,00	73,4	73,9	0,19	74,81	75,51	84,63	0,19	75,37	79,48	84,69	0,07	0,07	0,07	-1,12	-0,95	-0,076459	59,26
123,0	430,0	10,2	0,7	8,7	348,2	73,3	84,6	453,6	397,0	380,7	330,5	316,2	0,00	73,4	73,9	0,19	74,75	75,48	84,09	0,19	75,32	79,45	84,43	0,07	0,07	0,07	-1,13	-0,95	-0,355987	59,19
124,0	431,0	10,1	0,7	8,7	348,6	73,2	84,9	452,9	397,1	380,5	330,6	316,2	0,00	73,4	73,9	0,19	74,69	75,43	83,69	0,19	75,25	79,41	84,24	0,08	0,07	0,07	-1,12	-0,96	-0,497668	59,28
125,0	432,0	10,1	0,7	8,8	349,1	73,1	84,6	453,0	397,2	380,0	330,7	316,3	0,00	73,4	73,9	0,19	74,70	75,41	83,36	0,19	75,21	79,40	84,02	0,07	0,07	0,06	-1,12	-0,95	-0,492133	59,24
126,0	433,0	10,0	0,6	8,9	351,1	73,3	84,7	452,9	397,4	380,0	331,0	315,1	0,00	73,4	73,9	0,19	74,64	75,40	83,01	0,19	75,19	79,39	83,78	0,07	0,07	0,06	-1,12	-0,96	-0,654596	59,16
127,0	434,0	9,9	0,6	9,0	351,3	73,2	84,4	452,9	397,6	379,7	331,1	314,9	0,00	73,4	73,9	0,19	74,62	75,39	82,70	0,19	75,15	79,37	83,55	0,07	0,07	0,06	-1,12	-0,96	-0,708606	59,13
128,0	435,0	9,8	0,6	9,0	353,0	73,3	84,7	453,5	397,9	379,4	331,0	314,0	0,00	73,4	73,9	0,19	74,63	75,36	82,42	0,19	75,11	79,33	83,36	0,07	0,07	0,06	-1,12	-0,96	-0,790997	59,14
129,0	436,0	9,7	0,5	9,1	354,3	73,2	84,6	453,7	398,0	379,3	331,1	313,8	0,00	73,4	73,9	0,19	74,63	75,36	82,15	0,19	75,09	79,33	83,17	0,07	0,07	0,07	-1,12	-0,96	-0,757971	59,17
130,0	437,0	9,7	0,5	9,1	354,4	73,0	84,7	454,7	398,4	379,2	331,4	312,9	0,00	73,4	74,0	0,19	74,67	75,37	81,90	0,19	75,12	79,34	83,01	0,07	0,07	0,07	-1,12	-0,95	-0,641101	59,23
131,0	438,0	9,6	0,5	9,1	354,7	73,0	84,8	454,8	398,6	379,1	331,7	311,6	0,00	73,4	73,9	0,19	74,72	75,36	82,37	0,19	75,11	79,35	82,84	0,07	0,07	0,07	-1,12	-0,96	-0,770471	59,20
132,0	439,0	9,5	0,5	9,2	355,3	73,2	84,7	455,7	399,0	379,2	332,1	311,1	0,00	73,4	73,9	0,19	74,70	75,36	85,48	0,19	75,10	79,32	82,62	0,07	0,07	0,07	-1,13	-0,96	-0,547668	59,19
133,0	440,0	9,4	0,5	9,3	355,8	73,1	84,7	456,3	399,3	379,3	332,2	311,3	0,00	73,4	73,9	0,19	74,68	75,34	86,42	0,19	75,09	79,28	82,44	0,07	0,07	0,06	-1,13	-0,96	-0,258423	59,21
134,0	441,0	9,3	0,5	9,3	356,6	73,0	84,4	456,9	399,7	379,2	332,3	311,3	0,00	73,4	73,9	0,19	74,68	75,35	85,91	0,19	75,10	79,29	82,27	0,07	0,07	0,07	-1,13	-0,96	-0,052728	59,12
135,0	442,0	9,3	0,5	9,4	356,9	73,2	84,6	457,9	400,1	379,2	332,5	310,2	0,00	73,4	73,9	0,19	74,67	75,34	85,27	0,19	75,07	79,28	82,11	0,07	0,07	0,07	-1,13	-0,95	0,0530028	59,18
136,0	443,0	9,2	0,5	9,4	358,3	73,3	84,6	459,8	400,3	379,4	332,7	309,9	0,00	73,4	73,9	0,19	74,63	75,33	84,74	0,19	75,06	79,27	82,00	0,07	0,07	0,06	-1,13	-0,95	0,4868654	59,17
137,0	444,0	9,1	0,5	9,5	360,6	73,1	84,6	462,0	401,0	379,5	333,1	309,4	0,00	73,4	73,9	0,19	74,61	75,29	84,27	0,19	75,05	79,25	81,85	0,07	0,07	0,06	-1,13	-0,96	1,034595	59,17
138,0	445,0	9,0	0,5	9,7	362,2	73,2	84,4	464,4	401,2	379,2	333,5	308,4	0,00	73,4	73,9	0,19	74,56	75,28	83,82	0,19	75,02	79,24	81,76	0,07	0,07	0,07	-1,12	-0,96	1,406653	59,19
139,0	446,0	8,9	0,5	9,8	364,9	73,2	84,8	466,0	401,7	379,2	334,3	308,3	0,00	73,4	73,9	0,19	74,50	75,27	83,44	0,19	74,99	79,23	81,61	0,07	0,07	0,07	-1,13	-0,96	1,9620668	59,33
140,0	447,0	8,9	0,5	10,0	366,0	73,3	84,8	468,7	402,2	379,8	334,3	307,2	0,00	73,4	73,9	0,19	74,44	75,21	83,14	0,19	74,94	79,20	81,48	0,07	0,07	0,06	-1,12	-0,96	2,5017272	59,41
141,0	448,0	8,8	0,5	10,0	367,2	73,1	84,6	470,8	402,5	380,4	334,8	307,6	0,00	73,4	73,9	0,19	74,41	75,18	82,80	0,19	74,91	79,18	81,36	0,07	0,07	0,06	-1,12	-0,96	3,2612854	59,21
142,0	449,0	8,7	0,6	10,0	369,1	73,2	84,7	473,2	403,1	380,8	335,3	307,6	0,00	73,4	73,9	0,19	74,42	75,17	82,49	0,19	74,89	79,14	81,28	0,07	0,08	0,06	-1,13	-0,95	4,0652406	59,24
143,0	450,0	8,6	0,6	10,1	371,4	73,3	84,7	475,8	403,7	381,4	335,8	307,7	0,00	73,4	73,9	0,19	74,42	75,16	82,23	0,19	74,86	79,11	81,20	0,07	0,08	0,05	-1,12	-0,96	4,9138672	59,25
144,0	451,0	8,5	0,5	10,3	375,1	73,1	84,8	479,1	404,2	382,0	336,2	307,2	0,00	73,3	73,9	0,19	74,42	75,14	81,99	0,19	74,87	79,09	81,12	0,07	0,08	0,06	-1,13	-0,95	5,8217654	59,30
145,0	452,0	8,4	0,5	10,6	378,9	73,3	85,1	483,0	404,8	382,8	336,8	306,6	0,00	73,4	73,9	0,19	74,47	75,13	81,79	0,19	74,89	79,08	81,10	0,07	0,08	0,06	-1,12	-0,95	6,876947	59,37
146,0	453,0	8,3	0,5	10,8	380,1	73,2	85,5	486,3	405,6	382,3	337,4	305,6	0,00	73,4	73,9	0,19	74,52	75,12	82,39	0,19	74,90	79,06	81,11	0,07	0,07	0,06	-1,13	-0,96	7,5202332	59,48
147,0	454,0	8,2	0,5	10,3	376,4	73,4	85,7	486,5	406,4	382,7	338,0	305,4	0,00	73,4	73,9	0,19	74,56	75,14	85,52	0,19	74,93	79,07	82,89	0,07	0,07	0,06	-1,13	-0,96	7,861261	59,59
148,0	455,0	8,2	0,5	9,7	371,5	73,3	85,3	485,7	407,3	384,4	338,8	305,7	0,00	73,4	73,9	0,19	74,54	75,11	86,42	0,19	74,96	79,07	84,99	0,07	0,07	0,06	-1,13	-0,96	8,439734	59,43
149,0	456,0	8,1	0,4	9,0	366,1	73,2	85,4	483,8	408,2	385,5	339,1	305,1	0,00	73,4	73,9	0,19	74,58	75,13	85,95	0,19	74,96	79,06	85,32	0,07	0,07	0,06	-1,13	-0,96	8,3826294	59,28
150,0	457,0	8,0	0,4	8,8	360,9	73,1	85,1	480,7	409,1	386,4	339,8	305,5	0,00	73,4	73,9	0,19	74,63	75,16	85,34	0,19	74,97	79,08	85,11	0,07	0,07	0,06	-1,13	-0,96	8,3601012	59,15
151,0	458,0	8,0	0,4	8,5	356,0	73,2	85,1	477,8	410,2	387,3	340,3	304,7	0,00	73,4	73,9	0,19	74,65	75,18	84,79	0,19	74,98	79,09	84,83	0,07	0,07	0,06	-1,13	-0,96	8,1118838	59,05
152,0	459,0	7,9	0,4	8,4	352,3	73,4	84,1	474,4	411,0	388,2	340,9	304,3	0,00	73,3	73,9	0,19	74,73	75,22	84,28	0,19	75,03	79,11	84,53	0,07	0,07	0,06	-1,13	-0,96	7,7984132	58,83
153,0	460,0	7,9	0,4	8,1	349,2	73,1	84,8	470,6	412,2	389,2	341,3	302,6	0,00	73,4	73,9	0,19	74,75	75,23	83,87	0,19	75,07	79,09	84,28	0,07	0,07	0,06	-1,13	-0,95	7,2472594	58,85
154,0	461,0	7,8	0,4	8,0	345,5	73,1	84,5	467,5	412,9	390,3	342,0	303,4	0,00	73,4	73,9	0,19	74,84	75,30	83,50	0,19	75,17	79,13	84,05	0,07	0,07	0,06	-1,12	-0,97	7,2783874	58,88
155,0	462,0	7,8	0,4	7,8	340,7	73,1	84,4	463,6	413,6	391,0	342,2	303,9	0,00	73,4	73,9	0,19	74,76	75,29	83,14	0,19	75,17	79,17	83,81	0,07	0,07	0,06	-1,13	-0,96	6,923297	58,91
156,0	463,0	7,7	0,4	7,3	335,3	73,1	83,7	458,2	414,1	391,4	342,9	302,5	0,00	73,4	73,9	0,19	74,75	75,27	82,80	0,19	75,20	79,19	83,50	0,07	0,07	0,06	-1,13	-0,96	5,890515	58,64
157,0	464,0	7,7	0,4	7,0	328,4	73,3	84,0	453,2	414,6	391,5	343,4	301,4	0,00	73,3	73,9	0,19	74,79	75,30	82,49	0,19	75,20	79,20	83,23	0,07	0,07	0,06	-1,13	-0,96	4,864447	58,63
158,0	465,0	7,6	0,5	6,6	321,7	73,2	83,9	446,2	415,0	392,2	343,3	302,2	0,00	73,3	73,8	0,19	74,75	75,29	82,16	0,19	75,20	79,23	82,98	0,07	0,07	0,06	-1,13	-0,96	3,8330996	58,57
159,0	466,0	7,6	1,1	5,4	311,9	73,2	83,8	437,9	415,6	392,3	343,7	298,9	0,00	73,3	73,8	0,19	74,87	75,32	81,93	0,19	75,28	79,25	82,80	0,07	0,06	0,06	-1,12	-0,96	1,743097	58,39
160,0	467,0	7,5	1,1	5,5	308,4	73,2	83,8	431,6	415,9	392,4	343,6	299,0	0,00	73,3	73,8	0,19	74,94	75,36	81,67	0,19	75,32	79,27	82,63	0,07	0,07	0,06	-1,12	-0,96	0,5598756	58,31
161,0	468,0	7,5	1,0	5,5	302,4	73,3	83,2	424,6	416,0	392,3	343,5	300,6	0,00	73,3	73,9	0,19	74,93	75,37	81,46	0,19	75,31	79,29	82,40	0,07	0,06	0,06	-1,12	-0,95	-0,552435	58,13
162,0	469,0	7,5	1,1	5,5	296,6	73,3	82,7	417,3	416,0	391,7	343,3	299,3	0,00	73,3	73,9	0,19	75,03	75,42	83,01	0,19	75,38	79,32	82,20	0,07	0,06	0,06	-1,12	-0,94	-2,431091	58,01
163,0	470,0	7,4	1,1	5,4	293,4	73,3	83,0	410,9	415,7	391,3	342,9	300,5	0,00	73,3	73,9	0,19	75,03	75,43	86,01	0,19	75,39	79,32	82,01	0,07	0,06	0,06	-1,13	-0,95	-3,549359	58,10
164,0	471,0	7,4	1,1	5,5	290,4	73,2	82,9	405,4	415,1	391,2	342,4	300,8	0,00	73,3	73,8	0,19	75,09	75,46	86,25	0,19	75,46	79,33	81,82	0,07	0,06	0,06	-1,13	-0,95	-4,961145	57,96
165,0	472,0	7,3	1,1	5,5	288,9	73,4	82,7	400,1	414,3	391,0	341,7	301,2	0,00	73,4	73,9	0,19	75,11	75,48	85,66	0,19	75,47	79,36	81,66	0,07	0,06	0,06	-1,12	-0,94	-6,272559	58,02
166,0	473,0	7,3	1,1	5,5	286,9	73,5	83,0	396,1	413,3	390,8	340,8	298,5	0,00	73,3	73,9	0,19	75,13	75,49	85,03	0,19	75,52	79,39	81,53	0,07	0,06	0,06	-1,12	-0,95	-8,073596	57,91
167,0	474,0	7,3	1,0	5,6	285,1	73,5	83,3	390,9	411,9	390,1	339,7	300,5	0,00	73,4	73,9	0,19	75,08	75,52	84,49	0,19	75,49	79,42	81,46	0,07	0,06	0,06	-1,12	-0,95	-9,32688	58,19
168,0	475,0	7,2	1,0	5,8	284,5	73,2	82,4	387,9	410,5	389,3	338,8	300,6	0,00	73,4	73,9	0,19	75,15	75,57	83,97	0,19	75,58	79,44	81,27	0,07	0,06	0,06	-1,12	-0,95	-10,51978	58,02
169,0	476,0	7,2	1,0	5,7	283,9	73,0	82,5	385,1	409,1	388,9	337,8	299,3	0,00	73,4	73,9	0,19	75,25	75,60	83,49	0,19	75,62	79,51	81,12	0,07	0,06	0,06	-1,11	-0,94	-11,91666	57,93
170,0	477,0	7,2	1,0	5,9	286,0	73,2	82,7	382,7	407,4	388,8	337,0	297,9	0,00	73,4	73,9	0,19	75,29	75,68	83,05	0,19	75,65	79,55	81,02	0,07	0,06	0,06	-1,11	-0,95	-13,17582	57,90
171,0	478,0	7,1	0,9	6,0	286,4	73,3	82,4	381,6	405,8	388,0	336,2	298,3	0,00	73,4	73,9	0,19	75,35	75,70	82,70	0,19	75,69	79,56	81,02	0,07	0,06	0,07	-1,11	-0,93	-13,9679	57,98
172,0	479,0	7,1	0,8	6,2	289,5	73,5	82,4	380,6	403,9	387,4	335,6	296,0	0,00	73,4	73,9	0,19	75,38	75,74	82,36	0,19	75,70	79,61	82,57	0,07	0,06	0,00	-1,11	-0,95	-15,2473	58,08
173,0	480,0	7,1	0,7	6,3	290,2	73,2	82,6	379,5	402,0	387,2	334,7	296,6	0,00	73,4	73,9	0,19	75,35	75,72	82,11	0,19	75,70	79,64	84,75	0,07	0,06	0,06	-1,13	-0,95	-15,93958	58,13
174,0	481,0	7,0	0,7	6,3	291,0	73,1	82,1	378,9	400,3	387,2	333,7	297,5	0,00	73,4	73,9	0,19	75,28	75,69	81,78	0,19	75,67	79,63	85,10	0,07	0,06	0,00	-1,11	-0,95	-16,40839	57,89
175,0	482,0	7,0	0,7	6,3	290,6	73,2	82,2	378,4	398,8	386,0	333,1	296,5	0,00	73,4	73,9	0,19	75,21	75,69	81,55	0,19	75,62	79,62	84,82	0,07	0,06	0,00	-1,11	-0,95	-17,39216	58,15
176,0	483,0	6,9	0,8	6,2	289,9	73,4	82,4	377,7	397,2	385,6	332,5	297,6	0,00	73,4	73,9	0,19	75,25	75,71	84,07	0,19	75,60	79,61	84,41	0,07	0,06	0,06	-1,13	-0,95	-17,82366	58,07
177,0	484,0	6,9	0,8	6,2	290,0	73,2	82,4	377,5	395,6	386,0	331,6	295,5	0,00	73,4	73,9	0,19	75,30	75,73	86,40	0,19	75,67	79,65	84,11	0,07	0,06	0,06	-1,13	-0,95	-18,68286	58,03
178,0	485,0	6,9	0,7	6,5	290,9	72,8	82,4	377,5	394,2	385,8	330,7	295,9	0,00	73,4	73,9	0,19	75,27	75,75	86,08	0,19	75,64	79,66	83,84	0,07	0,06	0,05	-1,13	-0,95	-19,14006	58,00
179,0	486,0	6,8	0,7	6,4	290,0	73,0	82,6	377,9	392,8	385,8	330,1	294,8	0,00	73,4	73,9	0,19	75,24	75,75	85,40	0,19	75,60	79,65	83,63	0,07	0,06	0,06	-1,13	-0,96	-19,66122	58,00
180,0	487,0	6,8	0,7	6,4	290,3	73,0	82,4	378,4	391,6	385,4	329,2	295,2	0,00	73,4	73,9	0,19	75,19	75,74	84,83	0,19	75,57	79,63	83,39	0,07	0,06	0,06	-1,13	-0,96	-19,97321	58,00
181,0	488,0	6,7	0,7	6,4	289,9	73,2	82,3	377,9	390,4	385,3	328,5	295,3	0,00	73,4	73,9	0,19	75,14	75,71	84,27	0,19	75,53	79,58	83,18	0,07	0,06	0,05	-1,13	-0,95	-20,47551	57,90
182,0	489,0	6,7	0,7	6,4	290,7	73,0	82,4	378,2	389,3	385,1	327,8	296,3	0,00	73,4	73,9	0,19	75,09	75,69	83,78	0,19	75,50	79,55	82,98	0,07	0,06	0,06	-1,11	-0,95	-20,61845	57,93
183,0	490,0	6,7	0,7	6,5	291,0	73,1	82,4	378,6	388,2	385,5	327,5	296,1	0,00	73,4	73,9	0,19	75,17	75,71	83,33	0,19	75,47	79,58	82,81	0,07	0,06	0,06	-1,12	-0,95	-20,7741	57,89
184,0	491,0	6,6	0,7	6,6	291,3	73,2	82,3	379,0	387,2	385,4	326,7	296,8	0,00	73,4	73,9	0,19	75,16	75,73	82,94	0,19	75,45	79,57	82,56	0,07	0,06	0,06	-1,13	-0,96	-20,9283	57,87
185,0	492,0	6,6	0,7	6,7	293,2	73,0	82,4	379,4	386,2	385,8	326,1	296,8	0,00	73,4	73,9	0,19	75,15	75,73	82,60	0,19	75,43	79,53	82,38	0,07	0,06	0,05	-1,12	-0,95	-21,06858	57,92
186,0	493,0	6,5	0,6	6,8	294,9	72,9	82,0	380,5	385,2	386,3	325,7	297,5	0,00	73,4	73,9	0,19	75,21	75,73	82,26	0,19	75,45	79,53	82,18	0,07	0,06	0,05	-1,13	-0,94	-20,90295	57,90
187,0	494,0	6,5	0,6	6,9	296,8	73,0	82,4	381,0	384,4	386,7	325,2	297,3	0,00	73,4	73,9	0,19	75,26	75,71	81,95	0,19	75,50	79,56	82,02	0,07	0,06	0,05	-1,13	-0,95	-21,03212	58,01
188,0	495,0	6,5	0,6	7,0	298,1	73,1	82,7	382,3	383,8	387,3	324,7	297,5	0,00	73,4	73,9	0,19	75,23	75,72	81,73	0,19	75,48	79,56	81,88	0,07	0,06	0,06	-1,12	-0,96	-20,86611	58,07
189,0	496,0	6,4	0,5	7,1	299,3	73,1	82,4	383,6	382,7	387,4	324,2	296,8	0,00	73,4	73,9	0,19	75,19	75,71	81,45	0,19	75,46	79,52	81,72	0,07	0,06	0,06	-1,13	-0,96	-20,98473	58,01
190,0	497,0	6,4	0,5	7,0	298,4	73,0	82,3	383,7	382,0	387,8	324,5	298,8	0,00	73,4	73,9	0,19	75,16	75,69	83,48	0,19	75,45	79,53	81,57	0,07	0,06	0,06	-1,13	-0,95	-20,57588	57,98
191,0	498,0	6,3	0,6	6,8	298,2	73,0	82,4	384,5	381,6	387,9	324,1	296,5	0,00	73,4	73,9	0,19	75,16	75,70	86,16	0,19	75,40	79,52	81,39	0,07	0,06	0,05	-1,13	-0,96	-21,01174	58,02
192,0	499,0	6,3	0,6	6,6	297,9	73,1	82,6	384,6	380,9	388,5	323,9	299,8	0,00	73,4	73,9	0,19	75,12	75,67	86,18	0,19	75,40	79,52	81,27	0,07	0,06	0,05	-1,13	-0,95	-20,38363	57,95
193,0	500,0	6,2	0,7	6,3	295,5	73,1	82,5	383,0	380,7	388,4	324,2	298,2	0,00	73,4	73,9	0,19	75,20	75,67	85,50	0,19	75,41	79,50	81,12	0,07	0,06	0,06	-1,13	-0,95	-21,03648	57,85
194,0	501,0	6,2	0,6	6,5	293,5	73,0	82,5	381,4	380,1	388,0	324,2	297,1	0,00	73,4	73,9	0,19	75,16	75,65	84,87	0,19	75,38	79,50	81,05	0,07	0,06	0,05	-1,13	-0,95	-21,77924	58,10
195,0	502,0	6,2	0,6	6,5	292,2	73,0	82,2	380,4	379,6	389,0	324,3	298,8	0,00	73,4	73,9	0,19	75,02	75,63	84,38	0,19	75,33	79,45	82,98	0,07	0,06	0,06	-1,13	-0,94	-21,52635	58,10
196,0	503,0	6,1	0,6	6,4	291,3	73,0	82,4	378,4	379,1	389,7	324,2	296,8	0,00	73,4	73,8	0,19	74,96	75,59	83,92	0,19	75,28	79,45	84,99	0,07	0,06	0,06	-1,13	-0,97	-22,29537	58,07
197,0	504,0	6,1	0,6	6,4	289,4	72,8	82,5	376,8	378,6	389,3	324,0	298,6	0,00	73,4	73,8	0,19	74,90	75,57	83,49	0,19	75,27	79,45	85,23	0,07	0,06	0,06	-1,12	-0,96	-22,34959	58,02
198,0	505,0	6,1	0,6	6,3	287,5	72,8	82,3	374,8	378,2	390,3	323,9	298,6	0,00	73,4	73,8	0,19	74,88	75,55	83,02	0,19	75,25	79,44	84,93	0,07	0,06	0,06	-1,12	-0,96	-22,77115	57,89
199,0	506,0	6,0	0,6	6,3	286,5	72,7	82,2	373,3	377,8	390,3	323,9	300,0	0,00	73,4	73,8	0,19	74,80	75,52	82,61	0,19	75,20	79,41	84,60	0,07	0,06	0,06	-1,13	-0,95	-22,88764	57,82
200,0	507,0	6,0	0,6	6,3	279,3	72,7	82,1	370,7	377,3	390,6	324,0	299,7	0,00	73,4	73,8	0,19	74,71	75,48	82,27	0,19	75,12	79,38	84,29	0,07	0,06	0,06	-1,13	-0,95	-23,46919	57,71
201,0	508,0	5,9	1,2	5,1	268,1	72,7	81,8	365,2	377,2	390,8	324,2	299,5	0,00	73,4	73,8	0,19	74,64	75,42	81,95	0,19	75,08	79,34	84,00	0,07	0,06	0,05	-1,12	-0,96	-24,52597	57,48
202,0	509,0	5,9	1,3	5,0	261,3	72,9	81,8	359,2	377,1	391,0	324,2	301,2	0,00	73,4	73,8	0,19	74,59	75,39	81,65	0,19	75,02	79,30	83,73	0,07	0,05	0,06	-1,12	-0,95	-25,39936	57,52
203,0	510,0	5,9	1,4	5,0	256,2	72,7	81,8	354,2	377,0	391,1	324,6	301,0	0,00	73,4	73,8	0,19	74,56	75,36	82,63	0,19	74,98	79,29	83,52	0,07	0,05	0,05	-1,12	-0,96	-26,38376	57,54
204,0	511,0	5,8	1,4	5,0	252,9	72,7	81,7	348,8	376,7	391,6	324,4	300,4	0,00	73,4	73,8	0,19	74,51	75,29	85,68	0,19	74,95	79,

246,0	553,0	5,0	1,0	4,7	211,2	72,8	79,8	266,9	345,5	378,0	300,4	309,4	0,00	73,2	73,6	0,19	74,44	75,07	83,67	0,19	74,75	79,13	82,66	0,07	0,04	0,06	-1,13	-0,96	-55,90716	57,20
247,0	554,0	5,0	1,0	4,8	210,5	72,6	79,6	266,3	344,9	377,7	300,1	309,9	0,00	73,1	73,5	0,19	74,43	75,06	83,14	0,19	74,74	79,10	82,39	0,07	0,04	0,05	-1,13	-0,96	-56,14627	57,00
248,0	555,0	4,9	1,0	4,8	210,0	72,7	79,6	265,7	344,5	377,7	300,2	309,9	0,00	73,1	73,5	0,19	74,47	75,05	82,70	0,19	74,72	79,08	82,15	0,07	0,04	0,06	-1,13	-0,96	-56,34373	56,99
249,0	556,0	4,9	1,0	4,8	208,9	72,6	79,7	265,0	344,3	375,2	298,9	310,0	0,00	73,1	73,5	0,19	74,43	75,03	82,33	0,19	74,71	79,02	81,94	0,07	0,04	0,05	-1,13	-0,97	-57,28215	57,04
250,0	557,0	4,9	1,0	4,8	208,9	72,6	79,7	264,3	343,8	375,6	299,0	310,3	0,00	73,1	73,4	0,19	74,45	75,02	81,97	0,19	74,70	79,02	81,74	0,07	0,04	0,05	-1,13	-0,96	-57,35587	57,03
251,0	558,0	4,9	1,0	4,8	208,0	72,7	79,7	263,5	343,2	374,5	298,8	310,3	0,00	73,1	73,4	0,19	74,40	74,99	81,62	0,19	74,66	78,99	81,53	0,07	0,04	0,06	-1,13	-0,96	-57,87829	57,05
252,0	559,0	4,9	1,0	4,8	207,9	72,7	79,6	263,0	342,8	375,4	299,3	310,6	0,00	73,1	73,4	0,19	74,43	74,99	83,32	0,19	74,65	78,98	81,33	0,07	0,04	0,05	-1,13	-0,97	-57,71586	57,08
253,0	560,0	4,9	1,0	4,8	207,5	72,7	79,6	262,4	342,5	374,1	299,0	310,9	0,00	73,0	73,4	0,19	74,40	74,96	86,03	0,19	74,63	78,99	81,11	0,07	0,04	0,06	-1,13	-0,95	-58,18674	57,08
254,0	561,0	4,8	1,0	4,7	207,2	72,7	79,6	261,5	342,1	373,7	299,6	311,1	0,00	73,0	73,4	0,19	74,38	74,95	85,99	0,19	74,64	78,99	81,87	0,07	0,04	0,05	-1,13	-0,97	-58,03947	57,10
255,0	562,0	4,9	1,0	4,8	206,7	72,7	79,6	261,1	341,8	375,4	299,9	310,8	0,00	73,0	73,4	0,19	74,37	74,92	85,39	0,19	74,61	79,02	84,14	0,07	0,04	0,06	-1,13	-0,97	-58,13117	57,29
256,0	563,0	4,8	1,0	4,8	206,8	72,7	79,7	260,3	341,3	373,8	299,4	311,7	0,00	73,0	73,3	0,19	74,34	74,91	84,72	0,19	74,60	79,01	85,31	0,07	0,04	0,06	-1,13	-0,97	-58,61648	57,25
257,0	564,0	4,8	1,0	4,7	206,0	72,6	79,6	259,7	341,1	372,9	299,4	312,1	0,00	73,0	73,3	0,19	74,38	74,90	84,15	0,19	74,63	79,00	85,09	0,07	0,04	0,06	-1,13	-0,97	-58,9045	57,09
258,0	565,0	4,8	1,0	4,7	205,7	72,8	79,5	259,4	340,7	372,3	299,1	312,6	0,00	73,0	73,3	0,19	74,40	74,87	83,56	0,19	74,63	78,98	84,73	0,07	0,04	0,06	-1,13	-0,97	-59,13369	57,01
259,0	566,0	4,8	1,0	4,7	205,2	72,6	79,5	258,8	340,4	371,7	299,0	312,6	0,00	73,0	73,3	0,19	74,39	74,87	83,09	0,19	74,63	78,97	84,35	0,07	0,04	0,06	-1,13	-0,98	-59,44343	57,02
260,0	567,0	4,8	1,0	4,7	205,0	72,7	79,6	258,3	340,1	371,0	299,1	312,9	0,00	73,0	73,3	0,19	74,38	74,86	82,64	0,19	74,61	78,97	84,03	0,07	0,04	0,06	-1,13	-0,97	-59,65591	57,04
261,0	568,0	4,8	1,0	4,7	205,2	72,7	79,5	257,8	339,7	370,7	299,2	313,0	0,00	73,0	73,3	0,19	74,36	74,85	82,26	0,19	74,60	78,95	83,74	0,07	0,04	0,06	-1,12	-0,96	-59,86024	57,02
262,0	569,0	4,7	1,0	4,7	204,7	72,7	79,6	257,5	339,4	371,9	299,9	312,9	0,00	73,0	73,3	0,19	74,37	74,85	81,87	0,19	74,60	78,94	83,45	0,07	0,04	0,06	-1,12	-0,97	-59,61552	57,05
263,0	570,0	4,8	1,0	4,7	204,2	72,8	79,6	256,8	339,1	372,2	301,2	313,1	0,00	73,0	73,3	0,19	74,37	74,84	81,69	0,19	74,58	78,93	83,11	0,07	0,04	0,06	-1,13	-0,97	-59,45661	57,16
264,0	571,0	4,7	1,0	4,7	204,3	72,8	79,6	256,5	338,8	371,7	301,1	313,7	0,00	73,0	73,3	0,19	74,34	74,82	84,55	0,19	74,56	78,93	82,82	0,07	0,04	0,05	-1,13	-0,97	-59,60236	57,16
265,0	572,0	4,7	1,0	4,7	203,8	72,7	79,7	256,1	338,5	371,7	301,5	313,9	0,00	73,0	73,3	0,19	74,34	74,84	86,53	0,19	74,59	78,95	82,54	0,07	0,04	0,05	-1,13	-0,97	-59,61	57,12
266,0	573,0	4,7	1,0	4,7	203,5	72,7	79,6	255,7	338,3	371,5	302,0	314,3	0,00	73,0	73,3	0,19	74,37	74,81	86,15	0,19	74,58	78,95	82,34	0,07	0,04	0,05	-1,13	-0,97	-59,57903	57,05
267,0	574,0	4,7	1,0	4,7	203,5	72,8	79,5	255,5	338,0	371,4	302,3	314,8	0,00	73,0	73,3	0,19	74,38	74,80	85,45	0,19	74,59	78,95	82,11	0,07	0,04	0,06	-1,13	-0,96	-59,54206	57,06
268,0	575,0	4,6	1,0	4,7	203,1	72,7	79,6	255,3	337,9	371,1	302,9	315,2	0,00	73,0	73,3	0,19	74,36	74,82	84,78	0,19	74,59	78,95	81,88	0,07	0,04	0,05	-1,13	-0,97	-59,48338	57,05
269,0	576,0	4,6	1,0	4,7	203,3	72,7	79,5	255,1	337,6	370,6	303,3	315,5	0,00	73,0	73,3	0,19	74,37	74,82	84,15	0,19	74,60	78,95	81,69	0,07	0,04	0,06	-1,13	-0,97	-59,52742	57,02
270,0	577,0	4,6	1,0	4,7	203,2	72,7	79,5	254,4	337,4	370,2	303,7	315,8	0,00	73,0	73,3	0,19	74,38	74,82	83,62	0,19	74,58	78,96	81,46	0,07	0,04	0,06	-1,12	-0,96	-59,65934	57,05
271,0	578,0	4,6	1,0	4,7	202,8	72,7	79,5	254,1	337,2	369,8	304,1	316,2	0,00	72,9	73,3	0,19	74,41	74,80	83,15	0,19	74,60	78,94	81,29	0,07	0,04	0,06	-1,12	-0,96	-59,67745	57,03
272,0	579,0	4,6	1,0	4,7	202,4	72,6	79,5	254,1	337,0	369,1	304,7	316,6	0,00	72,9	73,3	0,19	74,38	74,80	82,72	0,19	74,59	78,94	81,09	0,07	0,04	0,07	-1,12	-0,96	-59,6139	57,03
273,0	580,0	4,6	1,0	4,7	201,6	72,7	79,5	253,4	336,7	369,0	305,1	317,0	0,00	72,9	73,3	0,19	74,39	74,80	82,33	0,19	74,60	78,93	81,09	0,07	0,04	0,06	-1,13	-0,96	-59,69341	57,02
274,0	581,0	4,6	1,0	4,7	201,5	72,7	79,6	253,2	336,6	368,9	306,5	316,8	0,00	72,9	73,3	0,19	74,40	74,81	81,98	0,19	74,63	78,93	82,11	0,07	0,04	0,06	-1,13	-0,97	-59,55165	57,17
275,0	582,0	4,6	1,0	4,7	201,3	72,7	79,5	253,1	336,3	368,8	307,1	317,0	0,00	72,9	73,3	0,19	74,40	74,80	81,66	0,19	74,60	78,95	84,30	0,07	0,04	0,05	-1,13	-0,97	-59,48523	57,27
276,0	583,0	4,5	1,0	4,7	200,8	72,7	79,4	252,5	336,2	368,3	307,6	317,7	0,00	72,9	73,3	0,19	74,40	74,79	81,92	0,19	74,62	78,95	85,09	0,07	0,04	0,06	-1,12	-0,98	-59,48842	57,17
277,0	584,0	4,5	1,0	4,7	201,2	72,7	79,5	252,5	336,0	368,1	308,1	317,7	0,00	72,9	73,2	0,19	74,40	74,80	85,01	0,19	74,61	78,95	84,77	0,07	0,04	0,05	-1,13	-0,97	-59,47137	57,15
278,0	585,0	4,5	1,0	4,7	201,1	72,7	79,5	251,9	336,0	367,0	308,3	318,2	0,00	72,9	73,2	0,19	74,39	74,80	86,34	0,19	74,60	78,95	84,40	0,07	0,04	0,05	-1,13	-0,97	-59,65681	57,06
279,0	586,0	4,5	1,0	4,7	200,4	72,7	79,5	251,9	335,9	367,0	308,9	318,6	0,00	72,9	73,2	0,19	74,40	74,79	85,82	0,19	74,59	78,96	84,09	0,07	0,04	0,05	-1,13	-0,98	-59,48912	57,01
280,0	587,0	4,4	1,0	4,7	200,0	72,7	79,5	251,1	335,6	366,7	309,8	318,7	0,00	72,9	73,2	0,19	74,39	74,78	85,13	0,19	74,60	78,95	83,74	0,07	0,04	0,05	-1,13	-0,97	-59,55874	57,13
281,0	588,0	4,5	1,0	4,7	200,3	72,6	79,6	251,2	335,5	366,0	309,9	319,3	0,00	72,9	73,2	0,19	74,39	74,79	84,49	0,19	74,59	78,94	83,40	0,07	0,04	0,05	-1,13	-0,97	-59,57715	57,14
282,0	589,0	4,4	1,0	4,7	199,6	72,7	79,4	250,8	335,4	365,5	310,2	319,7	0,00	72,9	73,3	0,19	74,39	74,77	83,91	0,19	74,60	78,93	83,11	0,07	0,04	0,06	-1,13	-0,97	-59,64353	57,00
283,0	590,0	4,4	1,0	4,7	199,8	72,7	79,4	250,6	335,4	365,2	310,8	319,9	0,00	72,9	73,2	0,19	74,40	74,79	83,40	0,19	74,59	78,89	82,86	0,07	0,04	0,06	-1,12	-0,97	-59,55305	57,06
284,0	591,0	4,4	1,0	4,7	200,1	72,7	79,4	250,5	335,2	364,7	311,4	320,3	0,00	72,9	73,2	0,19	74,40	74,79	82,91	0,19	74,59	78,86	82,61	0,07	0,04	0,06	-1,13	-0,97	-59,52618	57,04
285,0	592,0	4,4	1,0	4,7	199,4	72,7	79,3	250,1	335,2	364,5	311,7	320,4	0,00	72,9	73,2	0,19	74,41	74,79	82,50	0,19	74,58	78,89	82,37	0,07	0,04	0,06	-1,12	-0,97	-59,56217	57,02
286,0	593,0	4,4	1,0	4,7	199,5	72,5	79,4	250,0	335,1	364,3	312,2	320,9	0,00	72,9	73,2	0,19	74,40	74,77	82,10	0,19	74,57	78,84	82,16	0,07	0,04	0,06	-1,12	-0,96	-59,4321	57,05
287,0	594,0	4,4	1,0	4,8	199,5	72,6	79,3	249,6	335,0	363,7	312,7	321,2	0,00	72,9	73,3	0,19	74,39	74,77	81,72	0,19	74,58	78,83	81,92	0,07	0,04	0,06	-1,12	-0,96	-59,48286	56,98
288,0	595,0	4,3	1,0	4,8	199,1	72,7	79,4	249,4	334,9	363,3	313,8	321,5	0,00	72,9	73,2	0,19	74,40	74,76	82,65	0,19	74,59	78,82	81,71	0,07	0,04	0,07	-1,12	-0,97	-59,35781	57,00
289,0	596,0	4,3	1,0	4,8	198,9	72,7	79,5	249,1	334,8	363,2	314,4	321,4	0,00	72,9	73,2	0,19	74,42	74,77	85,69	0,19	74,57	78,83	81,50	0,07	0,04	0,06	-1,13	-0,97	-59,33397	57,11
290,0	597,0	4,3	1,0	4,8	199,1	72,7	79,4	248,9	334,8	362,7	314,5	322,1	0,00	72,9	73,2	0,19	74,42	74,78	86,20	0,19	74,58	78,85	81,31	0,07	0,04	0,06	-1,13	-0,97	-59,32817	57,01
291,0	598,0	4,3	1,0	4,8	199,1	72,7	79,3	248,9	334,7	362,1	314,9	322,0	0,00	72,9	73,2	0,19	74,41	74,76	85,55	0,19	74,60	78,82	81,11	0,07	0,04	0,07	-1,13	-0,97	-59,42983	57,01
292,0	599,0	4,3	1,0	4,8	198,7	72,8	79,5	248,4	334,7	361,7	316,0	322,1	0,00	72,9	73,2	0,19	74,41	74,74	84,86	0,19	74,58	78,83	82,01	0,07	0,04	0,06	-1,13	-0,97	-59,32417	57,13
293,0	600,0	4,3	1,0	4,8	198,8	72,7	79,5	248,6	334,7	361,6	317,0	322,4	0,00	72,9	73,2	0,19	74,40	74,74	84,31	0,19	74,60	78,87	84,20	0,07	0,04	0,06	-1,13	-0,97	-59,09913	57,27
294,0	601,0	4,3	1,0	4,8	198,9	72,7	79,4	248,2	334,6	359,9	315,9	322,9	0,00	72,9	73,2	0,19	74,40	74,76	83,77	0,19	74,61	78,84	85,15	0,07	0,04	0,06	-1,13	-0,96	-59,63509	57,19
295,0	602,0	4,3	1,0	4,9	198,8	72,7	79,3	248,3	334,4	358,9	315,6	323,4	0,00	72,9	73,2	0,19	74,40	74,73	83,23	0,19	74,61	78,84	84,87	0,07	0,04	0,06	-1,12	-0,96	-59,80566	57,03
296,0	603,0	4,2	1,0	4,9	198,6	72,7	79,3	248,1	334,5	358,1	315,6	323,7	0,00	72,9	73,2	0,19	74,42	74,76	82,77	0,19	74,61	78,82	84,52	0,07	0,04	0,05	-1,13	-0,97	-59,92639	57,04
297,0	604,0	4,2	1,0	4,9	199,1	72,7	79,4	247,6	334,4	358,4	316,3	324,1	0,00	72,8	73,2	0,19	74,41	74,74	82,35	0,19	74,59	78,83	84,20	0,07	0,04	0,05	-1,13	-0,97	-59,78092	57,06
298,0	605,0	4,2	1,1	4,9	200,0	72,7	79,4	247,9	334,4	358,3	316,8	324,0	0,00	72,9	73,2	0,19	74,40	74,75	81,98	0,19	74,61	78,83	83,84	0,07	0,04	0,05	-1,13	-0,97	-59,6781	57,19
299,0	606,0	4,2	1,1	5,0	199,8	72,6	79,3	248,1	334,4	356,7	316,5	324,5	0,00	72,9	73,2	0,19	74,38	74,74	81,63	0,19	74,58	78,82	83,51	0,07	0,04	0,06	-1,12	-0,97	-59,90596	57,08
300,0	607,0	4,2	1,1	5,0	200,0	72,7	79,4	248,1	334,4	357,3	317,3	324,9	0,00	72,9	73,2	0,19	74,39	74,73	82,67	0,19	74,59	78,82	83,21	0,07	0,04	0,06	-1,13	-0,97	-59,51487	57,07
301,0	608,0	4,2	1,1	5,0	200,1	72,7	79,4	248,1	334,4	356,1	317,5	325,2	0,00	72,8	73,2	0,19	74,40	74,73	85,82	0,19	74,60	78,79	82,94	0,07	0,04	0,06	-1,13	-0,98	-59,68074	57,18
302,0	609,0	4,1	1,1	5,0	200,5	72,8	79,6	248,2	334,3	355,3	317,5	325,7	0,00	72,9	73,2	0,19	74,42	74,74	86,19	0,19	74,62	78,83	82,69	0,07	0,04	0,06	-1,13	-0,97	-59,76391	57,07
303,0	610,0	4,1	1,1	5,0	200,7	72,7	79,3	248,2	334,4	354,6	317,6	325,9	0,00	72,8	73,2	0,19	74,41	74,74	85,54	0,19	74,60	78,82	82,45	0,07	0,04	0,05	-1,13	-0,96	-59,79662	57,03
304,0	611,0	4,1	1,1	5,0	201,0	72,7	79,4	248,4	334,5	353,8	318,1	326,4	0,00	72,8	73,2	0,19	74,41	74,72	84,84	0,19	74,58	78,80	82,21	0,07	0,04	0,06	-1,12	-0,96	-59,7281	57,03
305,0	612,0	4,1	1,1	5,0	201,0	72,7	79,3	248,6	334,6	353,4	318,5	326,8	0,00	72,8	73,2	0,19	74,44	74,73	84,18	0,19	74,59	78,79	81,97	0,07	0,04	0,06	-1,13	-0,98	-59,53988	57,02
306,0	613,0	4,1	1,1	5,0	200,9	72,6	79,2	248,6	334,7	353,2	318,9	327,3	0,00	72,8	73,2	0,19	74,44	74,74	83,62	0,19	74,60	78,80	81,77	0,07	0,04	0,05	-1,12	-0,97	-59,41756	57,03
307,0	614,0	4,0	1,1	5,0	201,0	72,7	79,4	248,7	334,7	352,6	318,9	327,7	0,00	72,8	73,2	0,19	74,45	74,74	83,09	0,19	74,63	78,80	81,58	0,07	0,04	0,05	-1,13	-0,96	-59,4077	57,03
308,0	615,0	4,0	1,1	5,0	201,2	72,7	79,3	248,5	334,9	351,8	319,4	327,5	0,00	72,9	73,2	0,19	74,45	74,75	82,63	0,19	74,60	78,77	81,37	0,07	0,04	0,05	-1,13	-0,97	-59,51634	57,02
309,0	616,0	4,0	1,1	5,1	201,0	72,7	79,4	248,7	335,1	351,4	319,8	328,2	0,00	72,9	73,2	0,19	74,44	74,75	82,24	0,19	74,61	78,79	81,20	0,07	0,04	0,05	-1,12	-0,97	-59,29825	57,03
310,0	617,0	4,0	1,1	5,0	200,7	72,7	79,3	248,6	335,2	351,1	320,3	328,6	0,00	72,9	73,2	0,19	74,48	74,75	81,89	0,19	74,62	78,78	81,04	0,07	0,04	0,06	-1,12	-0,96	-59,17025	57,04
311,0	618,0	4,0	1,1	5,0	201,3	72,7	79,3	248,6	335,4	352,3	321,9	328,7	0,00	72,9	73,2	0,19	74,48	74,75	81,54	0,19	74,64	78,82	81,99	0,07	0,04	0,06	-1,12	-0,97	-58,57853	57,17
312,0	619,0	4,0	1,1	5,0	201,4	72,7	79,5	248,3	335,6	352,8	324,2	328,8	0,00	72,9	73,2	0,19	74,46	74,73	83,30	0,19	74,60	78,82	84,20	0,07	0,04	0,06	-1,12	-0,97	-58,02539	57,19
313,0	620,0	3,9	1,1	5,0	201,2	72,7	79,4	248,4	335,9	352,1	323,8	329,1	0,00	72,9	73,2	0,19	74,44	74,74	86,17	0,19	74,63	78,84	85,34	0,07	0,04	0,07	-1,13	-0,97	-58,08587	57,16
314,0	621,0	3,9	1,1	5,0	201,5	72,7	79,4	248,6	336,1	352,3	324,5	330,0	0,00	72,8	73,2	0,19	74,45	74,74	86,23	0,19	74,62	78,83	85,08	0,07	0,04	0,05	-1,13	-0,97	-57,64688	56,99
315,0	622,0	3,9	1,2	5,1	201,5	72,7	79,4	248,9	336,5	352,8	325,3	330,1	0,00	72,8	73,2	0,19	74,47	74,75	85,53	0,19	74,62	78,84	84,69	0,07	0,04	0,05	-1,13	-0,98	-57,23104	57,07
316,0	623,0	3,9	1,2	5,1	201,8	72,7	79,4	248,9	336,6	351,6	325,5	330,8	0,00	72,8	73,2	0,19	74,46	74,74	84,85	0,19	74,62	78,83	84,27	0,07	0,04	0,06	-1,13	-0,96	-57,26456	57,05
317,0	624,0	3,9	1,2	5,1	202,1	72,7	79,4	249,1	337,0	350,7	325,9	330,8	0,00	72,8	73,2	0,19	74,44	74,74	84,23	0,19	74,63	78,83	83,96	0,07	0,04	0,06	-1,12	-0,96	-57,22567	56,98
318,0	625,0	3,8	1,2	5,1	202,5	72,7	79,4	249,0	337,4	350,2	326,4	330,8	0,00	72,8	73,2	0,19	74,46	74,73	83,67	0,19	74,63	78,84	83,67	0,07	0,04	0,01	-1,13	-0,97	-57,20874	56,99
319,0	626,0	3,8	1,2	5,1	202,2	72,7	79,4	249,4	337,6	349,8	327,0	331,5	0,00	72,8	73,1	0,19	74,46	74,75	83,17	0,19	74,65	78,83	83,38	0,07	0,04	0,05	-1,13	-0,97	-56,88585	56,98
320,0	627,0	3,8	1,2	5,1	202,4	72,7	79,4	249,3	337,9	349,6	327,6	332,0	0,00	72,9	73,2	0,19	74,47	74,77	82,74	0,19	74,66	78,84	83,10	0,07	0,04	0,06	-1,12	-0,97	-56,64832	56,99
321,0	628,0	3,8	1,1	5,1	202,2	72,6	79,3	249,2	338,4	349,1	328,2	332,1	0,00	72,9	73,2	0,19	74,45	74,76	82,27	0,19	74,63	78,81	82,84	0,07	0,04	0,05	-1,12	-0,96	-56,53887	56,98
322,0	629,0	3,8	1,1	5,1	202,4	72,7	79,2	249,3	338,6	349,0	328,9	332,3	0,00	72,9	73,2	0,19	74,48	74,75	81,92	0,19	74,64	78,82	82,58	0,07	0,04	0,05	-1,12	-0,96	-56,32178	56,95
323,0	630,0	3,8	1,1	5,1	202,8	72,6	79,2	249,2	339,0	348,6	329,6	332,8	0,00	72,9	73,2	0,19	74,48	74,76	81,58	0,19	74,66	78,83	82,33	0,07	0,04	0,05	-1,12	-0,97	-56,11287	56,90
324,0	631,0	3,8	1,1	5,1	202,7	72,7	79,2	249,5	339,3	349,7	331,0	333,0	0,00	72,9	73,1	0,19	74,49	74,77	82,00	0,19	74,66	78,85	82,12	0,07	0,04	0,05	-1,13	-0,97	-55,42773	56,89
325,0	632,0	3,7	1,2	5,1	202,7	72,7	79,3	249,5	339,6	350,1	332,0	333,2	0,00	72,9	73,2	0,19	74,51	74,77	85,22	0,19	74,66	78,85	81,88	0,07	0,04	0,05	-1,13	-0,96	-55,06833	56,98
326,0	633,0	3,7	1,1	5,1	203,1	72,7	79,3	249,4	340,0	348,7	332,3	333,5	0,00	72,9	73,1	0,19	74,48	74,77	86,26	0,19	74,66	78,83	81,66	0,07	0,04	0,05	-1,13	-0,96	-55,201	56,86
327,0	634,0	3,7	1,1	5,1	203,2	72,7	79,3	249,3	340,4	348,4	332,8	333,9	0,00	72,8	73,2	0,19	74,48	74,75	85,68	0,19	74,67	78,86	81,46	0,07	0,04	0,05	-1,12	-0,96	-54,97881	56,84
328,0	635,0	3,7	1,1	5,1	203,2	72,7	79,3	249,6	340,7	348,2	333,5	334,2	0,00	72,9	73,1	0,19	74,49	74,78	84,98	0,19	74,66	78,82	81,25	0,07	0,04	0,05	-1,12	-0,97	-54,68391	56,86
329,0	636,0	3,7	1,1	5,1	203,6	72,7	79,3	249,9	341,1	348,1	334,1	334,2	0,00	72,9	73,2	0,19	74,48	74,78	84,33	0,19	74,67	78,83	81,07	0,07	0,04

371,0	678,0	3,0	1,2	5,2	207,0	72,8	79,5	254,4	358,7	353,3	346,5	343,3	0,00	72,9	73,1	0,19	74,57	74,82	81,59	0,19	74,72	78,91	85,23	0,07	0,04	0,06	-1,13	-0,96	-44,71537	57,03
372,0	679,0	2,9	1,2	5,2	207,1	72,9	79,3	254,6	359,0	354,7	346,5	343,4	0,00	72,8	73,1	0,19	74,55	74,81	83,82	0,19	74,74	78,90	84,98	0,07	0,04	0,06	-1,14	-0,97	-44,30716	56,94
373,0	680,0	2,9	1,2	5,2	207,2	72,8	79,4	255,2	359,4	354,2	345,5	343,5	0,00	72,8	73,1	0,19	74,54	74,83	86,10	0,19	74,71	78,91	84,58	0,07	0,04	0,06	-1,13	-0,96	-44,37428	56,89
374,0	681,0	2,9	1,2	5,2	206,6	72,8	79,4	254,9	359,9	353,6	345,1	343,6	0,00	72,8	73,1	0,19	74,56	74,82	85,82	0,19	74,73	78,92	84,23	0,07	0,04	0,05	-1,13	-0,96	-44,52246	56,81
375,0	682,0	2,9	1,2	5,2	207,3	72,8	79,4	255,4	360,4	353,4	344,2	343,7	0,00	72,9	73,2	0,19	74,57	74,84	85,14	0,19	74,73	78,91	83,94	0,07	0,04	0,05	-1,13	-0,97	-44,54988	56,82
376,0	683,0	2,9	1,2	5,2	207,8	72,8	79,4	255,3	360,8	353,5	343,6	344,1	0,00	72,9	73,1	0,19	74,57	74,84	84,48	0,19	74,73	78,90	83,62	0,07	0,04	0,05	-1,13	-0,96	-44,46571	56,80
377,0	684,0	2,9	1,2	5,2	207,9	72,8	79,4	255,3	361,2	353,1	343,3	344,2	0,00	72,9	73,2	0,19	74,60	74,86	83,89	0,19	74,73	78,88	83,35	0,07	0,04	0,05	-1,13	-0,96	-44,504	56,78
378,0	685,0	2,8	1,1	5,2	207,9	72,8	79,3	255,3	361,6	353,5	343,2	344,6	0,00	72,9	73,1	0,19	74,61	74,85	83,35	0,19	74,73	78,89	83,06	0,07	0,04	0,06	-1,13	-0,96	-44,30358	56,71
379,0	686,0	2,8	1,1	5,2	207,9	72,8	79,3	255,8	362,1	353,8	343,0	344,8	0,00	72,9	73,2	0,19	74,60	74,85	82,85	0,19	74,72	78,87	82,79	0,07	0,04	0,05	-1,13	-0,96	-44,04348	56,73
380,0	687,0	2,8	1,1	5,2	207,7	72,8	79,3	255,7	362,5	354,3	342,7	344,9	0,00	72,9	73,2	0,19	74,61	74,86	82,42	0,19	74,73	78,88	82,54	0,07	0,04	0,06	-1,13	-0,97	-43,93457	56,75
381,0	688,0	2,8	1,1	5,2	208,3	72,8	79,3	255,7	362,9	354,5	342,6	345,0	0,00	72,9	73,2	0,19	74,60	74,84	82,01	0,19	74,73	78,88	82,30	0,07	0,04	0,06	-1,13	-0,96	-43,80571	56,75
382,0	689,0	2,8	1,1	5,2	207,9	72,9	79,3	255,8	363,3	354,6	342,4	344,9	0,00	72,9	73,2	0,19	74,61	74,86	81,64	0,19	74,71	78,86	82,07	0,07	0,04	0,06	-1,13	-0,96	-43,74947	56,69
383,0	690,0	2,8	1,1	5,2	208,3	72,9	79,3	255,8	363,7	356,1	342,9	345,1	0,00	72,9	73,2	0,19	74,62	74,86	81,68	0,19	74,71	78,87	81,83	0,07	0,04	0,06	-1,13	-0,96	-43,19757	56,71
384,0	691,0	2,7	1,1	5,2	208,2	72,9	79,3	256,0	364,2	357,4	343,3	345,1	0,00	72,9	73,2	0,19	74,62	74,86	84,70	0,19	74,72	78,86	81,60	0,07	0,04	0,06	-1,13	-0,95	-42,75377	56,81
385,0	692,0	2,7	1,1	5,2	208,4	73,0	79,3	255,9	364,5	358,3	343,5	344,6	0,00	72,9	73,2	0,19	74,60	74,86	86,15	0,19	74,70	78,87	81,39	0,07	0,04	0,06	-1,13	-0,96	-42,56586	56,81
386,0	693,0	2,7	1,1	5,2	208,4	72,9	79,3	256,2	364,9	358,8	343,1	344,9	0,00	72,9	73,2	0,19	74,59	74,87	85,67	0,19	74,72	78,88	81,17	0,07	0,04	0,06	-1,13	-0,96	-42,37058	56,85
387,0	694,0	2,7	1,1	5,2	208,2	72,9	79,3	256,3	365,4	358,5	342,7	345,2	0,00	72,9	73,2	0,19	74,58	74,87	84,98	0,19	74,70	78,90	81,17	0,07	0,04	0,06	-1,13	-0,96	-42,31826	56,83
388,0	695,0	2,7	1,1	5,2	208,5	72,8	79,2	256,2	365,8	359,9	343,1	345,2	0,00	72,9	73,2	0,19	74,58	74,87	84,31	0,19	74,66	78,88	82,78	0,07	0,04	0,05	-1,13	-0,96	-41,89571	56,89
389,0	696,0	2,7	1,1	5,2	208,3	72,9	79,4	256,5	366,3	360,0	342,8	345,1	0,00	72,9	73,2	0,19	74,57	74,86	83,78	0,19	74,68	78,89	84,83	0,07	0,04	0,06	-1,13	-0,97	-41,80569	56,99
390,0	697,0	2,7	1,1	5,3	208,5	72,8	79,2	256,4	366,6	359,7	342,4	345,4	0,00	72,9	73,2	0,19	74,57	74,86	83,28	0,19	74,65	78,91	85,06	0,07	0,04	0,05	-1,13	-0,97	-41,83127	56,89
391,0	698,0	2,6	1,1	5,2	208,4	72,8	79,2	256,8	367,0	360,1	342,0	345,7	0,00	72,9	73,2	0,19	74,55	74,88	82,78	0,19	74,67	78,91	84,73	0,07	0,04	0,05	-1,13	-0,97	-41,63237	56,79
392,0	699,0	2,6	1,1	5,2	208,5	72,9	79,2	256,9	367,4	360,2	341,9	345,8	0,00	72,9	73,2	0,19	74,58	74,88	82,32	0,19	74,68	78,90	84,35	0,07	0,04	0,05	-1,13	-0,97	-41,50358	56,70
393,0	700,0	2,6	1,1	5,3	208,7	72,9	79,3	257,3	367,9	360,7	341,8	345,6	0,00	72,9	73,2	0,19	74,58	74,86	81,92	0,19	74,68	78,88	84,01	0,07	0,04	0,05	-1,13	-0,96	-41,28148	56,72
394,0	701,0	2,6	1,1	5,3	208,9	72,8	79,3	257,6	368,3	360,9	341,5	346,0	0,00	72,9	73,2	0,19	74,58	74,86	81,56	0,19	74,67	78,88	83,72	0,07	0,04	0,06	-1,13	-0,96	-41,09492	56,67
395,0	702,0	2,6	1,0	5,3	209,2	72,9	79,2	257,5	368,6	362,5	342,1	346,3	0,00	72,9	73,2	0,19	74,60	74,87	82,34	0,19	74,70	78,88	83,42	0,07	0,04	0,06	-1,13	-0,96	-40,5491	56,68
396,0	703,0	2,6	1,0	5,3	209,6	72,8	79,2	257,7	369,0	362,6	342,1	345,8	0,00	72,9	73,2	0,19	74,60	74,88	85,46	0,19	74,71	78,86	83,10	0,07	0,04	0,06	-1,14	-0,96	-40,51285	56,81
397,0	704,0	2,6	1,0	5,3	209,7	72,9	79,3	257,7	369,2	362,0	341,3	346,2	0,00	72,9	73,2	0,19	74,61	74,89	86,09	0,19	74,70	78,89	82,84	0,07	0,04	0,06	-1,13	-0,96	-40,66205	56,71
398,0	705,0	2,5	1,0	5,3	209,7	72,8	79,2	257,8	369,5	362,2	340,9	346,6	0,00	72,9	73,2	0,19	74,59	74,87	85,47	0,19	74,68	78,87	82,57	0,07	0,04	0,05	-1,13	-0,96	-40,54114	56,67
399,0	706,0	2,5	1,0	5,3	209,8	72,9	79,2	257,7	370,0	362,2	340,8	346,8	0,00	72,9	73,2	0,19	74,62	74,87	84,76	0,19	74,69	78,88	82,32	0,07	0,04	0,06	-1,13	-0,96	-40,4392	56,66
400,0	707,0	2,5	1,0	5,3	210,1	72,8	79,1	258,0	370,4	363,0	340,6	346,8	0,00	72,9	73,2	0,19	74,60	74,88	84,13	0,19	74,69	78,87	82,08	0,07	0,04	0,06	-1,14	-0,96	-40,19863	56,67
401,0	708,0	2,5	1,0	5,3	210,2	72,9	79,3	258,1	370,8	363,2	340,5	346,7	0,00	72,9	73,2	0,19	74,57	74,88	83,56	0,19	74,70	78,88	81,85	0,07	0,04	0,05	-1,13	-0,96	-40,062	56,71
402,0	709,0	2,5	1,0	5,3	210,4	72,9	79,1	258,2	371,0	364,9	341,2	346,4	0,00	72,9	73,2	0,19	74,58	74,87	83,07	0,19	74,67	78,87	81,65	0,07	0,04	0,05	-1,14	-0,97	-39,60537	56,73
403,0	710,0	2,4	1,0	5,3	210,2	72,8	79,2	258,3	371,4	365,9	341,8	346,4	0,00	72,9	73,2	0,19	74,58	74,87	82,62	0,19	74,67	78,88	81,39	0,07	0,04	0,05	-1,13	-0,96	-39,19372	56,81
404,0	711,0	2,4	1,0	5,3	210,5	72,8	79,3	258,5	371,7	365,1	341,1	346,8	0,00	72,9	73,2	0,19	74,58	74,90	82,20	0,19	74,69	78,88	81,20	0,07	0,04	0,06	-1,13	-0,96	-39,31876	56,81
405,0	712,0	2,4	1,0	5,3	209,9	72,8	79,3	258,8	372,1	365,2	340,6	346,9	0,00	72,9	73,2	0,19	74,58	74,90	81,81	0,19	74,67	78,86	81,02	0,07	0,04	0,06	-1,13	-0,95	-39,22327	56,76
406,0	713,0	2,4	1,0	5,2	209,9	72,8	79,2	258,6	372,4	366,6	341,4	347,2	0,00	72,9	73,2	0,19	74,60	74,91	81,48	0,19	74,67	78,86	81,54	0,07	0,04	0,05	-1,13	-0,96	-38,68691	56,78
407,0	714,0	2,3	1,0	5,2	209,8	72,9	79,3	258,6	372,8	366,8	342,5	346,7	0,00	72,9	73,2	0,19	74,57	74,91	83,75	0,19	74,68	78,88	83,71	0,07	0,04	0,05	-1,14	-0,97	-38,45865	56,91
408,0	715,0	2,4	1,0	5,2	209,3	72,9	79,2	258,8	373,1	367,4	342,0	346,8	0,00	72,9	73,2	0,19	74,56	74,90	86,24	0,19	74,67	78,90	85,30	0,07	0,04	0,05	-1,14	-0,97	-38,31115	56,87
409,0	716,0	2,4	1,0	5,2	209,6	72,9	79,2	259,0	373,4	367,6	341,7	347,2	0,00	72,9	73,2	0,19	74,55	74,91	86,13	0,19	74,65	78,90	85,25	0,07	0,04	0,06	-1,14	-0,97	-38,14345	56,72
410,0	717,0	2,3	1,0	5,2	209,5	72,8	79,2	259,1	373,8	368,1	341,6	347,7	0,00	72,9	73,2	0,19	74,54	74,90	85,39	0,19	74,65	78,89	84,87	0,07	0,04	0,05	-1,14	-0,97	-37,88097	56,76
411,0	718,0	2,3	1,0	5,2	209,4	73,0	79,2	258,8	374,0	368,5	341,3	347,9	0,00	72,9	73,2	0,19	74,56	74,90	84,68	0,19	74,64	78,91	84,49	0,07	0,04	0,05	-1,14	-0,97	-37,85478	56,71
412,0	719,0	2,3	1,0	4,9	208,6	72,9	79,3	258,9	374,3	368,6	341,3	348,2	0,00	72,9	73,2	0,19	74,55	74,90	84,04	0,19	74,65	78,89	84,16	0,07	0,04	0,06	-1,13	-0,97	-37,68709	56,70
413,0	720,0	2,3	1,0	4,8	208,4	72,8	79,1	258,8	374,6	368,8	341,3	348,3	0,00	72,9	73,2	0,19	74,56	74,91	83,48	0,19	74,65	78,90	83,84	0,07	0,04	0,05	-1,13	-0,97	-37,59528	56,66
414,0	721,0	2,3	1,0	4,8	208,0	72,8	79,0	258,6	374,8	368,8	341,2	348,4	0,00	72,9	73,2	0,19	74,59	74,94	82,96	0,19	74,66	78,90	83,53	0,07	0,04	0,05	-1,14	-0,97	-37,59138	56,63
415,0	722,0	2,3	1,0	4,8	207,7	72,9	79,1	258,5	375,1	368,6	340,9	348,2	0,00	72,9	73,3	0,19	74,59	74,93	82,49	0,19	74,67	78,87	83,23	0,07	0,04	0,06	-1,14	-0,96	-37,65582	56,60
416,0	723,0	2,2	1,0	4,8	207,6	72,8	79,2	258,0	375,2	368,6	340,9	348,7	0,00	72,9	73,2	0,19	74,59	74,91	82,08	0,19	74,67	78,88	82,96	0,07	0,04	0,06	-1,13	-0,96	-37,64398	56,59
417,0	724,0	2,2	1,0	4,8	207,3	72,8	79,1	258,1	375,5	368,1	340,8	348,9	0,00	72,9	73,2	0,19	74,60	74,92	81,71	0,19	74,66	78,89	82,70	0,07	0,04	0,06	-1,13	-0,96	-37,68615	56,61
418,0	725,0	2,2	1,0	4,8	207,1	72,8	79,0	257,6	375,6	368,7	341,1	348,6	0,00	72,9	73,2	0,19	74,61	74,93	81,73	0,19	74,68	78,89	82,43	0,07	0,04	0,06	-1,14	-0,97	-37,63705	56,63
419,0	726,0	2,2	1,0	4,8	207,2	72,9	79,2	257,2	375,8	368,0	342,1	348,4	0,00	72,9	73,3	0,19	74,62	74,93	84,78	0,19	74,68	78,89	82,16	0,07	0,04	0,05	-1,14	-0,97	-37,64926	56,77
420,0	727,0	2,1	1,0	4,8	206,5	72,9	79,2	257,0	376,0	368,6	342,1	348,6	0,00	72,9	73,2	0,19	74,60	74,93	86,39	0,19	74,69	78,92	81,89	0,07	0,04	0,06	-1,14	-0,96	-37,48796	56,84
421,0	728,0	2,2	1,0	4,8	206,6	72,8	79,2	257,1	376,1	367,5	341,2	348,9	0,00	72,9	73,2	0,19	74,58	74,93	85,92	0,19	74,67	78,92	81,64	0,07	0,04	0,06	-1,14	-0,96	-37,77495	56,75
422,0	729,0	2,1	1,0	4,7	206,2	72,7	79,1	256,8	376,4	366,8	341,0	349,0	0,00	72,9	73,2	0,19	74,57	74,93	85,17	0,19	74,64	78,90	81,40	0,07	0,04	0,06	-1,14	-0,97	-37,94304	56,69
423,0	730,0	2,1	1,0	4,7	206,1	72,8	79,0	256,6	376,5	366,1	340,8	349,3	0,00	72,9	73,2	0,19	74,57	74,93	84,47	0,19	74,64	78,88	81,18	0,07	0,04	0,06	-1,14	-0,96	-38,06897	56,65
424,0	731,0	2,1	1,0	4,7	205,7	72,8	79,0	256,8	376,6	366,2	341,3	349,3	0,00	72,9	73,3	0,19	74,55	74,91	83,83	0,19	74,64	78,88	81,09	0,07	0,04	0,06	-1,14	-0,96	-37,90405	56,63
425,0	732,0	2,1	1,0	4,7	205,7	72,8	79,0	256,3	376,9	365,7	341,8	349,6	0,00	72,9	73,3	0,19	74,57	74,93	83,30	0,19	74,65	78,90	82,99	0,07	0,04	0,06	-1,14	-0,97	-37,86634	56,76
426,0	733,0	2,1	1,0	4,7	205,6	72,9	79,0	256,2	377,0	365,1	341,6	349,7	0,00	72,9	73,2	0,19	74,54	74,91	82,86	0,19	74,62	78,90	84,93	0,07	0,04	0,06	-1,14	-0,97	-38,03724	56,79
427,0	734,0	2,1	1,0	4,7	205,3	72,8	78,9	256,0	377,2	363,9	341,2	349,9	0,00	72,9	73,2	0,19	74,54	74,91	82,43	0,19	74,64	78,91	85,19	0,07	0,04	0,06	-1,14	-0,97	-38,27834	56,71
428,0	735,0	2,1	1,0	4,7	205,5	72,8	78,9	255,8	377,3	362,9	341,0	350,2	0,00	72,9	73,2	0,19	74,54	74,92	82,01	0,19	74,62	78,90	84,82	0,07	0,04	0,06	-1,13	-0,96	-38,49749	56,63
429,0	736,0	2,0	1,0	4,7	205,0	72,7	78,9	255,3	377,4	363,0	341,1	350,4	0,00	72,9	73,2	0,19	74,55	74,93	81,60	0,19	74,62	78,90	84,44	0,07	0,04	0,06	-1,14	-0,97	-38,50351	56,59
430,0	737,0	2,0	1,0	4,7	204,5	72,9	78,9	255,3	377,4	362,1	341,5	350,4	0,00	72,9	73,2	0,19	74,56	74,96	82,01	0,19	74,62	78,89	84,07	0,07	0,04	0,06	-1,14	-0,97	-38,57497	56,57
431,0	738,0	2,0	1,0	4,7	204,1	72,8	78,8	255,1	377,5	361,6	341,7	350,4	0,00	72,9	73,2	0,19	74,53	74,93	84,98	0,19	74,62	78,90	83,69	0,07	0,04	0,06	-1,14	-0,97	-38,70182	56,65
432,0	739,0	2,0	1,0	4,7	204,3	72,9	78,9	254,9	377,5	361,0	341,1	350,6	0,00	72,9	73,2	0,19	74,54	74,95	86,22	0,19	74,60	78,90	83,39	0,07	0,04	0,06	-1,14	-0,97	-38,91563	56,59
433,0	740,0	2,0	1,0	4,7	203,9	72,9	78,9	254,8	377,7	360,2	340,9	350,4	0,00	72,9	73,2	0,19	74,55	74,93	85,65	0,19	74,60	78,90	83,10	0,07	0,04	0,06	-1,14	-0,97	-39,13771	56,55
434,0	741,0	2,0	1,0	4,7	203,8	72,7	78,8	254,7	377,6	359,4	340,7	350,7	0,00	72,9	73,2	0,19	74,56	74,96	84,90	0,19	74,63	78,90	82,82	0,07	0,04	0,06	-1,13	-0,97	-39,33113	56,54
435,0	742,0	2,0	1,0	4,7	203,6	72,8	78,8	254,3	377,8	358,8	340,8	350,8	0,00	72,9	73,2	0,19	74,55	74,95	84,23	0,19	74,60	78,90	82,54	0,07	0,04	0,06	-1,14	-0,97	-39,46797	56,52
436,0	743,0	2,0	1,0	4,7	203,6	72,8	79,0	254,2	377,6	358,0	340,5	350,5	0,00	72,9	73,2	0,19	74,53	74,94	83,63	0,19	74,62	78,89	82,27	0,07	0,04	0,06	-1,14	-0,97	-39,76666	56,72
437,0	744,0	1,9	1,0	4,7	203,4	72,8	78,8	253,9	377,7	355,9	339,1	350,8	0,00	72,9	73,2	0,19	74,53	74,94	83,13	0,19	74,62	78,89	81,98	0,07	0,04	0,06	-1,14	-0,97	-40,44087	56,61
438,0	745,0	1,9	1,0	4,7	203,6	72,8	79,0	253,9	377,7	354,6	338,4	350,9	0,00	72,9	73,2	0,19	74,53	74,92	82,67	0,19	74,61	78,88	81,74	0,07	0,04	0,05	-1,14	-0,97	-40,87935	56,56
439,0	746,0	1,9	0,9	4,7	203,7	72,7	78,8	253,5	377,7	353,1	337,9	351,0	0,00	72,9	73,2	0,19	74,54	74,94	82,22	0,19	74,63	78,88	81,53	0,07	0,04	0,06	-1,13	-0,96	-41,29005	56,51
440,0	747,0	1,9	0,9	4,7	203,6	72,7	78,9	253,6	377,7	351,9	337,3	351,3	0,00	72,9	73,2	0,19	74,53	74,93	81,82	0,19	74,59	78,87	81,31	0,07	0,04	0,06	-1,13	-0,96	-41,56815	56,53
441,0	748,0	1,9	0,9	4,7	203,4	72,8	78,8	253,4	377,6	351,9	337,8	351,4	0,00	72,9	73,2	0,19	74,53	74,91	81,45	0,19	74,61	78,88	81,21	0,07	0,04	0,06	-1,13	-0,97	-41,51906	56,56
442,0	749,0	1,9	0,9	4,7	202,6	72,8	78,7	253,1	377,7	352,0	338,8	351,3	0,00	72,9	73,2	0,19	74,51	74,91	83,81	0,19	74,59	78,87	83,04	0,07	0,04	0,06	-1,14	-0,97	-41,3506	56,64
443,0	750,0	1,8	0,9	4,7	202,6	72,8	79,1	253,1	377,6	350,7	337,9	351,3	0,00	72,9	73,2	0,19	74,48	74,91	86,14	0,19	74,58	78,90	84,92	0,07	0,04	0,05	-1,14	-0,96	-41,81301	56,77
444,0	751,0	1,8	0,9	4,7	203,0	72,7	79,4	253,0	377,7	348,6	336,7	351,8	0,00	72,9	73,2	0,19	74,49	74,90	85,91	0,19	74,55	78,90	85,12	0,08	0,04	0,06	-1,14	-0,96	-42,40375	56,80
445,0	752,0	1,8	1,0	4,7	203,3	72,5	79,4	252,8	377,5	347,1	335,8	351,9	0,00	72,9	73,2	0,19	74,49	74,90	85,17	0,19	74,55	78,90	84,77	0,07	0,04	0,06	-1,14	-0,97	-42,92061	56,70
446,0	753,0	1,8	1,0	4,7	203,3	72,6	79,3	252,8	377,3	345,8	335,0	352,1	0,00	72,9	73,2	0,19	74,49	74,90	84,49	0,19	74,53	78,88	84,39	0,07	0,04	0,06	-1,14	-0,96	-43,33447	56,66
447,0	754,0	1,8	1,0	4,6	204,0	72,8	79,3	252,8	377,3	344,5	334,6	351,7	0,00	72,9	73,2	0,19	74,48	74,91	83,86	0,19	74,54	78,89	84,07	0,07	0,04	0,06	-1,14	-0,95	-43,75736	56,67
448,0	755,0	1,8	0,9	4,7	204,3	72,6	79,2	253,0	377,3	343,3	333,8	352,1	0,00	72,9	73,2	0,19	74,49	74,93	83,33	0,19	74,53	78,87	83,75	0,07	0,04	0,06	-1,13	-0,96	-44,01585	56,63
449,0	756,0	1,7	0,9	4,7	204,1	72,7	79,4	252,9	377,1	342,0	333,4	352,2	0,00	72,9	73,2	0,19	74,49	74,91	82,81	0,19	74,53	78,87	83,42	0,07	0,04	0,06	-1,14	-0,96	-44,42515	56,63
450,0	757,0	1,8	0,9	4,7	204,6	72,7	79,4	253,2	377,0	341,1	332,8	352,4	0,00	72,9	73,2	0,19	74,51	74,91	82,32	0,19	74,52	78,88	83,13	0,07	0,04	0,06	-1,13	-0,96	-44,62948	56,63
451,0	758,0	1,7	0,9	4,7	204,4	72,7	79,4	253,0	377,0	340,8	332,9	352,5	0,00	72,9	73,2	0,19	74,51	74,91	81,92	0,19	74,55	78,89	82,86	0,07	0,04	0,06	-1,13	-0,95	-44,69318	56,65
452,0	759,0	1,7	0,9	4,6	203,8	72,6	79,1	253,1	376,9	341,4	333,2	352,4	0,00	72,9	73,2	0,19	74,49	74,92	81,56	0,19	74,55	78,86	82,56	0,07	0,04	0,06	-1,14	-0,96	-44,55415	56,70
453,0	760,0	1,7	0,9	4,5	203,1	72,6	79,1	252,8	376,7	341,2	333,3	352,7	0,00	72,9	73,2	0,19	74,45	74,94	83,12	0,19	74,51	78,88	82,20	0,07	0,04	0,06	-1,14	-0,96	-44,59517	56,76
454,0	761,0	1,7	0,9	4,6	203,4	72,8	79,1	252,7	376,6	339,8	332,2	352,7	0,00	72,9	73,2	0,19	74,45	74,92	85,96	0,19	74,51	78,89	81,92	0,07	0,04

496,0	803,0	1,1	0,8	4,7	200,8	72,3	78,3	249,1	375,8	327,0	319,2	353,0	0,00	72,7	73,0	0,19	74,21	74,74	81,93	0,19	74,27	78,70	84,17	0,07	0,04	0,07	-1,15	-0,97	-51,12682	57,33
497,0	804,0	1,1	0,8	4,6	200,6	72,4	78,3	248,8	376,0	327,1	319,0	352,5	0,00	72,7	73,0	0,19	74,21	74,74	84,72	0,19	74,28	78,69	83,81	0,07	0,04	0,07	-1,15	-0,97	-51,25838	56,87
498,0	805,0	1,1	0,8	4,6	200,6	72,5	78,4	249,3	375,9	326,8	318,9	351,8	0,00	72,7	73,0	0,19	74,22	74,74	86,02	0,19	74,26	78,73	83,43	0,07	0,04	0,07	-1,16	-0,97	-51,38964	56,51
499,0	806,0	1,1	0,8	4,6	200,6	72,4	78,6	249,1	375,9	326,5	318,7	352,3	0,00	72,7	73,0	0,19	74,20	74,73	85,51	0,19	74,28	78,72	83,05	0,07	0,04	0,06	-1,15	-0,97	-51,4455	56,42
500,0	807,0	1,0	0,8	4,6	200,5	72,3	78,5	249,2	375,9	325,0	317,7	352,5	0,00	72,7	73,0	0,19	74,18	74,72	84,77	0,19	74,27	78,71	82,72	0,07	0,04	0,07	-1,16	-0,97	-51,8648	56,24
501,0	808,0	1,0	0,8	4,6	200,5	72,4	78,6	249,3	375,9	324,3	317,2	352,7	0,00	72,7	73,0	0,19	74,20	74,74	84,07	0,19	74,27	78,70	82,45	0,07	0,04	0,06	-1,15	-0,96	-52,06159	56,16
502,0	809,0	1,0	0,8	4,5	200,8	72,1	78,4	249,2	375,9	323,9	316,9	352,8	0,00	72,7	73,0	0,19	74,19	74,71	83,42	0,19	74,25	78,69	82,19	0,07	0,04	0,06	-1,15	-0,97	-52,20686	56,09
503,0	810,0	1,0	0,8	4,5	200,7	72,4	78,6	249,0	375,9	323,5	316,5	352,6	0,00	72,7	73,0	0,19	74,19	74,73	82,86	0,19	74,26	78,66	81,94	0,07	0,04	0,06	-1,15	-0,96	-52,42915	56,10
504,0	811,0	1,0	0,8	4,5	200,8	72,4	78,4	248,8	375,9	323,4	316,1	352,4	0,00	72,7	73,0	0,19	74,18	74,72	82,36	0,19	74,25	78,63	81,69	0,07	0,04	0,07	-1,15	-0,95	-52,595	56,08
505,0	812,0	1,0	0,8	4,5	200,3	72,3	78,4	248,6	375,7	322,9	315,9	352,5	0,00	72,7	73,0	0,19	74,18	74,71	81,90	0,19	74,26	78,64	81,43	0,07	0,04	0,07	-1,15	-0,96	-52,82779	56,06
506,0	813,0	1,0	0,8	4,5	200,3	72,2	78,5	248,5	375,9	322,5	315,7	352,4	0,00	72,6	73,0	0,19	74,15	74,70	81,49	0,19	74,24	78,63	81,20	0,07	0,04	0,06	-1,15	-0,97	-52,94787	56,00
507,0	814,0	1,0	0,8	4,5	200,4	72,4	78,4	248,7	375,8	323,7	316,0	351,9	0,00	72,6	73,0	0,19	74,16	74,71	83,53	0,19	74,24	78,63	81,20	0,07	0,04	0,06	-1,15	-0,96	-52,72293	56,10
508,0	815,0	0,9	0,8	4,5	200,0	72,3	78,4	248,8	375,9	324,2	316,8	351,5	0,00	72,6	72,9	0,19	74,13	74,69	85,96	0,19	74,20	78,62	82,37	0,07	0,04	0,07	-1,15	-0,96	-52,47726	56,18
509,0	816,0	0,9	0,8	4,5	199,7	72,4	78,4	247,9	375,8	323,8	316,5	351,7	0,00	72,7	73,0	0,19	74,13	74,67	85,84	0,19	74,21	78,64	84,28	0,07	0,04	0,06	-1,16	-0,97	-52,80305	56,25
510,0	817,0	0,9	0,8	4,6	199,6	72,3	78,5	247,7	375,9	322,9	315,4	351,7	0,00	72,6	72,9	0,19	74,11	74,68	85,09	0,19	74,19	78,63	85,11	0,07	0,04	0,06	-1,15	-0,97	-53,22963	56,17
511,0	818,0	0,9	0,8	4,6	199,5	72,2	78,4	247,6	375,9	322,1	314,6	351,9	0,00	72,6	72,9	0,19	74,12	74,65	84,36	0,19	74,19	78,63	84,77	0,07	0,04	0,06	-1,15	-0,97	-53,51999	56,13
512,0	819,0	0,9	0,8	4,5	199,2	72,2	78,3	247,8	375,8	321,3	314,0	351,8	0,00	72,6	72,9	0,19	74,13	74,66	83,70	0,19	74,21	78,64	84,37	0,07	0,04	0,06	-1,15	-0,97	-53,80148	56,02
513,0	820,0	0,9	0,8	4,5	199,2	72,4	78,4	247,9	375,7	321,9	314,5	351,6	0,00	72,6	72,9	0,19	74,14	74,66	83,10	0,19	74,20	78,63	83,97	0,07	0,04	0,07	-1,15	-0,97	-53,63198	56,04
514,0	821,0	0,9	0,8	4,5	199,0	72,2	78,5	247,6	375,6	322,1	314,3	351,1	0,00	72,6	72,9	0,19	74,11	74,65	82,59	0,19	74,19	78,62	83,57	0,07	0,04	0,07	-1,15	-0,97	-53,79736	56,16
515,0	822,0	0,8	0,8	4,5	199,2	72,3	78,5	246,7	375,7	321,2	313,5	351,3	0,00	72,6	72,9	0,19	74,10	74,65	82,12	0,19	74,19	78,63	83,20	0,07	0,04	0,07	-1,15	-0,97	-54,27638	56,15
516,0	823,0	0,9	0,8	4,5	199,4	72,3	78,4	246,6	375,6	320,7	313,1	351,4	0,00	72,6	72,9	0,19	74,09	74,64	81,67	0,19	74,18	78,61	82,89	0,07	0,04	0,07	-1,15	-0,96	-54,46432	56,10
517,0	824,0	0,8	0,8	4,5	198,8	72,3	78,1	246,7	375,6	321,2	313,3	351,2	0,00	72,6	72,9	0,19	74,11	74,64	82,81	0,19	74,19	78,61	82,57	0,07	0,04	0,06	-1,15	-0,97	-54,35828	56,02
518,0	825,0	0,8	0,8	4,5	198,7	72,2	78,5	246,5	375,4	320,6	312,7	350,7	0,00	72,6	72,9	0,19	74,09	74,62	85,66	0,19	74,18	78,61	82,24	0,07	0,04	0,06	-1,15	-0,96	-54,74214	56,11
519,0	826,0	0,8	0,8	4,5	198,7	72,2	78,6	246,0	375,4	319,9	311,9	350,9	0,00	72,6	72,9	0,19	74,07	74,62	86,05	0,19	74,17	78,59	82,00	0,07	0,04	0,07	-1,15	-0,97	-55,11068	56,05
520,0	827,0	0,8	0,8	4,5	198,8	72,1	78,3	245,9	375,2	319,5	311,6	350,9	0,00	72,6	72,9	0,19	74,07	74,62	85,29	0,19	74,16	78,60	81,71	0,07	0,04	0,07	-1,15	-0,96	-55,32913	55,95
521,0	828,0	0,8	0,8	4,5	198,7	72,1	78,4	246,0	375,2	318,9	311,0	350,8	0,00	72,6	72,9	0,19	74,06	74,59	84,53	0,19	74,15	78,57	81,47	0,07	0,04	0,07	-1,15	-0,96	-55,56216	55,93
522,0	829,0	0,7	0,8	4,5	198,4	72,2	78,2	245,3	375,1	318,6	310,8	350,9	0,00	72,6	72,9	0,19	74,06	74,60	83,86	0,19	74,14	78,59	81,23	0,07	0,04	0,06	-1,15	-0,96	-55,82328	55,94
523,0	830,0	0,7	0,7	4,5	198,3	72,3	78,2	245,5	374,9	319,5	311,0	351,0	0,00	72,6	72,9	0,19	74,08	74,59	83,23	0,19	74,14	78,57	81,27	0,07	0,04	0,06	-1,15	-0,97	-55,55539	55,92
524,0	831,0	0,7	0,7	4,5	197,9	72,2	78,2	245,7	374,9	319,4	311,1	350,3	0,00	72,6	72,9	0,19	74,07	74,59	82,72	0,19	74,14	78,57	83,18	0,07	0,04	0,05	-1,15	-0,96	-55,65091	56,08
525,0	832,0	0,7	0,7	4,5	197,7	72,3	78,5	245,4	374,8	319,2	310,5	350,5	0,00	72,6	72,9	0,19	74,04	74,59	82,26	0,19	74,13	78,60	84,94	0,07	0,04	0,07	-1,15	-0,97	-55,87315	56,16
526,0	833,0	0,7	0,7	4,5	197,5	72,2	78,2	244,6	374,8	318,5	309,9	350,6	0,00	72,6	72,9	0,19	74,04	74,59	81,81	0,19	74,12	78,60	85,04	0,07	0,04	0,06	-1,15	-0,97	-56,2843	56,00
527,0	834,0	0,7	0,7	4,5	197,7	72,1	78,1	244,9	374,5	318,7	310,1	350,5	0,00	72,6	72,8	0,19	74,01	74,57	81,61	0,19	74,11	78,58	84,60	0,07	0,04	0,06	-1,15	-0,96	-56,21174	55,90
528,0	835,0	0,7	0,7	4,4	197,8	72,3	78,0	244,7	374,5	319,8	311,0	349,5	0,00	72,6	72,9	0,19	73,99	74,56	84,27	0,19	74,11	78,57	84,15	0,07	0,04	0,06	-1,16	-0,98	-56,04706	55,96
529,0	836,0	0,7	0,7	4,4	197,2	72,3	78,3	244,4	374,4	319,5	310,4	349,2	0,00	72,6	72,9	0,19	73,98	74,58	86,22	0,19	74,10	78,60	83,71	0,07	0,04	0,06	-1,16	-0,96	-56,34326	56,10
530,0	837,0	0,6	0,7	4,4	197,1	72,3	78,0	244,1	374,3	318,5	309,5	349,6	0,00	72,5	72,8	0,19	73,97	74,56	85,76	0,19	74,08	78,58	83,34	0,07	0,04	0,06	-1,15	-0,96	-56,72321	55,99
531,0	838,0	0,6	0,7	4,4	196,8	72,1	78,1	244,1	374,2	318,0	309,1	349,9	0,00	72,5	72,8	0,19	73,97	74,56	84,95	0,19	74,07	78,58	82,99	0,07	0,04	0,06	-1,15	-0,97	-56,87236	55,89
532,0	839,0	0,7	0,7	4,4	196,5	72,1	78,1	243,9	374,1	317,9	308,8	349,7	0,00	72,5	72,8	0,19	73,97	74,55	84,20	0,19	74,08	78,57	82,69	0,07	0,04	0,07	-1,15	-0,97	-57,07783	55,84
533,0	840,0	0,6	0,7	4,4	196,6	72,2	78,1	243,6	373,8	317,4	308,5	349,3	0,00	72,5	72,8	0,19	73,97	74,52	83,52	0,19	74,07	78,56	82,40	0,07	0,04	0,06	-1,15	-0,96	-57,39983	55,86
534,0	841,0	0,6	0,7	4,4	196,5	72,1	78,1	243,6	373,7	317,4	308,3	349,6	0,00	72,5	72,8	0,19	73,97	74,53	82,93	0,19	74,08	78,55	82,12	0,07	0,04	0,07	-1,15	-0,96	-57,42581	55,78
535,0	842,0	0,6	0,7	4,4	195,8	72,1	78,0	243,1	373,5	317,2	308,0	349,5	0,00	72,5	72,8	0,19	74,01	74,53	82,39	0,19	74,07	78,54	81,84	0,07	0,04	0,07	-1,15	-0,96	-57,6973	55,74
536,0	843,0	0,6	0,7	4,4	195,6	72,1	78,0	242,6	373,3	316,8	307,9	349,3	0,00	72,5	72,8	0,19	74,01	74,51	81,89	0,19	74,06	78,51	81,56	0,07	0,04	0,07	-1,15	-0,96	-57,95548	55,75
537,0	844,0	0,6	0,7	4,4	195,9	72,1	78,0	242,9	373,1	317,2	307,8	349,3	0,00	72,5	72,8	0,19	73,99	74,53	81,65	0,19	74,06	78,52	81,31	0,07	0,04	0,07	-1,16	-0,96	-57,8733	55,76
538,0	845,0	0,6	0,7	4,4	195,7	72,1	77,9	242,5	372,9	317,5	308,0	348,9	0,00	72,5	72,8	0,19	74,00	74,52	84,23	0,19	74,07	78,52	81,02	0,07	0,04	0,06	-1,16	-0,96	-57,98507	55,78
539,0	846,0	0,5	0,7	4,3	194,9	72,2	77,9	242,6	372,8	317,5	307,9	348,5	0,00	72,5	72,8	0,19	73,97	74,51	86,13	0,19	74,06	78,52	81,52	0,07	0,04	0,07	-1,16	-0,96	-58,08365	55,79
540,0	847,0	0,5	0,7	4,4	194,8	72,2	78,1	242,3	372,6	317,3	307,6	348,5	0,00	72,5	72,8	0,19	73,96	74,48	85,70	0,19	74,05	78,51	83,53	0,07	0,04	0,06	-1,15	-0,97	-58,28517	55,95
541,0	848,0	0,5	0,7	4,3	195,0	72,3	78,0	241,3	372,5	316,8	306,8	348,5	0,00	72,5	72,8	0,19	73,94	74,50	84,97	0,19	74,03	78,54	85,12	0,07	0,04	0,07	-1,16	-0,97	-58,74594	55,90
542,0	849,0	0,5	0,7	4,3	194,7	72,0	77,8	241,4	372,1	316,1	306,2	348,6	0,00	72,5	72,8	0,19	73,92	74,51	84,24	0,19	74,02	78,53	85,01	0,07	0,04	0,06	-1,16	-0,97	-59,07199	55,65
543,0	850,0	0,5	0,7	4,2	194,2	72,1	77,8	241,4	372,1	316,2	306,4	348,2	0,00	72,5	72,8	0,19	73,94	74,50	83,55	0,19	74,02	78,53	84,61	0,07	0,04	0,07	-1,15	-0,97	-59,07778	55,50
544,0	851,0	0,5	0,7	4,2	193,8	72,1	78,1	241,0	372,0	316,9	306,4	347,8	0,00	72,5	72,8	0,19	73,91	74,49	82,93	0,19	74,01	78,51	84,13	0,07	0,04	0,07	-1,16	-0,96	-59,11862	55,49
545,0	852,0	0,5	0,7	4,2	193,9	72,2	77,9	240,5	371,7	316,0	305,9	347,8	0,00	72,5	72,8	0,19	73,88	74,46	82,44	0,19	73,98	78,52	83,67	0,07	0,04	0,06	-1,16	-0,97	-59,54584	55,33
546,0	853,0	0,5	0,7	4,2	193,7	72,1	77,9	240,0	371,5	315,8	305,4	347,8	0,00	72,5	72,8	0,19	73,89	74,47	81,98	0,19	73,99	78,50	83,33	0,07	0,04	0,07	-1,15	-0,97	-59,93795	55,26
547,0	854,0	0,5	0,7	4,2	193,4	72,0	77,8	239,7	371,4	314,7	305,0	347,5	0,00	72,5	72,8	0,19	73,90	74,46	81,49	0,19	73,98	78,53	82,99	0,07	0,04	0,07	-1,16	-0,97	-60,27523	55,20
548,0	855,0	0,4	0,7	4,2	192,8	72,1	77,8	239,8	371,1	315,2	305,5	347,0	0,00	72,5	72,8	0,19	73,90	74,46	83,04	0,19	73,99	78,50	82,65	0,07	0,04	0,06	-1,16	-0,97	-60,20062	55,23
549,0	856,0	0,4	0,7	4,2	192,7	72,0	78,0	239,5	371,0	314,8	304,8	346,9	0,00	72,5	72,7	0,19	73,91	74,44	85,74	0,19	73,98	78,51	82,32	0,07	0,04	0,06	-1,16	-0,98	-60,54535	55,34
550,0	857,0	0,4	0,7	4,2	192,5	72,1	77,9	239,0	370,8	314,1	304,1	347,0	0,00	72,5	72,7	0,19	73,90	74,44	85,79	0,19	73,99	78,51	82,02	0,07	0,04	0,07	-1,16	-0,97	-60,91318	55,19
551,0	858,0	0,4	0,7	4,2	192,3	72,1	77,8	238,8	370,6	313,3	303,7	347,1	0,00	72,4	72,8	0,19	73,88	74,44	85,02	0,19	73,98	78,50	81,74	0,07	0,04	0,07	-1,16	-0,96	-61,23339	55,16
552,0	859,0	0,4	0,7	4,2	192,5	72,0	77,9	238,8	370,5	312,9	303,4	347,4	0,00	72,4	72,7	0,19	73,89	74,43	84,28	0,19	73,97	78,49	81,47	0,07	0,04	0,07	-1,16	-0,97	-61,35064	55,13
553,0	860,0	0,4	0,7	4,2	192,3	72,1	77,9	238,7	370,3	312,0	302,6	347,1	0,00	72,4	72,7	0,19	73,87	74,42	83,63	0,19	73,99	78,47	81,23	0,07	0,04	0,07	-1,16	-0,96	-61,80508	55,15
554,0	861,0	0,3	0,7	4,2	191,9	72,0	77,6	238,3	370,1	311,9	302,9	347,0	0,00	72,5	72,7	0,19	73,88	74,41	83,00	0,19	73,98	78,46	81,39	0,07	0,04	0,05	-1,16	-0,97	-61,89176	55,07
555,0	862,0	0,4	0,7	4,2	191,8	72,1	77,7	238,3	369,8	312,5	303,3	346,9	0,00	72,4	72,7	0,19	73,87	74,41	82,49	0,19	73,97	78,47	83,31	0,07	0,04	0,06	-1,16	-0,98	-61,77953	55,24
556,0	863,0	0,3	0,7	4,2	191,4	72,1	77,9	237,7	369,6	311,6	302,7	346,7	0,00	72,4	72,7	0,19	73,87	74,41	82,02	0,19	73,96	78,48	84,97	0,07	0,04	0,06	-1,16	-0,98	-62,2523	55,31
557,0	864,0	0,3	0,7	4,1	191,5	72,1	77,7	237,4	369,4	311,0	302,2	346,9	0,00	72,4	72,7	0,19	73,87	74,38	81,54	0,19	73,95	78,50	84,93	0,07	0,04	0,06	-1,16	-0,97	-62,56455	55,16
558,0	865,0	0,3	0,7	4,0	191,2	72,1	77,5	237,4	369,2	312,7	303,7	346,0	0,00	72,4	72,7	0,19	73,83	74,40	82,44	0,19	73,96	78,48	84,41	0,07	0,04	0,06	-1,16	-0,98	-62,12901	55,22
559,0	866,0	0,3	0,7	4,0	190,3	72,0	77,8	237,1	369,0	313,0	304,0	345,9	0,00	72,4	72,7	0,19	73,83	74,40	85,49	0,19	73,95	78,49	83,93	0,07	0,04	0,06	-1,16	-0,98	-62,1209	55,43
560,0	867,0	0,3	0,7	4,0	190,0	72,0	77,9	236,5	368,8	310,3	301,9	346,2	0,00	72,4	72,7	0,19	73,81	74,39	86,21	0,19	73,93	78,50	83,48	0,07	0,04	0,06	-1,16	-0,98	-63,19463	55,33
561,0	868,0	0,3	0,7	4,0	189,8	71,9	77,8	235,9	368,4	309,1	301,3	346,2	0,00	72,4	72,7	0,19	73,80	74,37	85,51	0,19	73,94	78,50	83,14	0,07	0,04	0,06	-1,16	-0,97	-63,76491	55,22
562,0	869,0	0,3	0,7	4,0	189,8	71,9	77,7	236,1	368,1	308,1	300,5	346,4	0,00	72,4	72,7	0,19	73,83	74,37	84,69	0,19	73,95	78,48	82,79	0,07	0,04	0,06	-1,17	-0,97	-64,11133	55,16
563,0	870,0	0,3	0,7	4,0	189,5	71,9	77,6	236,0	367,7	307,9	300,1	346,2	0,00	72,4	72,7	0,19	73,81	74,36	83,89	0,19	73,96	78,47	82,51	0,07	0,04	0,05	-1,16	-0,97	-64,51844	55,16
564,0	871,0	0,3	0,7	4,0	189,5	72,0	77,6	235,3	367,4	306,1	299,7	346,0	0,00	72,4	72,7	0,19	73,82	74,39	83,24	0,19	73,95	78,48	82,21	0,07	0,04	0,06	-1,15	-0,97	-65,05904	55,16
565,0	872,0	0,2	0,7	4,0	189,0	72,0	77,5	235,2	367,1	304,8	299,3	345,6	0,00	72,4	72,7	0,19	73,85	74,37	82,61	0,19	73,94	78,46	81,91	0,07	0,04	0,06	-1,16	-0,97	-65,52512	55,17
566,0	873,0	0,2	0,7	4,1	188,8	71,9	77,4	235,1	366,8	304,0	299,0	345,5	0,00	72,4	72,7	0,19	73,83	74,35	82,08	0,19	73,94	78,45	81,62	0,07	0,04	0,06	-1,16	-0,96	-65,86876	55,12
567,0	874,0	0,2	0,7	4,0	188,4	71,9	77,6	234,6	366,5	303,5	298,9	345,6	0,00	72,4	72,7	0,19	73,82	74,35	81,63	0,19	73,93	78,45	81,35	0,07	0,04	0,06	-1,16	-0,97	-66,11749	55,16
568,0	875,0	0,2	0,7	4,1	188,3	72,0	77,4	234,6	366,2	304,8	300,3	345,4	0,00	72,4	72,7	0,19	73,82	74,34	82,37	0,19	73,91	78,44	81,11	0,07	0,04	0,06	-1,16	-0,97	-65,69599	55,17
569,0	876,0	0,2	0,7	4,1	188,2	72,0	77,4	234,5	366,0	305,9	301,4	345,0	0,00	72,4	72,7	0,19	73,81	74,33	85,15	0,19	73,90	78,42	81,49	0,07	0,04	0,06	-1,17	-0,98	-65,37624	55,23
570,0	877,0	0,2	0,7	4,1	188,5	72,0	77,5	234,2	365,8	306,3	301,9	345,0	0,00	72,4	72,7	0,19	73,77	74,32	85,98	0,19	73,86	78,42	83,36	0,07	0,04	0,05	-1,17	-0,97	-65,29982	55,33
571,0	878,0	0,2	0,7	4,1	188,0	72,0	77,4	233,8	365,4	306,0	302,0	344,8	0,00	72,4	72,7	0,19	73,76	74,32	85,39	0,19	73,87	78,46	84,94	0,07	0,04	0,06	-1,17	-0,98	-65,54478	55,43
572,0	879,0	0,1	0,7	4,1	188,0	71,9	77,5	233,3	365,2	306,0	302,1	344,7	0,00	72,4	72,7	0,19	73,75	74,32	84,59	0,19	73,86	78,46	84,95	0,07	0,04	0,06	-1,17	-0,98	-65,68753	55,33
573,0	880,0	0,2	0,7	4,0	187,6	71,9	77,5	233,2	365,1	306,4	302,7	344,0	0,00	72,3	72,7	0,19	73,74	74,31	83,86	0,19	73,88	78,44	84,47	0,07	0,04	0,06	-1,16	-0,98	-65,67468	55,38
574,0	881,0	0,1	0,8	3,9	187,8	72,0	77,2	232,9	364,8	305,5	302,5	344,1	0,00	72,3	72,7	0,19	73,74	74,30	83,21	0,19	73,84	78,44	83,98	0,08	0,04	0,06	-1,16	-0,98	-65,99614	55,32
575,0	882,0	0,1	0,7	3,9	187,7	71,8	77,2	232,5	364,6	304,7	302,2	344,3	0,00	72,3	72,6	0,19	73,73	74,30	82,60	0,19	73,86	78,43	83,58	0,07	0,04	0,06	-1,17	-0,97	-66,28225	55,28
576,0	883,0	0,1	0,7	3,8	187,3	72,0	77,3	232,5	364,3	304,1	302,1	344,3	0,00	72,3	72,6	0,19	73,71	74,29	82,03	0,19	73,85	78,40	83,22	0,07	0,04	0,06	-1,16	-0,97	-66,4894	55,27
577,0	884,0	0,1	0,7	3,8	187,2	71,9	77,2	232,0	364,1	304,1	302,2	344,3	0,00	72,3	72,7	0,19	73,72	74,28	81,57	0,19	73,86	78,40	82,87	0,07	0,04	0,06	-1,17	-0,97	-66,60126	55,27
578,0	885,0	0,1	0,7	3,8	187,2	72,0	77,2	232,1	364,0	304,5	303,0	343,8	0,00	72,3	72,7	0,19	73,72	74,28	82,86	0,19	73,85	78,38	82,51	0,07	0,04	0,06	-1,17	-0,97	-66,44908	55,31
579,0	886,0	0,1	0,7	3,8	187,0	71,9	77,3	232,0	363,8	303,9	303,3	343,0	0,00	72,3	72,7	0,19	73,71	74,28	85,47	0,19	73,85	78,39	82,18	0,07	0,04

Manufacturer: ENERCO
Model: WS110

Run: 1
Project #: PI 20350
Test Duration: 118 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses

	HHV	LHV
Eff	70,91%	76,30%
Comb Eff	98,19%	98,19%
HT Eff	72,22%	77,71%
Output	55 580	kJ/h
Burn Rate		kg/h
Grams CO	214	g
Input	78 380	kJ/h
MC wet	17,11	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,86
F_0
1,051

Overall Heating Efficiency: 70,91%
Combustion Efficiency: 98,19%
Heat Transfer Efficiency: 72,22%

Heat Output: 52 724 Btu/h
Heat Input: 74 352 Btu/h
Burn Duration: 1,97 h
Burn Rate: lb/h
Stack Temp: 587,2 Deg. F

Averages	0,29	11,97	0,83	20,28	8,16	307,73	22,87	98,1%	72,2%	70,8%
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	9,20	0,52	4,76	276,0%	20,65	15,63	221,1	22,2	92,6%	63,5%	58,8%
1,00	9,11	0,17	1,94	842,6%	20,83	18,80	180,9	22,3	95,9%	41,2%	39,5%
2,00	9,02	0,18	3,14	498,3%	20,76	17,53	203,7	22,0	97,0%	54,3%	52,7%
3,00	8,98	0,70	6,11	191,7%	20,57	14,11	214,8	22,1	92,0%	69,4%	63,9%
4,00	8,89	0,61	6,68	172,3%	20,54	13,55	222,4	22,1	93,6%	70,3%	65,8%
5,00	8,79	0,58	7,47	146,8%	20,50	12,75	238,3	22,2	94,4%	70,7%	66,7%
6,00	8,71	0,32	9,34	105,6%	20,42	10,92	269,5	22,1	97,5%	71,8%	70,0%
7,00	8,66	0,32	10,54	82,9%	20,35	9,65	279,4	22,2	97,8%	72,9%	71,3%
8,00	8,57	0,34	9,57	100,4%	20,40	10,66	274,2	22,2	97,4%	71,8%	70,0%
9,00	8,48	0,37	8,86	115,3%	20,44	11,39	270,3	22,2	97,0%	70,9%	68,8%
10,00	8,43	0,37	8,65	120,2%	20,45	11,62	268,3	22,3	96,9%	70,6%	68,4%
11,00	8,34	0,38	8,68	119,3%	20,45	11,58	269,0	22,3	96,9%	70,6%	68,4%
12,00	8,25	0,38	8,91	113,9%	20,44	11,34	270,6	22,4	97,0%	70,9%	68,8%
13,00	8,20	0,38	9,26	106,2%	20,42	10,97	275,1	22,4	97,1%	71,2%	69,1%
14,00	8,11	0,37	9,59	99,3%	20,40	10,62	280,9	22,4	97,2%	71,4%	69,3%
15,00	8,02	0,37	10,14	89,1%	20,37	10,05	288,6	22,5	97,3%	71,7%	69,8%
16,00	7,91	0,34	11,07	74,1%	20,32	9,08	306,1	22,4	97,7%	71,8%	70,2%
17,00	7,80	0,23	12,41	57,2%	20,25	7,73	318,9	22,5	98,6%	72,7%	71,8%
18,00	7,71	0,15	12,60	55,8%	20,25	7,57	320,9	22,6	99,2%	72,9%	72,3%
19,00	7,61	0,16	12,42	57,9%	20,26	7,75	324,4	22,6	99,1%	72,4%	71,8%
20,00	7,52	0,16	12,69	54,7%	20,24	7,48	328,5	22,7	99,1%	72,5%	71,9%
21,00	7,39	0,11	13,11	50,2%	20,22	7,05	332,3	22,5	99,4%	72,8%	72,3%
22,00	7,30	0,10	13,71	43,9%	20,19	6,43	338,1	22,4	99,6%	73,1%	72,7%
23,00	7,19	0,22	14,52	34,7%	20,14	5,51	346,5	22,5	98,8%	73,3%	72,5%
24,00	7,06	0,24	15,43	26,8%	20,09	4,55	359,4	22,8	98,8%	73,5%	72,6%
25,00	6,93	0,31	16,25	20,0%	20,04	3,64	373,1	22,7	98,5%	73,4%	72,3%
26,00	6,80	0,45	16,89	14,6%	20,00	2,89	386,1	22,8	97,9%	73,3%	71,7%
27,00	6,66	0,56	17,39	10,7%	19,97	2,30	399,3	22,7	97,4%	73,0%	71,1%
28,00	6,53	0,86	17,84	6,2%	19,93	1,65	411,9	22,9	96,2%	72,7%	69,9%
29,00	6,39	0,88	18,06	4,9%	19,91	1,41	413,8	22,9	96,2%	72,8%	70,0%
30,00	6,25	0,52	17,65	9,3%	19,96	2,05	405,5	22,9	97,6%	72,9%	71,2%
31,00	6,12	0,35	17,14	13,6%	19,99	2,68	398,6	22,9	98,4%	72,9%	71,7%
32,00	5,98	0,28	16,84	16,1%	20,01	3,04	392,5	22,9	98,7%	73,0%	72,0%
33,00	5,84	0,25	16,61	17,9%	20,03	3,30	388,0	23,0	98,8%	73,0%	72,2%
34,00	5,71	0,24	16,45	19,0%	20,04	3,47	385,8	22,9	98,9%	73,0%	72,2%
35,00	5,62	0,23	16,41	19,4%	20,04	3,52	384,1	23,0	98,9%	73,1%	72,3%
36,00	5,48	0,24	16,39	19,4%	20,04	3,53	382,7	22,9	98,9%	73,1%	72,3%
37,00	5,34	0,25	16,33	19,8%	20,04	3,59	381,5	22,8	98,8%	73,1%	72,2%
38,00	5,25	0,25	16,22	20,6%	20,05	3,71	379,0	22,9	98,8%	73,1%	72,2%
39,00	5,12	0,26	16,06	21,7%	20,06	3,86	376,7	22,9	98,7%	73,1%	72,2%
40,00	4,98	0,26	16,02	22,0%	20,06	3,91	376,5	22,8	98,7%	73,1%	72,2%
41,00	4,89	0,27	16,08	21,5%	20,05	3,84	376,6	23,1	98,7%	73,2%	72,2%
42,00	4,75	0,28	16,02	21,8%	20,06	3,89	375,0	23,0	98,6%	73,2%	72,2%
43,00	4,66	0,29	15,98	22,0%	20,06	3,93	374,3	23,0	98,6%	73,2%	72,1%
44,00	4,53	0,28	15,93	22,5%	20,06	3,99	373,9	22,9	98,6%	73,2%	72,1%
45,00	4,39	0,30	16,03	21,6%	20,05	3,87	374,8	23,2	98,5%	73,2%	72,1%
46,00	4,30	0,33	16,16	20,5%	20,05	3,72	375,9	23,3	98,4%	73,3%	72,1%
47,00	4,16	0,34	16,29	19,4%	20,04	3,58	376,5	23,3	98,4%	73,3%	72,1%
48,00	4,07	0,34	16,38	18,8%	20,03	3,48	378,3	23,4	98,3%	73,3%	72,1%
49,00	3,94	0,36	16,41	18,5%	20,03	3,44	378,4	23,2	98,3%	73,3%	72,0%
50,00	3,84	0,36	16,41	18,4%	20,03	3,44	378,4	23,3	98,2%	73,3%	72,0%
51,00	3,71	0,37	16,29	19,2%	20,04	3,56	376,5	23,3	98,2%	73,3%	72,0%
52,00	3,62	0,37	16,23	19,7%	20,04	3,63	375,5	23,3	98,2%	73,3%	72,0%
53,00	3,48	0,37	16,15	20,3%	20,04	3,71	374,2	23,4	98,2%	73,3%	72,0%
54,00	3,35	0,38	16,05	20,9%	20,05	3,81	373,3	23,2	98,1%	73,3%	71,9%
55,00	3,26	0,39	16,06	20,7%	20,05	3,79	372,4	23,3	98,1%	73,3%	71,9%
56,00	3,12	0,39	16,03	21,0%	20,05	3,83	372,2	23,2	98,1%	73,3%	71,9%
57,00	3,03	0,39	16,08	20,6%	20,05	3,77	373,1	23,1	98,1%	73,3%	71,9%
58,00	2,94	0,39	16,20	19,8%	20,04	3,65	373,0	23,4	98,1%	73,4%	72,0%
59,00	2,80	0,41	16,06	20,6%	20,05	3,78	371,9	23,3	98,0%	73,4%	71,9%
60,00	2,71	0,40	15,92	21,7%	20,06	3,94	369,5	23,3	98,0%	73,4%	71,9%
61,00	2,62	0,36	15,62	24,3%	20,07	4,28	364,5	23,2	98,2%	73,4%	72,0%
62,00	2,53	0,33	15,16	28,3%	20,10	4,78	358,5	23,3	98,3%	73,3%	72,1%
63,00	2,44	0,32	14,79	31,5%	20,12	5,17	353,3	23,2	98,3%	73,3%	72,0%
64,00	2,35	0,31	14,61	33,1%	20,13	5,36	349,9	23,4	98,4%	73,3%	72,1%
65,00	2,26	0,30	14,31	36,0%	20,15	5,69	346,1	23,4	98,4%	73,2%	72,0%
66,00	2,17	0,21	13,69	42,9%	20,19	6,39	338,4	23,2	98,9%	73,0%	72,2%
67,00	2,11	0,17	12,90	52,0%	20,23	7,25	328,9	23,3	99,1%	72,8%	72,1%
68,00	2,03	0,14	12,38	58,7%	20,26	7,81	321,0	23,3	99,3%	72,7%	72,1%
69,00	1,94	0,12	11,94	64,7%	20,29	8,29	313,9	23,4	99,4%	72,6%	72,1%
70,00	1,89	0,11	11,68	68,5%	20,30	8,57	308,7	23,3	99,4%	72,6%	72,1%
71,00	1,85	0,11	11,48	71,4%	20,31	8,78	303,5	23,1	99,4%	72,6%	72,2%
72,00	1,80	0,10	11,10	77,3%	20,33	9,18	298,4	23,0	99,5%	72,5%	72,1%
73,00	1,71	0,11	10,93	79,8%	20,34	9,35	294,6	23,0	99,4%	72,5%	72,1%
74,00	1,67	0,12	10,92	79,9%	20,34	9,36	292,0	22,9	99,3%	72,7%	72,2%
75,00	1,62	0,14	10,99	78,5%	20,34	9,28	290,6	23,0	99,2%	72,8%	72,2%
76,00	1,53	0,15	10,98	78,3%	20,34	9,27	291,3	22,9	99,1%	72,8%	72,1%
77,00	1,49	0,17	11,36	72,2%	20,31	8,87	292,1	23,0	99,0%	73,2%	72,5%
78,00	1,44	0,14	11,10	76,6%	20,33	9,16	289,4	23,0	99,2%	73,1%	72,5%
79,00	1,40	0,13	10,99	78,7%	20,34	9,29	287,2	23,0	99,3%	73,1%	72,5%
80,00	1,35	0,12	10,85	81,0%	20,34	9,43	285,3	23,1	99,3%	73,0%	72,5%
81,00	1,26	0,13	10,79	82,0%	20,35	9,50	284,3	23,0	99,3%	73,0%	72,5%
82,00	1,21	0,12	10,78	82,3%	20,35	9,51	283,2	22,9	99,3%	73,1%	72,6%
83,00	1,17	0,13	10,67	84,0%	20,35	9,62	281,6	23,1	99,3%	73,0%	72,5%
84,00	1,12	0,11	10,41	88,8%	20,37	9,91	279,2	23,0	99,4%	72,8%	72,4%
85,00	1,08	0,11	10,31	90,7%	20,38	10,01	277,4	23,1	99,4%	72,8%	72,4%
86,00	1,03	0,10	10,28	91,4%	20,38	10,05	275,6	23,0	99,5%	72,9%	72,5%
87,00	0,99	0,08	10,25	92,3%	20,38	10,09	274,7	23,0	99,6%	72,9%	72,6%
88,00	0,94	0,10	10,03	96,0%	20,39	10,31	271,2	23,0	99,5%	72,9%	72,5%
89,00	0,90	0,14	9,70	101,8%	20,41	10,63	266,9	23,1	99,1%	72,7%	72,0%
90,00	0,85	0,16	9,56	104,3%	20,41	10,77	263,8	23,2	98,9%	72,7%	71,9%
91,00	0,83	0,17	9,57	103,9%	20,41	10,76	262,5	23,1	98,8%	72,8%	71,9%
92,00	0,81	0,18	9,69	101,4%	20,41	10,63	261,2	23,0	98,8%	73,1%	72,2%

93,00	0,76	0,18	9,71	100,8%	20,40	10,60	260,1	23,1	98,8%	73,2%	72,3%
94,00	0,71	0,18	9,64	102,3%	20,41	10,68	258,6	23,0	98,8%	73,2%	72,3%
95,00	0,67	0,19	9,37	107,8%	20,42	10,96	254,9	22,9	98,7%	73,0%	72,1%
96,00	0,63	0,21	9,11	113,1%	20,43	11,22	251,6	22,8	98,4%	72,9%	71,7%
97,00	0,62	0,23	8,99	115,4%	20,44	11,33	249,5	22,9	98,3%	72,8%	71,6%
98,00	0,58	0,24	8,93	116,5%	20,44	11,39	248,0	22,9	98,2%	72,8%	71,5%
99,00	0,53	0,25	9,03	114,0%	20,44	11,28	246,8	22,9	98,1%	73,1%	71,7%
100,00	0,49	0,24	9,13	112,0%	20,43	11,18	246,6	22,9	98,2%	73,3%	72,0%
101,00	0,49	0,23	9,19	110,9%	20,43	11,12	246,0	22,8	98,3%	73,4%	72,2%
102,00	0,44	0,18	9,24	110,9%	20,43	11,10	249,0	22,9	98,8%	73,3%	72,4%
103,00	0,40	0,16	9,20	112,3%	20,43	11,16	250,1	22,8	98,9%	73,1%	72,3%
104,00	0,40	0,17	9,17	112,6%	20,43	11,18	250,9	22,9	98,8%	73,0%	72,2%
105,00	0,35	0,18	9,19	111,9%	20,43	11,15	251,2	22,8	98,7%	73,0%	72,1%
106,00	0,31	0,19	9,03	115,5%	20,44	11,32	251,2	22,8	98,6%	72,8%	71,7%
107,00	0,26	0,20	8,88	118,8%	20,45	11,47	249,5	22,8	98,5%	72,6%	71,6%
108,00	0,26	0,21	8,61	125,2%	20,46	11,75	247,4	22,8	98,3%	72,3%	71,1%
109,00	0,22	0,22	8,36	131,6%	20,48	12,01	245,2	22,8	98,2%	72,0%	70,8%
110,00	0,21	0,25	8,39	130,0%	20,47	11,96	242,8	22,8	98,0%	72,3%	70,9%
111,00	0,17	0,30	8,25	132,3%	20,48	12,08	239,1	22,8	97,4%	72,3%	70,5%
112,00	0,12	0,33	7,85	142,9%	20,50	12,48	234,4	22,8	97,1%	72,0%	69,9%
113,00	0,12	0,41	7,62	147,5%	20,50	12,68	230,5	22,8	96,2%	71,8%	69,1%
114,00	0,08	0,50	7,51	148,1%	20,51	12,75	226,8	22,7	95,3%	71,9%	68,5%
115,00	0,08	0,56	7,37	150,5%	20,51	12,86	223,3	22,8	94,6%	71,9%	68,0%
116,00	0,03	0,62	7,16	155,4%	20,52	13,05	219,8	22,6	93,9%	71,7%	67,3%
117,00	0,03	0,55	6,77	171,5%	20,54	13,50	215,3	22,6	94,3%	71,3%	67,2%
118,00	0,03	0,58	6,53	179,5%	20,55	13,74	211,6	22,7	93,7%	71,0%	66,6%

Manufacturer: ENERCO
Model: WS110

Run: 1
Project #: PI 20350
Test Duration: 583 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses

	HHV	LHV
Eff	72,82%	78,35%
Comb Eff	94,20%	94,20%
HT Eff	77,30%	83,18%
Output	16 377	kJ/h
Burn Rate	1,11	kg/h
Grams CO	921	g
Input	22 491	kJ/h
MC wet	16,62	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,86
F_0
1,049

Overall Heating Efficiency: 72,82%
Combustion Efficiency: 94,20%
Heat Transfer Efficiency: 77,30%

Heat Output: 15 536 Btu/h
Heat Input: 21 335 Btu/h
Burn Duration: 9,72 h
Burn Rate: 2,45 lb/h
Stack Temp: 272,3 Deg. F

Averages	0,82	6,53	2,01	20,54	13,60	133,51	22,68	0,90	0,79	0,71
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	12,97	0,46	2,64	540,5%	20,77	17,90	127,9	22,5	89,4%	66,1%	59,1%
1,00	12,74	0,46	2,88	494,8%	20,76	17,65	141,0	22,5	90,2%	65,2%	58,8%
2,00	12,70	0,74	4,57	273,5%	20,65	15,71	152,2	22,5	89,3%	72,2%	64,4%
3,00	12,61	0,77	5,63	210,1%	20,59	14,57	180,1	22,3	90,6%	72,0%	65,3%
4,00	12,47	0,58	10,28	82,9%	20,35	9,78	237,4	22,4	95,8%	75,5%	72,4%
5,00	12,33	0,50	15,16	26,8%	20,09	4,68	319,1	22,6	97,4%	75,4%	73,5%
6,00	12,20	0,20	17,42	12,8%	19,98	2,47	358,7	22,7	99,1%	75,1%	74,5%
7,00	12,02	0,25	18,30	7,1%	19,93	1,51	376,5	22,8	98,9%	74,9%	74,1%
8,00	11,88	0,27	18,41	6,3%	19,93	1,38	386,6	23,1	98,8%	74,5%	73,6%
9,00	11,70	0,31	18,53	5,4%	19,92	1,23	391,3	23,2	98,6%	74,4%	73,3%
10,00	11,52	0,33	18,64	4,7%	19,91	1,11	395,6	23,1	98,6%	74,2%	73,2%
11,00	11,34	0,34	18,65	4,6%	19,91	1,08	397,4	23,3	98,5%	74,2%	73,1%
12,00	11,20	0,32	18,74	4,2%	19,91	1,01	400,6	23,1	98,6%	74,1%	73,0%
13,00	11,02	0,27	18,84	3,9%	19,90	0,93	401,9	23,2	98,8%	74,1%	73,2%
14,00	10,91	0,47	18,18	6,5%	19,93	1,52	349,6	23,3	97,9%	76,0%	74,4%
15,00	10,79	0,65	15,88	20,2%	20,04	3,84	317,4	23,3	96,8%	76,0%	73,6%
16,00	10,74	0,57	13,96	36,7%	20,15	5,91	296,6	23,2	96,8%	75,7%	73,3%
17,00	10,61	0,56	12,91	47,4%	20,21	7,02	281,8	23,1	96,7%	75,6%	73,1%
18,00	10,56	0,52	12,49	52,7%	20,23	7,49	272,0	22,9	96,8%	75,7%	73,3%
19,00	10,47	0,51	12,41	53,8%	20,24	7,58	266,0	23,0	96,9%	76,0%	73,6%
20,00	10,38	0,51	12,42	53,6%	20,24	7,56	261,4	23,0	96,9%	76,3%	73,9%
21,00	10,29	0,53	12,45	53,0%	20,24	7,52	258,2	23,0	96,8%	76,5%	74,1%
22,00	10,25	0,55	12,60	51,0%	20,23	7,35	256,2	22,9	96,7%	76,8%	74,2%
23,00	10,15	0,58	12,62	50,5%	20,22	7,32	254,9	22,9	96,5%	76,9%	74,1%
24,00	10,07	0,59	12,73	49,1%	20,22	7,19	253,6	23,0	96,4%	77,0%	74,3%
25,00	9,97	0,60	12,88	47,3%	20,21	7,03	253,8	23,0	96,4%	77,2%	74,4%
26,00	9,93	0,61	12,98	46,2%	20,20	6,92	254,2	23,0	96,4%	77,2%	74,4%
27,00	9,84	0,63	13,02	45,6%	20,20	6,87	253,8	23,1	96,3%	77,3%	74,4%
28,00	9,75	0,62	13,08	45,0%	20,20	6,81	253,7	23,1	96,3%	77,3%	74,5%
29,00	9,68	0,63	13,08	44,9%	20,20	6,80	253,6	23,1	96,3%	77,3%	74,5%
30,00	9,61	0,62	13,10	44,8%	20,20	6,79	253,5	23,1	96,3%	77,3%	74,5%
31,00	9,52	0,64	13,06	45,0%	20,20	6,81	252,5	23,0	96,3%	77,4%	74,5%
32,00	9,43	0,65	13,03	45,2%	20,20	6,84	252,2	23,1	96,2%	77,4%	74,4%
33,00	9,38	0,66	13,03	45,1%	20,20	6,84	251,9	23,0	96,1%	77,4%	74,4%
34,00	9,29	0,65	12,96	46,0%	20,20	6,92	251,5	23,1	96,2%	77,3%	74,4%
35,00	9,20	0,65	12,93	46,3%	20,20	6,95	250,4	23,1	96,2%	77,4%	74,4%
36,00	9,16	0,64	12,83	47,4%	20,21	7,06	249,2	23,1	96,2%	77,4%	74,4%
37,00	9,07	0,64	12,77	48,2%	20,21	7,13	248,1	23,2	96,2%	77,4%	74,4%
38,00	8,98	0,62	12,68	49,4%	20,22	7,23	247,3	23,2	96,3%	77,4%	74,5%
39,00	8,93	0,61	12,63	50,0%	20,22	7,28	246,2	23,1	96,3%	77,4%	74,5%
40,00	8,84	0,60	12,57	50,9%	20,23	7,36	245,4	23,1	96,4%	77,4%	74,6%
41,00	8,79	0,57	12,50	51,9%	20,23	7,44	244,0	23,1	96,5%	77,4%	74,7%
42,00	8,70	0,57	12,44	52,7%	20,23	7,51	243,0	23,1	96,5%	77,4%	74,7%
43,00	8,66	0,54	12,42	53,3%	20,24	7,55	242,0	23,1	96,7%	77,5%	74,9%
44,00	8,57	0,52	12,41	53,6%	20,24	7,57	241,7	23,0	96,8%	77,5%	75,0%
45,00	8,48	0,51	12,39	54,0%	20,24	7,60	241,1	23,0	96,9%	77,5%	75,1%
46,00	8,43	0,51	12,40	53,8%	20,24	7,58	240,6	23,0	96,8%	77,5%	75,1%
47,00	8,39	0,51	12,36	54,4%	20,24	7,63	240,0	23,0	96,9%	77,5%	75,1%
48,00	8,29	0,51	12,29	55,2%	20,25	7,70	239,5	23,1	96,8%	77,5%	75,1%
49,00	8,25	0,50	12,14	57,1%	20,25	7,86	237,9	22,9	96,9%	77,5%	75,0%
50,00	8,16	0,54	12,01	58,3%	20,26	7,98	236,4	23,0	96,6%	77,4%	74,8%
51,00	8,11	0,57	11,92	59,0%	20,26	8,06	236,1	23,1	96,4%	77,4%	74,6%
52,00	8,02	0,60	11,86	59,4%	20,26	8,11	234,7	23,2	96,2%	77,4%	74,4%
53,00	7,98	0,58	11,85	59,8%	20,27	8,13	234,1	23,1	96,3%	77,4%	74,5%
54,00	7,88	0,58	11,82	60,1%	20,27	8,15	233,0	23,1	96,3%	77,5%	74,6%
55,00	7,84	0,57	11,79	60,6%	20,27	8,19	232,0	23,0	96,3%	77,5%	74,7%
56,00	7,80	0,55	11,76	61,4%	20,27	8,24	231,3	23,0	96,4%	77,5%	74,8%
57,00	7,70	0,55	11,76	61,4%	20,27	8,24	230,4	22,9	96,5%	77,6%	74,9%
58,00	7,66	0,55	11,70	62,2%	20,28	8,31	229,6	23,0	96,5%	77,6%	74,8%
59,00	7,57	0,53	11,64	63,1%	20,28	8,37	228,7	22,9	96,5%	77,6%	74,9%
60,00	7,52	0,52	11,56	64,4%	20,29	8,46	228,0	22,9	96,6%	77,6%	75,0%
61,00	7,48	0,50	11,53	65,1%	20,29	8,51	227,6	23,0	96,7%	77,6%	75,0%
62,00	7,43	0,49	11,49	65,8%	20,29	8,55	226,8	23,1	96,8%	77,6%	75,1%
63,00	7,34	0,49	11,47	66,2%	20,29	8,58	225,4	22,9	96,8%	77,7%	75,2%
64,00	7,29	0,46	11,43	67,1%	20,30	8,64	224,4	22,9	97,0%	77,7%	75,3%
65,00	7,25	0,45	11,40	67,6%	20,30	8,67	224,2	22,9	97,0%	77,7%	75,3%
66,00	7,19	0,41	11,39	68,4%	20,30	8,71	223,5	23,0	97,3%	77,7%	75,7%
67,00	7,11	0,38	11,34	69,4%	20,30	8,77	222,4	23,0	97,5%	77,8%	75,8%
68,00	7,07	0,37	11,33	69,7%	20,31	8,79	221,7	23,1	97,6%	77,8%	75,9%
69,00	7,02	0,37	11,28	70,5%	20,31	8,85	220,7	22,9	97,6%	77,8%	75,9%
70,00	6,93	0,35	11,26	71,0%	20,31	8,87	220,3	23,1	97,7%	77,8%	76,0%
71,00	6,89	0,33	11,25	71,4%	20,31	8,89	220,2	23,1	97,8%	77,8%	76,1%
72,00	6,84	0,34	11,25	71,5%	20,31	8,90	219,5	23,0	97,8%	77,9%	76,2%
73,00	6,78	0,35	11,23	71,6%	20,31	8,91	219,2	23,0	97,7%	77,9%	76,1%
74,00	6,74	0,35	11,21	71,8%	20,31	8,92	218,9	23,0	97,7%	77,9%	76,1%
75,00	6,66	0,37	11,19	72,0%	20,31	8,95	218,7	22,9	97,6%	77,9%	76,0%
76,00	6,61	0,35	11,12	73,2%	20,32	9,03	218,0	22,9	97,6%	77,8%	76,0%
77,00	6,57	0,35	11,02	74,6%	20,32	9,13	217,0	22,9	97,6%	77,8%	76,0%
78,00	6,52	0,33	10,93	76,4%	20,33	9,23	216,1	23,1	97,8%	77,8%	76,1%
79,00	6,48	0,32	10,82	78,3%	20,34	9,36	215,2	22,9	97,8%	77,7%	76,1%
80,00	6,43	0,31	10,72	80,0%	20,34	9,46	214,0	22,8	97,9%	77,7%	76,1%
81,00	6,37	0,30	10,63	81,9%	20,35	9,57	213,1	22,8	98,0%	77,7%	76,1%
82,00	6,31	0,29	10,51	84,0%	20,35	9,70	211,6	22,9	98,0%	77,7%	76,2%
83,00	6,27	0,27	10,44	85,4%	20,36	9,78	210,0	22,9	98,1%	77,7%	76,3%
84,00	6,21	0,27	10,32	87,5%	20,37	9,91	209,0	22,8	98,1%	77,7%	76,2%
85,00	6,16	0,26	10,28	88,5%	20,37	9,96	208,1	22,7	98,2%	77,7%	76,3%
86,00	6,12	0,28	10,25	88,6%	20,37	9,98	207,7	22,9	98,0%	77,7%	76,1%
87,00	6,07	0,27	10,23	89,3%	20,37	10,01	206,4	23,0	98,1%	77,8%	76,3%
88,00	6,02	0,26	10,21	89,7%	20,37	10,03	205,7	22,9	98,2%	77,8%	76,4%
89,00	5,98	0,26	10,19	90,1%	20,37	10,05	205,4	22,9	98,2%	77,8%	76,4%
90,00	5,93	0,24	10,20	90,3%	20,37	10,06	205,0	22,8	98,3%	77,8%	76,5%
91,00	5,89	0,24	10,16	91,0%	20,38	10,10	204,0	22,9	98,3%	77,9%	76,6%
92,00	5,84	0,24	10,11	91,9%	20,38	10,15	203,3	22,9	98,3%	77,9%	76,6%

93,00	5,80	0,22	10,14	91,6%	20,38	10,12	202,2	22,8	98,5%	78,0%	76,8%
94,00	5,75	0,31	10,03	92,1%	20,38	10,19	201,6	22,9	97,8%	77,9%	76,2%
95,00	5,71	0,50	9,70	94,7%	20,39	10,44	200,6	22,9	96,2%	77,5%	74,6%
96,00	5,66	0,52	9,62	95,9%	20,39	10,51	200,0	22,8	96,0%	77,5%	74,4%
97,00	5,62	0,52	9,60	96,2%	20,39	10,53	199,0	22,8	96,0%	77,5%	74,4%
98,00	5,57	0,53	9,52	97,6%	20,40	10,61	197,7	22,8	95,9%	77,5%	74,3%
99,00	5,53	0,54	9,49	98,1%	20,40	10,64	196,9	22,8	95,8%	77,5%	74,3%
100,00	5,49	0,55	9,42	99,3%	20,40	10,71	195,6	22,7	95,7%	77,5%	74,2%
101,00	5,48	0,56	9,37	100,0%	20,40	10,75	194,4	22,9	95,6%	77,6%	74,2%
102,00	5,43	0,54	9,37	100,5%	20,40	10,77	193,2	22,9	95,8%	77,7%	74,4%
103,00	5,39	0,53	9,39	100,2%	20,40	10,75	192,3	22,8	95,8%	77,8%	74,5%
104,00	5,34	0,56	9,23	103,0%	20,41	10,90	190,9	22,8	95,6%	77,7%	74,2%
105,00	5,30	0,59	9,11	104,8%	20,41	11,01	189,8	22,8	95,2%	77,6%	73,9%
106,00	5,25	0,60	9,09	104,9%	20,41	11,02	189,1	22,6	95,1%	77,6%	73,9%
107,00	5,21	0,63	9,06	105,0%	20,41	11,04	188,2	22,8	94,9%	77,7%	73,7%
108,00	5,16	0,60	9,07	105,3%	20,42	11,04	187,1	22,8	95,1%	77,8%	74,0%
109,00	5,16	0,63	8,98	106,8%	20,42	11,13	186,0	22,9	94,9%	77,7%	73,8%
110,00	5,12	0,65	8,88	108,5%	20,42	11,22	185,0	22,9	94,6%	77,7%	73,5%
111,00	5,07	0,68	8,80	109,5%	20,43	11,29	183,7	22,9	94,3%	77,7%	73,3%
112,00	5,03	0,68	8,71	111,5%	20,43	11,38	182,6	22,7	94,3%	77,7%	73,2%
113,00	4,98	0,67	8,66	112,8%	20,43	11,44	181,5	22,8	94,4%	77,7%	73,3%
114,00	4,98	0,67	8,67	112,8%	20,43	11,43	180,0	22,8	94,4%	77,8%	73,4%
115,00	4,94	0,70	8,58	114,0%	20,44	11,51	179,5	22,9	94,1%	77,7%	73,1%
116,00	4,89	0,69	8,63	113,2%	20,43	11,46	178,6	23,0	94,2%	77,9%	73,4%
117,00	4,84	0,68	8,59	114,3%	20,44	11,51	177,7	22,9	94,2%	77,9%	73,4%
118,00	4,80	0,69	8,60	113,7%	20,44	11,49	177,4	22,9	94,1%	77,9%	73,4%
119,00	4,77	0,71	8,58	113,7%	20,44	11,50	176,9	23,0	94,0%	77,9%	73,2%
120,00	4,75	0,69	8,65	112,6%	20,43	11,44	176,8	22,9	94,2%	78,0%	73,5%
121,00	4,71	0,69	8,67	112,3%	20,43	11,42	176,2	23,0	94,2%	78,1%	73,6%
122,00	4,66	0,70	8,65	112,3%	20,43	11,43	176,0	23,0	94,1%	78,1%	73,5%
123,00	4,62	0,69	8,71	111,2%	20,43	11,37	175,7	23,0	94,3%	78,2%	73,7%
124,00	4,57	0,69	8,72	111,1%	20,43	11,37	175,9	22,9	94,2%	78,2%	73,7%
125,00	4,57	0,67	8,78	110,1%	20,43	11,31	176,1	22,8	94,4%	78,3%	73,9%
126,00	4,53	0,60	8,86	109,9%	20,43	11,27	177,3	22,9	95,0%	78,3%	74,4%
127,00	4,48	0,56	8,96	108,7%	20,42	11,19	177,4	22,9	95,4%	78,4%	74,8%
128,00	4,44	0,56	8,99	108,0%	20,42	11,15	178,3	22,9	95,5%	78,4%	74,8%
129,00	4,39	0,54	9,07	106,6%	20,42	11,07	179,1	22,9	95,6%	78,4%	75,0%
130,00	4,39	0,53	9,12	105,7%	20,42	11,03	179,1	22,8	95,7%	78,5%	75,1%
131,00	4,35	0,53	9,11	106,1%	20,42	11,05	179,3	22,8	95,7%	78,4%	75,1%
132,00	4,30	0,53	9,20	104,1%	20,41	10,94	179,6	22,9	95,8%	78,5%	75,2%
133,00	4,25	0,53	9,25	103,1%	20,41	10,89	179,9	22,8	95,8%	78,5%	75,3%
134,00	4,21	0,52	9,30	102,3%	20,41	10,85	180,3	22,8	95,9%	78,6%	75,3%
135,00	4,21	0,51	9,38	100,8%	20,40	10,77	180,5	22,9	96,0%	78,7%	75,5%
136,00	4,16	0,51	9,42	100,0%	20,40	10,73	181,3	22,9	96,0%	78,6%	75,5%
137,00	4,12	0,51	9,54	97,6%	20,39	10,60	182,6	22,9	96,1%	78,7%	75,6%
138,00	4,07	0,52	9,68	94,7%	20,39	10,45	183,4	22,9	96,1%	78,7%	75,6%
139,00	4,03	0,50	9,81	92,6%	20,38	10,32	185,0	22,9	96,2%	78,8%	75,8%
140,00	4,03	0,46	9,98	90,1%	20,37	10,16	185,6	22,9	96,6%	78,9%	76,2%
141,00	3,98	0,54	9,95	89,4%	20,37	10,15	186,2	22,8	96,0%	78,8%	75,7%
142,00	3,94	0,56	10,00	88,2%	20,37	10,09	187,3	22,9	95,9%	78,8%	75,5%
143,00	3,89	0,55	10,15	85,6%	20,36	9,94	188,6	22,9	96,0%	78,8%	75,6%
144,00	3,85	0,53	10,32	82,9%	20,35	9,76	190,6	22,8	96,2%	78,9%	75,8%
145,00	3,80	0,48	10,61	79,1%	20,34	9,49	192,7	23,0	96,6%	79,0%	76,3%
146,00	3,76	0,49	10,84	75,3%	20,33	9,24	193,4	22,9	96,6%	79,2%	76,5%
147,00	3,71	0,45	10,26	85,5%	20,36	9,87	191,3	23,0	96,8%	78,8%	76,2%
148,00	3,71	0,48	9,67	95,8%	20,39	10,49	188,6	23,0	96,4%	78,4%	75,5%
149,00	3,66	0,44	8,99	110,6%	20,43	11,22	185,6	22,9	96,4%	77,8%	75,0%
150,00	3,62	0,40	8,78	116,3%	20,44	11,46	182,7	22,9	96,7%	77,8%	75,3%
151,00	3,62	0,38	8,55	122,4%	20,46	11,72	180,0	22,9	96,8%	77,8%	75,3%
152,00	3,57	0,39	8,37	126,7%	20,46	11,90	178,0	23,0	96,7%	77,7%	75,1%
153,00	3,57	0,40	8,14	132,7%	20,48	12,14	176,2	22,8	96,5%	77,5%	74,8%
154,00	3,53	0,39	8,02	136,1%	20,48	12,27	174,1	22,8	96,6%	77,5%	74,9%
155,00	3,53	0,39	7,78	143,2%	20,50	12,53	171,5	22,8	96,5%	77,4%	74,7%
156,00	3,48	0,38	7,29	158,8%	20,52	13,04	168,5	22,9	96,3%	77,0%	74,1%
157,00	3,48	0,40	6,96	169,6%	20,54	13,37	164,7	23,0	95,9%	76,8%	73,6%
158,00	3,44	0,52	6,57	180,2%	20,56	13,73	160,9	22,9	94,5%	76,4%	72,1%
159,00	3,44	1,08	5,41	206,1%	20,59	14,64	155,5	22,9	86,9%	74,2%	64,5%
160,00	3,39	1,09	5,52	200,5%	20,58	14,51	153,5	22,9	87,1%	74,7%	65,1%
161,00	3,39	0,96	5,55	205,2%	20,59	14,56	150,2	22,9	88,5%	75,2%	66,6%
162,00	3,39	1,05	5,46	205,3%	20,59	14,61	147,0	23,0	87,3%	75,3%	65,8%
163,00	3,35	1,10	5,42	204,3%	20,59	14,61	145,2	22,9	86,7%	75,4%	65,4%
164,00	3,35	1,09	5,47	202,8%	20,58	14,57	143,5	22,9	87,0%	75,8%	65,9%
165,00	3,33	1,09	5,49	201,8%	20,58	14,55	142,7	23,0	87,0%	75,9%	66,0%
166,00	3,30	1,10	5,52	199,8%	20,58	14,51	141,6	23,0	86,9%	76,1%	66,2%
167,00	3,30	1,04	5,64	197,5%	20,58	14,42	140,6	23,0	87,8%	76,5%	67,2%
168,00	3,27	0,96	5,77	195,0%	20,57	14,33	140,3	22,9	88,8%	76,8%	68,2%
169,00	3,26	1,01	5,69	196,7%	20,58	14,39	140,0	22,8	88,2%	76,6%	67,6%
170,00	3,26	0,96	5,87	191,0%	20,57	14,22	141,1	22,9	89,0%	76,9%	68,5%
171,00	3,21	0,88	5,98	189,2%	20,57	14,14	141,4	22,9	89,9%	77,2%	69,4%
172,00	3,21	0,76	6,23	184,3%	20,56	13,95	143,1	23,1	91,5%	77,5%	70,9%
173,00	3,21	0,70	6,29	184,2%	20,56	13,92	143,5	22,9	92,3%	77,6%	71,6%
174,00	3,16	0,71	6,31	183,0%	20,56	13,90	143,9	22,8	92,1%	77,5%	71,5%
175,00	3,16	0,70	6,35	181,8%	20,56	13,86	143,7	22,9	92,3%	77,6%	71,7%
176,00	3,15	0,79	6,18	185,1%	20,56	13,99	143,3	23,0	91,2%	77,4%	70,5%
177,00	3,12	0,78	6,25	182,6%	20,56	13,92	143,3	22,9	91,4%	77,5%	70,8%
178,00	3,12	0,71	6,45	177,2%	20,55	13,74	143,8	22,7	92,3%	77,8%	71,8%
179,00	3,07	0,73	6,38	179,5%	20,55	13,81	143,3	22,8	92,0%	77,7%	71,5%
180,00	3,07	0,72	6,40	179,0%	20,55	13,80	143,5	22,8	92,2%	77,7%	71,6%
181,00	3,05	0,71	6,41	178,6%	20,55	13,78	143,3	22,9	92,2%	77,8%	71,8%
182,00	3,03	0,72	6,44	177,6%	20,55	13,76	143,7	22,8	92,2%	77,8%	71,8%
183,00	3,03	0,69	6,52	175,6%	20,55	13,68	143,9	22,8	92,6%	77,9%	72,2%
184,00	2,98	0,67	6,60	173,3%	20,55	13,61	144,0	22,9	92,9%	78,1%	72,5%
185,00	2,98	0,65	6,69	170,7%	20,54	13,53	145,1	22,8	93,1%	78,1%	72,7%
186,00	2,94	0,64	6,78	167,7%	20,54	13,44	146,0	22,7	93,4%	78,1%	73,0%
187,00	2,94	0,59	6,95	163,4%	20,53	13,29	147,1	22,8	94,0%	78,3%	73,6%
188,00	2,94	0,56	7,05	161,2%	20,53	13,20	147,8	22,9	94,4%	78,4%	74,0%
189,00	2,89	0,52	7,12	160,0%	20,53	13,15	148,5	22,8	94,8%	78,5%	74,4%
190,00	2,89	0,52	6,98	164,9%	20,53	13,29	148,0	22,8	94,7%	78,3%	74,2%
191,00	2,85	0,57	6,82	168,8%	20,54	13,44	147,9	22,8	94,0%	78,0%	73,4%
192,00	2,85	0,61	6,62	174,9%	20,55	13,63	147,7	22,8	93,5%	77,7%	72,7%
193,00	2,80	0,69	6,26	185,9%	20,56	13,96	146,4	22,8	92,3%	77,2%	71,3%
194,00	2,80	0,56	6,52	180,5%	20,56	13,76	145,3	22,8	94,0%	77,8%	73,1%
195,00	2,80	0,62	6,47	180,3%	20,56	13,78	144,6	22,8	93,3%	77,8%	72,6%
196,00	2,76	0,61	6,42	182,7%	20,56	13,84	144,1	22,8	93,4%	77,8%	72,6%
197,00	2,76	0,60	6,37	184,8%	20,56	13,89	143,0	22,7	93,4%	77,8%	72,6%
198,00	2,76	0,62	6,27	188,0%	20,57	13,98	141,9	22,7	93,1%	77,7%	72,3%
199,00	2,71	0,61	6,28	188,3%	20,57	13,98	141,4	22,6	93,3%	77,8%	72,5%
200,00	2,71	0,60	6,27	188,9%	20,57	13,99	137,4	22,6	93,3%	78,2%	72,9%
201,00	2,67	1,25	5,11	212,2%	20,60	14,86	131,1	22,6	84,6%	76,3%	64,5%
202,00	2,67	1,34	5,00	213,1%	20,60	14,92	127,4	22,7	83,3%	76,4%	63,7%
203,00	2,67	1,36	5,03	210,5%	20,59	14,88	124,6	22,6	83,2%	76,8%	63,9%
204,00	2,62	1,37	5,02	211,1%	20,59	14,89	122,7	22,6	83,1%	77,0%	64,0%
205,00	2,62	1,37	5,00	211,9%	20,59	14,91	121,3	22,6	83,1%	77,2%	64,1%
206,00	2,62	1,37	4,97	213,5%	20,60	14,95	120,1	22,6	83,0%	77,2%	64,1%

207,00	2,57	1,36	4,93	215,5%	20,60	14,98	118,9	22,6	83,0%	77,3%	64,2%
208,00	2,58	1,36	4,95	214,5%	20,60	14,96	118,0	22,6	83,0%	77,4%	64,3%
209,00	2,57	1,36	4,95	214,9%	20,60	14,97	116,9	22,7	83,1%	77,6%	64,5%
210,00	2,53	1,33	4,92	218,1%	20,60	15,02	116,2	22,8	83,3%	77,6%	64,7%
211,00	2,53	1,32	4,93	217,8%	20,60	15,01	115,2	22,7	83,5%	77,8%	64,9%
212,00	2,53	1,29	4,90	221,2%	20,60	15,06	114,2	22,6	83,7%	77,8%	65,1%
213,00	2,53	1,25	4,87	224,8%	20,61	15,12	113,3	22,6	84,0%	77,9%	65,4%
214,00	2,53	1,12	4,61	247,0%	20,63	15,47	112,5	22,7	84,7%	77,5%	65,6%
215,00	2,48	1,18	4,83	230,7%	20,61	15,20	111,8	22,6	84,6%	78,0%	66,0%
216,00	2,48	1,15	4,81	233,1%	20,62	15,23	111,2	22,6	84,9%	78,1%	66,3%
217,00	2,48	1,13	4,81	234,9%	20,62	15,25	110,8	22,7	85,2%	78,1%	66,5%
218,00	2,48	1,11	4,83	234,3%	20,62	15,23	110,1	22,7	85,4%	78,3%	66,8%
219,00	2,48	1,11	4,82	235,5%	20,62	15,25	109,5	22,8	85,4%	78,4%	66,9%
220,00	2,44	1,10	4,82	235,6%	20,62	15,25	108,7	22,7	85,5%	78,5%	67,1%
221,00	2,44	1,09	4,81	237,0%	20,62	15,27	108,5	22,7	85,6%	78,5%	67,2%
222,00	2,44	1,09	4,84	235,3%	20,62	15,24	107,7	22,6	85,6%	78,6%	67,3%
223,00	2,44	1,05	4,85	236,6%	20,62	15,24	107,1	22,6	86,1%	78,7%	67,8%
224,00	2,39	1,04	4,86	237,0%	20,62	15,25	106,8	22,6	86,2%	78,8%	67,9%
225,00	2,39	1,03	4,84	238,0%	20,62	15,26	106,1	22,6	86,3%	78,9%	68,0%
226,00	2,39	1,02	4,85	238,3%	20,62	15,26	105,9	22,7	86,4%	78,9%	68,2%
227,00	2,39	1,02	4,84	239,4%	20,62	15,28	105,4	22,7	86,4%	78,9%	68,2%
228,00	2,39	1,01	4,81	241,3%	20,62	15,31	105,2	22,8	86,5%	78,9%	68,2%
229,00	2,39	1,02	4,84	239,2%	20,62	15,27	105,0	22,7	86,5%	79,0%	68,3%
230,00	2,35	1,02	4,87	237,5%	20,62	15,24	104,4	22,7	86,5%	79,1%	68,4%
231,00	2,35	1,01	4,84	239,3%	20,62	15,28	104,3	22,7	86,5%	79,1%	68,4%
232,00	2,35	1,02	4,84	238,9%	20,62	15,27	103,9	22,6	86,4%	79,1%	68,4%
233,00	2,35	1,02	4,83	239,8%	20,62	15,29	103,6	22,7	86,4%	79,2%	68,4%
234,00	2,35	1,02	4,84	239,2%	20,62	15,28	103,3	22,6	86,5%	79,2%	68,5%
235,00	2,35	1,03	4,86	237,1%	20,62	15,24	102,8	22,7	86,4%	79,3%	68,5%
236,00	2,30	1,03	4,88	236,6%	20,62	15,23	102,6	22,7	86,4%	79,4%	68,6%
237,00	2,30	1,02	4,87	237,1%	20,62	15,24	102,3	22,8	86,4%	79,4%	68,6%
238,00	2,30	1,02	4,87	237,0%	20,62	15,24	101,8	22,8	86,5%	79,5%	68,7%
239,00	2,30	1,01	4,86	238,0%	20,62	15,25	101,5	22,6	86,5%	79,5%	68,8%
240,00	2,29	1,01	4,91	235,4%	20,62	15,20	101,7	22,8	86,7%	79,6%	69,0%
241,00	2,27	1,00	4,93	235,1%	20,62	15,19	101,4	22,7	86,8%	79,6%	69,2%
242,00	2,30	1,00	4,86	238,9%	20,62	15,26	100,8	22,6	86,7%	79,6%	69,0%
243,00	2,26	1,02	4,74	244,5%	20,63	15,37	100,4	22,6	86,2%	79,4%	68,4%
244,00	2,26	1,03	4,76	242,7%	20,63	15,35	100,0	22,7	86,1%	79,5%	68,4%
245,00	2,26	1,03	4,76	243,5%	20,63	15,36	99,9	22,6	86,2%	79,5%	68,5%
246,00	2,26	1,02	4,74	244,8%	20,63	15,38	99,5	22,6	86,2%	79,5%	68,6%
247,00	2,25	1,01	4,76	244,1%	20,63	15,36	99,2	22,6	86,3%	79,6%	68,7%
248,00	2,24	1,01	4,77	244,1%	20,63	15,36	98,9	22,6	86,4%	79,6%	68,8%
249,00	2,21	0,99	4,75	245,6%	20,63	15,38	98,3	22,6	86,5%	79,7%	68,9%
250,00	2,21	0,99	4,78	244,4%	20,63	15,35	98,3	22,6	86,7%	79,7%	69,1%
251,00	2,21	0,98	4,80	243,9%	20,63	15,34	97,8	22,6	86,8%	79,8%	69,3%
252,00	2,21	0,97	4,76	246,6%	20,63	15,38	97,7	22,6	86,9%	79,8%	69,3%
253,00	2,21	0,97	4,78	245,5%	20,63	15,36	97,5	22,6	86,9%	79,9%	69,4%
254,00	2,18	0,96	4,77	246,6%	20,63	15,38	97,4	22,6	87,0%	79,9%	69,5%
255,00	2,21	0,96	4,80	245,1%	20,63	15,35	97,1	22,6	87,1%	80,0%	69,6%
256,00	2,17	0,96	4,81	244,6%	20,63	15,34	97,1	22,6	87,1%	80,0%	69,6%
257,00	2,17	0,97	4,69	251,1%	20,63	15,46	96,7	22,6	86,7%	79,8%	69,1%
258,00	2,17	1,00	4,68	249,7%	20,63	15,45	96,5	22,6	86,3%	79,8%	68,8%
259,00	2,17	1,01	4,69	248,2%	20,63	15,43	96,2	22,6	86,2%	79,8%	68,8%
260,00	2,17	1,02	4,69	247,7%	20,63	15,43	96,1	22,6	86,1%	79,8%	68,7%
261,00	2,17	1,02	4,69	247,7%	20,63	15,43	96,2	22,6	86,0%	79,8%	68,7%
262,00	2,12	1,03	4,71	246,3%	20,63	15,41	95,9	22,6	86,0%	79,9%	68,7%
263,00	2,16	1,02	4,70	247,2%	20,63	15,42	95,7	22,7	86,1%	79,9%	68,8%
264,00	2,12	1,03	4,71	246,1%	20,63	15,40	95,7	22,7	86,1%	79,9%	68,8%
265,00	2,12	1,02	4,69	248,0%	20,63	15,43	95,4	22,6	86,1%	79,9%	68,8%
266,00	2,12	1,02	4,68	248,4%	20,63	15,44	95,3	22,6	86,1%	79,9%	68,8%
267,00	2,12	1,02	4,70	247,5%	20,63	15,42	95,3	22,6	86,1%	80,0%	68,8%
268,00	2,08	1,02	4,69	248,1%	20,63	15,43	95,0	22,6	86,1%	80,0%	68,9%
269,00	2,08	1,02	4,70	247,5%	20,63	15,42	95,2	22,6	86,1%	80,0%	68,8%
270,00	2,08	1,02	4,69	247,9%	20,63	15,43	95,1	22,6	86,1%	80,0%	68,8%
271,00	2,08	1,02	4,66	249,6%	20,63	15,46	94,9	22,6	86,1%	79,9%	68,8%
272,00	2,08	1,01	4,68	248,9%	20,63	15,44	94,7	22,6	86,1%	80,0%	68,9%
273,00	2,08	1,02	4,69	248,0%	20,63	15,43	94,2	22,6	86,1%	80,1%	69,0%
274,00	2,08	1,02	4,70	247,7%	20,63	15,43	94,2	22,6	86,1%	80,1%	69,0%
275,00	2,07	1,01	4,68	248,9%	20,63	15,44	94,0	22,6	86,2%	80,1%	69,0%
276,00	2,03	1,02	4,71	246,6%	20,63	15,41	93,8	22,6	86,2%	80,2%	69,1%
277,00	2,03	1,01	4,71	247,2%	20,63	15,42	94,0	22,6	86,2%	80,1%	69,1%
278,00	2,03	1,01	4,71	247,7%	20,63	15,42	93,9	22,6	86,3%	80,1%	69,1%
279,00	2,03	1,00	4,70	248,4%	20,63	15,43	93,6	22,6	86,3%	80,2%	69,2%
280,00	1,98	1,00	4,70	248,2%	20,63	15,43	93,3	22,6	86,3%	80,2%	69,3%
281,00	2,03	1,00	4,71	248,3%	20,63	15,43	93,5	22,6	86,4%	80,2%	69,3%
282,00	1,98	1,00	4,70	248,4%	20,63	15,43	93,1	22,6	86,4%	80,3%	69,3%
283,00	1,98	0,99	4,71	248,1%	20,63	15,42	93,2	22,6	86,4%	80,3%	69,4%
284,00	1,98	1,00	4,72	247,4%	20,63	15,41	93,4	22,6	86,4%	80,3%	69,4%
285,00	1,98	1,00	4,72	247,2%	20,63	15,41	93,0	22,6	86,4%	80,3%	69,4%
286,00	1,98	0,98	4,74	247,2%	20,63	15,40	93,1	22,5	86,6%	80,3%	69,6%
287,00	1,98	0,98	4,78	244,8%	20,63	15,36	93,0	22,6	86,7%	80,4%	69,7%
288,00	1,94	0,99	4,78	244,6%	20,63	15,36	92,8	22,6	86,7%	80,4%	69,7%
289,00	1,94	0,99	4,80	242,8%	20,63	15,33	92,7	22,6	86,7%	80,5%	69,8%
290,00	1,94	0,99	4,80	242,9%	20,63	15,33	92,8	22,6	86,6%	80,5%	69,7%
291,00	1,94	0,99	4,82	241,8%	20,62	15,31	92,8	22,6	86,7%	80,5%	69,8%
292,00	1,94	0,99	4,80	242,7%	20,63	15,33	92,7	22,7	86,6%	80,5%	69,7%
293,00	1,94	1,00	4,82	241,3%	20,62	15,30	92,7	22,6	86,6%	80,5%	69,8%
294,00	1,94	1,00	4,83	240,8%	20,62	15,30	92,7	22,6	86,6%	80,5%	69,8%
295,00	1,93	1,01	4,86	238,5%	20,62	15,26	92,7	22,6	86,6%	80,6%	69,8%
296,00	1,89	1,01	4,88	237,1%	20,62	15,24	92,5	22,6	86,6%	80,6%	69,8%
297,00	1,89	1,02	4,92	234,0%	20,62	15,18	92,8	22,6	86,6%	80,7%	69,8%
298,00	1,89	1,06	4,94	230,8%	20,61	15,14	93,3	22,6	86,2%	80,6%	69,5%
299,00	1,89	1,09	4,97	228,1%	20,61	15,10	93,2	22,6	86,0%	80,7%	69,3%
300,00	1,89	1,09	4,96	228,0%	20,61	15,10	93,3	22,6	85,9%	80,6%	69,3%
301,00	1,89	1,09	4,98	226,9%	20,61	15,08	93,4	22,6	85,9%	80,7%	69,3%
302,00	1,85	1,09	4,99	226,7%	20,61	15,08	93,6	22,6	85,9%	80,6%	69,3%
303,00	1,85	1,10	4,97	227,6%	20,61	15,10	93,7	22,6	85,9%	80,6%	69,2%
304,00	1,85	1,10	4,97	227,6%	20,61	15,10	93,9	22,6	85,9%	80,6%	69,2%
305,00	1,85	1,08	4,95	229,2%	20,61	15,12	93,9	22,6	86,0%	80,6%	69,2%
306,00	1,85	1,09	4,98	227,2%	20,61	15,08	93,9	22,6	86,0%	80,6%	69,3%
307,00	1,80	1,09	4,99	226,5%	20,61	15,07	93,9	22,6	86,0%	80,6%	69,3%
308,00	1,80	1,09	5,02	224,7%	20,61	15,04	94,0	22,6	86,0%	80,7%	69,4%
309,00	1,80	1,08	5,06	223,4%	20,61	15,01	93,9	22,6	86,2%	80,7%	69,6%
310,00	1,80	1,08	5,02	225,2%	20,61	15,04	93,7	22,6	86,1%	80,7%	69,5%
311,00	1,80	1,10	5,03	224,1%	20,61	15,03	94,1	22,6	85,9%	80,6%	69,3%
312,00	1,80	1,13	5,01	223,5%	20,61	15,03	94,1	22,6	85,6%	80,6%	69,0%
313,00	1,78	1,14	5,01	222,8%	20,61	15,02	94,0	22,6	85,4%	80,6%	68,9%
314,00	1,76	1,15	5,04	220,8%	20,60	14,99	94,1	22,6	85,5%	80,6%	68,9%
315,00	1,79	1,16	5,06	219,5%	20,60	14,96	94,2	22,6	85,4%	80,7%	68,9%
316,00	1,76	1,16	5,06	219,3%	20,60	14,96	94,3	22,6	85,4%	80,6%	68,8%
317,00	1,76	1,17	5,11	216,2%	20,60	14,90	94,5	22,6	85,4%	80,7%	68,9%
318,00	1,74	1,17	5,11	216,0%	20,60	14,90	94,7	22,6	85,3%	80,7%	68,9%
319,00	1,72	1,17	5,13	215,4%	20,60	14,88	94,6	22,6	85,4%	80,7%	68,9%
320,00	1,72	1,16	5,11	216,9%	20,60	14,91	94,7	22,6	85,5%	80,7%	69,0%

321,00	1,71	1,15	5,11	217,4%	20,60	14,92	94,6	22,6	85,6%	80,7%	69,1%
322,00	1,71	1,15	5,11	217,4%	20,60	14,92	94,6	22,6	85,6%	80,7%	69,1%
323,00	1,71	1,15	5,13	216,6%	20,60	14,90	94,9	22,6	85,7%	80,7%	69,1%
324,00	1,71	1,15	5,11	217,4%	20,60	14,92	94,8	22,6	85,6%	80,7%	69,1%
325,00	1,67	1,15	5,09	217,9%	20,60	14,93	94,8	22,6	85,5%	80,6%	69,0%
326,00	1,67	1,15	5,08	219,0%	20,60	14,95	95,0	22,6	85,5%	80,6%	68,9%
327,00	1,67	1,14	5,09	218,8%	20,60	14,94	95,1	22,6	85,7%	80,6%	69,1%
328,00	1,67	1,13	5,09	219,2%	20,60	14,95	95,1	22,6	85,8%	80,6%	69,2%
329,00	1,67	1,14	5,11	218,0%	20,60	14,92	95,3	22,6	85,7%	80,6%	69,1%
330,00	1,67	1,12	5,11	218,7%	20,60	14,93	95,3	22,6	85,9%	80,6%	69,2%
331,00	1,62	1,13	5,11	218,1%	20,60	14,92	95,4	22,6	85,8%	80,6%	69,1%
332,00	1,63	1,13	5,13	217,3%	20,60	14,91	95,4	22,6	85,8%	80,6%	69,2%
333,00	1,62	1,14	5,11	217,9%	20,60	14,92	95,5	22,7	85,7%	80,6%	69,1%
334,00	1,62	1,15	5,11	217,1%	20,60	14,91	95,4	22,6	85,6%	80,6%	69,0%
335,00	1,62	1,15	5,09	218,3%	20,60	14,93	95,4	22,6	85,6%	80,6%	69,0%
336,00	1,62	1,15	5,11	217,4%	20,60	14,92	95,4	22,6	85,6%	80,6%	69,0%
337,00	1,58	1,16	5,14	215,2%	20,60	14,88	95,2	22,7	85,6%	80,7%	69,1%
338,00	1,58	1,16	5,14	215,1%	20,60	14,87	95,2	22,6	85,6%	80,7%	69,0%
339,00	1,58	1,16	5,14	215,2%	20,60	14,88	95,4	22,6	85,6%	80,7%	69,0%
340,00	1,58	1,16	5,13	216,0%	20,60	14,89	95,4	22,6	85,6%	80,6%	69,0%
341,00	1,58	1,16	5,13	216,1%	20,60	14,89	95,7	22,7	85,6%	80,6%	69,0%
342,00	1,57	1,16	5,13	215,9%	20,60	14,89	95,7	22,6	85,5%	80,6%	68,9%
343,00	1,53	1,16	5,13	215,7%	20,60	14,89	95,9	22,6	85,5%	80,6%	68,9%
344,00	1,53	1,16	5,13	215,7%	20,60	14,89	96,2	22,6	85,5%	80,5%	68,8%
345,00	1,53	1,16	5,13	216,1%	20,60	14,89	96,3	22,6	85,6%	80,5%	68,9%
346,00	1,53	1,16	5,13	216,1%	20,60	14,89	96,3	22,6	85,6%	80,5%	68,9%
347,00	1,53	1,16	5,13	216,1%	20,60	14,89	96,3	22,7	85,6%	80,5%	68,9%
348,00	1,53	1,16	5,13	216,1%	20,60	14,89	96,3	22,7	85,6%	80,5%	68,9%
349,00	1,49	1,16	5,13	215,9%	20,60	14,89	96,3	22,7	85,5%	80,5%	68,9%
350,00	1,49	1,16	5,01	221,7%	20,61	15,01	96,3	22,7	85,2%	80,3%	68,5%
351,00	1,49	1,21	4,96	221,9%	20,61	15,04	96,3	22,7	84,7%	80,2%	67,9%
352,00	1,49	1,20	4,93	224,1%	20,61	15,08	96,4	22,7	84,6%	80,1%	67,8%
353,00	1,49	1,21	4,95	222,8%	20,61	15,06	96,2	22,6	84,6%	80,2%	67,9%
354,00	1,46	1,20	4,95	223,2%	20,61	15,06	96,3	22,7	84,7%	80,2%	67,9%
355,00	1,44	1,19	4,95	223,5%	20,61	15,06	96,2	22,7	84,8%	80,2%	68,0%
356,00	1,44	1,19	4,96	222,7%	20,61	15,05	96,1	22,6	84,8%	80,2%	68,0%
357,00	1,44	1,18	4,95	224,1%	20,61	15,07	96,3	22,7	84,9%	80,2%	68,1%
358,00	1,44	1,18	4,95	224,3%	20,61	15,07	96,4	22,6	84,9%	80,2%	68,1%
359,00	1,44	1,18	4,96	223,6%	20,61	15,06	96,4	22,7	85,0%	80,2%	68,2%
360,00	1,41	1,19	5,01	220,4%	20,60	15,00	96,2	22,7	85,0%	80,3%	68,3%
361,00	1,40	1,18	5,01	220,8%	20,60	15,00	96,4	22,6	85,1%	80,3%	68,3%
362,00	1,39	1,18	5,01	221,0%	20,60	15,00	96,5	22,6	85,1%	80,3%	68,3%
363,00	1,39	1,21	5,08	215,6%	20,60	14,91	96,5	22,7	84,9%	80,4%	68,2%
364,00	1,39	1,27	5,12	210,9%	20,59	14,84	96,6	22,6	84,3%	80,4%	67,8%
365,00	1,39	1,28	5,15	209,1%	20,59	14,80	96,7	22,6	84,4%	80,4%	67,9%
366,00	1,39	1,26	5,17	209,0%	20,59	14,79	97,0	22,7	84,5%	80,5%	68,0%
367,00	1,35	1,25	5,16	209,7%	20,59	14,80	96,9	22,7	84,7%	80,5%	68,1%
368,00	1,35	1,24	5,20	208,6%	20,59	14,77	97,3	22,7	84,9%	80,5%	68,3%
369,00	1,35	1,22	5,20	209,4%	20,59	14,78	97,1	22,6	85,0%	80,5%	68,4%
370,00	1,35	1,21	5,21	209,1%	20,59	14,77	97,3	22,7	85,2%	80,5%	68,6%
371,00	1,35	1,20	5,21	209,6%	20,59	14,78	97,2	22,7	85,3%	80,5%	68,7%
372,00	1,34	1,19	5,21	210,0%	20,59	14,78	97,3	22,7	85,4%	80,5%	68,7%
373,00	1,30	1,18	5,21	210,5%	20,59	14,79	97,3	22,7	85,5%	80,5%	68,8%
374,00	1,30	1,17	5,20	211,8%	20,59	14,81	97,0	22,7	85,5%	80,5%	68,9%
375,00	1,30	1,18	5,16	213,3%	20,60	14,85	97,4	22,7	85,4%	80,4%	68,7%
376,00	1,30	1,17	5,20	211,8%	20,59	14,81	97,7	22,7	85,5%	80,5%	68,8%
377,00	1,30	1,16	5,18	213,4%	20,60	14,84	97,7	22,7	85,6%	80,4%	68,9%
378,00	1,26	1,15	5,18	213,9%	20,60	14,84	97,7	22,6	85,7%	80,4%	69,0%
379,00	1,26	1,15	5,18	213,9%	20,60	14,84	97,7	22,7	85,7%	80,4%	69,0%
380,00	1,27	1,15	5,18	214,1%	20,60	14,85	97,6	22,7	85,8%	80,5%	69,0%
381,00	1,26	1,14	5,21	212,6%	20,60	14,81	97,9	22,7	85,9%	80,5%	69,1%
382,00	1,26	1,15	5,21	212,5%	20,60	14,81	97,7	22,7	85,8%	80,5%	69,1%
383,00	1,26	1,14	5,21	212,6%	20,60	14,81	98,0	22,7	85,9%	80,5%	69,1%
384,00	1,21	1,14	5,21	212,8%	20,60	14,82	97,9	22,7	85,9%	80,5%	69,1%
385,00	1,21	1,12	5,23	213,0%	20,60	14,81	98,0	22,8	86,2%	80,5%	69,4%
386,00	1,21	1,10	5,23	214,2%	20,60	14,82	98,0	22,7	86,4%	80,5%	69,6%
387,00	1,21	1,08	5,24	214,0%	20,60	14,81	97,9	22,7	86,6%	80,6%	69,7%
388,00	1,21	1,08	5,24	214,4%	20,60	14,82	98,1	22,7	86,6%	80,5%	69,8%
389,00	1,21	1,07	5,24	214,6%	20,60	14,82	97,9	22,7	86,7%	80,6%	69,8%
390,00	1,21	1,07	5,26	213,9%	20,60	14,80	98,1	22,7	86,7%	80,6%	69,9%
391,00	1,17	1,06	5,23	215,7%	20,60	14,84	98,0	22,7	86,8%	80,5%	69,9%
392,00	1,18	1,06	5,24	215,3%	20,60	14,83	98,1	22,7	86,8%	80,6%	69,9%
393,00	1,17	1,09	5,27	212,2%	20,60	14,78	98,2	22,7	86,6%	80,6%	69,8%
394,00	1,17	1,05	5,29	213,1%	20,60	14,78	98,3	22,7	87,0%	80,6%	70,1%
395,00	1,17	1,02	5,29	214,9%	20,60	14,80	98,4	22,7	87,3%	80,6%	70,4%
396,00	1,17	1,02	5,32	213,4%	20,60	14,77	98,7	22,7	87,4%	80,6%	70,5%
397,00	1,16	1,01	5,32	213,9%	20,60	14,77	98,7	22,7	87,5%	80,6%	70,6%
398,00	1,12	1,02	5,32	213,2%	20,60	14,76	98,7	22,7	87,4%	80,6%	70,5%
399,00	1,12	1,02	5,32	213,4%	20,60	14,77	98,8	22,7	87,4%	80,6%	70,5%
400,00	1,12	1,01	5,30	214,4%	20,60	14,79	98,9	22,7	87,4%	80,6%	70,5%
401,00	1,12	1,02	5,29	215,1%	20,60	14,80	99,0	22,7	87,4%	80,5%	70,4%
402,00	1,12	1,01	5,27	216,4%	20,60	14,82	99,1	22,7	87,5%	80,5%	70,4%
403,00	1,08	1,00	5,27	216,5%	20,60	14,83	99,0	22,7	87,5%	80,5%	70,4%
404,00	1,08	1,00	5,25	217,7%	20,60	14,85	99,2	22,7	87,5%	80,5%	70,4%
405,00	1,08	1,00	5,25	217,7%	20,60	14,85	98,8	22,7	87,5%	80,5%	70,5%
406,00	1,08	1,00	5,24	218,6%	20,60	14,87	98,9	22,7	87,5%	80,5%	70,4%
407,00	1,04	1,00	5,20	220,3%	20,60	14,90	98,8	22,7	87,4%	80,5%	70,3%
408,00	1,08	0,99	5,21	220,4%	20,60	14,90	98,5	22,7	87,5%	80,5%	70,4%
409,00	1,07	0,99	5,19	221,5%	20,60	14,92	98,7	22,7	87,5%	80,4%	70,4%
410,00	1,03	0,99	5,21	220,4%	20,60	14,90	98,6	22,7	87,5%	80,5%	70,4%
411,00	1,03	0,99	5,22	219,6%	20,60	14,88	98,6	22,8	87,5%	80,5%	70,4%
412,00	1,03	1,00	4,88	238,0%	20,62	15,25	98,1	22,7	86,7%	80,0%	69,3%
413,00	1,03	1,01	4,79	242,3%	20,63	15,33	98,0	22,7	86,4%	79,8%	69,0%
414,00	1,03	1,00	4,81	241,7%	20,62	15,31	97,8	22,7	86,5%	79,9%	69,1%
415,00	1,03	0,99	4,78	244,2%	20,63	15,35	97,6	22,7	86,6%	79,8%	69,1%
416,00	0,99	1,00	4,81	242,1%	20,63	15,32	97,5	22,7	86,6%	79,9%	69,2%
417,00	0,99	0,99	4,79	243,4%	20,63	15,34	97,4	22,7	86,7%	79,9%	69,2%
418,00	0,99	1,01	4,78	243,4%	20,63	15,35	97,3	22,7	86,4%	79,9%	69,0%
419,00	0,99	1,02	4,79	241,9%	20,62	15,32	97,3	22,7	86,3%	79,9%	69,0%
420,00	0,95	1,02	4,78	242,6%	20,63	15,34	96,9	22,7	86,3%	79,9%	68,9%
421,00	0,99	1,01	4,76	244,4%	20,63	15,36	97,0	22,7	86,4%	79,9%	69,0%
422,00	0,96	1,00	4,73	247,0%	20,63	15,40	96,8	22,6	86,4%	79,8%	69,0%
423,00	0,94	0,99	4,71	248,4%	20,63	15,42	96,7	22,7	86,5%	79,8%	69,0%
424,00	0,94	0,99	4,71	248,6%	20,63	15,43	96,5	22,7	86,5%	79,8%	69,1%
425,00	0,94	0,99	4,69	249,6%	20,63	15,44	96,5	22,6	86,5%	79,8%	69,0%
426,00	0,94	0,98	4,68	251,0%	20,63	15,47	96,5	22,7	86,5%	79,8%	69,0%
427,00	0,94	0,98	4,68	251,3%	20,63	15,47	96,3	22,7	86,5%	79,8%	69,1%
428,00	0,94	0,98	4,69	250,5%	20,63	15,46	96,4	22,7	86,5%	79,8%	69,1%
429,00	0,90	0,97	4,68	251,5%	20,63	15,47	96,1	22,6	86,6%	79,8%	69,1%
430,00	0,90	0,97	4,68	251,7%	20,63	15,47	95,8	22,7	86,6%	79,9%	69,2%
431,00	0,90	0,97	4,68	251,7%	20,63	15,47	95,6	22,6	86,6%	79,9%	69,2%
432,00	0,90	0,97	4,68	251,7%	20,63	15,47	95,7	22,7	86,6%	79,9%	69,2%
433,00	0,90	0,97	4,68	251,9%	20,63	15,47	95,5	22,7	86,7%	79,9%	69,3%
434,00	0,90	0,97	4,68	251,9%	20,63	15,47	95,5	22,6	86,7%	79,9%	69,3%

435,00	0,90	0,96	4,66	253,1%	20,64	15,49	95,4	22,7	86,7%	79,9%	69,3%
436,00	0,90	0,96	4,66	253,5%	20,64	15,50	95,3	22,7	86,7%	79,9%	69,3%
437,00	0,85	0,95	4,66	253,9%	20,64	15,50	95,2	22,7	86,8%	79,9%	69,4%
438,00	0,85	0,95	4,68	252,7%	20,63	15,48	95,3	22,7	86,8%	80,0%	69,4%
439,00	0,85	0,95	4,66	254,2%	20,64	15,50	95,4	22,6	86,9%	79,9%	69,4%
440,00	0,85	0,95	4,66	254,2%	20,64	15,50	95,3	22,6	86,9%	79,9%	69,4%
441,00	0,85	0,95	4,66	254,2%	20,64	15,50	95,2	22,7	86,9%	79,9%	69,4%
442,00	0,85	0,95	4,66	254,2%	20,64	15,50	94,8	22,6	86,9%	80,0%	69,5%
443,00	0,80	0,94	4,68	253,3%	20,64	15,49	94,8	22,7	86,9%	80,0%	69,6%
444,00	0,80	0,94	4,66	254,6%	20,64	15,50	95,0	22,6	86,9%	80,0%	69,5%
445,00	0,82	0,98	4,73	248,2%	20,63	15,42	95,2	22,5	86,7%	80,0%	69,4%
446,00	0,80	0,98	4,68	251,0%	20,63	15,47	95,2	22,6	86,5%	79,9%	69,2%
447,00	0,80	1,00	4,64	251,9%	20,63	15,49	95,6	22,6	86,2%	79,8%	68,8%
448,00	0,80	0,94	4,68	253,5%	20,64	15,49	95,7	22,6	87,0%	79,9%	69,5%
449,00	0,77	0,92	4,69	253,5%	20,64	15,48	95,6	22,6	87,2%	80,0%	69,7%
450,00	0,80	0,92	4,68	255,0%	20,64	15,50	95,9	22,6	87,3%	79,9%	69,7%
451,00	0,76	0,92	4,68	254,6%	20,64	15,50	95,8	22,6	87,2%	79,9%	69,7%
452,00	0,76	0,89	4,56	264,0%	20,64	15,64	95,5	22,6	87,3%	79,7%	69,6%
453,00	0,76	0,88	4,54	266,3%	20,65	15,66	95,1	22,6	87,5%	79,8%	69,8%
454,00	0,76	0,86	4,56	266,2%	20,65	15,65	95,2	22,6	87,7%	79,8%	70,0%
455,00	0,76	0,86	4,58	265,1%	20,65	15,64	95,0	22,6	87,7%	79,8%	70,1%
456,00	0,71	0,86	4,59	264,5%	20,64	15,62	94,9	22,6	87,9%	79,9%	70,2%
457,00	0,76	0,84	4,58	266,4%	20,65	15,65	95,3	22,6	88,0%	79,8%	70,2%
458,00	0,71	0,83	4,54	269,7%	20,65	15,69	95,0	22,6	88,1%	79,8%	70,3%
459,00	0,71	0,82	4,53	271,2%	20,65	15,71	95,1	22,5	88,1%	79,7%	70,3%
460,00	0,71	0,82	4,56	268,9%	20,65	15,68	95,1	22,6	88,2%	79,8%	70,4%
461,00	0,71	0,82	4,54	270,3%	20,65	15,69	95,1	22,6	88,2%	79,8%	70,4%
462,00	0,71	0,82	4,54	270,5%	20,65	15,70	94,8	22,5	88,2%	79,8%	70,4%
463,00	0,71	0,82	4,51	272,5%	20,65	15,73	94,6	22,5	88,1%	79,8%	70,3%
464,00	0,67	0,83	4,51	272,2%	20,65	15,73	94,5	22,5	88,1%	79,8%	70,3%
465,00	0,67	0,83	4,50	273,3%	20,65	15,74	94,4	22,5	88,0%	79,8%	70,2%
466,00	0,67	0,83	4,51	272,2%	20,65	15,73	94,4	22,5	88,1%	79,8%	70,3%
467,00	0,67	0,82	4,51	272,5%	20,65	15,73	94,2	22,5	88,1%	79,8%	70,3%
468,00	0,67	0,82	4,53	271,4%	20,65	15,71	94,2	22,5	88,2%	79,9%	70,4%
469,00	0,67	0,82	4,54	270,4%	20,65	15,70	94,0	22,6	88,2%	79,9%	70,5%
470,00	0,67	0,81	4,51	273,1%	20,65	15,73	94,0	22,5	88,2%	79,9%	70,5%
471,00	0,67	0,81	4,53	271,8%	20,65	15,72	94,1	22,6	88,3%	79,9%	70,5%
472,00	0,63	0,82	4,54	270,6%	20,65	15,70	94,2	22,5	88,3%	79,9%	70,5%
473,00	0,62	0,81	4,54	270,8%	20,65	15,70	93,9	22,6	88,3%	79,9%	70,6%
474,00	0,62	0,81	4,56	270,0%	20,65	15,68	93,8	22,5	88,4%	80,0%	70,7%
475,00	0,62	0,80	4,56	270,3%	20,65	15,69	93,9	22,5	88,5%	80,0%	70,7%
476,00	0,62	0,80	4,56	270,7%	20,65	15,69	93,9	22,5	88,5%	80,0%	70,8%
477,00	0,62	0,80	4,59	268,3%	20,65	15,65	93,9	22,6	88,6%	80,1%	70,9%
478,00	0,58	0,81	4,58	268,7%	20,65	15,67	93,7	22,5	88,4%	80,0%	70,7%
479,00	0,62	0,82	4,59	267,1%	20,65	15,64	94,2	22,5	88,3%	80,0%	70,7%
480,00	0,62	0,81	4,61	266,2%	20,65	15,63	94,0	22,4	88,4%	80,0%	70,8%
481,00	0,58	0,81	4,63	265,4%	20,65	15,61	94,2	22,4	88,5%	80,1%	70,9%
482,00	0,58	0,80	4,63	265,8%	20,65	15,62	94,0	22,4	88,6%	80,1%	71,0%
483,00	0,58	0,80	4,63	266,3%	20,65	15,62	94,0	22,5	88,7%	80,1%	71,0%
484,00	0,58	0,80	4,66	264,0%	20,64	15,59	94,0	22,5	88,7%	80,2%	71,1%
485,00	0,58	0,79	4,66	264,3%	20,64	15,59	94,0	22,6	88,8%	80,2%	71,2%
486,00	0,58	0,79	4,68	263,4%	20,64	15,57	94,0	22,5	88,9%	80,2%	71,3%
487,00	0,53	0,79	4,66	264,7%	20,64	15,59	94,0	22,5	88,9%	80,2%	71,3%
488,00	0,53	0,79	4,68	263,7%	20,64	15,57	93,9	22,5	88,9%	80,2%	71,3%
489,00	0,53	0,78	4,68	264,1%	20,64	15,58	94,0	22,5	89,0%	80,2%	71,4%
490,00	0,53	0,77	4,68	264,4%	20,64	15,58	93,9	22,4	89,1%	80,2%	71,4%
491,00	0,53	0,77	4,66	265,6%	20,65	15,60	93,9	22,4	89,0%	80,2%	71,4%
492,00	0,53	0,77	4,68	264,5%	20,64	15,58	94,0	22,4	89,1%	80,2%	71,4%
493,00	0,53	0,77	4,69	263,4%	20,64	15,56	93,9	22,5	89,1%	80,3%	71,5%
494,00	0,49	0,77	4,68	264,4%	20,64	15,58	93,8	22,4	89,1%	80,2%	71,5%
495,00	0,49	0,77	4,66	265,8%	20,65	15,60	94,0	22,4	89,1%	80,2%	71,4%
496,00	0,49	0,77	4,66	265,5%	20,65	15,60	93,8	22,4	89,0%	80,2%	71,4%
497,00	0,49	0,79	4,59	268,6%	20,65	15,66	93,6	22,4	88,6%	80,1%	71,0%
498,00	0,49	0,80	4,58	269,6%	20,65	15,67	93,6	22,5	88,6%	80,0%	70,9%
499,00	0,49	0,80	4,56	270,7%	20,65	15,69	93,6	22,5	88,5%	80,0%	70,8%
500,00	0,44	0,79	4,56	271,1%	20,65	15,69	93,6	22,4	88,6%	80,0%	70,9%
501,00	0,44	0,79	4,56	271,4%	20,65	15,70	93,6	22,4	88,7%	80,0%	70,9%
502,00	0,44	0,78	4,54	272,9%	20,65	15,72	93,8	22,3	88,7%	79,9%	70,9%
503,00	0,44	0,78	4,54	273,1%	20,65	15,72	93,7	22,4	88,7%	80,0%	71,0%
504,00	0,44	0,77	4,54	273,4%	20,65	15,72	93,8	22,4	88,8%	80,0%	71,0%
505,00	0,44	0,77	4,54	273,8%	20,65	15,72	93,5	22,4	88,9%	80,0%	71,1%
506,00	0,44	0,77	4,54	274,0%	20,65	15,72	93,5	22,3	88,9%	80,0%	71,1%
507,00	0,44	0,76	4,54	274,2%	20,65	15,73	93,6	22,4	88,9%	80,0%	71,2%
508,00	0,40	0,76	4,54	274,2%	20,65	15,73	93,3	22,4	89,0%	80,0%	71,2%
509,00	0,40	0,76	4,54	274,5%	20,65	15,73	93,1	22,4	89,0%	80,1%	71,3%
510,00	0,40	0,76	4,56	273,3%	20,65	15,71	93,1	22,4	89,0%	80,1%	71,3%
511,00	0,40	0,76	4,56	273,6%	20,65	15,71	93,1	22,3	89,1%	80,1%	71,4%
512,00	0,40	0,75	4,53	276,0%	20,65	15,75	92,9	22,3	89,0%	80,1%	71,3%
513,00	0,40	0,76	4,54	274,2%	20,65	15,73	92,9	22,4	88,9%	80,1%	71,2%
514,00	0,40	0,77	4,54	274,0%	20,65	15,72	92,8	22,4	88,9%	80,1%	71,2%
515,00	0,35	0,77	4,53	275,2%	20,65	15,74	92,9	22,4	88,9%	80,1%	71,2%
516,00	0,40	0,76	4,54	274,2%	20,65	15,73	93,0	22,4	89,0%	80,1%	71,2%
517,00	0,35	0,76	4,54	274,6%	20,65	15,73	92,7	22,4	89,0%	80,1%	71,3%
518,00	0,35	0,75	4,53	276,2%	20,65	15,75	92,6	22,4	89,1%	80,1%	71,3%
519,00	0,35	0,75	4,53	276,3%	20,65	15,75	92,6	22,3	89,1%	80,1%	71,4%
520,00	0,35	0,75	4,54	275,2%	20,65	15,73	92,7	22,3	89,1%	80,1%	71,4%
521,00	0,35	0,75	4,53	276,3%	20,65	15,75	92,6	22,3	89,1%	80,1%	71,3%
522,00	0,34	0,75	4,54	275,1%	20,65	15,73	92,4	22,3	89,1%	80,1%	71,4%
523,00	0,30	0,75	4,53	276,7%	20,65	15,75	92,4	22,4	89,2%	80,1%	71,4%
524,00	0,30	0,74	4,54	275,5%	20,65	15,74	92,2	22,4	89,2%	80,2%	71,5%
525,00	0,30	0,74	4,49	279,7%	20,66	15,79	92,0	22,4	89,2%	80,1%	71,5%
526,00	0,30	0,74	4,48	280,7%	20,66	15,81	92,0	22,3	89,2%	80,1%	71,4%
527,00	0,30	0,74	4,48	280,6%	20,66	15,81	92,0	22,3	89,2%	80,1%	71,4%
528,00	0,30	0,73	4,42	285,7%	20,66	15,87	92,1	22,4	89,2%	80,0%	71,3%
529,00	0,30	0,73	4,44	284,5%	20,66	15,86	91,8	22,4	89,2%	80,0%	71,4%
530,00	0,27	0,72	4,42	286,2%	20,66	15,88	91,7	22,4	89,3%	80,0%	71,4%
531,00	0,26	0,72	4,40	287,5%	20,66	15,90	91,6	22,3	89,2%	80,0%	71,4%
532,00	0,30	0,73	4,37	290,0%	20,66	15,93	91,4	22,3	89,1%	79,9%	71,2%
533,00	0,26	0,73	4,36	290,3%	20,66	15,94	91,4	22,3	89,1%	79,9%	71,2%
534,00	0,26	0,72	4,35	291,5%	20,66	15,95	91,4	22,3	89,2%	79,9%	71,3%
535,00	0,26	0,72	4,36	290,8%	20,66	15,94	91,0	22,3	89,2%	80,0%	71,3%
536,00	0,25	0,72	4,36	291,4%	20,66	15,95	90,9	22,3	89,2%	80,0%	71,4%
537,00	0,26	0,71	4,36	291,3%	20,66	15,95	91,0	22,3	89,3%	80,0%	71,4%
538,00	0,26	0,71	4,37	290,8%	20,66	15,94	90,9	22,3	89,3%	80,0%	71,4%
539,00	0,21	0,72	4,35	292,1%	20,67	15,96	90,5	22,3	89,2%	80,0%	71,4%
540,00	0,21	0,72	4,37	290,1%	20,66	15,93	90,4	22,3	89,2%	80,1%	71,4%
541,00	0,21	0,72	4,35	292,3%	20,67	15,96	90,5	22,4	89,2%	80,0%	71,4%
542,00	0,21	0,71	4,29	297,1%	20,67	16,02	90,4	22,2	89,1%	79,9%	71,2%
543,00	0,21	0,69	4,22	304,2%	20,67	16,11	90,1	22,3	89,3%	79,8%	71,2%
544,00	0,21	0,68	4,22	305,3%	20,67	16,11	89,9	22,3	89,4%	79,9%	71,4%
545,00	0,21	0,68	4,23	305,1%	20,67	16,11	90,0	22,3	89,5%	79,9%	71,5%
546,00	0,21	0,67	4,22	305,7%	20,67	16,12	89,8	22,3	89,6%	79,9%	71,5%
547,00	0,21	0,67	4,21	307,2%	20,68	16,13	89,7	22,2	89,6%	79,9%	71,5%
548,00	0,19	0,67	4,22	306,6%	20,68	16,12	89,3	22,3	89,6%	79,9%	71,6%

549,00	0,17	0,66	4,22	307,0%	20,68	16,13	89,3	22,2	89,7%	79,9%	71,7%
550,00	0,17	0,66	4,22	306,8%	20,68	16,12	89,2	22,3	89,7%	80,0%	71,7%
551,00	0,17	0,66	4,22	306,5%	20,68	16,12	89,1	22,3	89,7%	80,0%	71,7%
552,00	0,17	0,66	4,21	307,9%	20,68	16,14	89,2	22,2	89,7%	79,9%	71,7%
553,00	0,17	0,67	4,22	306,3%	20,67	16,12	89,0	22,3	89,7%	80,0%	71,7%
554,00	0,14	0,66	4,23	306,1%	20,67	16,12	88,8	22,2	89,7%	80,0%	71,8%
555,00	0,17	0,67	4,23	306,0%	20,67	16,12	88,8	22,3	89,7%	80,0%	71,8%
556,00	0,12	0,67	4,24	304,6%	20,67	16,10	88,6	22,3	89,7%	80,1%	71,8%
557,00	0,15	0,69	4,07	317,1%	20,68	16,27	88,6	22,3	89,0%	79,7%	70,9%
558,00	0,12	0,71	4,05	317,5%	20,68	16,28	88,4	22,3	88,7%	79,7%	70,6%
559,00	0,12	0,70	4,05	318,8%	20,68	16,29	88,0	22,2	88,8%	79,7%	70,8%
560,00	0,12	0,69	4,03	321,4%	20,68	16,31	87,8	22,2	89,0%	79,7%	70,9%
561,00	0,12	0,69	4,03	321,6%	20,68	16,32	87,6	22,2	88,9%	79,7%	70,9%
562,00	0,12	0,69	4,05	318,9%	20,68	16,29	87,7	22,2	88,9%	79,8%	70,9%
563,00	0,12	0,69	4,03	320,8%	20,68	16,31	87,5	22,2	88,9%	79,8%	70,9%
564,00	0,12	0,69	4,03	320,9%	20,68	16,31	87,5	22,2	88,9%	79,8%	70,9%
565,00	0,09	0,69	4,03	320,9%	20,68	16,31	87,2	22,2	89,0%	79,8%	71,0%
566,00	0,08	0,69	4,05	318,8%	20,68	16,28	87,1	22,2	89,0%	79,9%	71,1%
567,00	0,08	0,68	4,05	319,8%	20,68	16,29	86,9	22,2	89,0%	79,9%	71,1%
568,00	0,08	0,68	4,06	319,3%	20,68	16,29	86,8	22,2	89,1%	79,9%	71,2%
569,00	0,08	0,68	4,06	319,1%	20,68	16,28	86,8	22,2	89,1%	79,9%	71,2%
570,00	0,08	0,68	4,09	315,7%	20,68	16,24	86,9	22,2	89,1%	80,0%	71,3%
571,00	0,08	0,68	4,08	317,0%	20,68	16,26	86,7	22,2	89,1%	80,0%	71,3%
572,00	0,03	0,68	4,10	315,8%	20,68	16,24	86,7	22,2	89,2%	80,0%	71,4%
573,00	0,08	0,69	4,04	319,7%	20,68	16,30	86,4	22,2	88,9%	79,9%	71,1%
574,00	0,03	0,76	3,89	327,5%	20,69	16,42	86,5	22,2	87,5%	79,5%	69,6%
575,00	0,04	0,75	3,86	331,4%	20,69	16,46	86,5	22,1	87,7%	79,4%	69,6%
576,00	0,03	0,72	3,82	336,9%	20,69	16,51	86,3	22,2	87,9%	79,4%	69,8%
577,00	0,03	0,71	3,83	337,1%	20,69	16,51	86,2	22,2	88,1%	79,5%	70,0%
578,00	0,03	0,71	3,82	338,6%	20,69	16,52	86,2	22,2	88,2%	79,4%	70,1%
579,00	0,03	0,70	3,80	341,4%	20,70	16,54	86,1	22,2	88,2%	79,4%	70,1%
580,00	0,03	0,69	3,82	340,3%	20,70	16,53	85,8	22,1	88,3%	79,5%	70,2%
581,00	0,03	0,69	3,81	340,9%	20,70	16,54	85,9	22,2	88,4%	79,5%	70,2%
582,00	0,03	0,69	3,80	342,9%	20,70	16,55	85,7	22,1	88,4%	79,5%	70,3%
583,00	0,02	0,68	3,80	342,9%	20,70	16,55	85,7	22,1	88,4%	79,5%	70,3%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: pT 6350 Run: 2 Tech: MM Reviewer: SP

- kindling + start-up START FILE
- 1 min torche
- close DOOR immediatly
- FAN (High)
- At 2.9 LBS INSERT Load
- close DOOR immediatly
- At 5.00 LBS Stop pompe
- At 4.00 LBS keep FAN High and INSERT Load
- close DOOR immediatly
- At 12 min close air inlet (1/2) (mid point)

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: PI 10350 Run: 2 Tech: M.M Reviewer: SP

Equipment #	Time	12%	22%
EM-334	9:00	ok	ok

Moisture Meter Calibration Check:

Pre-Test Post-Test

Facility Conditions:

	Pre-Test	Post-Test
Smoke Capture Check (tunnel velocity)	ok	NA
Picture	4 sides ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	2026-04-21
Date Dilution Tunnel Cleaned	2026-04-21
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok

Temperature System:

Ambient (65°-90°F) Y/N	ok

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok

Pictures for report	
Side	ok
Coal bed	ok
Load	ok
Load in stove	ok
Fuel adjustment	ok

Load Length 5/6 of firebox Length +- 1inch	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2026. 04. 23 Manufacturer: ENERCO Model: WS 110

Project #: PT 6350 Run: 2 Tech: M.M Reviewer: M

Leakage Checks Tunnel Samplers high burn

	Train 1		Train 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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	386336.27	387170.96	137181.16	138008.25
Initial 1minute DGM (Liter)	386336.26	387170.96	137181.12	138008.21
Change (Liter)	0.01	0	0.04	0.04
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: PI 2350 Run: 2 Tech: M,M Reviewer: SO

Leakage Checks Tunnel Samplers High burn

	System 1st hour		Ambient	
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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	324155	325341	805034 28	805867 12
Initial 1minute DGM (Liter)	324155	325341	805034 26	805867 12
Change (Liter)	∅	∅	0.02 M.M ~~805 034 26~~	∅
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 116

Project #: PI 2350 Run: 2 Tech: M.K Reviewer: AD

Leakage Checks Tunnel Samplers Medium / Low burn

	Train 1		Train 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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	387171.58	388575.56	138009.41	139399.40
Initial 1minute DGM (Liter)	387171.58	388575.56	138009.36	139399.35
Change (Liter)	0	0	0.05	0,05
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2026 04 23 Manufacturer: LENECO Model: WS 110

Project #: PT 2035 Run: 2 Tech: M.M Reviewer: DS

Leakage Checks Tunnel Samplers Medium / Low burn

	System 1st hour		Ambient	
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)
Vacuum (inches Hg.)	-6	-6	-6	-6
Final 1minute DGM (Liter)	3253 49	3265 64	80586754	80725875
Initial 1minute DGM (Liter)	3253, 49	3265 64	80586753	80725875
Change (Liter)	Ø	Ø	0,01	Ø
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2026-04-21 Manufacturer: ENERCO Model: WS110

Project #: PI 20350 Run: 1 Tech: M.M Reviewer: DO

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre-Test	Post Test
Vacuum (inches Hg.)	-6	-6
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 H2o static	Pre-Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	0.5	3	0.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2026-04-21 Manufacturer: ENERCO Model: WS 110

Project #: PI 20350 Run: 1 Tech: M.M Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Platform	EM-205	10,00 Kg, Class F	10,0 Kg
Wood	EM-090	440 lbs, Class F	4,40 lbs
Analytical	EM-335	100,0 mg, Class S	100,0 mg
Analytical	EM-129	200 000g, Class S	200,000 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%

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: PT 4350 Run: 2 Tech: M.A Reviewer: AP

FOR 12 in TUNNELS

Barometric pressure (P_{bar}) _____ (KPa.) Static pressure (P_q) _____(inches w.c.)
Pitot tube type: Standard

Traverse Point	Position (inches)	Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
A Center	6	0.073	79.99
B Center	6	0.072	79.94
A-1	0.53	0.059	79.98
A-2	1.75	0.068	79.83
A-3	3.55	0.073	79.83
A-4	8.45	0.074	79.91
A-5	10.25	0.074	79.91
A-6	11.47	0.058	79.90
B-1	0.53	0.067	79.94
B-2	1.75	0.065	79.79
B-3	3.55	0.068	79.79
B-4	8.45	0.070	79.77
B-5	10.25	0.061	79.77
B-6	11.47	0.057	79.82

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 26-04-23 Manufacturer: ENERCO Model: WS 110

Project #: pT 26 350 Run: 2 Tech: M.A Reviewer: DL

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	3 086	3 000	1044	1000
Tolerance CO	0	+/- 0.02	0014	+/- 0.15	0044	+/- 0.05
CO_2	0	0	17 99	18 00	9.82	10 00
Tolerance CO2	0	+/- 0.02	0,01	+/- 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	3083	1040	0	0.02	0003	0.15	0004	0.05	✓	
CO_2	0	18 01	986	0	0.02	002	0.5	004	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: pt20350 Run: 2 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

		System 1st hour	System 1	System 2	Blank
High fire test	Final (Liter)	3253,37	387170,49	138007,21	805866,66
	Initial (Liter)	3241,63	386337,92	137182,72	805037,22
Low medium fire test	Final (Liter)	3265,61	38857508	139398,26	807258,48
	Initial (Liter)	3253,57	387173,32	138011,15	805869,72

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	100,8	100,5
Humidity (%):	27,2	20,8
Air Velocity (max 50ft/Min)	0	0

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: PT 20350 Run: 2 Tech: MM Reviewer: SL

FUEL DESCRIPTION:

Type of wood:

KINDLING AND START-UP LOAD

	Piece Size	Weight		Meter Moisture Content (% dry)				
	x x in.		lbs.					
kindlings	x x 15 in.	43	lbs.	9		9		9
	x x in.		lbs.					
	x x in.		lbs.					
start-up	x x 15 in.	662	lbs.	20		20		20
	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)				
400 x425 x 15 in.	4348	lbs.	246		213		224
325 x350 x 15 in.	3424	lbs.	201		194		200
425 x400 x 15 in.	4564	lbs.	199		190		191
x x in.		lbs.					
400 x400 x 15 in.	4994	lbs.	236		209		199
325 x325 x 15 in.	2752	lbs.	199		204		205
325 x375 x 15 in.	2900	lbs.	199		216		224
x x in.		lbs.					
x x in.		lbs.					

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: pT 4358 Run: 2 Tech: M.M Reviewer: DP

FUEL DESCRIPTION:

Type of wood:

LOW OR MEDIUM TEST LOAD

Piece Size				Weight		Meter Moisture Content (% dry)					
4.00	x 4.00	x 15	in.	4 784	lbs.	21.9		19.3		20.0
4.00	x 4.00	x 15	in.	4 696	lbs.	21.4		21.8		23.0
4.00	x 4.00	x 15	in.	5 136	lbs.	23.6		21.9		21.6
	x	x	in.		lbs.					
3.75	x 3.50	x 15	in.	4 048	lbs.	22.4		22.6		23.0
4.00	x 3.00	x 15	in.	3 218	lbs.	21.4		21.6		21.9
4.50	x 5.00	x 15	in.	6 186	lbs.	19.1		19.8		20.0
	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.					

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-23 Manufacturer: ENERCO Model: WS II

Project #: PT 6350 Run: 2 Tech: M.M Reviewer: DP

		HIGH FIRE TEST FILTERS							
		SYSTEM 1 – 1st 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
Date	Time	001	714-715		1	009	716-717		16
2026-04-22	17:00	61 1040	0 2520		3 3198	61 4511	0 2519		4 9573
2026-04-23	8:00	61 1040	0 2521		3 3199	61 4512	0 2518		4 9572

		SYSTEM 1 – 1st 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
Date	Time	001	714-715		1	009	716-717		16
2026-04-23	10:30	61 1045	0 2533		3 3220	61 4517	0 2529		4 9585
2026-04-27	8:00	61 1042	0 2533		3 3200	61 4513	0 2529		4 9575
2026-04-28	8:00	61 1042	0 2533		3 3200	61 4513	0 2529		4 9575

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: PT 20350 Run: 2 Tech: M.H Reviewer: D

		HIGH FIRE TEST FILTERS			
		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter
Date	Time	15	718-719	65	720
2026-04-22	17:00	108 7761	0 2558	5 0308	0 1284
2026-04-23	8:00	108 7761	0 2558	5 0309	0 1284

		HIGH FIRE TEST FILTERS				
		SYSTEM 2				
Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time	15	718-719	65	720	2026-04-23
2026-04-23	10:30	108 7767	02567	50324	0 1285	10:15
2026-04-27	8:00	108 7761	0 2567	5 0316	0 1285	
2026-04-28	8:00	108 7761	0 2567	5 0316	0 1285	

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-23 Manufacturer: EMISSIONS Model: WS 110

Project # pt 2350 Run: 2 Tech: MM Reviewer: DP

		MEDUIM / LOW FIRE TEST FILTERS							
		SYSTEM 1 – 1st 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
Date	Time	11	721	722	6	19	723	724	60
2026-04-22	17:00	93 7158	0 2551		5 0044	109 0881	0 2585		4 1854
2026-04-23	9:00	93 7157	0 2552		5 0045	109 0880	0 2586		4 1855

		SYSTEM 1 – 1st 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
Date	Time	11	721	722	6	19	723	724	60
2026-04-23	15:30	93 7167	0 2575		5 0060	109 0884	0 2616		4 1872
2026-04-27	8:00	93 7158	0 2573		~~5 0048~~ 5 0048	109 0881	0 2614		4 1856
2026-04-28	8:00	93 7158	0 2573		5 0048	109 0881	0 2614		4 1856

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2026-04-23 Manufacturer: ENERCO Model: WS 110

Project #: PT 20350 Run: 2 Tech: M.P Reviewer: DP

MEDIUM/ LOW FIRE TEST FILTERS

SYSTEM 2

Pre-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter
Date	Time	33	725-726	61	727
2026-04-22	17:00	109 3622	0 2590	4 1813	0 1280
2026-04-23	9:00	109 3622	0 2591	4 1814	0 1280

MEDIUM/ LOW FIRE TEST FILTERS

SYSTEM 2

Post-test Weight Record		Probe & Housing Number	Front & Back Filter Number	gaskets	Blank Filter	End test time and date
Date	Time	33	725-726	61	727	2026-04-23 15:15
2026-04-23	15:30	109 3629	0 2622	4 1834	0 1282	
2026-04-27	8:00	109 3622	0 2621	4 1815	0 1281	
2026-04-28	8:00	109 3622	0 2621	4 1815	0 1281	

Paramètres

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

Code verrouillage:	ENE

Description du test

Test standard	EPA
Run #	2
Date	23-04-2026
Technicien	M.M
Project #	PI 20350

Description de l'unité

Manufacturier	ENERCO	
Modèle	WS110	
Combustion system	Non-Cat	
Appliance type	WOOD STOVE	
Firebox volume	2,28	cu ft.
Appliance weight empty	na	lbs
Fan (no, Standard, Option)	option	

Paramètres du test

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

Échantillonnage

Blank Targeted sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,986	Dimensionless
Equipment number (DGM #1):	EM 178	
Calibration Factor (DGM #2):	1,010	Dimensionless
Equipment number (DGM #2):	EM 318	
Calibration Factor (DGM room):	0,989	
Equipment number (DGM room):	EM 179	Dimensionless
Calibration Factor (DGM 1st Hr):	1,000	
Equipment number (DGM 1st Hr):	EM 130	Dimensionless

Tunnel

Targeted tunnel flow rate	850	scfm
Tunnel diameter	12	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI 20350
Date	23-04-2026
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/ft^3 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	2,28	ft^3				
Total Nom. Load Wt. Target	22,80	lb				
Total Load Wt. Allowable Range	21,70	to	23,90	lb		
Core Target Wt. Allowable Range	10,30	to	14,80	lb		
Remainder Load Wt. Allowable Range	8,00	to	12,50	lb		
						Mid-Point
Core Load Pc. Wt. Allowable Range	3,40	to	5,70	lb		4,55
Remainder Load Pc. Wt. Allowable Range	2,30	to	12,50	lb		7,40
	Pc. #					
Core Load Piece Wt. Actual	1	4,35	lb	In Range		
	2	3,42	lb	In Range		
	3	4,56	lb	In Range		
Core Load Total. Wt. Actual		12,34	lb	In Range		
	Pc. #					
Remainder Load Piece Wt.	1	4,99	lb	In Range		
(1 to 3 Pcs.)	2	2,75	lb	In Range		
	3	2,90	lb	In Range		
Remainder Load Tot. Wt. Act		10,65	lb	In Range		
Total Load Wt. Actual		22,98	lb	In Range		
Core % of Total Wt.		54%		In Range	45-65%	
Remainder % of Total Wt.		46%		In Range	35-55%	
Actual Load % of Nominal Target		101%		In Range	95-105%	
Actual Fuel Load Density		10,1	lb/ft^3			
Kindling and Start-up Fuel						
Maximim Kindling Wt. (20% of Tot. Load Wt.)		4,60	lb			
Actual Kindling Wt.		4,30	lb	In Range	18,7%	
Maximum Start-up Fuel Wt. (30% of Tot. Load Wt.)		6,89	lb			
Actual Start-up Fuel Wt.		6,62	lb	In Range	28,8%	
Allowable Residual Start-up Fuel Wt. Range	2,3	to	4,6	lb		Mid-Point
Actual Residual Start-up Fuel Wt.		2,9	lb	In Range		3,4
Total Wt. All Fuel Added (wet basis)		33,90	lb			
High Fire Test Run End Point Range	Low		High			Mid-Point
Based on Fuel Load Wt. (w/tares)	2,1	to	2,5	lb		2,3
Actual Fuel Load Ending Wt.		2,1	lb	In Range		

Load pieces Length in. 15 in.

Fuel Piece Moisture Reading (%-dry basis) 1	2	3	Ave.		Pc. Wt. Dry Basis	
24,6	22,3	22,4	23,1	In Range	3,53 lb	1,60 kg
20,1	19,4	20	19,8	In Range	2,86 lb	1,30 kg
19,9	19	19,1	19,3	In Range	3,82 lb	1,73 kg
23,6	20,9	19,9	21,5	In Range	4,11 lb	1,86 kg
19,9	20,4	20,8	20,4	In Range	2,29 lb	1,04 kg
19,9	21,6	22,4	21,3	In Range	2,39 lb	1,08 kg
Total Load Ave. MC (%-dry basis)			20,9	In Range		
Total Load Ave. MC % (wet basis)			17,3			
Total Test Load Weight (dry basis)					19,00 lb	8,62 kg
Kindling Moisture (%-dry basis)						
9	9	9	9,0	In Range	3,94 lb	1,79 kg
Start-up Fuel Moisture Readings (%-dry basis)						
20	20	20	20,0	In Range	5,52 lb	2,50 kg
Total Wt. All Fuel Added (dry basis)					28,46 lb	12,91 kg
Total Wt. All Fuel Burned (dry basis)					23,5 lb	10,6 kg
Total Wt. All Fuel Burned (wet basis)					28,9 lb	13,1 kg

Adjunct to ASTM E XXXX Wood Heater Cordwood Test Method - May 10, 2017 Version

Cordwood Fuel Load Calculators - 12 lb/ft^3 Nominal Load Density

Core 45-65% of Total Load Weight, Remainder 35-55% of Total Load Weight

Values to be input manually

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For Usable Firebox Volumes up to 3.0 ft^3 - Low and Medium Fire

Nominal Required Load Density (wet basis)	12	lb/ft^3				
Usable Firebox Volume	2,28	ft^3				
Total Nom. Load Wt. Target	27,36	lb				
Total Load Wt. Allowable Range	25,99	to	28,73	lb		
Core Target Wt. Allowable Range	12,312	to	17,78	lb		
Remainder Load Wt. Allowable Range	9,58	to	15,05	lb		
						Mid-Point
Core Load Fuel Pc. Wt. Allowable Range	4,10	to	6,84	lb		5,47
Remainder Load Pc. Wt. Allowable Range	2,74	to	8,21	lb		5,47
	Pc. #					
Core Load Piece Wt. Actual	1	4,78	lb		In Range	
	2	4,70	lb		In Range	
	3	5,14	lb		In Range	
Core Load Total. Wt. Actual		14,62	lb		In Range	
	Pc. #					
Remainder Load Piece Wt.	1	4,05	lb		In Range	
(2 or 3 Pcs.)	2	3,22	lb		In Range	
	3	6,19	lb		In Range	
Remainder Load Piece Weight Ratio - Small/Large		52%			In Range	≤ 67%
Remainder Load Tot. Wt. Act		13,45	lb		In Range	
Total Load Wt. Actual		28,07	lb		In Range	
Core % of Total Wt.		52%			In Range	45-65%
Remainder % of Total Wt.		48%			In Range	35-55%
Actual Load % of Nominal Target		103%			In Range	95-105%
Actual Fuel Load Density		12,3	lb/ft^3			
Allowable Charcoal Bed Wt. Range (lb)	2,9	to	5,6			Mid-Point
Actual Charcoal Bed Wt.		4,0	lb		In Range	4,2
Actual Fuel Load Ending Wt.			lb		Valid Test	≥ 90%
Total Wt. of Fuel Burned During Test Run lb.		28,1	lb			
Load pieces Length in.		15	in.			

Fuel Piece Moisture Reading (%-dry basis)

1	2	3	Ave.		Pc. Wt. Dry Basis			
21,9	19,3	20	20,4	In Range	3,97	lb	1,80	kg
21,4	21,8	23	22,1	In Range	3,85	lb	1,75	kg
23,6	21,9	21,6	22,4	In Range	4,20	lb	1,90	kg
22,4	22,6	23	22,7	In Range	3,30	lb	1,50	kg
21,4	21,6	21,9	21,6	In Range	2,65	lb	1,20	kg
19,1	19,8	20	19,6	In Range	5,17	lb	2,35	kg
Total Load Ave. MC % (dry basis)			21,3	In Range				
Total Load Ave. MC % (wet basis)			17,6					
Total Test Load Weight (dry basis) →					23,13	lb	10,49	kg
Total Fuel Weight Burned During Test Run (dry basis)					23,1	lb	10,49	kg

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		
						Mid-Point
Core Load Fuel Pc. Wt. Allowable Range	0,00	to	0,00	lb		0,00
Remainder Load Pc. Wt. Allowable Range	0,00	to	0,00	lb		0,00
	Pc. #					
Core Load Piece Wt. Actual	1		lb		In Range	
	2		lb		In Range	
	3		lb		In Range	
Core Load Total. Wt. Actual		0,00	lb		In Range	
	Pc. #					
Remainder Load Piece Wt.	1		lb		In Range	
(3 or 4 Pcs.)	2		lb		In Range	
	3		lb		In Range	
	4		lb		NA	
Remainder Load Piece Weight Ratio - Small/Large		#NOMBRE!			#NOMBRE!	≤ 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/0!			#DIV/0!	45-65%
Remainder % of Total Wt.		#DIV/0!			#DIV/0!	35-55%
Actual Load % of Nominal Target		#DIV/0!			#DIV/0!	95-105%
Actual Fuel Load Density		#DIV/0!	lb/ft^3			
Allowable Charcoal Bed Wt. Range (lb)	0,1	to	-0,1			Mid-Point
Actual Charcoal Bed Wt.			lb		Out of Range	0,0
Actual Fuel Load Ending Wt.			lb		Valid Test	≥ 90%
Total Wt. of Fuel Burned During Test Run lb.		0,0	lb			

Fuel Piece Moisture Reading (%-dry basis)

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

	Start	End
Barometer (kPa):	100,8	100,5
Barometer (in.Hg):	29,766229	29,67763883
Dry Bulb (F):	69,371903	73,4257507
Humidity (%):	27,2	20,8
Air velocity (ft/min)	0	0

High fire test						
DGM #1st hr	Final:	3253,370	cuft	Final:	3253,370	cuft
	Initial:	3241,630	cuft	Initial:	3241,630	cuft
DGM #1	Final:	13672,797	cuft	Final:	387170,490	Liter
	Initial:	13643,395	cuft	Initial:	386337,920	Liter
DGM #2	Final:	4873,679	cuft	Final:	138007,210	Liter
	Initial:	4844,562	cuft	Initial:	137182,720	Liter
DGM room	Final:	28458,920	cuft	Final:	805866,860	Liter
	Initial:	28429,622	cuft	Initial:	805037,220	Liter

min or med burnrate						
DGM #1st hr	Final:	3265,610	cuft	Final:	3265,610	cuft
	Initial:	3253,570	cuft	Initial:	3253,570	cuft
DGM #1	Final:	13722,400	cuft	Final:	388575,080	Liter
	Initial:	13672,897	cuft	Initial:	387173,320	Liter
DGM #2	Final:	4922,803	cuft	Final:	139398,260	Liter
	Initial:	4873,818	cuft	Initial:	138011,150	Liter
DGM room	Final:	28508,065	cuft	Final:	807258,480	Liter
	Initial:	28459,011	cuft	Initial:	805869,420	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du test commence	31
Numéro de la ligne dans "Raw data" à partir duquel les données du highfire test commence	68
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 20350
Date	23-04-2026
Technicien	M.M

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: -0,12843066 in. H20
Barometer: 29,766 in. Hg

Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,073	80,0	0,2702
B center	0,072	79,9	0,2683
A1	0,059	80,0	0,2429
A2	0,068	79,8	0,2608
A3	0,073	79,8	0,2702
A4	0,074	79,9	0,2720
A5	0,074	79,9	0,2720
A6	0,058	79,9	0,2408
B1	0,057	79,9	0,2387
B2	0,065	79,8	0,2550
B3	0,068	79,8	0,2608
B4	0,070	79,8	0,2646
B5	0,061	79,8	0,2470
B6	0,057	79,8	0,2387
AVERAGE	0,0664	79,8693	0,2573

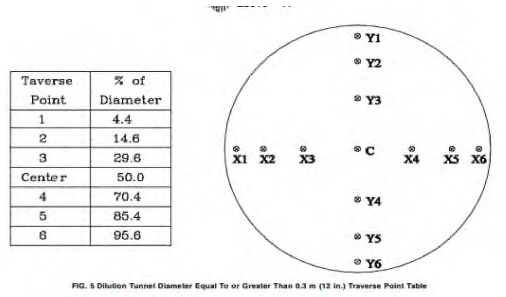


FIG. 5 Dilution Tunnel Diameter Equal To or Greater Than 0.3 m (12 in.) Traverse Point Table

PITOT CONSTANT=
0,915

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
AVERAGE	#DIV/0!	#DIV/0!	0,0000

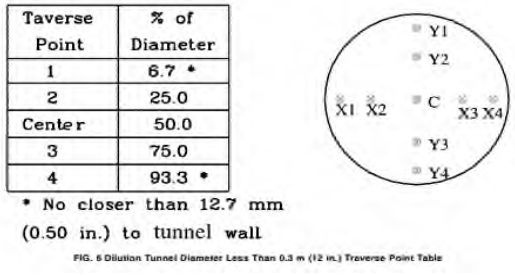


FIG. 6 Dilution Tunnel Diameter Less Than 0.3 m (12 in.) Traverse Point Table

Project nu.	PI 20350
Date	23-04-2026
Technicien	M.M

Filter set weight highfire

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Time	Test End date & time
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	gasket	Filter			
Number	1	714-715	1	9	716-717	16	15	718-719	65	720			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	61,1040	0,2520	3,3198	61,4511	0,2519	4,9573	108,7761	0,2558	5,0308	0,1284	2026-04-22	17:00	
Before (6)	61,1040	0,2521	3,3199	61,4512	0,2518	4,9572	108,7761	0,2558	5,0309	0,1284	2026-04-23	08:00	
After (1)	61,1045	0,2533	3,3220	61,4517	0,2529	4,9585	108,7767	0,2567	5,0324	0,1285	2026-04-23	10:30	
After (2)	61,1042	0,2533	3,3200	61,4513	0,2529	4,9575	108,7761	0,2567	5,0316	0,1285	2026-04-27	08:00	
After (3)	61,1042	0,2533	3,3200	61,4513	0,2529	4,9575	108,7761	0,2567	5,0316	0,1285	2026-04-28	08:00	2026-04-23 10:15
After (4)													
After (5)													
After (6)	61,1042	0,2533	3,3200	61,4513	0,2529	4,9575	108,7761	0,2567	5,0316	0,1285	2026-04-28	08:00	
Difference	0,0002	0,0012	0,0001	0,0001	0,0011	0,0003	0,0000	0,0009	0,0007	0,0001			
Total (mg)		1,5			1,5			1,6		0,1			
Total ajusté (mg)		**1,40**			**1,40**			**1,50**					

Project nu.	PI 20350
Date	23-04-2026
Technicien	M.M

Filter set weight Low/ medium fire

	System 1 (g) 1st hour			System 1 (g)			System 2 (g)			Ambient blank (g)	Date (yy/mm/dd)	Time	Test end date & time
	probe	front / Back	gasket	probe	front / Back	gasket	probe	front / Back	gasket	Filter			
Number	11	721-722	6	19	723-724	60	33	725-726	61	727			
Before (1)													
Before (2)													
Before (3)													
Before (4)													
Before (5)	93,7158	0,2551	5,0044	109,0881	0,2585	4,1854	109,3622	0,2590	4,1813	0,1280	2026-04-22	17:00	
Before (6)	93,7157	0,2552	5,0045	109,0880	0,2586	4,1855	109,3622	0,2591	4,1814	0,1280	2026-04-23	09:00	
After (1)	93,7167	0,2575	5,0060	109,0884	0,2616	4,1872	109,3629	0,2622	4,1834	0,1282	2026-04-23	15:30	
After (2)	93,7158	0,2573	5,0048	109,0881	0,2614	4,1856	109,3622	0,2621	4,1815	0,1281	2026-04-27	08:00	
After (3)	93,7158	0,2573	5,0048	109,0881	0,2614	4,1856	109,3622	0,2621	4,1815	0,1281	2026-04-28	08:00	
After (4)													2026-04-23 15:15
After (5)													
After (6)	93,7158	0,2573	5,0048	109,0881	0,2614	4,1856	109,3622	0,2621	4,1815	0,1281	2026-04-28	08:00	
Difference	0,0001	0,0021	0,0003	0,0001	0,0028	0,0001	0,0000	0,0030	0,0001	0,0001			
Total (mg)		2,5			3			3,1		0,1			
Total ajusté (mg)		**2,40**			**2,90**			**3,00**					

Project nu.	PI 20350
Date	23-04-2026
Technicien	M.M

SFBA EPA EMISSION RESULTS

Test Duration: **146** min

PRESSURE FACTOR:	DGM 1st hr	0,96915	
	DGM 1	0,95184	
	DGM 2	0,95841	
	DGM room	0,99338	
TEMPERATURE FACTORS	DGM 1st hr	0,99475	
	DGM 1	0,99160	
	DGM 2	0,98874	
	DGM room	0,99359	
VOLUMES SAMPLED	DGM 1st hr	11,318	SCft
	DGM 1	27,362	SCft
	DGM 2	27,867	Scft
	DGM room	28,600	SCft

TOTAL TUNNEL VOLUME : 106771

SAMPLE RATIOS

Sample Train 1st Hr:	3876,859
Sample Train 1:	3902,112
Sample Train 2:	3831,382

Paticulate concentration

Sample Train 1st Hr	**0,000133**	g/dscf
Sample Train 1	**0,000055**	g/dscf
Sample Train 2	**0,000057**	g/dscf
Room	**0,000003**	g/dscf

TOTAL EMISSIONS

Sample Train 1st Hr	**5,66**	g
Sample Train 1	**5,48**	g
Sample Train 2	**5,76**	g

EMISSION RATES

Sample Train 1st Hr	**5,66**	g/hr
Sample Train 1	**2,25**	g/hr
Sample Train 2	**2,37**	g/hr

	Train 1	Train 2	Train 1st Hr
Cs	5,482E-05	5,7415E-05	0,0001325

RESULTS

Average emission rate: 2,31 g/hr

Burn Rate : 4,220 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,72193381	in Hg
Start:	29,7662288	in Hg
End:	29,67763883	in Hg

DGM CONTROLLER VALUES

DGM 1st hr	Final:	3253,370	Cuft
	Initial:	3241,630	Cuft
DGM 1	Final:	13672,797	Cuft
	Initial:	13643,395	Cuft
DGM 2	Final:	4873,679	Cuft
	Initial:	4844,562	Cuft
DGMroom	Final:	28458,920	Cuft
	Initial:	28429,622	Cuft

TEMPERATURES

DGM 1st hr	530,788	°R
DGM 1	532,474	°R
DGM 2	534,011	°R

CALIBRATION FACTORS

DGM 1st Hr	1,0000
DGM 1	0,9860
DGM 2	1,0100
DGM room	0,9890

TUNNEL FLOW RATE: 731,308 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	1,50	mg
Total Sample Train 2:	1,60	mg
Total Sample Train 1 1st hour:	1,50	mg

DEVIATION: 2,47%

*		*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	Mass flow	DGM 1st hour	DGM 1st hour	Filter	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft				Change in	T wet bulb
Elapsed		Weight			Flue	Room	Tunnel	Unit	Unit	Unit	Unit	Unit	Reading	1st hour	1st hour	1st hour	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Filter 1	Filter 1	Filter 2	Surface	
Time	Raw data row	Remaining	CO	CO_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	1st hour	Inlet T	Outlet T	Temp									in wc	in wc				Temp.	
min		lbs	%	%	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	in. Hg	in. Hg	in. Hg	°F	oF
0,00	31,00	10,8	0,0	0,6	89,9	69,4	70,4	71,5	69,6	69,5	69,7	69,7	0,18	69,3	69,6	81,6	0,19	69,88	69,81	81,65	0,19	70,00	69,89	80,53	0,07	0,02	-0,70	-1,24	-1,00	0	53,77
1,0	32,0	10,7	0,0	3,5	139,3	69,4	73,5	76,8	69,6	69,7	69,9	69,7	0,18	69,3	69,6	81,1	0,19	69,90	69,82	81,95	0,19	69,98	69,89	81,47	0,07	0,03	-0,67	-1,22	-0,98	1,1371048	55,36
2,0	33,0	24,9	0,0	7,3	214,5	69,3	79,2	87,2	69,7	70,3	70,5	69,7	0,18	69,3	69,6	80,7	0,19	69,89	69,81	84,22	0,19	69,93	69,90	83,08	0,07	0,05	-0,67	-1,22	-0,98	3,460199	57,63
3,0	34,0	10,4	0,1	7,2	329,5	69,2	74,8	134,2	69,7	71,8	72,0	69,6	0,18	69,4	69,6	81,5	0,19	69,88	69,89	85,87	0,19	69,88	69,89	83,97	0,07	0,07	-0,66	-1,23	-0,98	13,483885	57,15
4,0	35,0	10,2	0,1	8,5	425,0	69,4	76,9	208,0	70,0	70,0	74,1	74,2	69,6	0,18	69,4	69,6	82,6	0,19	69,85	69,84	85,37	0,19	69,89	69,92	84,82	0,07	0,08	-0,67	-1,24	-0,99	29,204193	58,27
5,0	36,0	10,1	0,1	10,1	446,6	69,4	77,7	268,4	70,5	77,1	77,0	69,6	0,18	69,5	69,6	83,4	0,19	69,82	69,84	84,34	0,19	69,86	69,95	85,02	0,07	0,08	-0,67	-1,24	-0,99	42,526996	58,21
6,0	37,0	9,9	0,1	9,3	457,5	69,4	79,0	309,8	71,4	81,2	80,6	69,7	0,18	69,6	69,6	84,2	0,19	69,82	69,86	83,30	0,19	69,88	69,97	84,48	0,07	0,08	-0,69	-1,25	-1,00	52,53889	58,53
7,0	38,0	9,7	0,3	10,2	474,4	69,5	79,7	347,2	72,7	87,7	85,0	69,8	0,18	69,7	69,6	84,3	0,19	69,90	69,88	82,45	0,19	69,92	70,03	83,99	0,07	0,08	-0,69	-1,26	-1,00	62,474916	58,72
8,0	39,0	9,5	0,3	10,7	483,3	69,6	80,7	375,5	74,4	96,4	90,0	69,9	0,18	69,7	69,6	83,8	0,19	69,98	69,94	81,72	0,19	70,01	70,08	83,62	0,07	0,08	-0,69	-1,26	-1,00	71,254852	58,88
9,0	40,0	9,3	0,2	10,4	486,6	69,6	81,7	399,0	76,7	106,3	95,3	70,1	0,18	69,8	69,7	83,2	0,19	70,07	69,99	82,20	0,19	70,09	70,12	83,24	0,07	0,08	-0,68	-1,26	-1,00	79,502728	58,98
10,0	41,0	9,1	0,2	11,7	523,4	69,6	82,5	432,8	79,6	116,4	100,7	70,4	0,18	69,8	69,7	82,7	0,19	70,06	70,03	84,07	0,19	70,11	70,21	82,95	0,07	0,09	-0,68	-1,26	-1,01	89,983121	59,52
11,0	42,0	8,9	0,1	12,2	552,6	69,7	84,0	474,5	83,1	124,2	105,8	70,8	0,18	69,9	69,7	82,1	0,19	70,10	70,05	85,35	0,19	70,14	70,27	82,68	0,07	0,09	-0,69	-1,27	-1,01	101,67937	60,08
12,0	43,0	8,6	0,2	13,2	591,3	69,8	86,2	525,1	87,2	130,1	110,7	71,1	0,19	70,0	69,7	81,6	0,19	70,17	70,07	85,00	0,19	70,23	70,30	82,53	0,07	0,10	-0,69	-1,27	-1,02	114,86183	60,81
13,0	44,0	8,4	0,3	14,2	603,1	70,0	87,2	572,4	92,1	135,0	114,6	71,7	0,19	70,1	69,8	81,2	0,19	70,23	70,12	84,21	0,19	70,30	70,39	82,41	0,07	0,09	-0,70	-1,27	-1,03	127,15921	61,05
14,0	45,0	8,0	0,2	14,2	649,2	70,1	89,0	618,7	97,5	139,1	118,4	72,4	0,19	70,2	69,8	80,8	0,19	70,30	70,16	83,44	0,19	70,38	70,48	82,31	0,07	0,10	-0,70	-1,27	-1,02	139,22911	61,84
15,0	46,0	7,8	0,6	16,1	654,7	70,0	90,8	657,1	103,5	142,2	121,7	73,2	0,19	70,3	69,9	80,5	0,19	70,30	70,21	82,87	0,19	70,40	70,54	82,33	0,07	0,10	-0,69	-1,27	-1,03	149,53008	62,14
16,0	47,0	7,4	0,3	16,6	701,3	70,2	92,2	700,6	109,8	146,4	125,5	74,1	0,19	70,4	69,9	81,6	0,19	70,38	70,28	82,37	0,19	70,51	70,62	82,29	0,07	0,11	-0,69	-1,28	-1,04	161,26262	63,25
17,0	48,0	7,1	0,3	17,4	734,0	70,5	95,1	745,3	116,6	150,2	129,0	75,3	0,19	70,6	69,9	82,9	0,19	70,40	70,34	81,97	0,19	70,57	70,67	82,32	0,07	0,11	-0,70	-1,28	-1,04	173,28399	63,91
18,0	49,0	6,7	0,3	17,8	738,4	70,2	96,0	776,5	123,6	154,3	132,6	76,8	0,18	70,7	70,0	84,0	0,19	70,44	70,39	81,69	0,19	70,63	70,73	82,35	0,07	0,11	-0,71	-1,29	-1,05	182,77519	64,15
19,0	50,0	6,4	0,3	17,1	720,5	70,4	95,7	789,9	130,4	158,2	136,3	78,6	0,19	70,9	70,0	84,1	0,19	70,51	70,45	81,38	0,19	70,69	70,80	82,31	0,07	0,11	-0,72	-1,29	-1,05	188,67719	63,72
20,0	51,0	6,1	0,2	16,6	712,8	70,5	96,0	794,6	137,5	162,1	140,7	80,8	0,19	71,0	70,1	83,7	0,19	70,59	70,50	83,25	0,19	70,78	70,85	82,28	0,07	0,11	-0,72	-1,29	-1,06	193,18198	63,62
21,0	52,0	5,9	0,8	16,3	697,5	70,4	95,3	792,6	145,1	167,4	145,8	83,3	0,19	71,0	70,1	83,3	0,19	70,64	70,57	85,47	0,19	70,86	70,95	82,20	0,07	0,10	-0,72	-1,30	-1,07	196,84962	63,42
22,0	53,0	5,6	0,8	16,4	702,7	70,6	95,9	793,1	152,1	172,5	150,9	86,3	0,19	71,1	70,2	82,8	0,19	70,72	70,60	85,46	0,19	70,94	71,05	82,16	0,07	0,10	-0,72	-1,29	-1,06	200,99558	63,39
23,0	54,0	5,2	0,9	16,7	706,8	70,5	95,2	795,2	159,0	178,0	157,1	89,8	0,19	71,1	70,3	82,5	0,19	70,84	70,66	84,82	0,19	71,09	71,17	82,12	0,07	0,10	-0,77	-1,30	-1,07	205,82523	63,32
24,0	55,0	5,0	0,7	16,2	682,7	70,6	95,3	789,3	165,4	183,4	162,5	93,6	0,19	71,2	70,3	82,1	0,19	71,04	70,75	84,19	0,19	71,27	71,28	82,08	0,07	0,11	-0,72	-1,29	-1,07	208,84514	62,99
25,0	56,0	4,7	0,5	15,2	662,9	70,6	94,6	779,9	171,1	189,3	167,9	97,5	0,18	71,3	70,4	81,8	0,19	71,13	70,83	83,67	0,19	71,38	71,38	81,97	0,07	0,10	-0,72	-1,29	-1,07	211,14331	62,70
26,0	57,0	4,5	0,7	14,8	652,3	70,6	94,0	771,8	176,2	194,9	173,5	102,0	0,18	71,3	70,4	81,6	0,19	71,24	70,89	83,23	0,19	71,47	71,49	81,86	0,07	0,10	-0,72	-1,29	-1,07	213,66748	62,38
27,0	58,0	4,3	0,7	14,0	632,0	70,7	93,3	758,4	181,0	200,5	179,4	106,6	0,19	71,4	70,5	81,3	0,19	71,33	70,95	82,86	0,19	71,60	71,58	81,74	0,07	0,10	-0,72	-1,29	-1,08	215,18885	62,09
28,0	59,0	4,1	0,5	13,5	615,7	71,0	92,1	745,1	186,4	205,9	185,2	111,0	0,19	71,4	70,5	81,1	0,19	71,46	71,01	82,34	0,19	71,73	71,70	81,58	0,07	0,10	-0,77	-1,29	-1,07	216,75544	61,66
29,0	60,0	4,0	0,4	12,7	594,1	70,9	91,5	727,4	193,0	211,1	191,1	116,1	0,19	71,5	70,6	80,9	0,19	71,56	71,08	82,04	0,19	71,84	71,83	81,49	0,07	0,10	-0,72	-1,28	-1,06	217,76172	61,25
30,0	61,0	3,8	0,4	12,0	578,7	70,8	90,3	708,6	199,9	216,9	197,3	121,1	0,18	71,5	70,6	80,6	0,19	71,68	71,15	81,64	0,19	71,98	71,93	81,28	0,08	0,09	-0,72	-1,27	-1,04	218,77187	60,85
31,0	62,0	3,6	0,3	11,5	562,2	70,9	90,5	690,3	207,0	222,1	203,2	126,2	0,19	71,5	70,7	80,4	0,19	71,71	71,21	81,61	0,19	72,01	72,04	81,18	0,07	0,09	-0,71	-1,28	-1,05	219,74225	60,60
32,0	63,0	3,5	0,3	11,3	549,9	70,7	89,6	672,1	214,4	227,4	208,4	131,6	0,19	71,5	70,7	80,3	0,19	71,70	71,26	84,15	0,19	72,02	72,10	81,05	0,07	0,09	-0,71	-1,28	-1,04	220,80676	60,46
33,0	64,0	3,4	0,3	11,3	543,6	70,8	88,3	654,7	221,6	232,7	214,2	136,7	0,19	71,4	70,7	81,8	0,19	71,63	71,26	85,91	0,19	71,98	72,14	81,06	0,07	0,09	-0,72	-1,28	-1,05	221,997	60,50
34,0	65,0	3,2	0,3	11,4	537,9	70,6	89,0	641,9	229,0	237,7	219,2	142,1	0,19	71,4	70,7	83,2	0,19	71,67	71,28	85,45	0,19	71,99	72,22	82,83	0,08	0,09	-0,72	-1,27	-1,05	223,97206	60,87
35,0	66,0	3,1	0,2	11,4	543,3	70,9	88,8	635,2	236,2	242,5	224,0	147,9	0,19	71,4	70,8	84,2	0,19	71,78	71,35	84,78	0,19	72,08	72,31	84,55	0,07	0,09	-0,72	-1,27	-1,04	227,16278	60,95
36,0	67,0	2,9	0,2	11,5	542,1	71,1	89,2	630,0	243,4	247,1	228,8	153,8	0,19	71,4	70,8	84,0	0,19	71,92	71,41	84,11	0,19	72,19	72,42	85,00	0,07	0,09	-0,72	-1,27	-1,05	230,64055	60,37
37,0	68,0	25,4	0,1	1,3	535,0	71,1	119,0	614,7	253,6	252,0	234,1	166,2	0,19	71,5	70,8	83,8	0,19	72,03	71,47	84,83	0,19	72,32	72,48	86,84	0,07	0,08	-0,75	-1,29	-1,08	234,1291	66,94
38,0	69,0	25,1	0,1	3,6	536,2	71,2	125,2	589,0	263,4	257,0	239,7	176,4	0,19	71,5	70,8	83,5	0,19	72,20	71,50	85,43	0,19	72,50	72,54	88,21	0,07	0,08	-0,77	-1,30	-1,08	235,09986	69,03
39,0	70,0	24,8	0,1	5,1	580,5	71,1	102,0	595,2	271,0	262,4	245,0	178,1	0,19	71,6	70,9	83,2	0,19	72,29	71,56	84,99	0,19	72,58	72,63	87,73	0,07	0,10	-0,75	-1,29	-1,07	240,35177	65,88
40,0	71,0	24,5	0,3	13,0	609,5	71,0	95,5	614,5	277,9	266,2	249,4	181,4	0,19	71,6	70,9	82,8	0,19	72,20	71,55	83,78	0,19	72,54	72,68	86,11	0,07	0,10	-0,75	-1,29	-1,07	247,86967	64,07
41,0	72,0	24,3	0,2	13,8	624,8	70,8	94,4	636,0	283,7	269,5	252,7	185,4	0,19	71,7	70,9	82,6	0,19	72,14	71,56	83,16	0,19	72,51	72,74	85,37	0,07	0,10	-0,75	-1,28	-1,06	255,44845	63,29
42,0	73,0	24,0	0,2	13,9	638,5	71,1	94,7	658,9	287,7	271,9	255,9	189,3	0,19	71,7	71,0	82,3	0,19	72,14	71,63	82,83	0,19	72,58	72,82	85,05	0,07	0,10	-0,73	-1,27	-1,06	262,76056	62,97
43,0	74,0	23,8	0,2	14,0	643,1	71,2	94,0	679,9	290,2	273,6	258,6	192,5	0,19	71,8	71,0	82,0	0,19	72,14	71,66	82,58	0,19	72,49	72,88	84,79	0,07	0,10	-0,75	-1,28	-1,04	268,98767	62,83
44,0	75,0	23,6	0,2	13,9	645,4	71,1	94,7	693,5	291,6	274,9	261,2	196,0	0,19	71,7	71,0	81,8	0,19	72,18	71,71	82,35	0,19	72,53	72,97	84,60	0,07	0,10	-0,75	-1,28	-1,05	273,4271	62,97
45,0	76,0	23,3	0,1	14,0	647,4	71,3	94,3	705,6	291,9	276,0	263,1	199,4	0,19	71,8	71,1	81,5	0,19	72,20	71,75	82,19	0,19	72,58	73,06	84,44	0,07	0,10	-0,75	-1,27	-1,06	277,23012	62,91
46,0	77,0	23,1	0,1	14,0	649,3	71,3	94,6	714,2	291,6	276,0	265,7	201,7	0,19	71,8	71,1	81,3	0,19	72,18	71,79	82,01	0,19	72,59	73,14	84,35	0,07	0,10	-0,80	-1,27	-1,07	280,03696	62,81
47,0	78,0	22,8	0,1	14,0	649,4	71,4	94,8	719,9	290,9	277,2	266,7	203,5	0,18	71,8	71,1	81,2	0,19	72,23	71,85	81,83	0,19	72,66	73,21	84,24	0,07	0,11	-0,75	-1,27	-1,07	281,64746	62,95
48,0	79,0	22,6	0,1	14,1	651,5	71,5	95,6	724,7	289,8	277,9	268,3	205,3	0,18	71,9	71,1	81,0	0,19	72,18	71,88	81,68	0,19	72,67	73,28	84,19	0,07	0,10	-0,76	-1,27	-1,07	283,21959	63,16
49,0	80,0	22,3	0,1	14,2	656,1	71,5	95,8	730,8	288,7	278,2	269,7	206,8	0,19	71,9	71,2	80,8	0,19	72,14	71,89	81,62	0,19	72,65	73,29	84,09	0,07	0,11	-0,75	-1,27	-1,07	284,84059	63,17
50,0	81,0	22,1	0,1	14,5	665,1	71,4	96,7	741,5	287,2	278,8	270,8	208,4	0,19	71,9	71,2	80,6	0,19	72,11	71,89	81,53	0,19	72,60	73,30	84,06	0,07	0,11	-0,75	-1,27	-1,07	287,37029	63,37
51,0	82,0	21,8	0,1	14,8	670,5	71,6	96,4	751,9	286,0	279,9	272,0	209,8	0,19	72,0	71,2	80,5	0,19	72,10	71,90	81,50	0,19	72,64	73,33	84,05	0,08	0,11	-0,76	-1,27	-1,07	289,91511	63,47
52,0	83,0	21,6	0,1	14,7	669,5	71,4	96,8	760,6	284,6	281,3	273,1	210,4	0,19	72,0	71,2	80,3	0,19	72,10	71,91	84,27	0,19	72,66	73,38	83,98	0,07	0,11	-0,76	-1,27	-1,06	291,99378	63,47
53,0	84,0	21,3	0,1	14,5	667,4	71,5	96,5	764,9	283,4	282,8	274,0	211,4	0,19	72,0	71,2	80,5	0,19	72,14	71,96	86,14	0,19	72,71	73,41	83,92	0,07	0,10	-0,76	-1,27	-1,06	293,31185	63,67
54,0	85,0	21,1	0,1	14,3	662,8	71,7	96,5	767,3	282,2	284,7	274,6	212,5	0,19	72,0	71,3	82,3	0,19	72,17	71,96	85,74	0,19	72,73	73,46	83,77	0,07	0,11	-0,76	-1,27	-1,06	294,26566	63,69
55,0	86,0	20,9	0,1	14,1	660,6	71,5	96,6	767,7	281,0	286,7	275,6	213,9	0,19	72,0	71,3	83,9	0,19	72,23	72,00	85,10	0,19	72,78	73,50	83,66	0,07	0,11	-0,77	-1,26	-1,06	294,98405	63,75
56,0	87,0	20,6	0,1	14,0	660,8	71,7	96,6	769,2	280,1	288,7	276,0	214,9	0,19	72,1	71,3	84,4	0,19	72,39	72,06	84,62	0,19	72,91	73,57	83,62	0,07	0,10	-0,77	-1,26	-1,05	295,80446	63,74
57,0	88,0	20,4	0,2	14,3	667,1	71,5	95,1	773,3	279,2	290,9	276,7	216,7	0,19	72,2	71,4	84,2	0,19	72,48	72,13	84,13	0,19	72,99	73,62	83,55	0,07	0,11	-0,76	-1,26	-1,06	297,36203	63,37
58,0	89,0	20,1	0,2	14,5	673,7	71,7	97,0	779,0	278,3	293,3	277,2	217,7	0,19	72,2	71,4	83,8	0,19	72,58	72,21	83,47	0,19	73,07	73,68	83,55	0,07	0,11	-0,75	-1,26	-1,06	299,09859	63,64
59,0	90,0	19,8	0,2	14,9	685,2	72,0	97,4	788,8	277,6	295,6	277,6	218,1	0,19	72,3	71,5	83,5	0,19	72,67	72,27	82,97	0,19	73,17	73,79	83,56	0,07	0,11	-0,81	-1,26	-1,05	301,55649	63,77
60,0	91,0	19,6	0,2	15,2	689,7	71,9	98,3	797,9	276,9	297,7	277,6	218,0	0,19	72,4	71,5	83,2	0,19	72,68	72,32	82,71	0,19	73,22	73,87	83,67	0,07	0,11	-0,77	-1,25	-1,05	303,61827	63,98
61,0	92,0	19,3	0,2	15,4	692,7	71,7	98,4	806,7	276,3	300,1	278,5	218,6	0,00	72,1	71,5	82,7	0,19	72,69	72,37	82,46	0,19	73,25	74,07	83,71	0,07	0,11	0,11	-1,25	-1,06	306,06846	63,97
62,0	93,0	19,1	0,2	15,5	694,4	71,8	98,7	814,0	275,9	302,5	279,0	218,9	0,00	71,9	71,5	82,4	0,19	72,70	72,41	82,24	0,19	73,33	74,42	83,71	0,07	0,11	0,11	-1,25	-1,05	308,06719	63,99
63,0	94,0	18,8	0,2	15,5	694,6	72,0	98,3	818,0	275,6	304,6	279,6	220,2	0,00	71,8	71,5	82,1	0,19	72,79	72,48	82,13	0,19	73,42	74,76	83,70	0,07	0,11	0,11	-1,25	-1,06	309,60597	64,03
64,0	95,0	18,6	0,2	15,4	690,2	71,7	98,3	819,7	275,3	307,0	280,5	221,3	0,00	71,7	71,5	81,8	0,19	72,80	72,53	82,15	0,19	73,48	75,03	83,69	0,07	0,11	0,10	-1,25	-1,05	310,7632	63,95
65,0	96,0	18,3	0,2	15,3	685,9	71,7	98,4	819,3	275,3	309,2	281,6	221,3	0,00	71,6	71,5	81,6	0,19	72,75	72,55	82,01	0,19	73,45	75,24	83,67	0,07	0,11	0,10	-1,25	-1,05	311,35723	63,83
66,0	97,0	18,0	0,2	15,2	683,7	71,8	97,8	818,8	275,4	311,5	282,5	222,4	0,00	71,6	71,5	81,3	0,19	72,72	72,56	81,88	0,19	73,43	75,39	83,61	0,07	0,11	0,05	-1,24	-1,05	312,10863	63,58
67,0	98,0	17,8	0,2	15,1	681,2	71,5	98,4	817,1	275,6	313,7	283,8	222,8	0,00	71,5	71,5	81,1	0,19	72,70	72,58	81,82	0,19	73,42	75,56	83,64	0,07	0,11	0,10	-1,24	-1,05	312,62464	63,64
68,0	99,0	17,6	0,2	15,1	681,6	71,8	96,7	816,5	275,9	315,8	284,8	223,7	0,00	71,5	71,5	80,8	0,19	72,79	72,64	81,79	0,19	73,46	75,71	83,61	0,08	0,11	0,09	-1,24	-1,06	313,34498	63,54
69,0	100,0	17,3	0,2	15,0	683,2	71,8	96,9	815,8	276,2	318,2	286,3	224,7	0,00	71,4	71,5	80,6	0,19	72,85	72,66	81,76	0,19	73,54	75,88	83,59	0,07	0,11	0,09	-1,24	-1,05	314,25618	63,46
70,0	101,0	17,1	0,2	15,2	686,4	71,9	97,7	817,9	276,7	320,6	287,0	226,1	0,00	71,4	71,5	80,4	0,19	73,00	72,72	81,71	0,19	73,61	75,98	83,61	0,07	0,11	0,09	-1,24	-1,05	315,66343	63,62
71,0	102,0	16,8	0,3	15,3	689,3	72,0	97,1	820,8	277,2	323,2	288,3	227,7	0,00	71,4	71,5	80,2	0,19	73,02	72,79	81,75	0,19	73,67	76,13	83,65	0,07	0,11	0,09	-1,24	-1,05	317,44349	63,49
72,0	103,0	16,5	0,3	15,3	688,4	71,7	98,4	823,0	277,9	326,0	290,0	229,6	0,00	71,4	71,6	81,8	0,19	73,05	72,83	81,72	0,19	73,72	76,27	83,67	0,07	0,11	0,09	-1,24	-1,04	319,29907	63,81
73,0	104,0	16,2	0,3	15,3	687,1	71,7	99,0	822,8	278,7	328,9	290,9	231,5	0,00	71,4	71,6	83,4	0,19	73,08	72,88	81,70	0,19	73,76	76,35	83,74	0,07	0,11	0,08	-1,24	-1,05	320,56852	64,28
74,0	105,0	16,0	0,3	15,2	685,0	71,8	98,7	821,7	279,7	331,7	291,8	233,0	0,00	71,4	71,6	84,5	0,19	73,05	72,92	81,68	0,19	73,77	76,45	83,74	0,07	0,11	0,09	-1,23	-1,04	321,5918	63,94
75,0	106,0	15,8	0,3	15,3	684,7	71,9	98,4	822,5	281,1	334,7	293,2	234,1	0,00	71,3	71,6	84,4	0,19	73,00	72,92	81,71	0,19	73,78	76,51	83,75	0,07	0,11	0,04	-1,23	-1,04	323,13697	63,83
76,0	107,0	15,6	0,3	15,3	684,8	72,0	98,4	822,4	282,6	337,9	293,2	234,8	0,00	71,3	71,6	84,1	0,19	73,09	72,96	81,73	0,19	73,84	76,57	83,78	0,07	0,11	0,08	-1,23	-1,05	324,20718	63,73
77,0	108,0	15,3	0,3	15,2	684,9	71,9	98,5	822,6	284,4	341,3	295,1	235,5	0,00	71,3	71,6	83,7	0,19	73,08	72,97	81,75	0,19	73,86	76,63	83,83	0,07	0,11	0,08	-1,23	-1,04	325,82214	63,57
78,0	109,0	15,1	0,3	15,2	683,6	71,8	98,3	820,8	286,4	344,3	296,3	238,1	0,00	71,3	71,6	83,3	0,19	73,06	73,01	81,79

121,0	152,0	7,3	0,3	10,7	548,6	72,1	91,2	644,9	406,4	394,6	335,4	363,6	0,00	71,7	72,2	81,1	0,19	73,53	74,00	82,36	0,19	74,34	78,00	82,49	0,07	0,09	0,07	-1,22	-1,05	358,99243	59,97
122,0	153,0	7,2	0,3	10,5	543,0	72,0	90,2	639,9	407,9	393,1	335,3	369,9	0,00	71,6	72,1	80,9	0,19	73,44	73,97	82,16	0,19	74,27	77,97	82,42	0,07	0,09	0,07	-1,21	-1,04	359,20844	59,72
123,0	154,0	7,2	0,3	10,4	538,5	71,8	90,8	633,4	409,2	391,9	337,2	369,3	0,00	71,6	72,1	80,7	0,19	73,34	73,92	81,98	0,19	74,21	77,94	82,40	0,07	0,09	0,02	-1,22	-1,04	358,18946	59,71
124,0	155,0	7,0	0,3	10,4	535,7	71,7	90,5	628,6	410,8	390,4	338,7	375,6	0,00	71,6	72,1	80,5	0,19	73,27	73,88	81,84	0,19	74,15	77,91	82,34	0,07	0,09	0,07	-1,21	-1,04	358,85126	59,65
125,0	156,0	7,0	0,3	10,3	533,8	71,8	90,3	625,1	412,2	389,3	339,8	376,9	0,00	71,6	72,1	80,3	0,19	73,36	73,90	81,69	0,19	74,16	77,92	82,29	0,07	0,09	0,07	-1,21	-1,05	358,64558	59,64
126,0	157,0	6,8	0,2	10,5	532,6	71,9	90,2	620,1	413,9	387,8	341,8	382,0	0,00	71,6	72,1	81,5	0,19	73,38	73,91	81,51	0,19	74,15	77,93	82,24	0,07	0,09	0,07	-1,21	-1,05	359,14855	59,94
127,0	158,0	6,7	0,2	10,7	532,4	72,0	90,5	617,3	415,7	387,3	343,8	380,2	0,00	71,6	72,0	83,5	0,19	73,39	73,88	81,84	0,19	74,13	77,98	82,14	0,07	0,09	0,07	-1,22	-1,05	358,90131	60,07
128,0	159,0	6,6	0,2	10,6	532,1	72,0	89,9	614,6	417,3	386,1	344,6	389,3	0,00	71,5	72,0	84,5	0,19	73,47	73,88	85,45	0,19	74,22	78,00	82,09	0,07	0,09	0,06	-1,22	-1,05	360,39827	59,79
129,0	160,0	6,5	0,2	10,6	529,5	72,1	89,3	611,3	419,2	385,0	345,2	394,5	0,00	71,5	72,0	84,3	0,19	73,48	73,89	86,29	0,19	74,21	78,04	82,02	0,07	0,09	0,06	-1,22	-1,05	361,05493	59,43
130,0	161,0	6,4	0,2	10,6	527,9	71,7	90,2	607,0	421,1	384,9	347,5	392,0	0,00	71,5	72,0	83,9	0,19	73,40	73,85	85,74	0,19	74,12	77,99	81,99	0,07	0,09	0,07	-1,23	-1,06	360,52247	59,52
131,0	162,0	6,3	0,2	10,5	527,0	71,7	90,2	604,0	423,0	384,4	348,7	394,2	0,00	71,5	71,9	83,6	0,19	73,22	73,82	85,16	0,19	74,00	77,96	81,99	0,08	0,09	0,07	-1,22	-1,04	360,86285	59,42
132,0	163,0	6,2	0,2	10,5	525,8	71,6	90,1	601,9	425,3	384,3	350,4	396,4	0,00	71,4	71,9	83,3	0,19	73,04	73,77	84,67	0,19	73,85	77,89	81,96	0,07	0,09	0,07	-1,22	-1,05	361,68388	59,31
133,0	164,0	6,1	0,2	10,5	523,9	71,6	89,5	600,6	427,4	384,1	351,2	400,3	0,00	71,4	71,8	82,9	0,19	72,95	73,71	84,16	0,19	73,76	77,84	81,93	0,07	0,09	0,07	-1,23	-1,06	362,74497	59,13
134,0	165,0	6,0	0,2	10,5	523,9	71,4	89,2	598,6	429,8	384,2	352,6	403,7	0,00	71,3	71,8	82,6	0,19	72,90	73,66	83,72	0,19	73,72	77,82	81,83	0,07	0,09	0,07	-1,22	-1,05	363,81012	59,06
135,0	166,0	5,9	0,2	10,5	523,2	71,8	88,9	597,7	431,8	384,1	353,2	409,6	0,00	71,3	71,8	82,3	0,19	72,91	73,65	83,35	0,19	73,72	77,80	81,78	0,07	0,09	0,07	-1,23	-1,06	365,28674	59,04
136,0	167,0	5,8	0,2	10,5	521,2	71,7	89,0	596,1	434,4	384,0	354,4	415,8	0,00	71,3	71,7	82,0	0,19	72,92	73,61	83,02	0,19	73,71	77,79	81,70	0,08	0,09	0,02	-1,23	-1,06	366,93521	59,02
137,0	168,0	5,7	0,2	10,3	517,7	72,0	89,3	593,4	436,7	384,3	355,3	423,4	0,00	71,3	71,8	81,7	0,19	73,10	73,66	82,74	0,19	73,81	77,80	81,67	0,07	0,09	0,07	-1,23	-1,04	368,61403	59,00
138,0	169,0	5,7	0,2	10,2	515,0	71,9	88,6	590,5	438,6	384,7	356,2	422,8	0,00	71,3	71,8	81,4	0,19	73,13	73,66	82,43	0,19	73,84	77,83	81,59	0,07	0,09	0,08	-1,23	-1,06	368,57095	58,91
139,0	170,0	5,5	0,2	10,0	510,6	72,0	88,4	587,8	440,6	384,5	357,1	426,3	0,00	71,3	71,8	81,1	0,19	73,17	73,66	82,18	0,19	73,88	77,87	81,54	0,07	0,09	0,08	-1,23	-1,06	369,26803	58,92
140,0	171,0	5,5	0,2	9,9	506,8	71,9	89,1	583,1	442,8	384,7	358,4	429,9	0,01	71,3	71,9	80,9	0,19	73,33	73,71	81,91	0,19	73,98	77,76	81,47	0,07	0,09	-5,21	-1,23	-1,05	369,8036	58,80
141,0	172,0	5,4	0,2	9,9	502,6	71,9	89,0	579,7	444,6	384,6	359,4	433,6	0,00	71,7	72,0	######	0,19	73,31	73,73	81,70	0,19	73,96	77,55	81,43	0,07	0,09	0,10	-1,23	-1,06	370,40373	58,91
142,0	173,0	5,3	0,2	9,8	499,6	71,7	88,8	575,0	446,3	384,4	360,2	440,1	0,00	71,6	72,0	######	0,19	73,22	73,68	81,54	0,19	73,93	77,54	81,34	0,07	0,09	0,10	-1,23	-1,06	371,2186	58,80
143,0	174,0	5,2	0,2	9,6	494,5	71,7	88,0	569,2	448,3	384,1	361,2	437,7	0,00	71,5	71,9	######	0,19	73,09	73,65	81,37	0,19	73,87	77,57	81,28	0,07	0,09	0,08	-1,23	-1,06	370,11364	58,61
144,0	175,0	5,2	0,2	9,3	488,5	71,7	88,3	562,7	450,6	383,7	362,6	441,8	0,00	71,5	71,9	######	0,19	72,99	73,60	82,33	0,19	73,76	77,59	81,24	0,07	0,09	0,02	-1,23	-1,06	370,30093	58,55
145,0	176,0	5,1	0,2	9,1	481,6	71,6	87,8	556,8	452,8	383,4	363,5	444,4	0,00	71,4	71,9	######	0,19	72,89	73,57	85,62	0,19	73,65	77,59	81,17	0,08	0,09	0,08	-1,24	-1,06	370,20171	58,43
146,0	177,0	5,0	0,2	8,8	476,8	71,9	87,9	549,4	455,0	383,2	364,2	444,7	0,00	71,4	71,8	######	0,19	72,86	73,56	86,13	0,19	73,63	77,60	81,10	0,07	0,09	0,08	-1,24	-1,07	369,30191	58,39

SFBA EPA EMISSION RESULTS

Test Duration: **244** min

PRESSURE FACTOR:	DGM 1st hr	0,96646	
	DGM 1	0,95517	
	DGM 2	0,95808	
	DGM room	0,99338	
TEMPERATURE FACTORS	DGM 1st hr	0,98924	
	DGM 1	0,98670	
	DGM 2	0,98305	
	DGM room	0,98964	
VOLUMES SAMPLED	DGM 1st hr	11,511	SCft
	DGM 1	46,001	SCft
	DGM 2	46,598	Scft
	DGM room	47,694	SCft

TOTAL TUNNEL VOLUME : 180043

SAMPLE RATIOS

Sample Train 1st Hr:	3846,135
Sample Train 1:	3913,879
Sample Train 2:	3863,762

Paticulate concentration

Sample Train 1st Hr	**0,000217**	g/dscf
Sample Train 1	**0,000065**	g/dscf
Sample Train 2	**0,000067**	g/dscf
Room	**0,000002**	g/dscf

TOTAL EMISSIONS

Sample Train 1st Hr	**9,52**	g
Sample Train 1	**11,36**	g
Sample Train 2	**11,60**	g

EMISSION RATES

Sample Train 1st Hr	**9,52**	g/hr
Sample Train 1	**2,79**	g/hr
Sample Train 2	**2,85**	g/hr

	Train 1	Train 2	Train 1st Hr
Cs	6,522E-05	6,6527E-05	0,0002172

RESULTS

Average emission rate: 2,82 g/hr

Burn Rate : 2,580 Dry kg/hr

BAROMETRIC PRESSURE

Average:	29,72193381	in Hg
Start:	29,7662288	in Hg
End:	29,67763883	in Hg

DGM CONTROLLER VALUES

DGM 1st hr	Final:	3265,610	Cuft
	Initial:	3253,570	Cuft
DGM 1	Final:	13722,400	Cuft
	Initial:	13672,897	Cuft
DGM 2	Final:	4922,803	Cuft
	Initial:	4873,818	Cuft
DGM Room	Final:	28508,065	Cuft
	Initial:	28459,011	Cuft

TEMPERATURES

DGM 1st hr	533,744	°R
DGM 1	535,119	°R
DGM 2	537,102	°R

CALIBRATION FACTORS

DGM 1st Hr	1,0000
DGM 1	0,9860
DGM 2	1,0100
DGM Room	0,9890

TUNNEL FLOW RATE: 737,882 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	3,00	mg
Total Sample Train 2:	3,10	mg
Total Sample Train 1 1st hour:	2,50	mg

TUNNEL FLOW RATE: 737,882 Dscfm

DEVIATION: 1,03%

*		*	*	*	*1	*2	*3	*4	*5	*6	*7	*8	Mass flow	DGM 1st hour	DGM 1st hour	Filter	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft				Change in	T wet bulb
Elapsed		Weight			Flue	Room	Tunnel		Unit	Unit	Unit	Unit	Reading	1st hour	1st hour	1st hour	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure	Filter 1st hr	Filter 1	Filter 2	Surface	
Time	Raw data row	Remaining	CO	CO_2	Gas	Temp	Dry Bulb	Top	Back	R.Side	L.Side	Bottom	1st hour	Inlet T	Outlet T	Temp									in wc	in wc				Temp.	
min		lbs	%	%	°F	°F	°F	°F	°F	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc	in. Hg	in. Hg	in. Hg	°F	oF
0,00	206,00	24,4	0,5	3,1	295,1	71,7	94,8	360,6	450,8	380,0	368,7	490,4	0,19	71,0	71,2	84,0	0,23	71,84	73,14	86,49	0,19	73,73	74,45	83,72	0,07	0,04	-0,82	-1,21	-1,09	0	59,73
1,0	207,0	27,6	0,3	1,8	294,5	71,7	90,6	348,3	452,4	391,7	376,8	492,2	0,19	71,5	71,4	83,7	0,19	72,60	73,24	86,58	0,19	73,88	74,66	83,79	0,07	0,05	-0,75	-1,14	-1,01	2,0977052	60,00
2,0	208,0	25,5	0,2	1,4	272,3	72,1	96,4	334,2	454,2	399,1	382,6	498,4	0,19	71,8	71,5	84,0	0,19	72,90	73,30	86,21	0,19	73,87	74,74	84,17	0,07	0,06	-0,75	-1,14	-1,00	3,4885682	61,65
3,0	209,0	27,1	0,5	3,1	302,4	72,1	96,3	325,5	453,7	404,0	387,3	500,5	0,19	71,9	71,6	83,8	0,19	73,03	73,32	85,76	0,19	73,86	74,78	84,16	0,07	0,05	-0,75	-1,15	-1,00	3,9843628	61,92
4,0	210,0	26,8	0,3	3,2	346,7	72,2	102,3	319,2	453,2	407,5	390,1	502,8	0,19	72,0	71,6	84,1	0,19	73,16	73,37	85,25	0,19	73,84	74,83	84,49	0,07	0,07	-0,76	-1,16	-1,01	4,3497804	64,06
5,0	211,0	26,5	0,4	4,8	496,0	72,2	94,4	369,7	450,0	410,0	392,3	486,8	0,19	72,1	71,7	84,1	0,19	73,22	73,38	84,74	0,19	73,84	74,86	84,67	0,07	0,09	-0,75	-1,15	-1,01	11,548926	63,38
6,0	212,0	26,2	0,8	13,6	600,2	72,3	94,1	448,6	446,1	410,8	392,7	474,5	0,19	72,3	71,7	83,6	0,19	73,27	73,42	84,31	0,19	73,84	74,90	84,31	0,07	0,10	-0,80	-1,16	-1,02	24,325806	63,61
7,0	213,0	25,8	0,7	15,8	673,6	72,5	96,7	532,8	441,3	410,5	392,3	474,3	0,19	72,4	71,8	83,6	0,19	73,40	73,46	83,95	0,19	73,91	74,93	84,32	0,07	0,11	-0,75	-1,15	-1,02	40,056537	64,34
8,0	214,0	25,5	0,8	17,1	725,1	72,7	99,5	614,1	436,0	409,8	391,3	472,1	0,19	72,6	71,8	83,8	0,19	73,53	73,54	83,64	0,19	73,98	75,01	84,55	0,07	0,11	-0,76	-1,16	-1,02	54,45752	65,13
9,0	215,0	25,2	0,8	17,9	760,2	72,9	101,6	686,2	430,3	408,9	389,9	459,9	0,19	72,8	71,9	84,0	0,19	73,59	73,59	83,42	0,19	74,04	75,04	84,82	0,07	0,11	-0,76	-1,16	-1,02	64,837909	65,69
10,0	216,0	24,8	1,0	18,4	776,3	73,3	103,3	750,9	424,4	407,9	387,3	453,2	0,19	72,9	72,0	84,2	0,19	73,69	73,68	83,15	0,19	74,17	75,10	85,11	0,08	0,11	-0,76	-1,15	-1,02	74,536468	66,16
11,0	217,0	24,4	1,2	18,6	773,8	73,1	103,2	802,8	418,6	407,1	385,0	454,1	0,19	73,1	72,0	84,3	0,19	73,78	73,76	82,94	0,19	74,27	75,15	85,30	0,07	0,11	-0,76	-1,16	-1,03	83,312946	66,27
12,0	218,0	24,1	0,7	18,5	768,4	73,3	102,6	838,8	412,9	406,1	382,7	453,1	0,18	73,3	72,1	84,3	0,19	73,81	73,83	82,72	0,19	74,34	75,20	85,42	0,07	0,11	-0,77	-1,16	-1,01	88,527429	66,12
13,0	219,0	23,7	0,6	18,4	772,4	73,1	103,7	865,7	407,8	405,5	381,1	450,8	0,19	73,5	72,2	84,4	0,19	73,81	73,90	82,63	0,19	74,38	75,25	85,57	0,07	0,11	-0,76	-1,16	-1,01	91,884845	66,16
14,0	220,0	23,4	0,8	18,7	777,7	73,4	105,3	887,2	402,8	404,4	379,2	452,6	0,19	73,6	72,3	84,5	0,19	73,92	73,99	82,54	0,19	74,45	75,23	85,77	0,07	0,11	-0,76	-1,15	-1,03	95,035992	66,40
15,0	221,0	23,1	0,9	18,7	779,2	73,1	105,5	901,6	398,2	404,1	377,2	452,9	0,19	73,7	72,4	84,5	0,19	73,88	74,03	82,49	0,19	74,49	75,27	85,95	0,07	0,11	-0,77	-1,15	-1,02	96,591913	66,39
16,0	222,0	22,7	0,9	18,7	781,2	73,1	105,9	910,9	393,9	403,6	375,7	444,3	0,19	73,7	72,4	84,6	0,19	73,83	74,03	82,44	0,19	74,50	75,26	86,11	0,07	0,12	-0,78	-1,15	-1,02	95,478137	66,42
17,0	223,0	22,4	0,9	18,7	780,3	73,1	106,6	918,0	389,7	403,0	374,5	445,6	0,18	73,8	72,5	84,8	0,19	73,83	74,07	82,40	0,19	74,53	75,27	86,31	0,07	0,12	-0,77	-1,14	-1,02	95,934161	66,69
18,0	224,0	22,1	0,8	18,6	779,5	73,2	106,5	923,3	385,9	402,5	373,1	449,1	0,19	74,0	72,6	84,9	0,19	73,88	74,11	82,38	0,19	74,60	75,31	86,45	0,07	0,11	-0,78	-1,14	-1,01	96,59621	66,54
19,0	225,0	21,7	0,8	18,5	774,9	73,3	106,8	924,5	382,5	402,4	372,9	438,2	0,19	74,0	72,7	85,0	0,19	73,85	74,11	82,40	0,19	74,62	75,32	86,60	0,07	0,11	-0,78	-1,14	-1,03	93,8896224	66,60
20,0	226,0	21,4	0,7	18,4	768,9	73,4	105,6	924,6	379,2	402,4	372,4	438,9	0,19	73,9	72,7	85,0	0,19	73,83	74,12	82,39	0,19	74,62	75,36	86,70	0,07	0,11	-0,78	-1,14	-1,01	93,3116227	66,48
21,0	227,0	21,1	0,7	18,3	766,8	73,5	106,3	922,9	376,2	403,0	371,8	439,1	0,18	74,0	72,8	85,0	0,19	73,91	74,18	82,36	0,19	74,67	75,39	86,79	0,08	0,11	-0,78	-1,13	-1,01	92,414893	66,54
22,0	228,0	20,8	0,8	18,3	766,6	73,3	106,3	922,2	373,7	402,9	371,6	437,3	0,19	74,0	72,8	85,1	0,19	74,06	74,23	82,37	0,19	74,77	75,45	86,95	0,07	0,11	-0,78	-1,12	-1,01	91,325098	66,58
23,0	229,0	20,4	0,8	18,3	764,9	73,5	107,1	921,0	371,0	403,3	371,6	429,3	0,19	74,2	72,9	85,3	0,19	74,13	74,28	82,38	0,19	74,89	75,50	87,09	0,07	0,11	-0,78	-1,12	-1,01	89,018451	66,66
24,0	230,0	20,1	0,8	18,2	766,6	73,2	107,4	921,8	368,8	404,0	371,8	429,9	0,19	74,2	73,0	85,4	0,19	74,12	74,32	82,42	0,19	74,93	75,54	87,28	0,08	0,11	-0,79	-1,12	-1,01	89,035248	66,66
25,0	231,0	19,8	0,8	18,2	763,3	73,2	106,7	921,0	366,7	404,9	372,3	430,4	0,19	74,2	73,0	85,4	0,19	74,12	74,35	82,43	0,19	74,98	75,55	87,35	0,08	0,12	-0,79	-1,11	-1,02	88,857629	66,54
26,0	232,0	19,5	0,8	18,2	763,3	73,5	106,4	920,4	365,0	405,8	372,6	430,6	0,18	74,2	73,1	85,5	0,19	74,12	74,38	82,45	0,19	74,97	75,57	87,46	0,07	0,11	-0,79	-1,11	-1,00	88,691724	66,44
27,0	233,0	19,2	0,7	18,2	763,4	73,8	107,1	922,4	363,4	407,1	373,1	427,4	0,19	74,3	73,1	85,6	0,19	74,27	74,44	82,46	0,19	75,05	75,61	87,60	0,07	0,11	-0,80	-1,10	-1,00	88,476654	66,68
28,0	234,0	18,9	0,7	18,2	763,9	74,2	106,6	921,1	361,8	408,4	373,8	427,4	0,19	74,4	73,2	85,6	0,19	74,46	74,53	82,49	0,19	75,22	75,68	87,67	0,07	0,11	-0,79	-1,10	-1,00	88,288819	66,70
29,0	235,0	18,6	0,8	18,2	766,1	74,3	107,1	920,5	360,3	409,3	374,6	428,3	0,19	74,6	73,4	85,8	0,19	74,80	74,66	82,52	0,19	75,47	75,74	87,79	0,07	0,12	-0,80	-1,10	-0,99	88,422382	66,63
30,0	236,0	18,3	0,8	18,2	766,9	74,4	107,8	921,6	359,1	410,7	375,6	420,3	0,18	74,8	73,4	85,9	0,19	75,03	74,80	82,59	0,19	75,67	75,85	87,92	0,07	0,11	-0,81	-1,10	-1,00	87,266272	66,86
31,0	237,0	18,0	0,9	18,3	767,2	74,7	108,0	921,8	357,9	411,9	376,6	419,1	0,19	74,9	73,5	86,0	0,19	75,22	74,90	82,64	0,19	75,82	75,92	88,07	0,07	0,11	-0,85	-1,10	-1,00	87,259491	66,90
32,0	238,0	17,7	0,9	18,3	770,2	74,5	108,9	925,4	357,0	413,6	378,0	409,3	0,19	75,1	73,6	86,2	0,19	75,34	75,00	82,69	0,19	75,98	76,00	88,26	0,07	0,11	-0,81	-1,09	-1,00	86,465949	67,04
33,0	239,0	17,3	1,0	18,4	769,1	74,5	108,8	928,6	356,3	414,7	379,2	405,9	0,19	75,2	73,7	86,3	0,19	75,35	75,06	82,72	0,19	76,04	76,07	88,40	0,07	0,11	-0,81	-1,09	-1,01	86,760663	67,14
34,0	240,0	17,0	1,1	18,4	769,3	74,5	108,2	931,5	355,8	416,8	380,4	405,6	0,18	75,3	73,8	86,3	0,19	75,40	75,12	82,76	0,19	76,16	76,13	88,46	0,07	0,12	-0,82	-1,09	-1,00	87,810877	66,98
35,0	241,0	16,8	1,1	18,5	770,7	74,6	108,3	936,4	355,1	418,2	381,7	408,3	0,19	75,3	73,9	86,3	0,19	75,46	75,20	82,85	0,19	76,24	76,25	88,59	0,08	0,12	-0,82	-1,09	-0,99	89,709283	66,99
36,0	242,0	16,4	1,2	18,5	770,5	74,8	108,9	939,9	354,8	420,1	383,3	400,8	0,19	75,4	73,9	86,5	0,19	75,51	75,27	82,89	0,19	76,29	76,35	88,67	0,07	0,12	-0,82	-1,09	-1,00	89,561267	66,99
37,0	243,0	16,1	1,3	18,5	768,4	74,8	108,7	943,4	354,7	421,5	384,4	399,4	0,19	75,5	74,0	86,6	0,19	75,60	75,35	82,98	0,19	76,36	76,40	88,83	0,07	0,12	-0,83	-1,09	-1,00	90,48501	66,97
38,0	244,0	15,8	1,4	18,5	766,5	74,4	108,7	945,2	354,7	424,0	386,1	403,0	0,19	75,4	74,1	86,6	0,19	75,53	75,40	83,05	0,19	76,34	76,48	88,94	0,07	0,12	-0,83	-1,09	-0,99	92,404022	67,10
39,0	245,0	15,5	1,5	18,5	767,1	74,3	108,9	946,7	354,8	426,2	387,8	400,0	0,19	75,4	74,1	86,7	0,19	75,41	75,42	83,17	0,19	76,31	76,54	89,05	0,07	0,11	-0,84	-1,09	-1,01	92,889948	67,12
40,0	246,0	15,2	1,4	18,5	766,6	74,8	109,2	949,3	355,1	428,0	389,6	397,6	0,19	75,4	74,2	86,8	0,19	75,51	75,47	83,18	0,19	76,38	76,58	89,18	0,07	0,11	-0,84	-1,10	-1,01	93,741034	67,05
41,0	247,0	14,9	1,4	18,4	766,6	74,5	109,2	948,8	355,4	430,2	390,9	398,0	0,19	75,5	74,2	86,9	0,19	75,57	75,54	83,23	0,19	76,49	76,66	89,26	0,08	0,12	-0,89	-1,09	-1,01	94,447528	67,05
42,0	248,0	14,6	1,4	18,4	766,7	74,4	108,4	950,0	355,8	432,7	392,9	401,4	0,19	75,5	74,3	87,0	0,19	75,50	75,58	83,31	0,19	76,44	76,71	89,35	0,07	0,12	-0,84	-1,10	-1,02	96,368518	66,97
43,0	249,0	14,3	1,4	18,3	767,5	74,5	108,6	949,7	356,3	435,3	394,8	399,2	0,19	75,5	74,3	87,0	0,19	75,53	75,59	83,40	0,19	76,47	76,77	89,40	0,07	0,12	-0,86	-1,10	-1,00	96,856598	66,99
44,0	250,0	14,0	1,4	18,3	765,0	74,4	108,9	949,3	356,9	438,1	396,4	400,3	0,18	75,4	74,4	87,0	0,19	75,46	75,61	83,43	0,19	76,46	76,82	89,42	0,07	0,11	-0,86	-1,10	-1,00	97,990082	66,92
45,0	251,0	13,7	1,4	18,3	762,5	74,2	108,6	950,0	357,7	441,0	398,9	400,1	0,19	75,3	74,4	87,1	0,19	75,36	75,62	83,52	0,19	76,40	76,84	89,51	0,07	0,11	-0,87	-1,10	-1,02	99,344238	66,95
46,0	252,0	13,4	1,4	18,3	761,3	74,6	107,9	947,5	358,6	444,0	401,1	401,0	0,19	75,3	74,4	87,0	0,19	75,32	75,62	83,59	0,19	76,38	76,88	89,55	0,07	0,11	-0,88	-1,10	-1,01	100,23978	66,71
47,0	253,0	13,2	1,4	18,3	761,4	74,6	108,4	947,4	359,4	447,3	403,6	397,5	0,19	75,3	74,4	87,1	0,19	75,28	75,61	83,68	0,19	76,36	76,90	89,62	0,07	0,12	-0,88	-1,09	-1,03	100,84539	66,76
48,0	254,0	12,8	1,2	18,4	758,1	74,1	108,6	949,6	360,3	449,8	405,7	400,7	0,19	75,3	74,4	87,2	0,19	75,27	75,61	83,70	0,19	76,36	76,92	89,68	0,07	0,11	-0,88	-1,10	-1,02	103,01562	66,65
49,0	255,0	12,6	1,2	18,4	755,0	74,2	108,7	950,4	361,2	452,7	407,9	400,2	0,19	75,2	74,4	87,2	0,19	75,23	75,61	83,76	0,19	76,29	76,90	89,77	0,07	0,12	-0,88	-1,09	-1,03	104,26763	66,67
50,0	256,0	12,3	1,1	18,4	754,7	74,0	108,2	950,7	362,2	455,4	410,5	399,9	0,19	75,1	74,4	87,2	0,19	75,16	75,61	83,81	0,19	76,23	76,90	89,78	0,07	0,11	-0,89	-1,09	-1,03	105,55539	66,63
51,0	257,0	12,0	1,1	18,4	755,2	74,1	107,9	950,8	363,3	458,7	413,1	397,5	0,19	75,1	74,4	87,3	0,19	75,15	75,62	83,86	0,19	76,22	76,93	89,82	0,07	0,12	-0,89	-1,09	-1,02	106,4863	66,50
52,0	258,0	11,7	1,0	18,4	751,7	74,5	107,5	949,8	364,5	462,0	415,9	394,3	0,19	75,0	74,5	87,2	0,19	75,17	75,61	83,85	0,19	76,19	76,92	89,82	0,07	0,12	-0,90	-1,10	-1,02	107,09184	66,38
53,0	259,0	11,4	1,0	18,3	748,8	73,5	106,6	949,6	365,8	464,3	418,4	397,6	0,19	75,0	74,5	87,2	0,19	75,19	75,61	83,86	0,19	76,18	76,96	89,83	0,07	0,11	-0,90	-1,10	-1,03	108,9329	65,99
54,0	260,0	11,2	1,0	18,3	745,6	73,1	106,8	946,1	367,0	467,7	420,7	393,9	0,19	74,5	74,4	87,2	0,19	74,75	75,53	83,84	0,19	75,86	76,88	89,73	0,08	0,11	-0,91	-1,09	-1,01	108,8776	65,59
55,0	261,0	10,9	1,0	18,3	743,4	74,0	107,2	945,4	368,4	471,0	423,6	393,9	0,19	74,6	74,4	87,2	0,19	74,80	75,53	83,86	0,19	75,85	76,87	89,70	0,07	0,11	-0,91	-1,10	-1,03	110,26196	65,68
56,0	262,0	10,7	0,9	18,2	743,5	74,1	107,0	944,2	369,8	473,5	426,3	393,3	0,18	74,8	74,4	87,2	0,19	75,03	75,58	83,84	0,19	76,03	76,89	89,72	0,07	0,11	-0,47	-1,10	-1,04	111,19927	65,80
57,0	263,0	10,4	0,8	18,1	741,4	73,4	106,0	941,1	371,3	476,3	429,5	392,4	0,19	74,8	74,4	87,2	0,19	75,02	75,61	83,88	0,19	76,05	76,94	89,68	0,07	0,11	-0,43	-1,10	-1,03	111,90597	65,56
58,0	264,0	10,2	0,7	18,0	739,4	73,3	106,4	939,8	372,8	479,6	432,2	392,7	0,19	74,6	74,4	87,1	0,19	74,83	75,59	83,81	0,19	75,90	76,93	89,61	0,07	0,12	-0,92	-1,09	-1,02	113,21619	65,52
59,0	265,0	9,9	0,7	18,0	736,9	73,8	106,2	936,0	374,6	482,6	435,1	386,8	0,19	74,7	74,4	87,1	0,19	74,90	75,65	83,82	0,19	75,94	76,90	89,59	0,07	0,12	-0,92	-1,09	-1,04	112,82452	65,56
60,0	266,0	9,7	0,6	18,0	735,6	74,0	106,3	933,7	376,4	486,0	438,3	390,1	0,19	74,9	74,5	87,2	0,19	75,11	75,71	83,86	0,19	76,11	76,94	89,62	0,07	0,11	-0,92	-1,09	-1,03	114,70707	65,47
61,0	267,0	9,5	0,5	17,7	721,8	74,5	105,8	929,1	378,2	488,4	441,6	394,9	0,19	75,2	74,6		0,19	75,29	75,77	83,92	0,19	76,26	77,00	89,60	0,07	0,11	-0,93	-1,10	-1,04	116,23145	65,32
62,0	268,0	9,3	0,4	16,9	704,5	74,5	105,7	917,6	380,0	491,4	445,3	390,1	0,00	75,0	74,5		0,19	75,37	75,82	83,93	0,19	76,39	77,16	89,56	0,07	0,11	0,04	-1,09	-1,03	114,67266	65,21
63,0	269,0	9,1	0,3	16,7	696,5	74,3	105,2	906,3	382,1	494,4	449,3	386,6	0,00	74,7	74,4		0,19	75,42	75,88	83,97	0,19	76,49	77,51	89,56	0,07	0,11	0,04	-1,10	-1,04	113,54131	65,25
64,0	270,0	8,8	0,3	16,6	691,3	74,6	105,3	897,0	384,2	497,5	452,8	384,0	0,00	74,5	74,4		0,19	75,47	75,92	84,01	0,19	76,58	77,87	89,57	0,07	0,11	0,04	-1,10	-1,03	112,89581	65,20
65,0	271,0	8,6	0,3	16,5	688,7	74,5	105,1	891,1	386,3	500,1	456,4	380,7	0,00	74,3	74,4		0,19	75,43	75,95	83,98	0,19	76,58	78,14	89,55	0,07	0,11	0,04	-1,10	-1,04	112,74321	65,00
66,0	272,0	8,4	0,3	16,5	686,3	74,3	105,1	886,3	388,7	502,7	460,1	379,1	0,00	74,3	74,5		0,19	75,47	75,98	84,03	0,19	76,64	78,40	89,54	0,07	0,11	0,03	-1,10	-1,03	113,18622	65,05
67,0	273,0	8,3	0,3	16,4	683,9	74,5	104,2	882,8	391,2	505,3	463,9	381,8	0,00	74,2	74,5		0,19	75,54	76,02	84,03	0,19	76,70	78,63	89,53	0,07	0,11	0,03	-1,09	-1,05	114,81368	64,79
68,0	274,0	8,0	0,3	16,5	678,3	74,4	104,2	880,4	393,7	507,7	467,4	389,2	0,00	74,2	74,5		0,19	75,55	76,07	83,99	0,19	76,73	78,81	89,49	0,07	0,11	0,03	-1,10	-1,04	117,46957	64,78
69,0	275,0	7,8	0,3	16,3	672,8	74,7	104,0	876,0	396,4	510,1	470,9	388,2	0,00	74,1	74,5		0,19	75,51	76,08	84,03	0,19	76,69	78,94	89,49	0,07	0,11	0,03	-1,10	-1,04	118,10912	64,50
70,0	276,0	7,6	0,3	15,8	663,5	74,3	104,1	866,6	399,1	512,5	474,3	388,0	0,00	74,1	74,5		0,19	75,48	76,06	84,05	0,19	76,64	79,02	89,42	0,07	0,11	0,04	-1,10	-1,03	117,89377	64,32
71,0	277,0	7,5	0,2	15,4	654,4	74,2	103,7	855,9	402,0	514,8	478,1	390,7	0,00	74,0	74,4		0,19	75,43	76,05	84,03	0,19	76,59	79,11	89,38	0,08	0,11	-0,01	-1,10	-1,03	118,09178	64,19
72,0	278,0	7,3	0,2	15,1	649,3	73,9	102,7	846,3	404,9	516,5	481,0	394,5	0,00	73,9	74,4		0,19	75,36	76,05	84,00	0,19	76,57	79,16	89,30	0,07	0,11	0,03	-1,10	-1,04	118,46055	64,03
73,0	279,0	7,1	0,2	15,0	651,4	73,9	102,8	842,9	408,0	518,5	483,7	395,2	0,00	73,8	74,3		0,19	75,24	76,00	83,96	0,19	76,46	79,18	89,25	0,07	0,11	-0,01	-1,09	-1,04	119,55466	63,73
74,0	280,0	7,0	0,1	14,8	646,9	74,0	101,7	837,9	411,3	521,7	487,0	396,2	0,00	73,7	74,2		0,19	75,16	75,96	83,94	0,19	76,40	79,21	89,13	0,08	0,11	0,03	-1,09	-1,04	120,62638	63,50
75,0	281,0	6,9	0,1	14,6	641,3	73,7	102,1	832,4	414,3	523,2	489,7	396,4	0,00	73,7	74,2		0,19	75,17	75,94	83,93	0,19	76,40	79,23	89,08	0,07	0,11	0,03	-1,09	-1,03	120,97726	63,39
76,0	282,0	6,7	0,1	14,3	636,1	73,9	101,9	823,1	417,7	526,0	492,3	388,7	0,00	73,6	74,2		0,19	75,19	75,96	83,92	0,19	76,38	79,28	88,91	0,07	0,10	0,04	-1,10	-1,04	119,34507	63,40
77,0	283,0	6,6	0,2	14,1	629,7	73,5	100,8	816,5	421,1	527,4	495,0	393,3	0,00	73,5	74,1		0,19	75,20	75,96	83,89	0,19	76,37	79,28	88,86	0,08	0,10	0,04	-1,09	-1,04	120,46157	63,22
78,0	284,0	6,4	0,2	14,0	623,3	74,0	100,9	810,5	424,9	530,0	497,7	393,8	0,00	73,5	74,1		0,19	75,19	75,97	83,86	0,19	76,33	79,29	88,71	0,07	0,10	0,03	-1,09	-1,04	121,16531	63,18
79,0	285,0	6,3	0,2

121,0	327,0	3,1	0,6	8,2	432,6	73,0	91,9	510,8	571,3	567,0	518,1	450,2	0,00	73,2	73,9	0,19	74,76	75,86	82,07	0,19	75,82	79,60	84,97	0,07	0,08	0,03	-1,11	-1,05	113,27172	59,05
122,0	328,0	3,0	0,6	8,2	428,9	72,8	91,6	504,4	572,2	565,3	517,0	452,5	0,00	73,1	73,8	0,19	74,74	75,82	82,04	0,19	75,75	79,56	84,89	0,07	0,08	0,03	-1,12	-1,06	112,05516	58,96
123,0	329,0	3,0	0,7	8,1	424,9	72,8	91,4	498,0	573,2	563,1	515,9	454,1	0,00	73,1	73,8	0,19	74,69	75,81	82,00	0,19	75,70	79,52	84,80	0,08	0,08	0,03	-1,12	-1,05	110,65395	58,90
124,0	330,0	2,9	0,8	8,0	421,3	72,7	91,1	492,3	574,4	561,3	514,7	455,3	0,00	73,0	73,7	0,19	74,65	75,76	81,95	0,19	75,65	79,48	84,68	0,07	0,08	0,03	-1,12	-1,06	109,39747	58,82
125,0	331,0	2,9	0,8	8,0	417,5	72,9	90,8	487,5	575,3	559,6	514,1	456,4	0,00	73,0	73,7	0,19	74,65	75,71	81,89	0,19	75,63	79,42	84,62	0,08	0,08	0,03	-1,12	-1,05	108,35666	58,68
126,0	332,0	2,9	0,8	7,8	414,5	73,2	90,5	482,2	576,0	557,8	513,3	444,8	0,00	73,0	73,7	0,19	74,63	75,71	81,85	0,19	75,63	79,41	84,49	0,07	0,08	0,03	-1,12	-1,06	104,60989	58,68
127,0	333,0	2,9	0,5	7,4	411,0	73,3	90,3	477,2	577,1	555,2	512,7	439,4	0,00	73,0	73,7	0,19	74,71	75,71	81,75	0,19	75,67	79,39	84,43	0,07	0,08	0,03	-1,12	-1,05	102,11061	58,67
128,0	334,0	2,8	0,6	7,2	407,2	73,3	90,5	472,0	578,2	551,7	511,7	443,1	0,00	73,0	73,7	0,19	74,80	75,71	81,73	0,19	75,71	79,40	84,40	0,08	0,08	0,03	-1,12	-1,06	101,12142	58,74
129,0	335,0	2,8	0,7	7,1	403,0	73,6	90,3	467,6	578,7	549,2	510,9	438,4	0,00	73,0	73,8	0,19	74,91	75,72	81,68	0,19	75,77	79,45	84,32	0,07	0,08	0,03	-1,12	-1,05	98,743732	58,71
130,0	336,0	2,8	0,8	7,0	399,9	73,8	89,7	463,3	579,1	547,7	510,2	439,4	0,00	73,1	73,8	0,19	75,04	75,74	81,63	0,19	75,85	79,51	84,24	0,07	0,08	0,03	-1,12	-1,05	97,747107	58,71
131,0	337,0	2,7	0,7	6,7	395,4	73,8	89,4	457,6	579,3	544,9	509,4	443,0	0,00	73,1	73,8	0,19	75,16	75,77	82,86	0,19	75,93	79,57	84,13	0,07	0,08	0,03	-1,12	-1,06	96,641565	58,64
132,0	338,0	2,8	0,7	6,6	391,6	73,9	89,6	453,5	578,7	542,8	508,5	443,8	0,00	73,2	73,9	0,19	75,24	75,80	85,78	0,19	76,00	79,61	84,09	0,07	0,07	0,03	-1,13	-1,06	95,26994	58,52
133,0	339,0	2,7	0,8	6,6	388,4	73,9	89,5	449,6	578,0	541,1	507,6	443,1	0,00	73,2	73,9	0,19	75,30	75,83	86,94	0,19	76,07	79,66	84,00	0,07	0,07	0,02	-1,14	-1,06	93,659003	58,48
134,0	340,0	2,7	0,9	6,5	385,6	73,8	89,2	444,8	576,8	538,3	506,4	444,8	0,00	73,2	74,0	0,19	75,30	75,82	86,96	0,19	76,07	79,71	83,95	0,07	0,07	0,02	-1,13	-1,05	92,032501	58,44
135,0	341,0	2,6	1,0	6,4	382,8	73,9	89,2	440,1	575,5	536,0	504,9	443,7	0,00	73,3	74,0	0,19	75,35	75,85	86,70	0,19	76,11	79,72	83,89	0,07	0,07	0,03	-1,13	-1,06	89,834033	58,44
136,0	342,0	2,6	1,1	6,4	381,2	74,0	89,2	436,9	573,8	533,3	504,3	440,8	0,00	73,3	74,0	0,19	75,39	75,85	86,36	0,19	76,12	79,71	83,83	0,07	0,07	0,02	-1,13	-1,05	87,626154	58,47
137,0	343,0	2,6	1,1	6,4	378,9	74,0	89,3	432,2	572,1	531,0	502,9	442,2	0,00	73,4	74,1	0,19	75,51	75,89	86,05	0,19	76,19	79,74	83,82	0,07	0,07	0,03	-1,14	-1,06	85,898663	58,47
138,0	344,0	2,6	1,2	6,7	376,5	74,0	88,8	430,2	570,2	528,3	500,9	441,3	0,00	73,4	74,1	0,19	75,50	75,91	85,74	0,19	76,19	79,77	83,75	0,08	0,07	0,02	-1,14	-1,06	83,964514	58,41
139,0	345,0	2,5	1,3	6,7	375,0	73,9	88,7	426,3	568,2	526,1	498,8	439,4	0,00	73,4	74,1	0,19	75,48	75,92	85,35	0,19	76,17	79,79	83,66	0,07	0,07	0,03	-1,13	-1,05	81,572009	58,31
140,0	346,0	2,5	1,3	6,7	374,4	73,9	88,8	423,2	566,1	523,7	497,0	439,8	0,00	73,5	74,2	0,19	75,55	75,94	85,02	0,19	76,21	79,81	83,62	0,07	0,07	-0,01	-1,14	-1,07	79,751825	58,40
141,0	347,0	2,5	1,3	6,8	373,4	73,9	88,5	421,6	563,9	521,6	494,8	438,2	0,00	73,5	74,2	0,19	75,56	75,95	84,71	0,19	76,22	79,86	83,55	0,08	0,07	0,02	-1,14	-1,06	77,814276	58,27
142,0	348,0	2,4	1,3	6,7	372,3	74,0	88,5	417,8	561,9	519,6	492,4	437,7	0,00	73,5	74,2	0,19	75,58	75,97	84,42	0,19	76,22	79,86	83,51	0,07	0,07	0,03	-1,14	-1,07	75,660888	58,30
143,0	349,0	2,4	1,3	6,7	371,5	74,1	88,1	416,1	560,0	517,8	490,5	438,3	0,00	73,5	74,2	0,19	75,58	75,97	84,17	0,19	76,25	79,85	83,42	0,07	0,07	0,02	-1,14	-1,07	74,319037	58,19
144,0	350,0	2,4	1,3	6,7	369,6	73,8	88,0	413,6	558,1	515,7	488,1	443,2	0,00	73,5	74,2	0,19	75,61	75,99	83,92	0,19	76,23	79,90	83,36	0,07	0,07	0,02	-1,14	-1,07	73,537506	58,20
145,0	351,0	2,4	1,2	6,6	368,1	73,7	87,8	413,0	556,5	513,2	486,2	451,6	0,00	73,5	74,2	0,19	75,50	75,94	83,71	0,19	76,17	79,91	84,37	0,07	0,07	0,03	-1,15	-1,07	73,896008	58,15
146,0	352,0	2,3	1,3	6,6	366,1	73,3	88,1	409,1	555,0	511,3	483,8	457,2	0,00	73,5	74,2	0,19	75,29	75,92	83,52	0,19	76,05	79,91	83,29	0,07	0,07	0,03	-1,15	-1,07	73,079206	58,16
147,0	353,0	2,3	1,3	6,6	366,3	73,5	87,2	407,3	553,1	510,4	481,2	450,7	0,00	73,5	74,1	0,19	75,15	75,86	83,29	0,19	75,92	79,89	83,15	0,07	0,07	0,03	-1,15	-1,07	70,363525	57,95
148,0	354,0	2,2	1,3	6,6	365,5	73,3	87,3	407,1	551,4	508,3	479,0	456,5	0,00	73,5	74,1	0,19	75,16	75,84	83,08	0,19	75,89	79,87	83,03	0,07	0,07	0,03	-1,15	-1,05	70,277679	57,92
149,0	355,0	2,2	1,3	6,6	364,4	73,4	87,2	403,5	550,0	506,6	476,6	453,1	0,00	73,4	74,1	0,19	75,15	75,84	82,89	0,19	75,85	79,87	82,97	0,07	0,07	0,02	-1,15	-1,07	67,768445	57,81
150,0	356,0	2,2	1,3	6,6	363,6	73,3	87,6	401,9	548,7	505,0	474,9	456,2	0,00	73,4	74,0	0,19	75,09	75,82	82,70	0,19	75,85	79,85	82,94	0,07	0,07	0,03	-1,15	-1,06	67,145807	57,82
151,0	357,0	2,2	1,3	6,6	363,2	73,3	87,7	400,5	547,2	503,4	472,8	457,7	0,00	73,4	74,0	0,19	74,97	75,76	82,56	0,19	75,76	79,78	82,89	0,07	0,07	0,03	-1,15	-1,06	66,107471	57,83
152,0	358,0	2,1	1,3	6,6	363,3	73,2	87,5	398,7	545,7	501,9	470,6	457,1	0,00	73,3	74,0	0,19	74,91	75,70	82,40	0,19	75,70	79,75	82,85	0,08	0,07	0,02	-1,16	-1,07	64,576801	57,83
153,0	359,0	2,1	1,3	6,5	362,0	73,0	87,5	396,9	544,5	500,5	468,2	446,9	0,00	73,3	73,9	0,19	74,86	75,68	82,30	0,19	75,66	79,73	82,80	0,08	0,07	0,52	-1,16	-1,06	61,191693	57,84
154,0	360,0	2,1	1,2	6,5	361,1	73,1	86,8	396,2	543,2	498,7	466,6	452,0	0,00	73,3	73,9	0,19	74,88	75,67	82,14	0,19	75,64	79,72	82,72	0,07	0,07	0,02	-1,16	-1,07	61,11731	57,75
155,0	361,0	2,1	1,3	6,5	360,4	73,2	87,2	394,6	542,0	497,1	464,9	454,0	0,00	73,3	73,9	0,19	74,84	75,66	82,00	0,19	75,62	79,71	82,69	0,07	0,07	0,64	-1,16	-1,07	60,326324	57,84
156,0	362,0	2,1	1,2	6,6	360,5	73,3	87,2	392,6	540,7	495,5	462,9	449,4	0,00	73,3	73,9	0,19	74,85	75,64	81,90	0,19	75,62	79,71	82,65	0,07	0,07	0,02	-1,16	-1,07	58,025403	57,77
157,0	363,0	2,0	1,1	6,5	359,5	73,5	87,2	392,8	539,9	492,9	460,6	454,6	0,00	73,3	73,9	0,19	74,86	75,63	81,78	0,19	75,61	79,69	82,60	0,07	0,07	0,03	-1,17	-1,07	57,98432	57,85
158,0	364,0	2,0	1,1	6,6	359,0	73,4	87,4	390,3	538,8	491,2	458,9	455,5	0,00	73,2	73,9	0,19	74,84	75,61	81,62	0,19	75,60	79,71	82,54	0,07	0,07	0,03	-1,17	-1,06	56,73949	58,05
159,0	365,0	2,0	1,1	6,6	357,6	73,4	87,3	390,8	538,0	488,4	456,6	456,0	0,00	73,2	73,9	0,19	74,92	75,61	82,11	0,19	75,62	79,67	82,50	0,07	0,07	-0,01	-1,17	-1,09	55,56235	58,05
160,0	366,0	1,9	1,0	6,3	355,7	73,3	86,6	388,3	536,7	487,6	455,4	457,6	0,00	73,3	73,9	0,19	74,90	75,60	84,71	0,19	75,60	79,67	82,40	0,07	0,07	0,03	-1,17	-1,07	54,907904	57,81
161,0	367,0	1,9	1,0	6,2	353,6	73,6	86,7	387,0	536,0	486,6	453,8	459,3	0,00	73,3	73,9	0,19	75,02	75,64	86,63	0,19	75,71	79,71	82,34	0,07	0,07	0,03	-1,17	-1,08	54,34931	57,82
162,0	368,0	1,9	1,0	6,2	352,5	73,9	87,1	385,5	534,9	485,3	452,9	458,7	0,00	73,3	73,9	0,19	75,16	75,65	86,88	0,19	75,78	79,70	82,33	0,07	0,07	0,03	-1,17	-1,07	53,243805	57,87
163,0	369,0	1,9	1,0	6,2	351,3	73,8	87,3	384,1	533,9	484,1	451,5	453,0	0,00	73,3	74,0	0,19	75,23	75,72	86,67	0,19	75,86	79,70	82,33	0,08	0,07	0,02	-1,17	-1,08	51,998773	57,87
164,0	370,0	1,8	1,0	6,3	351,4	73,6	86,5	382,7	532,9	482,4	450,6	452,8	0,00	73,3	74,0	0,19	75,23	75,72	86,29	0,19	75,86	79,73	82,28	0,07	0,07	0,03	-1,17	-1,08	50,090918	57,70
165,0	371,0	1,8	1,0	6,3	350,5	73,9	86,8	381,3	532,0	480,6	449,4	448,8	0,00	73,3	74,0	0,19	75,20	75,70	85,88	0,19	75,85	79,73	82,26	0,07	0,07	0,03	-1,18	-1,08	48,23158	57,85
166,0	372,0	1,7	1,0	6,3	350,7	73,5	86,3	380,6	530,7	478,8	448,1	447,8	0,00	73,4	74,0	0,19	75,22	75,72	85,53	0,19	75,86	79,73	82,20	0,07	0,07	0,02	-1,18	-1,07	46,983978	57,67
167,0	373,0	1,7	1,0	6,3	350,0	73,4	86,7	379,4	529,8	477,2	446,7	445,9	0,00	73,4	74,0	0,19	75,09	75,71	85,20	0,19	75,77	79,71	82,11	0,07	0,07	0,03	-1,18	-1,08	45,584278	57,59
168,0	374,0	1,7	1,0	6,3	348,4	73,0	87,0	378,1	528,9	475,5	445,2	453,7	0,00	73,3	73,9	0,19	74,87	75,65	84,85	0,19	75,58	79,66	82,10	0,07	0,07	0,03	-1,18	-1,09	46,059192	57,58
169,0	375,0	1,6	1,0	6,3	348,6	72,8	86,5	378,2	527,5	474,1	444,6	455,0	0,00	73,3	73,9	0,19	74,74	75,58	84,48	0,19	75,47	79,61	82,05	0,07	0,07	0,03	-1,18	-1,08	45,681757	57,52
170,0	376,0	1,6	0,9	6,2	347,3	72,7	86,7	376,8	526,9	472,8	443,6	457,9	0,00	73,2	73,8	0,19	74,56	75,52	84,13	0,19	75,33	79,55	82,02	0,07	0,07	0,02	-1,19	-1,08	45,378839	57,55
171,0	377,0	1,6	0,9	6,2	347,5	72,7	86,8	376,8	525,6	471,8	442,7	458,3	0,00	73,2	73,7	0,19	74,42	75,46	83,81	0,19	75,19	79,51	82,01	0,07	0,07	0,03	-1,18	-1,08	44,825915	57,50
172,0	378,0	1,6	0,9	6,2	347,6	72,6	86,8	375,4	524,7	470,3	441,2	452,6	0,00	73,1	73,6	0,19	74,31	75,39	83,52	0,19	75,06	79,44	81,94	0,07	0,07	0,02	-1,18	-1,08	42,617627	57,33
173,0	379,0	1,6	0,8	6,1	345,8	72,1	86,7	374,3	523,6	468,9	440,5	456,2	0,00	73,0	73,6	0,19	74,18	75,33	83,26	0,19	74,94	79,39	81,91	0,07	0,07	0,03	-1,18	-1,08	42,513721	57,16
174,0	380,0	1,5	0,7	6,0	344,2	72,5	85,7	373,5	522,6	468,0	440,1	451,5	0,00	72,9	73,5	0,19	74,06	75,23	82,95	0,19	74,86	79,33	81,80	0,07	0,07	0,02	-1,18	-1,07	40,935675	56,99
175,0	381,0	1,5	0,7	6,0	343,2	72,3	85,9	372,5	522,0	466,7	439,3	449,5	0,00	72,8	73,4	0,19	74,04	75,17	82,70	0,19	74,84	79,27	81,71	0,08	0,07	0,03	-1,17	-1,08	39,792157	57,05
176,0	382,0	1,5	0,7	6,0	342,6	72,7	85,8	370,8	521,1	465,4	438,8	443,9	0,00	72,8	73,4	0,19	74,02	75,16	82,45	0,19	74,78	79,20	81,68	0,07	0,07	0,03	-1,17	-1,08	37,788739	57,07
177,0	383,0	1,4	0,7	6,0	341,9	72,7	85,9	370,2	520,5	463,5	438,1	451,3	0,00	72,8	73,3	0,19	74,01	75,15	82,21	0,19	74,79	79,17	81,66	0,07	0,07	0,02	-1,18	-1,08	38,508948	57,23
178,0	384,0	1,4	0,7	6,0	340,8	72,6	86,1	369,8	519,7	461,7	437,2	452,3	0,00	72,8	73,3	0,19	74,04	75,12	82,04	0,19	74,78	79,17	81,64	0,07	0,07	0,03	-1,17	-1,08	37,935864	57,36
179,0	385,0	1,4	0,7	6,0	340,4	72,4	86,1	369,0	519,0	460,4	436,5	454,4	0,00	72,7	73,3	0,19	74,01	75,06	81,87	0,19	74,72	79,14	81,61	0,07	0,07	0,03	-1,18	-1,09	37,657953	57,25
180,0	386,0	1,4	0,7	6,0	339,3	72,6	85,6	367,3	518,1	459,3	436,0	448,5	0,00	72,7	73,2	0,19	73,99	75,04	81,68	0,19	74,67	79,11	81,55	0,08	0,07	0,02	-1,18	-1,09	35,663696	57,02
181,0	387,0	1,3	0,7	5,9	338,5	72,6	85,5	366,3	517,5	457,8	435,5	444,9	0,00	72,6	73,2	0,19	74,05	75,02	81,51	0,19	74,69	79,09	81,53	0,07	0,07	0,03	-1,17	-1,08	34,190778	56,91
182,0	388,0	1,3	0,7	5,9	338,2	72,3	85,7	364,9	516,7	456,5	435,1	448,2	0,00	72,6	73,1	0,19	74,01	75,00	81,70	0,19	74,64	79,07	81,45	0,07	0,07	0,03	-1,19	-1,08	34,090942	57,00
183,0	389,0	1,3	0,7	5,9	337,2	72,8	85,5	363,9	515,8	453,6	433,1	448,9	0,00	72,5	73,1	0,19	74,03	74,99	84,32	0,19	74,62	79,03	81,42	0,07	0,07	0,02	-1,18	-1,08	32,844537	57,11
184,0	390,0	1,3	0,7	5,9	336,7	73,1	85,8	362,9	515,0	452,3	434,0	442,0	0,00	72,5	73,1	0,19	74,20	75,02	86,72	0,19	74,67	79,03	81,36	0,07	0,07	0,03	-1,18	-1,09	31,186175	57,27
185,0	391,0	1,3	0,7	5,8	335,8	73,0	85,9	361,1	514,5	452,4	433,5	441,9	0,00	72,6	73,1	0,19	74,25	75,01	87,01	0,19	74,76	79,03	81,39	0,07	0,07	-0,01	-1,18	-1,08	30,487469	57,27
186,0	392,0	1,2	0,7	5,8	335,4	73,1	85,3	360,4	514,0	451,2	433,0	444,7	0,00	72,6	73,2	0,19	74,29	75,01	86,71	0,19	74,81	79,06	81,37	0,07	0,06	0,03	-1,19	-1,09	30,456323	57,16
187,0	393,0	1,2	0,7	5,8	334,4	73,1	85,7	359,5	513,5	449,5	432,2	449,5	0,00	72,6	73,2	0,19	74,34	75,00	86,27	0,19	74,85	79,07	81,35	0,07	0,06	0,03	-1,18	-1,09	30,622577	57,29
188,0	394,0	1,2	0,6	5,7	333,2	73,2	85,7	358,2	512,8	448,3	432,0	441,7	0,00	72,7	73,2	0,19	74,37	75,01	85,83	0,19	74,91	79,08	81,33	0,07	0,07	0,03	-1,19	-1,09	28,366852	57,27
189,0	395,0	1,1	0,6	5,7	333,4	73,0	85,4	357,5	511,8	446,9	431,3	439,9	0,00	72,7	73,3	0,19	74,43	75,01	85,44	0,19	74,92	79,07	81,30	0,08	0,07	0,02	-1,19	-1,08	27,279309	57,25
190,0	396,0	1,1	0,7	5,8	333,4	73,4	85,5	357,1	510,9	445,4	430,8	442,2	0,00	72,8	73,3	0,19	74,52	75,05	84,92	0,19	75,00	79,11	81,27	0,08	0,07	0,02	-1,19	-1,09	27,073694	57,11
191,0	397,0	1,1	0,7	5,8	333,1	73,6	84,6	355,7	510,0	444,1	430,3	443,5	0,00	72,8	73,3	0,19	74,69	75,09	84,32	0,19	75,10	79,14	81,15	0,07	0,07	0,03	-1,19	-1,09	26,49328	56,89
192,0	398,0	1,1	0,7	5,5	331,6	73,5	84,5	355,3	509,1	442,5	429,8	445,9	0,00	72,8	73,4	0,19	74,71	75,13	83,72	0,19	75,16	79,15	81,06	0,08	0,07	0,03	-1,19	-1,08	26,335675	56,86
193,0	399,0	1,0	0,7	5,5	331,0	73,6	85,4	354,2	508,1	441,1	429,1	446,4	0,00	72,9	73,4	0,19	74,79	75,17	83,10	0,19	75,21	79,15	81,02	0,08	0,06	0,03	-1,19	-1,09	25,572296	56,92
194,0	400,0	1,0	0,7	5,5	330,3	73,6	85,0	352,4	507,3	439,6	428,7	438,1	0,00	72,9	73,5	0,19	74,87	75,21	82,62	0,19	75,27	79,17	80,99	0,08	0,06	0,03	-1,19	-1,09	23,003473	56,94
195,0	401,0	1,0	0,7	5,5	329,0	73,8	85,0	351,4	506,2	438,4	428,2	437,0	0,00	73,0	73,5	0,19	75,04	75,29	82,27	0,19	75,38	79,21	80,96	0,08	0,06	0,03	-1,19	-1,08	22,02757	56,93
196,0	402,0	1,0	0,7	5,5	328,3	73,6	85,0	351,2	505,4	436,7	427,7	443,3	0,00	73,0	73,6	0,19	75,02	75,30	81,95	0,19	75,38	79,23	80,94	0,07	0,06	0,03	-1,19	-1,09	22,649854	57,01
197,0	403,0	1,0	0,7	5,5	327,5	73,7	84,6	349,7	504,4	435,8	427,5	444,6	0,00	73,0	73,6	0,19	74,99	75,30	81,64	0,19	75,38	79,27	81,96	0,07	0,06	0,02	-1,19	-1,10	22,153284	57,37
198,0	404,0	1,0	0,6	5,5	326,5	73,5	85,1	348,8	503,2	435,1	426,9	438,4	0,00	73,1	73,6	0,19	74,92	75,27	81,40	0,19	75,36	79,29	84,25	0,07	0,06	0,03	-1,19	-1,10	20,28009	57,81
199,0	405,0	0,9	0,6	5,5	325,8	73,5	85,2	347,6	502,0	433,9	426,6	438,8	0,00	73,1	73,6	0,19	74,87	75,26	82,28	0,19	75,34	79,31	85,51	0,07	0,06	0,03	-1,19	-1,10	19,592688	57,47
200,0	406,0	0,9	0,6	5,5	324,3	73,4	85,4	346,7	501,0	433,4	426,0	433,1	0,00	73,1	73,6	0,19	74,84	75,24	85,24	0,19	75,32	79,35	85,64	0,07	0,06	0,03	-1,19	-1,10	17,854211	57,27
201,0	407,0	0,9	0,6	5,5	323,4	73,4	84,9	345,8	499,7	432,1	425,4	433,2	0,00	73,1	73,7	0,19	74,87	75,25	86,72	0,19	75,33	79,36	85,44	0,08	0,06	0,03	-1,19	-1,10	17,072607	57,15
202,0	408,0	0,8	0,6	5,4	322,9	73,3	84,8	345,3	498,9	431,3	424,7	437,0	0,00	73,1	73,6	0,19	74,84	75,23	86,70	0,19	75,31	79,38	85,22	0,07	0,06	0,03	-1,20	-1,11	17,228528	57,12
203,0	409,0	0,8	0,6	5,4	321,5	73,2	84,8	344,9	497,9	429,9	423,9	434,8	0,00	73,1	73,6	0,19	74,73	75,23	86,36	0,19	75,27	79,38	84,95	0,07	0,06	0,03	-1,19	-1,10	16,08252	57,03
204,0	410,0	0,8	0,6	5,4	320,5	73,4	84,9	343,9	496,9	428,8	423,2	432,8	0,00	73,1	73,6	0,19	74,74	75,19	86,00	0,19	75,27	79,36	84,81	0,07

Manufacturer: ENERCO
Model: WS110

Run: 2
Project #: PI 20350
Test Duration: 108 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses

	HHV	LHV
Eff	71,26%	76,68%
Comb Eff	98,88%	98,88%
HT Eff	72,07%	77,55%
Output	61 174	kJ/h
Burn Rate		kg/h
Grams CO	137	g
Input	85 846	kJ/h
MC wet	17,32	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,86
F_0
1,051

Overall Heating Efficiency: 71,26%
Combustion Efficiency: 98,88%
Heat Transfer Efficiency: 72,07%

Heat Output: 58 030 Btu/h
Heat Input: 81 435 Btu/h
Burn Duration: 1,80 h
Burn Rate: lb/h
Stack Temp: 615,2 Deg. F

Averages	0,20	12,77	0,71	20,24	7,36	323,62	22,12	98,8%	71,6%	70,8%
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	9,25	0,15	1,27	1304,6%	20,86	19,52	279,4	21,7	95,3%	-29,4%	-28,0%
1,00	9,11	0,11	3,59	437,6%	20,74	17,10	280,1	21,8	98,8%	44,6%	44,1%
2,00	8,98	0,07	5,08	285,7%	20,66	15,55	304,7	21,7	99,6%	53,8%	53,6%
3,00	8,84	0,30	12,95	49,9%	20,22	7,12	320,9	21,7	98,3%	73,1%	71,9%
4,00	8,75	0,19	13,81	41,9%	20,18	6,28	329,4	21,6	99,0%	73,5%	72,8%
5,00	8,62	0,21	13,92	40,6%	20,17	6,15	336,9	21,7	98,9%	73,2%	72,4%
6,00	8,52	0,17	13,95	40,6%	20,17	6,13	339,5	21,8	99,1%	73,1%	72,4%
7,00	8,43	0,15	13,89	41,5%	20,18	6,21	340,8	21,7	99,2%	73,0%	72,4%
8,00	8,30	0,13	14,01	40,4%	20,17	6,10	341,9	21,8	99,3%	73,1%	72,6%
9,00	8,20	0,13	13,97	40,9%	20,18	6,14	343,0	21,8	99,3%	73,0%	72,5%
10,00	8,07	0,13	13,95	41,0%	20,18	6,16	343,0	21,9	99,3%	72,9%	72,4%
11,00	7,98	0,13	14,09	39,7%	20,17	6,02	344,2	22,0	99,4%	73,0%	72,5%
12,00	7,86	0,12	14,16	39,1%	20,17	5,95	346,7	21,9	99,4%	72,9%	72,5%
13,00	7,75	0,12	14,55	35,5%	20,14	5,54	351,7	21,9	99,4%	73,0%	72,6%
14,00	7,61	0,13	14,78	33,2%	20,13	5,29	354,7	22,0	99,4%	73,1%	72,6%
15,00	7,52	0,14	14,66	34,2%	20,14	5,40	354,2	21,9	99,3%	73,0%	72,5%
16,00	7,39	0,14	14,50	35,8%	20,15	5,58	353,0	21,9	99,3%	72,9%	72,4%
17,00	7,30	0,14	14,30	37,6%	20,16	5,79	350,4	22,1	99,3%	72,9%	72,4%
18,00	7,20	0,13	14,09	39,7%	20,17	6,01	349,2	22,0	99,3%	72,7%	72,2%
19,00	7,07	0,14	14,04	40,0%	20,17	6,06	349,3	22,0	99,3%	72,7%	72,1%
20,00	6,98	0,17	14,27	37,6%	20,16	5,80	352,9	22,0	99,1%	72,7%	72,1%
21,00	6,84	0,19	14,55	34,7%	20,14	5,49	356,5	22,0	99,0%	72,8%	72,0%
22,00	6,71	0,23	14,86	31,6%	20,12	5,15	362,9	22,2	98,8%	72,7%	71,9%
23,00	6,61	0,22	15,21	28,7%	20,10	4,78	365,4	22,2	98,9%	72,9%	72,1%
24,00	6,48	0,22	15,39	27,3%	20,09	4,60	367,0	22,0	98,9%	73,0%	72,2%
25,00	6,39	0,22	15,47	26,6%	20,09	4,51	368,0	22,1	98,9%	73,0%	72,2%
26,00	6,25	0,21	15,47	26,7%	20,09	4,51	368,1	22,2	99,0%	73,0%	72,2%
27,00	6,16	0,21	15,39	27,3%	20,09	4,60	365,7	22,0	99,0%	73,0%	72,3%
28,00	6,03	0,20	15,27	28,4%	20,10	4,73	363,3	22,0	99,0%	73,1%	72,3%
29,00	5,89	0,20	15,16	29,3%	20,11	4,85	362,1	22,1	99,0%	73,0%	72,3%
30,00	5,80	0,20	15,14	29,5%	20,11	4,87	360,7	21,9	99,0%	73,1%	72,4%
31,00	5,70	0,20	15,09	29,9%	20,11	4,92	360,9	22,1	99,0%	73,0%	72,3%
32,00	5,57	0,24	14,99	30,4%	20,11	5,00	361,8	22,1	98,8%	72,9%	72,0%
33,00	5,48	0,25	15,18	28,8%	20,10	4,81	363,5	22,2	98,8%	73,0%	72,1%
34,00	5,34	0,29	15,29	27,5%	20,10	4,66	365,2	22,2	98,5%	73,0%	71,9%
35,00	5,21	0,32	15,32	27,0%	20,09	4,61	364,7	22,1	98,4%	73,0%	71,8%
36,00	5,09	0,32	15,28	27,4%	20,09	4,66	364,0	22,0	98,4%	73,0%	71,8%
37,00	4,98	0,31	15,21	28,0%	20,10	4,74	362,8	22,1	98,4%	73,0%	71,9%
38,00	4,89	0,30	15,26	27,6%	20,10	4,68	362,6	22,2	98,4%	73,1%	71,9%
39,00	4,80	0,30	15,26	27,7%	20,10	4,69	362,7	22,2	98,5%	73,1%	72,0%
40,00	4,66	0,29	15,24	27,9%	20,10	4,71	362,7	22,2	98,5%	73,1%	72,0%
41,00	4,57	0,28	15,17	28,5%	20,10	4,78	362,0	22,1	98,5%	73,0%	72,0%
42,00	4,44	0,41	15,18	27,4%	20,09	4,71	363,0	22,3	97,9%	73,0%	71,4%
43,00	4,30	0,43	15,27	26,5%	20,09	4,60	362,9	22,0	97,8%	73,0%	71,4%
44,00	4,21	0,41	15,25	26,8%	20,09	4,63	362,5	22,1	97,9%	73,1%	71,5%
45,00	4,12	0,38	15,25	27,0%	20,09	4,65	362,7	22,2	98,0%	73,1%	71,6%
46,00	3,98	0,35	15,26	27,2%	20,09	4,66	361,3	22,2	98,2%	73,1%	71,8%
47,00	3,89	0,29	15,22	28,0%	20,10	4,73	360,2	22,2	98,5%	73,2%	72,1%
48,00	3,76	0,26	15,22	28,3%	20,10	4,75	360,1	22,1	98,7%	73,2%	72,2%
49,00	3,67	0,26	15,28	27,8%	20,10	4,69	360,5	22,5	98,7%	73,2%	72,3%
50,00	3,57	0,27	15,35	27,1%	20,09	4,60	360,5	22,2	98,6%	73,3%	72,3%
51,00	3,48	0,30	15,31	27,3%	20,09	4,64	360,8	22,2	98,5%	73,2%	72,1%
52,00	3,35	0,32	15,35	26,8%	20,09	4,58	361,0	22,6	98,4%	73,3%	72,1%
53,00	3,26	0,34	15,32	26,8%	20,09	4,60	360,6	22,5	98,3%	73,2%	72,0%
54,00	3,12	0,33	15,29	27,2%	20,09	4,64	360,8	22,3	98,3%	73,2%	72,0%
55,00	3,08	0,27	15,31	27,5%	20,10	4,65	358,4	22,4	98,6%	73,4%	72,4%
56,00	2,94	0,20	15,01	30,7%	20,12	5,01	352,8	22,2	99,0%	73,4%	72,7%
57,00	2,85	0,17	14,53	35,1%	20,14	5,53	346,5	22,3	99,1%	73,3%	72,7%
58,00	2,76	0,16	14,12	39,1%	20,17	5,97	340,4	22,2	99,2%	73,3%	72,7%
59,00	2,67	0,14	13,75	43,0%	20,19	6,36	334,9	22,2	99,3%	73,2%	72,7%
60,00	2,58	0,13	13,37	47,1%	20,21	6,77	330,1	22,3	99,4%	73,1%	72,6%
61,00	2,53	0,12	13,09	50,3%	20,22	7,07	326,5	22,3	99,4%	73,0%	72,6%
62,00	2,44	0,11	12,83	53,5%	20,24	7,35	323,6	22,3	99,4%	72,9%	72,5%
63,00	2,35	0,12	12,64	55,8%	20,25	7,55	321,4	22,4	99,4%	72,8%	72,4%
64,00	2,30	0,12	12,56	56,7%	20,25	7,64	320,2	22,3	99,4%	72,8%	72,4%
65,00	2,21	0,12	12,45	58,0%	20,26	7,75	318,2	22,2	99,4%	72,8%	72,4%
66,00	2,12	0,12	12,26	60,5%	20,27	7,95	315,3	22,1	99,4%	72,7%	72,3%
67,00	2,08	0,12	12,04	63,4%	20,28	8,18	313,4	22,4	99,4%	72,6%	72,2%
68,00	1,99	0,12	11,92	65,1%	20,29	8,31	311,6	22,3	99,4%	72,6%	72,1%
69,00	1,94	0,12	11,79	66,7%	20,29	8,44	310,6	22,2	99,4%	72,5%	72,0%
70,00	1,85	0,12	11,78	67,0%	20,30	8,46	309,0	22,3	99,4%	72,6%	72,1%
71,00	1,80	0,12	11,81	66,5%	20,29	8,42	307,8	22,5	99,4%	72,7%	72,2%
72,00	1,71	0,13	11,84	65,9%	20,29	8,38	306,9	22,4	99,3%	72,8%	72,3%
73,00	1,67	0,12	11,77	67,0%	20,30	8,46	305,5	22,3	99,3%	72,8%	72,3%
74,00	1,62	0,13	11,63	68,9%	20,30	8,61	302,9	22,2	99,3%	72,8%	72,3%
75,00	1,53	0,14	11,35	72,9%	20,32	8,90	299,7	22,0	99,2%	72,6%	72,0%
76,00	1,49	0,14	11,09	76,9%	20,33	9,17	297,4	22,1	99,2%	72,4%	71,9%
77,00	1,44	0,11	10,84	81,4%	20,35	9,45	294,1	22,2	99,4%	72,3%	71,9%
78,00	1,40	0,10	10,79	82,3%	20,35	9,51	292,7	22,0	99,5%	72,3%	72,0%
79,00	1,34	0,12	10,82	81,6%	20,35	9,47	291,1	22,3	99,3%	72,5%	72,0%
80,00	1,26	0,15	10,84	80,8%	20,34	9,43	290,6	22,2	99,1%	72,5%	71,9%
81,00	1,21	0,19	10,86	79,8%	20,34	9,39	290,8	22,3	98,8%	72,6%	71,7%
82,00	1,17	0,22	10,82	80,0%	20,34	9,42	290,4	22,3	98,6%	72,5%	71,5%
83,00	1,12	0,27	10,82	79,1%	20,34	9,38	289,7	22,2	98,2%	72,6%	71,3%
84,00	1,03	0,28	10,69	81,0%	20,35	9,51	287,0	22,3	98,1%	72,6%	71,2%
85,00	0,99	0,29	10,49	84,3%	20,36	9,72	283,9	22,2	98,0%	72,5%	71,1%
86,00	0,99	0,28	10,43	85,5%	20,36	9,79	281,4	22,1	98,1%	72,6%	71,2%
87,00	0,90	0,26	10,38	86,6%	20,36	9,85	279,8	22,0	98,2%	72,6%	71,3%
88,00	0,90	0,27	10,34	87,1%	20,36	9,89	278,8	22,1	98,1%	72,6%	71,3%
89,00	0,81	0,23	10,49	85,1%	20,36	9,75	278,1	22,1	98,4%	72,9%	71,8%
90,00	0,76	0,21	10,65	82,8%	20,35	9,59	278,0	22,2	98,6%	73,1%	72,1%
91,00	0,71	0,20	10,64	83,1%	20,35	9,61	277,8	22,2	98,7%	73,1%	72,2%
92,00	0,67	0,19	10,57	84,5%	20,36	9,69	276,4	22,3	98,7%	73,1%	72,2%

93,00	0,62	0,17	10,56	85,1%	20,36	9,71	275,5	22,0	98,9%	73,2%	72,4%
94,00	0,58	0,16	10,51	86,2%	20,36	9,77	275,0	22,0	99,0%	73,1%	72,4%
95,00	0,53	0,16	10,50	86,3%	20,36	9,78	274,3	22,0	99,0%	73,2%	72,4%
96,00	0,49	0,18	10,47	86,5%	20,36	9,80	273,3	22,0	98,9%	73,2%	72,4%
97,00	0,44	0,18	10,49	86,2%	20,36	9,78	273,3	21,9	98,9%	73,2%	72,4%
98,00	0,40	0,18	10,49	86,1%	20,36	9,78	272,9	22,1	98,8%	73,3%	72,4%
99,00	0,35	0,18	10,46	86,7%	20,36	9,82	271,8	22,1	98,9%	73,3%	72,5%
100,00	0,31	0,17	10,29	89,9%	20,37	10,00	269,8	22,2	98,9%	73,2%	72,4%
101,00	0,30	0,18	10,16	92,1%	20,38	10,13	268,3	22,2	98,8%	73,1%	72,3%
102,00	0,22	0,20	10,00	94,7%	20,39	10,29	265,9	22,2	98,6%	73,1%	72,1%
103,00	0,22	0,22	9,93	95,8%	20,39	10,35	263,8	22,2	98,5%	73,1%	72,0%
104,00	0,17	0,22	9,86	97,0%	20,39	10,42	261,5	22,2	98,5%	73,2%	72,1%
105,00	0,12	0,23	9,75	99,1%	20,40	10,53	259,8	22,0	98,4%	73,1%	72,0%
106,00	0,08	0,22	9,58	102,7%	20,41	10,72	256,9	22,0	98,5%	73,1%	72,0%
107,00	0,08	0,21	9,31	108,6%	20,42	11,01	253,6	22,1	98,4%	72,9%	71,8%
108,00	0,03	0,21	9,06	114,3%	20,44	11,27	249,8	22,0	98,5%	72,8%	71,7%

Manufacturer: ENERCO
Model: WS110

Run: 2
Project #: PI 20350
Test Duration: 244 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses

	HHV	LHV
Eff	72,43%	77,94%
Comb Eff	96,45%	96,45%
HT Eff	75,10%	80,81%
Output	32 818	kJ/h
Burn Rate	2,24	kg/h
Grams CO	436	g
Input	45 307	kJ/h
MC wet	17,58	

Ultimate CO_2
$CO_{2\text{-ult}}$ 19,86
F_0
1,051

Overall Heating Efficiency: 72,43%
Combustion Efficiency: 96,45%
Heat Transfer Efficiency: 75,10%

Heat Output: 31 131 Btu/h
Heat Input: 42 978 Btu/h
Burn Duration: 4,07 h
Burn Rate: 4,94 lb/h
Stack Temp: 491,5 Deg. F

Averages	0,68	10,22	1,35	20,35	9,79	254,83	23,07	0,94	0,73	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	11,06	0,52	3,13	445,0%	20,74	17,36	146,2	22,1	89,6%	65,7%	58,9%
1,00	12,53	0,28	1,75	874,5%	20,83	18,93	145,8	22,1	91,0%	48,6%	44,2%
2,00	11,56	0,23	1,44	1092,8%	20,85	19,30	133,5	22,3	91,9%	45,1%	41,4%
3,00	12,29	0,54	3,14	439,4%	20,74	17,33	150,2	22,3	89,2%	65,1%	58,0%
4,00	12,17	0,27	3,17	477,3%	20,75	17,45	174,8	22,4	94,9%	60,4%	57,4%
5,00	12,02	0,45	4,83	276,5%	20,65	15,60	257,8	22,3	93,8%	58,8%	55,1%
6,00	11,88	0,84	13,59	37,6%	20,16	6,14	315,6	22,4	95,3%	73,9%	70,4%
7,00	11,70	0,73	15,83	19,9%	20,04	3,84	356,4	22,5	96,4%	73,7%	71,1%
8,00	11,56	0,77	17,09	11,2%	19,97	2,50	385,0	22,6	96,4%	73,3%	70,7%
9,00	11,43	0,83	17,93	5,9%	19,92	1,58	404,6	22,7	96,4%	73,0%	70,3%
10,00	11,25	0,98	18,41	2,5%	19,89	1,00	413,5	22,9	95,8%	72,9%	69,8%
11,00	11,06	1,24	18,64	-0,1%	19,86	0,60	412,1	22,8	94,8%	73,1%	69,3%
12,00	10,93	0,74	18,50	3,2%	19,90	1,03	409,1	23,0	96,8%	73,2%	70,9%
13,00	10,75	0,63	18,44	4,2%	19,91	1,15	411,3	22,8	97,3%	73,1%	71,1%
14,00	10,61	0,78	18,67	2,1%	19,89	0,83	414,3	23,0	96,7%	73,1%	70,6%
15,00	10,47	0,86	18,65	1,8%	19,88	0,80	415,1	22,8	96,3%	73,0%	70,3%
16,00	10,29	0,92	18,73	1,1%	19,87	0,68	416,2	22,8	96,1%	73,0%	70,2%
17,00	10,15	0,90	18,72	1,3%	19,88	0,71	415,7	22,8	96,2%	73,0%	70,2%
18,00	10,02	0,84	18,64	2,0%	19,88	0,82	415,3	22,9	96,4%	73,0%	70,4%
19,00	9,84	0,76	18,50	3,1%	19,90	1,01	412,7	22,9	96,7%	73,0%	70,7%
20,00	9,70	0,71	18,40	3,9%	19,90	1,15	409,4	23,0	96,9%	73,1%	70,9%
21,00	9,57	0,72	18,29	4,5%	19,91	1,25	408,2	23,1	96,8%	73,1%	70,8%
22,00	9,43	0,75	18,27	4,4%	19,91	1,26	408,1	22,9	96,7%	73,1%	70,7%
23,00	9,25	0,79	18,26	4,3%	19,91	1,26	407,2	23,0	96,6%	73,1%	70,6%
24,00	9,11	0,84	18,24	4,1%	19,91	1,25	408,1	22,9	96,3%	73,1%	70,4%
25,00	8,98	0,83	18,23	4,2%	19,91	1,26	406,3	22,9	96,4%	73,1%	70,5%
26,00	8,84	0,76	18,19	4,8%	19,91	1,34	406,3	23,0	96,7%	73,1%	70,7%
27,00	8,70	0,73	18,19	5,0%	19,91	1,36	406,3	23,2	96,8%	73,1%	70,8%
28,00	8,57	0,74	18,19	5,0%	19,91	1,36	406,6	23,4	96,8%	73,1%	70,8%
29,00	8,43	0,76	18,21	4,7%	19,91	1,32	407,9	23,5	96,7%	73,1%	70,7%
30,00	8,29	0,81	18,24	4,3%	19,91	1,27	408,3	23,5	96,5%	73,1%	70,5%
31,00	8,16	0,89	18,29	3,5%	19,90	1,16	408,4	23,7	96,1%	73,1%	70,3%
32,00	8,02	0,93	18,31	3,3%	19,90	1,13	410,1	23,6	96,0%	73,0%	70,1%
33,00	7,84	1,01	18,37	2,5%	19,89	1,01	409,5	23,6	95,7%	73,1%	69,9%
34,00	7,70	1,09	18,42	1,8%	19,88	0,92	409,7	23,6	95,4%	73,1%	69,7%
35,00	7,61	1,11	18,47	1,4%	19,88	0,85	410,4	23,7	95,3%	73,1%	69,6%
36,00	7,43	1,20	18,50	0,8%	19,87	0,77	410,3	23,8	94,9%	73,1%	69,4%
37,00	7,30	1,30	18,53	0,2%	19,86	0,68	409,1	23,8	94,6%	73,2%	69,2%
38,00	7,16	1,42	18,52	-0,4%	19,86	0,63	408,1	23,6	94,1%	73,2%	68,8%
39,00	7,02	1,46	18,50	-0,5%	19,86	0,62	408,4	23,5	93,9%	73,1%	68,7%
40,00	6,89	1,42	18,47	-0,1%	19,86	0,69	408,1	23,8	94,1%	73,1%	68,8%
41,00	6,75	1,38	18,42	0,3%	19,87	0,76	408,1	23,6	94,2%	73,1%	68,9%
42,00	6,61	1,43	18,39	0,2%	19,87	0,76	408,2	23,6	94,0%	73,1%	68,7%
43,00	6,48	1,45	18,30	0,6%	19,87	0,84	408,6	23,6	93,9%	73,0%	68,6%
44,00	6,34	1,42	18,32	0,6%	19,87	0,84	407,2	23,6	94,0%	73,1%	68,7%
45,00	6,21	1,41	18,29	0,9%	19,87	0,88	405,8	23,5	94,1%	73,1%	68,8%
46,00	6,07	1,39	18,29	1,0%	19,87	0,89	405,2	23,7	94,1%	73,2%	68,9%
47,00	5,98	1,35	18,33	0,9%	19,87	0,86	405,2	23,7	94,3%	73,2%	69,0%
48,00	5,80	1,24	18,42	1,0%	19,87	0,83	403,4	23,4	94,8%	73,3%	69,5%
49,00	5,71	1,19	18,44	1,2%	19,88	0,85	401,6	23,4	95,0%	73,4%	69,7%
50,00	5,57	1,13	18,41	1,7%	19,88	0,91	401,5	23,4	95,2%	73,4%	69,9%
51,00	5,43	1,07	18,42	1,9%	19,88	0,93	401,8	23,4	95,5%	73,5%	70,1%
52,00	5,30	1,00	18,37	2,5%	19,89	1,01	399,8	23,6	95,7%	73,5%	70,4%
53,00	5,17	0,98	18,34	2,8%	19,89	1,06	398,2	23,1	95,8%	73,6%	70,5%
54,00	5,07	1,00	18,29	3,0%	19,89	1,11	396,5	22,9	95,7%	73,6%	70,4%
55,00	4,94	0,98	18,25	3,3%	19,90	1,15	395,2	23,3	95,8%	73,7%	70,5%
56,00	4,84	0,89	18,19	4,1%	19,91	1,27	395,3	23,4	96,1%	73,6%	70,8%
57,00	4,71	0,80	18,09	5,1%	19,92	1,42	394,1	23,0	96,5%	73,6%	71,0%
58,00	4,62	0,69	18,03	6,1%	19,92	1,55	393,0	22,9	96,9%	73,6%	71,4%
59,00	4,48	0,67	17,96	6,6%	19,93	1,63	391,6	23,2	97,0%	73,7%	71,5%
60,00	4,39	0,64	17,96	6,8%	19,93	1,65	390,9	23,3	97,1%	73,7%	71,6%
61,00	4,30	0,49	17,68	9,3%	19,95	2,03	383,2	23,6	97,8%	73,9%	72,3%
62,00	4,21	0,35	16,92	15,0%	20,00	2,90	373,6	23,6	98,3%	73,9%	72,6%
63,00	4,12	0,32	16,67	16,9%	20,02	3,18	369,2	23,5	98,5%	73,9%	72,8%
64,00	3,98	0,32	16,57	17,6%	20,02	3,29	366,3	23,7	98,5%	74,0%	72,8%
65,00	3,92	0,33	16,50	18,0%	20,03	3,36	364,8	23,6	98,4%	74,0%	72,8%
66,00	3,81	0,34	16,51	17,9%	20,03	3,35	363,5	23,5	98,4%	74,1%	72,9%
67,00	3,76	0,34	16,44	18,3%	20,03	3,42	362,2	23,6	98,4%	74,1%	72,9%
68,00	3,62	0,32	16,46	18,4%	20,03	3,41	359,1	23,5	98,5%	74,2%	73,1%
69,00	3,53	0,33	16,33	19,2%	20,04	3,55	356,0	23,4	98,4%	74,3%	73,1%
70,00	3,44	0,30	15,85	23,0%	20,06	4,07	350,8	23,5	98,5%	74,2%	73,1%
71,00	3,39	0,25	15,41	26,9%	20,09	4,56	345,8	23,4	98,7%	74,1%	73,2%
72,00	3,30	0,23	15,15	29,2%	20,11	4,84	342,9	23,3	98,8%	74,0%	73,1%
73,00	3,22	0,19	15,01	30,7%	20,12	5,01	344,1	23,3	99,0%	73,9%	73,1%
74,00	3,16	0,14	14,81	32,8%	20,13	5,25	341,6	23,4	99,3%	73,8%	73,3%
75,00	3,12	0,14	14,56	35,1%	20,14	5,51	338,5	23,2	99,3%	73,8%	73,3%
76,00	3,03	0,14	14,28	37,7%	20,16	5,81	335,6	23,3	99,3%	73,7%	73,1%
77,00	2,98	0,15	14,10	39,4%	20,17	5,99	332,0	23,1	99,2%	73,7%	73,1%
78,00	2,89	0,16	13,97	40,6%	20,17	6,13	328,5	23,3	99,2%	73,8%	73,2%
79,00	2,85	0,16	13,81	42,3%	20,18	6,30	325,2	23,2	99,2%	73,8%	73,2%
80,00	2,80	0,16	13,63	44,1%	20,19	6,48	321,4	23,2	99,2%	73,8%	73,2%
81,00	2,71	0,16	13,50	45,4%	20,20	6,62	318,5	23,1	99,2%	73,9%	73,3%
82,00	2,67	0,17	13,36	46,9%	20,21	6,76	315,7	23,4	99,1%	73,9%	73,3%
83,00	2,62	0,16	13,13	49,4%	20,22	7,01	312,2	23,3	99,1%	73,9%	73,2%
84,00	2,57	0,16	13,00	50,9%	20,23	7,15	309,0	23,6	99,1%	74,0%	73,3%
85,00	2,49	0,16	12,85	52,7%	20,23	7,31	306,1	23,7	99,1%	74,0%	73,3%
86,00	2,44	0,17	12,74	53,9%	20,24	7,42	303,3	23,8	99,1%	74,0%	73,4%
87,00	2,39	0,17	12,62	55,3%	20,25	7,54	300,7	23,6	99,0%	74,1%	73,3%
88,00	2,35	0,18	12,51	56,6%	20,25	7,66	298,4	23,8	99,0%	74,1%	73,3%
89,00	2,30	0,19	12,45	57,2%	20,25	7,71	295,9	23,9	98,9%	74,2%	73,4%
90,00	2,26	0,20	12,35	58,2%	20,26	7,81	293,4	23,9	98,8%	74,2%	73,3%
91,00	2,21	0,21	12,27	59,1%	20,26	7,88	291,3	23,7	98,7%	74,3%	73,3%
92,00	2,17	0,23	12,24	59,3%	20,26	7,91	289,5	23,7	98,7%	74,3%	73,3%

93,00	2,12	0,24	12,15	60,3%	20,27	8,00	287,8	23,8	98,6%	74,3%	73,3%
94,00	2,08	0,26	12,06	61,2%	20,27	8,08	285,7	23,7	98,4%	74,4%	73,2%
95,00	2,03	0,28	11,97	62,1%	20,28	8,16	283,9	23,6	98,3%	74,4%	73,1%
96,00	1,98	0,31	11,99	61,5%	20,27	8,13	283,0	23,4	98,1%	74,4%	73,0%
97,00	1,94	0,30	11,84	63,6%	20,28	8,29	280,5	23,4	98,1%	74,4%	73,0%
98,00	1,90	0,32	11,54	67,5%	20,30	8,60	277,6	23,4	98,0%	74,3%	72,8%
99,00	1,89	0,33	11,28	71,2%	20,31	8,87	274,7	23,3	97,9%	74,1%	72,6%
100,00	1,86	0,32	11,16	72,9%	20,32	8,99	272,8	23,2	97,9%	74,1%	72,5%
101,00	1,85	0,33	11,06	74,2%	20,32	9,09	269,6	23,2	97,8%	74,2%	72,6%
102,00	1,80	0,34	10,77	78,8%	20,34	9,40	266,3	23,3	97,7%	74,1%	72,4%
103,00	1,76	0,30	10,63	81,8%	20,35	9,57	264,4	23,3	98,0%	74,0%	72,5%
104,00	1,76	0,27	10,49	84,7%	20,36	9,73	261,9	23,3	98,2%	74,0%	72,7%
105,00	1,71	0,27	10,42	85,9%	20,36	9,81	260,2	23,2	98,2%	74,1%	72,7%
106,00	1,71	0,29	10,39	86,0%	20,36	9,83	258,3	23,1	98,0%	74,1%	72,6%
107,00	1,67	0,30	10,37	86,1%	20,36	9,84	257,2	23,1	97,9%	74,2%	72,6%
108,00	1,62	0,29	10,28	87,9%	20,37	9,94	256,2	23,1	98,0%	74,1%	72,6%
109,00	1,62	0,21	10,51	85,4%	20,36	9,75	255,5	23,0	98,6%	74,5%	73,5%
110,00	1,58	0,19	10,36	88,2%	20,37	9,91	254,1	23,1	98,7%	74,4%	73,5%
111,00	1,53	0,18	10,22	90,9%	20,38	10,06	252,9	23,2	98,8%	74,3%	73,5%
112,00	1,53	0,19	9,98	95,3%	20,39	10,31	249,9	23,1	98,8%	74,2%	73,3%
113,00	1,53	0,20	9,57	103,3%	20,41	10,74	246,2	23,1	98,6%	73,9%	72,9%
114,00	1,49	0,24	9,28	108,6%	20,42	11,02	243,0	23,0	98,2%	73,7%	72,4%
115,00	1,49	0,26	9,19	110,4%	20,43	11,11	240,2	23,0	98,1%	73,8%	72,3%
116,00	1,49	0,28	8,87	116,9%	20,44	11,43	236,1	22,8	97,8%	73,6%	71,9%
117,00	1,44	0,30	8,74	119,7%	20,45	11,56	233,0	22,8	97,6%	73,6%	71,8%
118,00	1,44	0,35	8,71	119,3%	20,45	11,57	231,1	22,8	97,1%	73,7%	71,6%
119,00	1,42	0,42	8,54	121,6%	20,45	11,70	227,8	22,8	96,4%	73,7%	71,0%
120,00	1,39	0,50	8,27	126,5%	20,46	11,95	225,1	22,7	95,6%	73,4%	70,2%
121,00	1,39	0,57	8,18	126,9%	20,47	12,00	222,5	22,8	95,0%	73,4%	69,7%
122,00	1,35	0,64	8,15	126,0%	20,46	11,99	220,5	22,7	94,4%	73,5%	69,4%
123,00	1,35	0,71	8,07	126,1%	20,46	12,04	218,3	22,6	93,7%	73,6%	68,9%
124,00	1,32	0,78	8,00	126,1%	20,46	12,07	216,3	22,6	93,0%	73,6%	68,4%
125,00	1,30	0,80	7,96	126,8%	20,47	12,11	214,2	22,7	92,8%	73,7%	68,4%
126,00	1,30	0,81	7,81	130,5%	20,47	12,26	212,5	22,9	92,6%	73,6%	68,1%
127,00	1,30	0,52	7,42	150,1%	20,51	12,83	210,5	23,0	95,0%	73,1%	69,4%
128,00	1,28	0,58	7,19	155,6%	20,52	13,04	208,4	23,0	94,3%	72,8%	68,6%
129,00	1,26	0,70	7,06	156,1%	20,52	13,11	206,1	23,1	93,0%	72,7%	67,7%
130,00	1,26	0,78	6,99	155,6%	20,52	13,14	204,4	23,2	92,2%	72,7%	67,0%
131,00	1,21	0,74	6,75	165,2%	20,53	13,42	201,9	23,2	92,3%	72,4%	66,8%
132,00	1,26	0,72	6,57	172,3%	20,54	13,61	199,8	23,3	92,3%	72,2%	66,7%
133,00	1,21	0,81	6,55	170,0%	20,54	13,59	198,0	23,3	91,4%	72,4%	66,2%
134,00	1,21	0,89	6,49	169,2%	20,54	13,61	196,4	23,2	90,5%	72,3%	65,5%
135,00	1,17	1,01	6,40	167,9%	20,54	13,63	194,9	23,3	89,2%	72,3%	64,5%
136,00	1,17	1,08	6,45	163,8%	20,53	13,54	194,0	23,3	88,7%	72,5%	64,2%
137,00	1,17	1,13	6,45	162,2%	20,53	13,52	192,7	23,4	88,2%	72,6%	64,0%
138,00	1,17	1,20	6,67	152,3%	20,51	13,24	191,4	23,3	87,9%	73,2%	64,3%
139,00	1,12	1,25	6,70	149,8%	20,51	13,18	190,6	23,3	87,5%	73,3%	64,2%
140,00	1,12	1,26	6,74	148,4%	20,51	13,14	190,2	23,3	87,5%	73,4%	64,2%
141,00	1,12	1,28	6,77	146,9%	20,50	13,10	189,7	23,3	87,4%	73,5%	64,3%
142,00	1,08	1,25	6,74	148,5%	20,51	13,14	189,1	23,4	87,6%	73,6%	64,4%
143,00	1,08	1,25	6,73	148,7%	20,51	13,15	188,6	23,4	87,5%	73,6%	64,4%
144,00	1,08	1,26	6,73	148,8%	20,51	13,15	187,5	23,2	87,5%	73,7%	64,4%
145,00	1,08	1,24	6,59	153,9%	20,52	13,31	186,7	23,2	87,5%	73,4%	64,2%
146,00	1,03	1,25	6,55	154,4%	20,52	13,34	185,6	23,0	87,3%	73,5%	64,1%
147,00	1,03	1,26	6,57	153,6%	20,52	13,31	185,7	23,1	87,2%	73,5%	64,1%
148,00	0,99	1,26	6,55	154,2%	20,52	13,33	185,3	22,9	87,2%	73,5%	64,1%
149,00	1,02	1,26	6,55	154,1%	20,52	13,33	184,7	23,0	87,2%	73,5%	64,1%
150,00	0,99	1,26	6,57	153,6%	20,52	13,31	184,2	22,9	87,2%	73,6%	64,2%
151,00	0,99	1,27	6,64	151,1%	20,51	13,24	184,0	22,9	87,2%	73,8%	64,4%
152,00	0,94	1,26	6,55	154,2%	20,52	13,33	184,0	22,9	87,2%	73,6%	64,2%
153,00	0,94	1,25	6,54	155,0%	20,52	13,35	183,3	22,8	87,3%	73,6%	64,3%
154,00	0,94	1,24	6,50	156,5%	20,52	13,39	182,8	22,8	87,3%	73,6%	64,3%
155,00	0,94	1,25	6,54	155,0%	20,52	13,35	182,5	22,9	87,2%	73,7%	64,3%
156,00	0,94	1,16	6,56	157,4%	20,52	13,38	182,5	22,9	88,1%	73,8%	65,0%
157,00	0,90	1,12	6,54	159,1%	20,52	13,42	181,9	23,0	88,4%	73,8%	65,3%
158,00	0,90	1,12	6,58	158,1%	20,52	13,39	181,6	23,0	88,5%	73,9%	65,5%
159,00	0,90	1,13	6,58	157,8%	20,52	13,38	180,9	23,0	88,4%	74,0%	65,4%
160,00	0,85	1,02	6,26	172,9%	20,55	13,78	179,8	23,0	89,0%	73,5%	65,4%
161,00	0,85	0,98	6,18	177,4%	20,55	13,88	178,7	23,1	89,3%	73,4%	65,6%
162,00	0,85	0,98	6,23	175,8%	20,55	13,84	178,0	23,3	89,4%	73,6%	65,8%
163,00	0,85	0,99	6,25	174,5%	20,55	13,81	177,4	23,2	89,3%	73,7%	65,8%
164,00	0,80	1,00	6,27	173,5%	20,55	13,78	177,5	23,1	89,2%	73,7%	65,8%
165,00	0,80	0,99	6,28	173,2%	20,55	13,77	176,9	23,3	89,3%	73,8%	65,9%
166,00	0,76	0,98	6,31	172,4%	20,54	13,74	177,1	23,1	89,4%	73,9%	66,0%
167,00	0,76	0,97	6,33	172,2%	20,54	13,73	176,6	23,0	89,6%	74,0%	66,3%
168,00	0,76	0,96	6,33	172,4%	20,54	13,73	175,8	22,8	89,7%	74,0%	66,4%
169,00	0,71	0,95	6,33	172,6%	20,55	13,74	175,9	22,7	89,7%	74,0%	66,4%
170,00	0,72	0,93	6,25	176,8%	20,55	13,84	175,2	22,6	89,8%	73,9%	66,4%
171,00	0,71	0,93	6,25	176,9%	20,55	13,84	175,3	22,6	89,9%	73,9%	66,4%
172,00	0,71	0,91	6,23	178,4%	20,55	13,87	175,3	22,5	90,1%	73,8%	66,5%
173,00	0,71	0,80	6,06	189,7%	20,57	14,11	174,3	22,3	91,0%	73,5%	66,9%
174,00	0,67	0,72	6,02	194,8%	20,57	14,20	173,4	22,5	91,7%	73,6%	67,5%
175,00	0,67	0,70	6,01	195,9%	20,58	14,22	172,9	22,4	91,9%	73,6%	67,7%
176,00	0,67	0,70	6,01	196,2%	20,58	14,22	172,6	22,6	92,0%	73,7%	67,8%
177,00	0,62	0,70	6,01	196,0%	20,58	14,22	172,2	22,6	92,0%	73,7%	67,8%
178,00	0,62	0,69	5,99	197,2%	20,58	14,24	171,6	22,5	92,0%	73,7%	67,9%
179,00	0,62	0,69	5,99	197,0%	20,58	14,24	171,3	22,5	92,0%	73,8%	67,8%
180,00	0,62	0,70	5,98	197,6%	20,58	14,25	170,7	22,5	91,9%	73,8%	67,8%
181,00	0,58	0,70	5,93	199,9%	20,58	14,30	170,3	22,6	91,9%	73,7%	67,7%
182,00	0,58	0,67	5,88	203,2%	20,58	14,37	170,1	22,4	92,1%	73,6%	67,8%
183,00	0,58	0,67	5,86	204,1%	20,59	14,39	169,6	22,7	92,1%	73,7%	67,8%
184,00	0,58	0,67	5,86	204,1%	20,59	14,39	169,3	22,8	92,1%	73,7%	67,9%
185,00	0,58	0,66	5,83	205,9%	20,59	14,43	168,8	22,8	92,1%	73,7%	67,9%
186,00	0,53	0,66	5,83	206,0%	20,59	14,43	168,6	22,8	92,2%	73,7%	67,9%
187,00	0,53	0,66	5,82	206,4%	20,59	14,44	168,0	22,8	92,2%	73,8%	68,0%
188,00	0,53	0,64	5,69	213,6%	20,60	14,58	167,4	22,9	92,2%	73,5%	67,8%
189,00	0,49	0,64	5,73	211,8%	20,59	14,54	167,5	22,8	92,3%	73,6%	67,9%
190,00	0,49	0,65	5,81	207,3%	20,59	14,45	167,4	23,0	92,3%	73,8%	68,1%
191,00	0,49	0,65	5,79	208,2%	20,59	14,47	167,3	23,1	92,2%	73,8%	68,1%
192,00	0,49	0,67	5,53	220,5%	20,60	14,74	166,5	23,0	91,8%	73,2%	67,2%
193,00	0,46	0,67	5,50	222,1%	20,61	14,77	166,1	23,1	91,7%	73,2%	67,1%
194,00	0,47	0,66	5,48	223,3%	20,61	14,79	165,7	23,1	91,7%	73,2%	67,1%
195,00	0,44	0,66	5,50	222,5%	20,61	14,78	165,0	23,2	91,8%	73,3%	67,3%
196,00	0,44	0,66	5,50	222,8%	20,61	14,78	164,6	23,1	91,8%	73,3%	67,4%
197,00	0,44	0,65	5,49	223,2%	20,61	14,79	164,2	23,2	91,9%	73,4%	67,4%
198,00	0,44	0,64	5,48	224,2%	20,61	14,80	163,6	23,1	92,0%	73,4%	67,5%
199,00	0,40	0,65	5,52	222,3%	20,61	14,77	163,2	23,1	92,0%	73,5%	67,6%
200,00	0,40	0,65	5,48	224,2%	20,61	14,80	162,4	23,0	91,9%	73,5%	67,6%
201,00	0,40	0,64	5,45	226,0%	20,61	14,84	161,9	23,0	91,9%	73,5%	67,6%
202,00	0,38	0,63	5,43	227,7%	20,61	14,86	161,6	23,0	92,1%	73,5%	67,7%
203,00	0,35	0,62	5,43	228,2%	20,61	14,87	160,8	22,9	92,2%	73,6%	67,8%
204,00	0,35	0,61	5,43	228,8%	20,61	14,88	160,3	23,0	92,3%	73,7%	68,0%
205,00	0,35	0,61	5,42	229,7%	20,61	14,89	160,0	22,9	92,3%	73,6%	68,0%
206,00	0,35	0,60	5,37	232,6%	20,62	14,95	159,9	22,9	92,3%	73,5%	67,9%

207,00	0,30	0,59	5,32	236,1%	20,62	15,01	159,3	22,9	92,4%	73,5%	67,9%
208,00	0,30	0,58	5,29	238,7%	20,62	15,05	158,9	22,9	92,5%	73,4%	67,9%
209,00	0,30	0,57	5,25	241,1%	20,62	15,09	158,2	22,8	92,6%	73,4%	68,0%
210,00	0,30	0,56	5,27	240,6%	20,62	15,07	158,0	22,8	92,7%	73,5%	68,1%
211,00	0,26	0,56	5,25	241,8%	20,62	15,09	157,9	22,9	92,7%	73,5%	68,1%
212,00	0,26	0,56	5,25	241,7%	20,62	15,09	157,7	22,9	92,7%	73,5%	68,1%
213,00	0,26	0,56	5,22	243,9%	20,63	15,13	157,2	22,7	92,7%	73,4%	68,1%
214,00	0,26	0,55	5,22	244,0%	20,63	15,13	156,8	23,0	92,8%	73,5%	68,2%
215,00	0,22	0,55	5,20	245,5%	20,63	15,15	156,4	23,0	92,9%	73,5%	68,3%
216,00	0,21	0,54	5,17	247,7%	20,63	15,19	156,1	22,9	92,9%	73,4%	68,2%
217,00	0,21	0,54	5,15	249,0%	20,63	15,21	155,7	22,9	92,9%	73,5%	68,2%
218,00	0,21	0,52	5,02	258,4%	20,64	15,36	155,4	22,7	93,0%	73,1%	68,0%
219,00	0,21	0,51	5,01	259,9%	20,64	15,38	155,1	22,7	93,0%	73,1%	68,0%
220,00	0,17	0,51	4,99	260,9%	20,64	15,40	154,4	22,7	93,0%	73,1%	68,0%
221,00	0,17	0,51	4,99	260,9%	20,64	15,40	153,8	22,7	93,0%	73,2%	68,1%
222,00	0,17	0,51	4,94	264,2%	20,64	15,45	153,7	22,6	93,0%	73,0%	67,9%
223,00	0,17	0,51	4,89	267,6%	20,65	15,50	153,2	22,6	92,9%	73,0%	67,8%
224,00	0,17	0,51	4,91	266,5%	20,65	15,48	152,9	22,7	92,9%	73,0%	67,9%
225,00	0,12	0,52	4,91	266,2%	20,65	15,48	152,5	22,6	92,9%	73,1%	67,9%
226,00	0,12	0,52	4,89	267,3%	20,65	15,50	152,3	22,8	92,9%	73,1%	67,9%
227,00	0,12	0,53	4,91	265,5%	20,65	15,47	151,8	22,8	92,7%	73,2%	67,9%
228,00	0,12	0,53	4,89	266,7%	20,65	15,49	151,4	23,0	92,7%	73,2%	67,9%
229,00	0,12	0,53	4,91	265,5%	20,65	15,47	151,2	22,9	92,7%	73,3%	68,0%
230,00	0,12	0,52	4,86	269,4%	20,65	15,53	150,9	23,0	92,8%	73,2%	67,9%
231,00	0,12	0,51	4,89	267,9%	20,65	15,50	150,5	22,7	93,0%	73,3%	68,2%
232,00	0,08	0,51	4,86	270,0%	20,65	15,54	150,3	22,8	92,9%	73,2%	68,1%
233,00	0,08	0,51	4,82	272,2%	20,65	15,57	150,0	22,8	92,8%	73,2%	67,9%
234,00	0,03	0,51	4,84	271,1%	20,65	15,55	149,7	22,9	92,9%	73,3%	68,1%
235,00	0,03	0,53	4,87	267,8%	20,65	15,51	149,2	23,0	92,7%	73,5%	68,1%
236,00	0,03	0,51	4,61	287,9%	20,66	15,80	149,0	22,9	92,6%	72,6%	67,3%
237,00	0,03	0,51	4,54	293,3%	20,67	15,87	148,8	22,8	92,6%	72,4%	67,0%
238,00	0,03	0,51	4,53	294,4%	20,67	15,89	148,1	22,8	92,5%	72,5%	67,0%
239,00	0,03	0,51	4,53	294,1%	20,67	15,88	147,8	22,9	92,4%	72,5%	67,0%
240,00	0,03	0,51	4,51	295,4%	20,67	15,90	147,4	22,8	92,4%	72,5%	67,0%
241,00	0,03	0,51	4,51	295,5%	20,67	15,90	146,8	22,9	92,4%	72,6%	#DIV/0!
242,00	0,03	0,52	4,49	296,3%	20,67	15,92	146,3	23,0	92,3%	72,6%	#DIV/0!
243,00	0,03	0,52	4,49	296,5%	20,67	15,92	146,2	23,0	92,3%	72,6%	67,0%
244,00	0,00	0,53	4,48	297,0%	20,67	15,93	145,8	23,0	92,2%	72,6%	66,9%

APPENDIX 2: Proportionality results

Average	Average	Average	Average								Average	Average
16,31	Inlet +	Inlet +	Inlet +								0,264	-0,119
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	96,62	101,91	102,23	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	**Proportional Rates**			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st Hr	**PR1**	**PR2**				Time		negative val
Ft/Sec	Deg. R	Deg. R	Deg. R	**%**	**%**	**%**	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
15,971	529,6	530,4	531,2				0,186	0,187	0,195	0	0,2638201	0,1332997
15,840	529,6	530,5	531,0	96,50	102,12	102,54	0,186	0,187	0,195	1	0,260894	0,1239883
16,136	529,7	530,5	530,9	94,96	100,60	101,13	0,185	0,187	0,195	2	0,2652118	0,1241834
16,616	529,7	530,5	530,9	92,15	97,40	97,93	0,186	0,187	0,195	3	0,2733343	0,1208949
16,294	529,8	530,5	530,9	93,60	99,53	100,09	0,184	0,187	0,195	4	0,2676717	0,1156171
16,194	529,8	530,5	530,9	95,29	100,50	101,14	0,186	0,187	0,195	5	0,2657805	0,1239889
16,021	529,9	530,6	530,9	96,03	101,67	102,25	0,186	0,187	0,196	6	0,2628521	0,1260632
16,018	529,9	530,6	531,0	96,45	101,65	102,04	0,186	0,187	0,195	7	0,2628611	0,1260627
16,203	530,0	530,6	531,0	95,18	100,58	101,27	0,186	0,187	0,195	8	0,2657033	0,1260624
16,145	530,0	530,7	531,0	95,47	100,82	101,47	0,186	0,187	0,196	9	0,2647896	0,1260615
16,081	530,1	530,7	531,0	96,32	101,27	101,78	0,187	0,187	0,195	10	0,2637881	0,1260478
16,262	530,1	530,7	531,0	95,21	100,12	100,55	0,187	0,187	0,195	11	0,2667158	0,1239876
16,191	530,2	530,7	531,1	96,09	101,14	101,69	0,186	0,187	0,195	12	0,2647891	0,131235
16,159	530,2	530,7	531,1	95,90	101,76	102,19	0,185	0,187	0,195	13	0,2638204	0,1260526
16,341	530,3	530,8	531,1	95,57	100,60	101,54	0,186	0,187	0,195	14	0,2666065	0,1312357
16,068	530,4	530,8	531,2	97,19	102,41	103,35	0,186	0,187	0,196	15	0,2618806	0,1258341
15,967	530,4	530,9	531,2	97,65	103,48	104,31	0,185	0,187	0,196	16	0,2599104	0,1312339
16,205	530,5	531,0	531,3	97,19	102,65	103,46	0,186	0,187	0,196	17	0,262853	0,1239926
16,128	530,6	531,0	531,3	98,21	103,93	104,44	0,185	0,187	0,195	18	0,2607734	0,1260629
16,038	530,7	531,1	531,4	99,33	104,60	105,15	0,186	0,187	0,195	19	0,2589293	0,1260636
16,231	530,8	531,2	531,5	97,96	103,69	104,19	0,185	0,187	0,195	20	0,2618795	0,1281529
16,006	531,0	531,4	531,7	99,78	105,30	105,74	0,186	0,187	0,195	21	0,2579415	0,1240004
16,571	531,1	531,5	531,8	96,43	101,99	102,58	0,185	0,187	0,195	22	0,2667596	0,1333034
16,276	531,2	531,6	531,9	97,96	103,68	104,41	0,185	0,187	0,195	23	0,2618812	0,1281331
16,097	531,4	531,7	532,1	98,95	105,16	105,69	0,185	0,187	0,195	24	0,2589363	0,1333051
15,987	531,5	531,7	532,2	100,17	105,83	106,24	0,186	0,187	0,195	25	0,257142	0,1333037
16,756	531,5	531,9	532,3	94,46	100,84	101,26	0,183	0,187	0,195	26	0,2695778	0,1312382
16,147	531,6	532,0	532,4	98,72	104,48	105,17	0,185	0,187	0,195	27	0,2599194	0,1281319
16,552	531,7	532,0	532,5	96,09	101,90	102,26	0,185	0,187	0,195	28	0,2667288	0,1312371
16,262	531,8	532,1	532,5	96,44	102,84	103,72	0,183	0,187	0,195	29	0,2627656	0,1281336
16,158	531,9	532,2	532,6	97,65	103,06	103,83	0,185	0,186	0,195	30	0,2615944	0,1281311
16,448	531,8	532,2	532,7	95,39	101,13	101,41	0,185	0,187	0,195	31	0,2668114	0,133305
16,361	531,8	532,3	532,8	96,06	101,24	102,02	0,186	0,187	0,195	32	0,2656321	0,1239944
16,236	531,8	532,4	532,9	96,36	101,77	102,60	0,185	0,186	0,195	33	0,2638213	0,123996
16,100	531,8	532,5	533,0	96,98	102,67	102,90	0,185	0,186	0,195	34	0,2618876	0,1313755
16,263	531,8	532,5	533,1	95,76	101,24	101,87	0,185	0,186	0,195	35	0,2648017	0,1239925
16,382	531,8	532,5	533,1	94,24	100,64	100,94	0,183	0,186	0,195	36	0,2667302	0,1312363
16,192	531,8	532,6	533,2	96,01	101,71	102,17	0,185	0,187	0,195	37	0,2638205	0,1239934
16,070	531,8	532,7	533,3	97,07	102,30	102,73	0,186	0,186	0,195	38	0,261888	0,1281162
16,025	531,9	532,7	533,3	97,13	102,59	103,13	0,185	0,186	0,194	39	0,2611533	0,1239931
16,571	531,9	532,7	533,4	98,21	103,49	103,62	0,186	0,187	0,195	40	0,264804	0,1236543
16,487	531,9	532,8	533,5	98,08	103,49	103,84	0,185	0,187	0,194	41	0,2638359	0,1239914
15,894	531,9	532,9	533,5	98,61	104,16	105,04	0,185	0,186	0,195	42	0,257954	0,1167513
16,363	531,9	532,9	533,6	95,18	100,64	101,18	0,185	0,186	0,195	43	0,2664416	0,1239991
16,138	531,9	532,8	533,5	96,86	102,25	102,59	0,186	0,187	0,195	44	0,262858	0,1239931
16,142	531,9	532,8	533,5	96,68	102,01	102,41	0,185	0,187	0,195	45	0,2628657	0,1188214
15,979	531,9	532,8	533,5	98,12	103,30	103,61	0,186	0,186	0,194	46	0,2599279	0,1191923
16,328	531,9	532,8	533,6	95,87	101,36	101,91	0,185	0,186	0,195	47	0,2653389	0,1239921
16,463	531,9	532,8	533,5	94,81	100,24	100,87	0,185	0,186	0,195	48	0,2676885	0,1239924
16,405	531,9	532,8	533,6	95,12	100,53	101,27	0,185	0,186	0,195	49	0,2667314	0,1188249
15,866	532,0	532,8	533,6	98,66	103,79	104,45	0,185	0,186	0,195	50	0,2580426	0,1208891
16,105	532,0	532,9	533,7	97,02	102,65	103,17	0,185	0,186	0,195	51	0,2618536	0,126062
16,179	532,0	532,9	533,7	96,50	102,29	102,73	0,185	0,187	0,195	52	0,2628682	0,1239937
16,412	532,0	532,9	533,7	94,78	100,79	101,24	0,184	0,186	0,195	53	0,2667326	0,1167505
16,302	532,1	532,9	533,8	95,96	101,53	101,92	0,185	0,186	0,194	54	0,2647651	0,1188232
16,072	532,1	533,0	533,8	97,19	103,09	103,63	0,184	0,186	0,194	55	0,2609102	0,118822
16,203	532,1	532,9	533,8	97,04	102,32	102,79	0,185	0,186	0,194	56	0,262871	0,1167517
15,983	532,1	533,0	533,9	98,24	104,07	104,64	0,185	0,186	0,195	57	0,2589457	0,1167515
16,283	532,2	533,1	533,9	96,79	102,31	102,80	0,185	0,186	0,195	58	0,2636899	0,1167492
16,242	532,2	533,1	534,0	96,89	102,75	103,02	0,185	0,187	0,194	59	0,2628739	0,1210772
16,126	532,3	533,1	534,0	98,10	103,21	103,67	0,186	0,186	0,194	60	0,2609145	0,1208873
16,009	532,3	533,1	534,0	98,47	104,19	104,69	0,185	0,186	0,194	61	0,2589451	0,1167528
16,351	532,4	533,2	534,1	0,02	102,24	102,49	0,000	0,186	0,194	62	0,264287	0,1136638
16,332	532,2	533,3	534,3	0,01	102,35	102,78	0,000	0,186	0,194	63	0,263841	0,1142541
16,114	532,2	533,3	534,5	0,01	104,18	104,47	0,000	0,186	0,194	64	0,2599336	0,1115841
16,549	532,1	533,4	534,7	0,00	101,46	101,86	0,000	0,186	0,194	65	0,2667378	0,1239955
16,443	532,1	533,4	534,9	0,00	102,28	102,50	0,000	0,186	0,194	66	0,2648465	0,1188249
16,512	532,1	533,5	535,0	0,00	101,95	102,36	0,000	0,186	0,194	67	0,2657784	0,1281402
16,295	532,1	533,6	535,2	0,00	103,60	103,71	0,000	0,186	0,194	68	0,2618961	0,1208912
16,120	532,1	533,6	535,3	0,00	104,88	105,05	0,000	0,186	0,194	69	0,2589519	0,1239976
16,318	532,2	533,6	535,4	0,00	103,67	103,92	0,000	0,186	0,194	70	0,261972	0,1188267
16,298	532,2	533,7	535,5	0,00	103,55	103,89	0,000	0,186	0,194	71	0,261897	0,117347
16,164	532,3	533,7	535,6	0,00	104,37	104,82	0,000	0,186	0,194	72	0,2599353	0,1208943
16,362	532,3	533,7	535,7	0,00	103,07	103,44	0,000	0,186	0,194	73	0,2628765	0,1239977
16,545	532,3	533,7	535,7	0,00	101,69	102,14	0,000	0,186	0,194	74	0,2658741	0,1167563
16,061	532,3	533,8	535,8	0,00	105,31	105,41	0,000	0,186	0,194	75	0,2579661	0,123998
16,640	532,3	533,8	535,8	0,00	101,37	101,54	0,000	0,186	0,194	76	0,2675254	0,1208989
16,475	532,3	533,9	535,9	0,00	102,23	102,60	0,000	0,186	0,194	77	0,2648527	0,1208935
16,519	532,4	533,9	536,0	0,00	101,89	102,18	0,000	0,186	0,194	78	0,2657872	0,1208957
16,470	532,4	534,0	536,0	0,00	102,21	102,45	0,000	0,186	0,194	79	0,264817	0,1188268
16,472	532,4	534,0	536,1	0,00	102,36	102,49	0,000	0,186	0,193	80	0,2648175	0,1167554
16,341	532,4	534,1	536,1	0,00	102,89	103,27	0,000	0,186	0,194	81	0,2628771	0,1188241
16,109	532,4	534,2	536,2	0,00	104,74	104,77	0,000	0,186	0,194	82	0,2589715	0,1188218
16,103	532,4	534,2	536,3	0,00	104,68	104,95	0,000	0,186	0,194	83	0,2589556	0,1136553
16,586	532,4	534,2	536,3	0,00	101,46	101,77	0,000	0,186	0,194	84	0,2667455	0,1208945
16,469	532,5	534,3	536,4	0,00	102,27	102,59	0,000	0,186	0,194	85	0,2647932	0,1188266
16,452	532,5	534,3	536,4	0,00	102,34	102,59	0,000	0,186	0,194	86	0,2644814	0,1136555
16,713	532,5	534,3	536,4	0,00	100,80	100,98	0,000	0,186	0,193	87	0,2686572	0,1208175
16,835	532,5	534,3	536,5	0,00	100,33	100,27	0,000	0,186	0,193	88	0,2705322	0,1260679

16,592	532,5	534,4	536,5	0,00	101,50	101,76	0,000	0,186	0,193	89	0,2667425	0,1239976
16,475	532,6	534,4	536,6	0,00	102,41	102,42	0,000	0,186	0,193	90	0,264822	0,1208938
16,617	532,6	534,4	536,6	0,00	101,25	101,29	0,000	0,186	0,193	91	0,2671673	0,1167554
16,398	532,6	534,5	536,7	0,00	102,80	102,72	0,000	0,186	0,193	92	0,2638519	0,1188257
16,525	532,7	534,6	536,7	0,00	101,79	102,07	0,000	0,186	0,193	93	0,2657961	0,126069
16,473	532,7	534,6	536,8	0,00	102,25	102,47	0,000	0,186	0,193	94	0,2648196	0,1167573
16,356	532,8	534,7	536,8	0,00	102,88	103,07	0,000	0,186	0,193	95	0,2628841	0,1196808
16,411	532,8	534,7	536,9	0,00	102,60	102,67	0,000	0,186	0,193	96	0,2638344	0,1167569
16,463	532,9	534,7	536,9	0,00	102,25	102,30	0,000	0,186	0,193	97	0,2648211	0,1208935
16,530	532,9	534,7	536,9	0,00	101,76	102,00	0,000	0,186	0,193	98	0,2657913	0,1188499
16,472	532,9	534,7	536,9	0,00	102,23	102,53	0,000	0,186	0,193	99	0,2648072	0,1188237
16,224	532,9	534,7	537,0	0,00	103,72	104,04	0,000	0,186	0,194	100	0,2609281	0,1208959
16,521	533,0	534,8	537,0	0,00	101,85	101,81	0,000	0,186	0,193	101	0,2657877	0,1136578
16,511	533,0	534,9	537,1	0,00	101,77	101,87	0,000	0,186	0,193	102	0,2657892	0,118713
16,690	533,0	535,0	537,2	0,00	100,59	100,89	0,000	0,186	0,193	103	0,26866	0,1115896
16,554	533,1	535,0	537,2	0,00	101,11	101,25	0,000	0,186	0,193	104	0,2667556	0,1208953
16,556	533,1	535,0	537,2	0,00	101,17	101,54	0,000	0,186	0,193	105	0,2667503	0,1241451
16,467	533,1	534,9	537,2	0,00	101,66	101,60	0,000	0,186	0,193	106	0,2654167	0,1208962
16,424	533,1	534,9	537,2	0,00	101,80	102,02	0,000	0,186	0,193	107	0,2648219	0,1208939
16,165	533,2	534,8	537,2	0,00	103,37	103,55	0,000	0,186	0,193	108	0,2609322	0,1115843
16,427	533,2	534,8	537,2	0,00	101,78	101,65	0,000	0,186	0,193	109	0,2652085	0,1188285
16,745	533,2	534,8	537,1	0,00	99,54	99,57	0,000	0,186	0,193	110	0,2705715	0,1167567
16,260	533,2	534,8	537,1	0,00	102,48	102,48	0,000	0,186	0,193	111	0,2628871	0,1167562
16,481	533,2	534,8	537,2	0,00	100,73	101,14	0,000	0,186	0,193	112	0,2667499	0,1167564
16,301	533,2	534,9	537,2	0,00	101,84	101,83	0,000	0,186	0,193	113	0,2638569	0,1115812
16,465	533,2	535,0	537,2	0,00	100,62	100,99	0,000	0,186	0,193	114	0,2667453	0,1167541
16,360	533,2	535,0	537,2	0,00	101,31	101,58	0,000	0,185	0,193	115	0,2648215	0,1127586
16,469	533,2	535,1	537,2	0,00	100,59	100,80	0,000	0,185	0,193	116	0,2667484	0,1136521
16,466	533,3	535,2	537,3	0,00	100,57	100,97	0,000	0,185	0,193	117	0,2667545	0,1167502
16,467	533,3	535,2	537,3	0,00	100,91	100,79	0,000	0,186	0,193	118	0,2667507	0,1115795
16,229	533,3	535,3	537,3	0,00	102,00	102,23	0,000	0,186	0,193	119	0,262885	0,1167503
16,225	533,4	535,3	537,3	0,00	101,98	102,23	0,000	0,185	0,193	120	0,2629028	0,1167507
16,402	533,4	535,2	537,3	0,00	100,89	101,26	0,000	0,185	0,193	121	0,2657604	0,1167525
16,648	533,4	535,3	537,3	0,00	99,54	99,81	0,000	0,185	0,193	122	0,2696078	0,1095009
16,031	533,4	535,3	537,3	0,00	103,12	103,26	0,000	0,185	0,193	123	0,2599464	0,1136475
16,254	533,5	535,3	537,3	0,00	101,73	101,99	0,000	0,186	0,193	124	0,2635661	0,1136551
16,388	533,4	535,2	537,3	0,00	100,88	101,06	0,000	0,186	0,193	125	0,2657901	0,1136528
16,507	533,4	535,2	537,3	0,00	100,08	100,30	0,000	0,186	0,193	126	0,2677014	0,1166086
16,507	533,4	535,2	537,3	0,00	100,27	100,46	0,000	0,186	0,193	127	0,2677068	0,1115826
16,345	533,4	535,3	537,3	0,00	101,04	101,39	0,000	0,186	0,193	128	0,2651293	0,1115883
16,435	533,5	535,4	537,4	0,00	100,31	100,59	0,000	0,185	0,193	129	0,2667625	0,1136509
16,073	533,5	535,4	537,4	0,00	102,40	102,73	0,000	0,185	0,193	130	0,2609348	0,1136525
16,371	533,4	535,3	537,4	0,00	100,75	100,83	0,000	0,185	0,193	131	0,2657912	0,111585
16,231	533,4	535,2	537,3	0,00	101,62	101,83	0,000	0,186	0,193	132	0,2636194	0,1136535
16,424	533,4	535,1	537,3	0,00	100,41	100,51	0,000	0,186	0,193	133	0,2667387	0,1136708
16,185	533,4	535,0	537,3	0,00	101,75	101,91	0,000	0,186	0,193	134	0,2628828	0,1136529
16,397	533,4	535,0	537,2	0,00	100,48	100,77	0,000	0,185	0,193	135	0,2663322	0,1163824
16,299	533,4	534,9	537,2	0,00	101,16	101,22	0,000	0,186	0,193	136	0,2648221	0,1115829
16,171	533,4	534,9	537,2	0,00	101,75	102,10	0,000	0,186	0,193	137	0,262859	0,1136548
16,236	533,4	534,9	537,2	0,00	101,60	101,68	0,000	0,186	0,193	138	0,2638526	0,1064111
16,615	533,4	534,9	537,2	0,00	98,98	99,35	0,000	0,186	0,193	139	0,2700696	0,1167537
16,325	533,4	534,8	537,1	0,00	100,77	101,11	0,000	0,186	0,193	140	0,2653743	0,1081424
16,348	533,3	534,8	537,1	0,00	100,79	100,88	0,000	0,186	0,193	141	0,2657893	0,1136546
16,349	533,3	534,8	537,1	0,00	100,62	101,07	0,000	0,186	0,193	142	0,2658118	0,1095169
16,115	533,3	534,7	537,1	0,00	102,20	102,42	0,000	0,186	0,193	143	0,2619096	0,1115812
16,405	533,3	534,7	537,1	0,00	100,16	100,40	0,000	0,186	0,193	144	0,2667739	0,1064418
16,401	533,3	534,6	537,0	0,00	100,38	100,68	0,000	0,186	0,193	145	0,2667475	0,1167529
16,291	533,3	534,6	537,0	0,00	101,10	101,05	0,000	0,186	0,193	146	0,2648209	0,116756
16,219	533,3	534,6	537,0	0,00	101,58	101,68	0,000	0,186	0,193	147	0,2637232	0,1064116
16,270	533,2	534,5	537,0	0,00	101,17	101,14	0,000	0,186	0,193	148	0,2646567	0,1095154
16,162	533,2	534,5	537,0	0,00	101,96	102,01	0,000	0,186	0,193	149	0,2628765	0,1167548
16,393	533,2	534,5	536,9	0,00	100,41	100,37	0,000	0,186	0,193	150	0,2667444	0,1166265
16,033	533,1	534,5	536,9	0,00	102,77	102,62	0,000	0,186	0,193	151	0,260926	0,1115821
16,392	533,1	534,5	536,9	0,00	100,32	100,39	0,000	0,186	0,193	152	0,2668274	0,113654
16,442	533,1	534,4	536,9	0,00	99,97	100,03	0,000	0,186	0,193	153	0,2677031	0,1136548
16,144	533,1	534,5	536,9	0,00	101,73	101,85	0,000	0,186	0,193	154	0,2628813	0,1167545
16,201	533,1	534,4	536,9	0,00	101,25	101,20	0,000	0,186	0,193	155	0,2638512	0,1115825
16,252	533,1	534,4	536,9	0,00	100,87	101,06	0,000	0,186	0,193	156	0,2648192	0,1095156
16,181	533,1	534,4	536,9	0,00	101,10	101,42	0,000	0,186	0,193	157	0,2638493	0,1065792
16,125	533,0	534,5	536,9	0,00	101,63	101,59	0,000	0,186	0,193	158	0,2628847	0,1115804
16,301	533,1	534,6	536,9	0,00	100,42	100,43	0,000	0,186	0,193	159	0,2657862	0,1136547
16,239	533,1	534,6	536,9	0,00	100,71	100,90	0,000	0,186	0,193	160	0,2648169	0,1115793

Average	Average	Average	Average								Average	Average
16,30	Inlet +	Inlet +	Inlet +								0,267	-0,119
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	97,87	100,20	100,62	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	**Proportional Rates**			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st Hr	**PR1**	**PR2**				Time		neg value
Ft/Sec	Deg. R	Deg. R	Deg. R	**%**	**%**	**%**	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
16,195	533,1	534,4	535,9				0,184	0,186	0,194	0	0,2628727	0,1136486
16,265	533,1	534,6	535,9	96,19	101,09	101,63	0,185	0,186	0,194	1	0,2657786	0,1167479
16,017	533,1	534,6	535,7	97,58	102,49	103,07	0,185	0,186	0,194	2	0,2618098	0,116749
16,210	533,1	534,6	535,7	96,45	101,39	101,94	0,184	0,186	0,194	3	0,264739	0,1095123
16,072	533,1	534,5	535,6	98,30	102,80	103,28	0,185	0,186	0,194	4	0,2618937	0,1167482
16,442	533,2	534,5	535,6	96,90	101,43	101,91	0,185	0,186	0,194	5	0,266737	0,113651
16,551	533,2	534,4	535,5	96,51	101,37	102,08	0,185	0,186	0,194	6	0,2676641	0,1115808
16,228	533,4	534,4	535,5	98,68	103,72	104,38	0,184	0,186	0,194	7	0,2618914	0,116759
16,439	533,5	534,5	535,5	98,02	102,72	103,35	0,185	0,186	0,194	8	0,2648094	0,1160052
16,052	533,6	534,6	535,6	100,61	105,36	106,25	0,185	0,186	0,194	9	0,2582092	0,1095179
16,236	533,7	534,6	535,6	99,54	104,70	105,16	0,184	0,186	0,194	10	0,2609177	0,113651
16,191	533,8	534,8	535,7	99,84	105,08	105,92	0,184	0,186	0,194	11	0,2599375	0,1136519
16,067	533,9	534,8	535,8	100,65	106,01	106,93	0,184	0,186	0,194	12	0,2577987	0,118824
16,508	534,0	534,9	535,8	97,88	103,24	103,75	0,184	0,186	0,194	13	0,2648144	0,1167531
16,237	534,1	534,9	535,9	98,71	103,67	104,40	0,184	0,186	0,194	14	0,2619009	0,1188238
16,044	534,2	535,0	535,9	99,64	104,36	105,17	0,185	0,185	0,194	15	0,2593073	0,1188728
16,296	534,3	535,0	535,9	98,11	102,54	103,19	0,185	0,185	0,194	16	0,2638487	0,1281342
16,469	534,2	535,0	536,0	96,79	101,59	101,98	0,185	0,186	0,194	17	0,2667449	0,118824
16,283	534,2	535,0	536,0	97,39	102,44	103,02	0,184	0,186	0,194	18	0,2638466	0,1239929
16,090	534,2	534,9	536,0	98,54	103,61	104,16	0,184	0,186	0,194	19	0,2609226	0,1188234
16,326	534,2	534,9	535,9	96,74	101,87	102,74	0,184	0,186	0,194	20	0,2648173	0,1208896
16,262	534,2	534,8	535,9	97,50	102,32	103,04	0,184	0,185	0,194	21	0,2638475	0,1167534
16,277	534,2	534,8	535,9	97,34	102,17	102,84	0,184	0,186	0,194	22	0,264072	0,120891
15,882	534,2	534,7	535,9	99,51	104,93	105,51	0,184	0,186	0,194	23	0,2577742	0,1145898
16,017	534,2	534,8	535,9	99,42	103,83	104,65	0,185	0,186	0,194	24	0,2600217	0,1188315
16,316	534,2	534,8	535,9	97,08	101,94	102,33	0,184	0,186	0,194	25	0,2648081	0,1208909
16,062	534,2	534,9	535,9	98,22	103,38	103,93	0,184	0,186	0,193	26	0,260922	0,1188233
16,196	534,2	535,0	536,0	98,11	102,87	103,34	0,185	0,186	0,194	27	0,2628588	0,1206616
16,430	534,2	535,0	536,0	96,15	101,17	101,49	0,184	0,186	0,193	28	0,2667449	0,1208902
16,367	534,2	535,1	536,1	96,58	101,40	102,05	0,184	0,186	0,193	29	0,2657837	0,1167516
15,960	534,3	535,1	536,1	99,44	103,99	104,72	0,185	0,185	0,194	30	0,2591088	0,1208887
16,193	534,3	535,1	536,1	97,63	102,76	103,44	0,184	0,186	0,194	31	0,2628875	0,1208893
16,253	534,3	535,0	536,1	97,65	102,22	102,75	0,185	0,186	0,194	32	0,2638468	0,1188222
16,429	534,3	535,0	536,1	96,20	101,10	101,72	0,184	0,186	0,193	33	0,2667461	0,1208886
15,821	534,2	535,0	536,1	99,94	104,89	105,64	0,184	0,185	0,194	34	0,2569699	0,1136512
16,123	534,3	535,0	536,1	98,55	102,85	103,65	0,185	0,185	0,194	35	0,2619041	0,1188212
16,175	534,3	535,0	536,1	97,44	102,73	103,19	0,184	0,186	0,194	36	0,2627394	0,1167517
16,029	534,3	535,0	536,1	98,51	103,79	104,29	0,184	0,186	0,194	37	0,2602679	0,1208901
16,185	534,4	535,0	536,1	97,34	102,56	103,11	0,184	0,186	0,194	38	0,2628781	0,1095159
16,176	534,4	535,1	536,1	97,82	102,55	103,25	0,185	0,186	0,194	39	0,2628793	0,1136514
16,130	534,4	535,1	536,2	98,15	102,92	103,55	0,185	0,186	0,194	40	0,2620935	0,1115728
16,240	534,4	535,1	536,2	97,31	102,23	103,10	0,184	0,186	0,194	41	0,2638455	0,1188231
16,356	534,4	535,1	536,2	96,49	101,46	102,01	0,184	0,186	0,194	42	0,265784	0,109515
16,292	534,4	535,1	536,2	96,84	101,96	102,44	0,184	0,186	0,194	43	0,2648193	0,1115807
15,950	534,4	535,2	536,2	98,88	104,06	104,58	0,184	0,186	0,194	44	0,2591852	0,1167531
16,581	534,4	535,1	536,2	94,90	99,87	100,39	0,184	0,186	0,193	45	0,2696108	0,1167517
15,991	534,4	535,2	536,3	98,35	103,54	104,31	0,184	0,185	0,193	46	0,2599399	0,1188218
15,920	534,4	535,2	536,3	99,30	103,98	104,74	0,185	0,185	0,194	47	0,2589571	0,113652
16,050	534,4	535,3	536,3	98,05	103,11	103,96	0,184	0,185	0,194	48	0,2609251	0,113651
15,931	534,4	535,2	536,3	98,69	104,01	104,60	0,184	0,185	0,194	49	0,2589675	0,1188222
16,343	534,4	535,2	536,3	96,09	101,29	101,90	0,184	0,185	0,193	50	0,2657858	0,1188222
15,986	534,4	535,3	536,3	98,72	103,50	104,28	0,184	0,185	0,194	51	0,2599427	0,1167498
16,405	534,4	535,3	536,3	96,32	100,87	101,44	0,185	0,185	0,193	52	0,2667488	0,1188212
16,349	534,4	535,4	536,3	97,36	101,29	101,99	0,186	0,185	0,193	53	0,2657852	0,1121972
15,942	534,4	535,4	536,4	98,50	103,90	104,60	0,183	0,185	0,194	54	0,2591633	0,1115791
16,423	534,4	535,4	536,3	95,70	100,56	101,43	0,184	0,185	0,194	55	0,2671288	0,1188233
16,224	534,4	535,3	536,3	97,26	102,15	102,60	0,184	0,185	0,194	56	0,2638478	0,1115777
15,912	534,4	535,4	536,4	98,93	103,89	104,65	0,184	0,186	0,194	57	0,2589572	0,1136508
16,026	534,4	535,4	536,4	98,17	103,07	103,70	0,184	0,186	0,194	58	0,2609245	0,1115795
16,269	534,3	535,3	536,3	96,81	101,44	102,08	0,184	0,185	0,193	59	0,2648192	0,1115786
16,387	534,3	535,3	536,3	96,10	100,70	101,42	0,184	0,185	0,193	60	0,2667493	0,1115811
16,347	534,3	535,3	536,3	96,36	101,26	101,97	0,184	0,186	0,194	61	0,2660779	0,1043381
16,277	534,3	535,3	536,3	0,02	101,77	102,20	0,000	0,186	0,194	62	0,2648198	0,1167525
16,214	534,2	535,3	536,5	0,01	102,14	102,81	0,000	0,186	0,194	63	0,2638527	0,1136509
16,216	534,2	535,4	536,7	0,01	102,05	102,61	0,000	0,186	0,194	64	0,2638516	0,1095132
15,973	534,1	535,5	536,8	0,00	103,57	104,01	0,000	0,186	0,193	65	0,2599432	0,1136525
16,102	534,1	535,5	537,0	0,00	102,61	102,95	0,000	0,186	0,193	66	0,2621053	0,1115792
16,564	534,1	535,6	537,1	0,00	99,77	100,24	0,000	0,185	0,193	67	0,2696104	0,1115822
16,328	534,1	535,5	537,1	0,00	101,40	101,81	0,000	0,186	0,193	68	0,2657872	0,1095172
16,213	534,1	535,4	537,2	0,00	101,45	102,31	0,000	0,185	0,193	69	0,2639695	0,1095138
16,678	534,1	535,5	537,3	0,00	99,05	99,26	0,000	0,185	0,193	70	0,2715015	0,1115794
16,667	534,1	535,5	537,3	0,00	98,97	99,70	0,000	0,185	0,193	71	0,2714962	0,1188228
16,324	534,1	535,4	537,3	0,00	101,15	101,63	0,000	0,185	0,193	72	0,2657887	0,1115772
16,199	534,0	535,3	537,3	0,00	101,81	102,24	0,000	0,185	0,193	73	0,2638526	0,1167519
16,550	534,0	535,3	537,3	0,00	99,80	99,88	0,000	0,186	0,193	74	0,2696134	0,1167493
16,377	534,0	535,3	537,3	0,00	100,90	101,20	0,000	0,186	0,193	75	0,2667464	0,1136523
16,317	534,0	535,3	537,3	0,00	100,77	101,43	0,000	0,185	0,193	76	0,2659998	0,1136514
16,015	534,0	535,4	537,4	0,00	103,13	103,30	0,000	0,185	0,193	77	0,2609252	0,1188222
16,665	534,0	535,4	537,4	0,00	99,03	99,33	0,000	0,186	0,193	78	0,2714983	0,1167508
16,622	534,0	535,4	537,4	0,00	99,11	99,61	0,000	0,185	0,193	79	0,2707067	0,1136526
16,676	534,0	535,3	537,4	0,00	99,04	99,21	0,000	0,185	0,193	80	0,2716195	0,1135947
16,660	534,0	535,4	537,4	0,00	98,98	99,23	0,000	0,186	0,193	81	0,2714822	0,1188218
16,312	534,0	535,4	537,4	0,00	101,01	101,32	0,000	0,185	0,193	82	0,2657855	0,1095124
16,374	534,0	535,3	537,4	0,00	100,73	101,24	0,000	0,185	0,193	83	0,2667486	0,1208897
16,614	534,0	535,3	537,4	0,00	99,37	99,63	0,000	0,186	0,193	84	0,2708432	0,113651
16,310	533,9	535,2	537,4	0,00	101,11	101,42	0,000	0,186	0,193	85	0,2657887	0,1102442
16,195	533,9	535,3	537,5	0,00	102,05	102,25	0,000	0,186	0,193	86	0,2639192	0,1188309
16,424	533,9	535,3	537,5	0,00	100,34	100,76	0,000	0,186	0,193	87	0,2677057	0,1137045
16,307	533,9	535,3	537,5	0,00	100,91	101,48	0,000	0,185	0,193	88	0,2657589	0,1167491

16,306	533,9	535,3	537,5	0,00	101,01	101,48	0,000	0,185	0,193	89	0,2657862	0,1197823
16,597	533,9	535,3	537,5	0,00	99,26	99,34	0,000	0,185	0,193	90	0,2705567	0,1175719
16,361	533,9	535,3	537,5	0,00	100,86	101,02	0,000	0,186	0,193	91	0,2667306	0,116751
16,362	533,9	535,3	537,5	0,00	100,59	101,07	0,000	0,186	0,193	92	0,2667384	0,1208726
16,183	533,9	535,2	537,5	0,00	101,78	102,17	0,000	0,185	0,193	93	0,2638495	0,1167507
16,400	533,9	535,2	537,4	0,00	100,40	100,79	0,000	0,186	0,193	94	0,2674528	0,113651
16,181	533,9	535,1	537,4	0,00	101,75	102,16	0,000	0,186	0,193	95	0,2639102	0,1219949
16,525	533,9	535,1	537,3	0,00	99,65	100,02	0,000	0,186	0,193	96	0,2696103	0,1167499
16,470	533,9	535,1	537,3	0,00	99,87	100,42	0,000	0,186	0,193	97	0,268657	0,1208843
16,167	533,9	535,0	537,3	0,00	101,73	102,20	0,000	0,185	0,193	98	0,2637972	0,11674
16,360	533,9	535,0	537,3	0,00	100,72	101,08	0,000	0,186	0,193	99	0,2668384	0,1188213
16,348	533,9	535,0	537,3	0,00	100,51	101,04	0,000	0,186	0,193	100	0,2667461	0,1136519
16,407	533,8	535,0	537,3	0,00	100,29	100,73	0,000	0,185	0,193	101	0,2676994	0,1205636
16,287	533,8	535,0	537,3	0,00	100,95	101,38	0,000	0,186	0,193	102	0,2657438	0,1208858
16,168	533,8	535,0	537,3	0,00	101,64	102,08	0,000	0,185	0,193	103	0,2638484	0,1167516
16,525	533,8	535,0	537,3	0,00	99,51	99,93	0,000	0,185	0,193	104	0,2696128	0,1188211
16,579	533,8	535,0	537,3	0,00	99,20	99,58	0,000	0,186	0,193	105	0,2705541	0,1167503
16,153	533,8	535,1	537,3	0,00	101,91	102,03	0,000	0,186	0,193	106	0,263689	0,1188233
16,452	533,8	535,0	537,3	0,00	99,87	100,29	0,000	0,186	0,193	107	0,268653	0,113651
16,279	533,8	535,1	537,3	0,00	101,08	101,37	0,000	0,186	0,193	108	0,2657826	0,1115808
16,280	533,7	535,1	537,4	0,00	100,97	101,16	0,000	0,186	0,193	109	0,2657841	0,111592
16,276	533,7	535,1	537,4	0,00	100,91	101,34	0,000	0,186	0,193	110	0,2658051	0,120578
16,451	533,7	535,1	537,3	0,00	99,65	100,33	0,000	0,185	0,193	111	0,2686666	0,1141478
16,401	533,7	535,1	537,3	0,00	100,24	100,70	0,000	0,185	0,193	112	0,2677019	0,1095117
16,452	533,7	535,2	537,4	0,00	99,80	100,20	0,000	0,186	0,193	113	0,2687247	0,1188209
16,500	533,7	535,2	537,4	0,00	99,54	99,90	0,000	0,186	0,193	114	0,269495	0,1168375
16,385	533,7	535,2	537,4	0,00	100,10	100,36	0,000	0,186	0,193	115	0,2676996	0,1208876
16,330	533,7	535,2	537,5	0,00	100,39	100,89	0,000	0,185	0,193	116	0,2667441	0,1095144
16,692	533,7	535,2	537,5	0,00	98,23	98,76	0,000	0,185	0,193	117	0,2726086	0,1166353
16,093	533,7	535,3	537,5	0,00	102,12	102,29	0,000	0,186	0,193	118	0,2628716	0,1136498
16,213	533,7	535,3	537,5	0,00	101,28	101,69	0,000	0,186	0,193	119	0,2648132	0,1167492
16,155	533,7	535,3	537,5	0,00	101,32	102,02	0,000	0,185	0,193	120	0,2639371	0,1208881
16,327	533,7	535,2	537,5	0,00	100,63	100,92	0,000	0,185	0,193	121	0,266744	0,111579
16,389	533,6	535,2	537,4	0,00	100,12	100,51	0,000	0,186	0,193	122	0,2677532	0,116749
16,209	533,6	535,1	537,4	0,00	101,25	101,60	0,000	0,186	0,193	123	0,2648144	0,1115789
16,795	533,6	535,1	537,3	0,00	97,70	98,23	0,000	0,186	0,193	124	0,274326	0,11675
16,386	533,6	535,1	537,3	0,00	100,13	100,52	0,000	0,186	0,193	125	0,26771	0,1115779
16,270	533,6	535,0	537,3	0,00	100,96	101,15	0,000	0,186	0,193	126	0,2657831	0,1188212
16,567	533,6	535,0	537,3	0,00	99,07	99,46	0,000	0,186	0,193	127	0,2707174	0,1097989
16,386	533,6	535,0	537,2	0,00	100,08	100,52	0,000	0,186	0,193	128	0,2677007	0,1167513
16,151	533,7	535,0	537,2	0,00	101,66	101,92	0,000	0,186	0,193	129	0,263869	0,1136519
16,151	533,7	535,0	537,2	0,00	101,65	102,05	0,000	0,186	0,193	130	0,2638472	0,1188197
16,504	533,7	535,0	537,2	0,00	99,26	100,06	0,000	0,185	0,193	131	0,2696077	0,1208886
16,346	533,7	535,0	537,2	0,00	100,38	100,90	0,000	0,185	0,193	132	0,2670486	0,1169443
16,270	533,7	535,0	537,2	0,00	100,86	101,20	0,000	0,186	0,193	133	0,265787	0,1187584
16,205	533,7	535,0	537,2	0,00	101,12	101,63	0,000	0,185	0,193	134	0,2648139	0,1166703
16,071	533,6	535,0	537,2	0,00	101,93	102,27	0,000	0,185	0,193	135	0,2625845	0,118794
16,382	533,7	535,0	537,2	0,00	100,16	100,54	0,000	0,185	0,193	136	0,2676608	0,1188208
16,617	533,7	534,9	537,2	0,00	98,80	99,23	0,000	0,186	0,193	137	0,2714941	0,1095138
16,205	533,7	534,9	537,1	0,00	101,22	101,46	0,000	0,186	0,193	138	0,2648163	0,118823
16,270	533,7	534,9	537,1	0,00	101,00	101,31	0,000	0,186	0,193	139	0,2657833	0,1188209
16,328	533,6	534,8	537,1	0,00	100,56	101,18	0,000	0,186	0,193	140	0,2667306	0,1208886
16,559	533,6	534,8	537,0	0,00	99,13	99,54	0,000	0,186	0,194	141	0,2705532	0,11365
16,328	533,6	534,8	537,0	0,00	100,60	100,86	0,000	0,186	0,193	142	0,2667415	0,1188231
16,211	533,6	534,8	537,0	0,00	101,27	101,77	0,000	0,186	0,193	143	0,2648144	0,1192182
16,153	533,6	534,8	537,0	0,00	101,77	102,05	0,000	0,186	0,193	144	0,263847	0,1188784
16,625	533,6	534,8	537,0	0,00	98,91	99,14	0,000	0,186	0,193	145	0,2714949	0,1208878
16,423	533,6	534,8	537,0	0,00	100,32	100,61	0,000	0,186	0,193	146	0,2680984	0,1188201
16,634	533,7	534,8	537,0	0,00	98,80	99,25	0,000	0,186	0,193	147	0,2714961	0,1188234
16,100	533,6	534,8	537,0	0,00	102,17	102,64	0,000	0,186	0,193	148	0,2628771	0,118822
16,644	533,6	534,9	537,0	0,00	98,74	99,29	0,000	0,186	0,194	149	0,2717342	0,1167492
16,302	533,6	534,9	537,0	0,00	101,01	101,10	0,000	0,186	0,193	150	0,2662107	0,1208888
16,097	533,6	534,9	537,0	0,00	101,95	102,53	0,000	0,186	0,193	151	0,2628764	0,1136493
16,319	533,6	535,0	537,1	0,00	100,53	100,98	0,000	0,186	0,193	152	0,2667432	0,1136513
16,212	533,6	535,0	537,1	0,00	101,29	101,62	0,000	0,186	0,193	153	0,2648153	0,1167518
16,362	533,6	535,1	537,1	0,00	100,44	100,52	0,000	0,186	0,193	154	0,2673488	0,1208886
16,323	533,6	535,0	537,2	0,00	100,54	100,96	0,000	0,186	0,193	155	0,2667435	0,1208892
16,314	533,6	535,0	537,2	0,00	100,15	100,62	0,000	0,185	0,193	156	0,2667432	0,1188211
16,259	533,6	535,0	537,2	0,00	100,84	101,22	0,000	0,185	0,193	157	0,2657809	0,1188205
16,491	533,6	535,0	537,2	0,00	99,44	99,74	0,000	0,186	0,193	158	0,2696071	0,1208911
16,373	533,6	535,1	537,3	0,00	100,03	100,32	0,000	0,186	0,193	159	0,267699	0,1095124
16,256	533,6	535,2	537,3	0,00	100,82	101,39	0,000	0,186	0,193	160	0,2657826	0,1119026
16,309	533,6	535,2	537,3	0,00	100,40	100,84	0,000	0,186	0,193	161	0,2668081	0,1188186
16,026	533,6	535,2	537,3	0,00	102,04	102,25	0,000	0,186	0,193	162	0,2622791	0,1167489
16,302	533,6	535,2	537,4	0,00	100,38	100,69	0,000	0,186	0,193	163	0,266741	0,1188195
16,301	533,6	535,3	537,4	0,00	100,36	100,57	0,000	0,186	0,193	164	0,2667429	0,1208894
16,232	533,6	535,3	537,4	0,00	100,51	101,17	0,000	0,185	0,193	165	0,2656765	0,120887
16,321	533,6	535,3	537,5	0,00	100,27	100,59	0,000	0,185	0,193	166	0,2670444	0,1208852
16,482	533,6	535,3	537,5	0,00	99,35	99,65	0,000	0,186	0,193	167	0,269607	0,1167479
16,352	533,6	535,4	537,5	0,00	99,91	100,27	0,000	0,186	0,193	168	0,2676969	0,1167714
16,125	533,6	535,4	537,6	0,00	101,12	101,60	0,000	0,185	0,193	169	0,2639538	0,1115647
16,645	533,6	535,5	537,6	0,00	98,15	98,56	0,000	0,185	0,193	170	0,2724258	0,1188215
16,468	533,6	535,5	537,6	0,00	99,10	99,51	0,000	0,185	0,193	171	0,2696041	0,1167489
16,292	533,6	535,6	537,7	0,00	100,20	100,54	0,000	0,185	0,193	172	0,2667382	0,1208867
16,257	533,7	535,5	537,7	0,00	100,59	100,90	0,000	0,186	0,193	173	0,2660909	0,1188205
16,348	533,7	535,5	537,6	0,00	99,83	100,36	0,000	0,186	0,193	174	0,2676965	0,1136498
16,291	533,7	535,5	537,6	0,00	100,25	100,68	0,000	0,185	0,193	175	0,2667411	0,1136482
16,293	533,7	535,5	537,6	0,00	100,25	100,50	0,000	0,185	0,193	176	0,2667397	0,1239889
16,263	533,7	535,5	537,7	0,00	100,37	100,90	0,000	0,185	0,193	177	0,2662445	0,1188143
15,998	533,7	535,5	537,6	0,00	102,16	102,53	0,000	0,185	0,193	178	0,2619006	0,1188195
16,306	533,7	535,5	537,6	0,00	100,38	100,69	0,000	0,186	0,193	179	0,266899	0,1188204
16,207	533,7	535,5	537,6	0,00	100,84	101,15	0,000	0,186	0,193	180	0,2653352	0,1167494
16,406	533,7	535,4	537,6	0,00	99,55	99,99	0,000	0,186	0,193	181	0,2686161	0,1208849
16,351	533,7	535,4	537,5	0,00	99,94	100,12	0,000	0,186	0,193	182	0,2676969	0,118822
16,176	533,7	535,4	537,5	0,00	100,99	101,24	0,000	0,186	0,193	183	0,2648131	0,1208854
16,642	533,6	535,4	537,5	0,00	98,08	98,61	0,000	0,185	0,193	184	0,2724742	0,1136477

16,526	533,6	535,4	537,5	0,00	98,73	99,32	0,000	0,185	0,193	185	0,2705516	0,1167506
16,520	533,6	535,5	537,5	0,00	98,73	99,24	0,000	0,185	0,193	186	0,2705511	0,1136494
16,235	533,6	535,5	537,5	0,00	100,76	100,97	0,000	0,186	0,193	187	0,265779	0,1188202
16,587	533,6	535,5	537,5	0,00	98,57	99,12	0,000	0,186	0,193	188	0,2714915	0,1208649
16,116	533,6	535,5	537,5	0,00	101,47	101,84	0,000	0,186	0,193	189	0,2638412	0,1188195
16,319	533,6	535,4	537,5	0,00	99,94	100,34	0,000	0,185	0,193	190	0,2671834	0,1095116
16,359	533,6	535,4	537,5	0,00	99,72	100,31	0,000	0,185	0,193	191	0,2678106	0,1188213
16,354	533,6	535,4	537,5	0,00	99,78	100,22	0,000	0,185	0,193	192	0,2676941	0,1239891
16,308	533,6	535,4	537,5	0,00	100,18	100,68	0,000	0,185	0,193	193	0,2669636	0,1188199
16,177	533,6	535,4	537,4	0,00	100,95	101,29	0,000	0,185	0,193	194	0,2648117	0,116748
16,465	533,6	535,3	537,4	0,00	99,19	99,39	0,000	0,185	0,193	195	0,2696031	0,1188189
16,293	533,6	535,3	537,4	0,00	100,21	100,74	0,000	0,185	0,193	196	0,266737	0,1167499
16,527	533,6	535,2	537,4	0,00	98,82	99,22	0,000	0,185	0,193	197	0,2705488	0,1188155
16,188	533,6	535,2	537,3	0,00	101,00	101,22	0,000	0,186	0,193	198	0,2650355	0,1136536
16,461	533,6	535,2	537,3	0,00	99,19	99,57	0,000	0,186	0,193	199	0,2695444	0,1188204
16,521	533,6	535,1	537,3	0,00	98,89	99,23	0,000	0,186	0,193	200	0,2705516	0,1136505
16,206	533,6	535,0	537,2	0,00	100,67	101,06	0,000	0,186	0,193	201	0,2654554	0,1167516
16,114	533,6	535,0	537,2	0,00	101,35	101,68	0,000	0,186	0,193	202	0,2639474	0,1188205
16,225	533,6	535,0	537,1	0,00	100,70	100,96	0,000	0,186	0,193	203	0,2657782	0,1188226
16,572	533,6	534,9	537,1	0,00	98,50	98,94	0,000	0,186	0,193	204	0,2714926	0,1208875
16,330	533,6	534,9	537,1	0,00	100,07	100,62	0,000	0,186	0,194	205	0,2675359	0,1188221
16,277	533,6	534,8	537,0	0,00	100,26	100,54	0,000	0,186	0,193	206	0,2667369	0,1167486
16,450	533,6	534,8	537,0	0,00	99,07	99,74	0,000	0,186	0,193	207	0,2696026	0,1188206
16,182	533,6	534,9	537,1	0,00	100,78	101,12	0,000	0,186	0,193	208	0,2652811	0,1188203
16,269	533,6	534,9	537,1	0,00	100,22	100,61	0,000	0,186	0,193	209	0,266715	0,1195049
16,272	533,5	535,0	537,1	0,00	99,97	100,57	0,000	0,185	0,193	210	0,2667391	0,118821
16,621	533,5	535,0	537,1	0,00	98,24	98,60	0,000	0,186	0,193	211	0,272431	0,120888
15,902	533,5	535,0	537,1	0,00	102,60	102,87	0,000	0,186	0,193	212	0,2606584	0,1208871
16,387	533,5	534,9	537,1	0,00	99,65	99,64	0,000	0,186	0,193	213	0,2686501	0,1167298
16,094	533,5	534,9	537,1	0,00	101,23	101,68	0,000	0,186	0,193	214	0,2638436	0,1208888
16,269	533,5	534,9	537,1	0,00	100,22	100,67	0,000	0,186	0,193	215	0,2667385	0,1136505
16,534	533,5	534,9	537,0	0,00	98,71	98,83	0,000	0,186	0,193	216	0,2710727	0,1188226
16,264	533,5	534,9	537,1	0,00	100,16	100,62	0,000	0,186	0,193	217	0,2667314	0,1208872
16,320	533,5	534,9	537,1	0,00	99,71	100,09	0,000	0,186	0,193	218	0,2676947	0,1167518
16,141	533,5	535,0	537,2	0,00	100,77	101,22	0,000	0,185	0,193	219	0,2648097	0,1188192
16,153	533,5	535,1	537,2	0,00	100,78	101,24	0,000	0,186	0,193	220	0,2649476	0,1188211
16,274	533,5	535,1	537,2	0,00	100,09	100,35	0,000	0,186	0,193	221	0,2669071	0,1188208
16,145	533,5	535,1	537,2	0,00	100,97	101,12	0,000	0,186	0,193	222	0,2648054	0,1188209
16,189	533,5	535,0	537,1	0,00	100,67	100,91	0,000	0,186	0,193	223	0,2655891	0,1115774
16,434	533,5	535,0	537,1	0,00	99,12	99,50	0,000	0,186	0,193	224	0,2696028	0,1239891
16,202	533,5	534,9	537,0	0,00	100,53	100,97	0,000	0,186	0,193	225	0,2657776	0,1239893
16,202	533,5	534,9	537,0	0,00	100,53	100,84	0,000	0,186	0,193	226	0,265776	0,1177626
16,138	533,5	534,9	537,0	0,00	100,93	101,18	0,000	0,186	0,193	227	0,2648101	0,1188213
16,262	533,5	535,0	537,1	0,00	99,95	100,47	0,000	0,186	0,193	228	0,2667374	0,1167484
16,199	533,5	535,0	537,1	0,00	100,38	100,80	0,000	0,185	0,193	229	0,2657787	0,1208869
16,142	533,5	534,9	537,0	0,00	100,89	101,30	0,000	0,186	0,193	230	0,2648101	0,1188216
16,257	533,5	534,9	537,0	0,00	100,17	100,39	0,000	0,186	0,193	231	0,266738	0,118824
16,315	533,5	534,8	537,0	0,00	99,85	100,35	0,000	0,186	0,193	232	0,2676935	0,1167491
16,019	533,5	534,8	537,0	0,00	101,78	102,04	0,000	0,186	0,194	233	0,262869	0,1188222
16,321	533,5	534,8	537,0	0,00	99,80	100,01	0,000	0,186	0,193	234	0,2676923	0,1136505
16,147	533,5	534,9	537,0	0,00	100,89	101,47	0,000	0,186	0,193	235	0,264809	0,1208867
16,431	533,4	534,9	537,0	0,00	99,10	99,62	0,000	0,186	0,194	236	0,2695986	0,1115771
16,199	533,4	534,9	537,0	0,00	100,44	100,96	0,000	0,186	0,193	237	0,2657738	0,1181955
16,250	533,4	534,9	537,0	0,00	100,16	100,38	0,000	0,186	0,193	238	0,2667385	0,1208877
16,136	533,4	534,9	537,0	0,00	100,95	101,07	0,000	0,186	0,193	239	0,264804	0,1168274
16,140	533,4	535,0	537,1	0,00	100,81	101,10	0,000	0,186	0,193	240	0,264808	0,1260618
16,081	533,4	535,0	537,1	0,00	101,40	101,59	0,000	0,186	0,193	241	0,2638383	0,116749
16,270	533,4	534,9	537,1	0,00	100,09	100,57	0,000	0,186	0,193	242	0,2668818	0,1208866
16,430	533,4	534,9	537,1	0,00	99,14	99,43	0,000	0,186	0,193	243	0,2695477	0,1136495
16,607	533,4	534,8	537,0	0,00	98,11	98,51	0,000	0,186	0,193	244	0,2724283	0,1260624
16,483	533,4	534,8	537,0	0,00	98,62	99,18	0,000	0,186	0,193	245	0,2705448	0,1167468
16,539	533,4	534,8	536,9	0,00	98,48	98,81	0,000	0,186	0,193	246	0,2714196	0,1167492
16,424	533,3	534,7	536,9	0,00	99,01	99,43	0,000	0,186	0,193	247	0,2695868	0,1188198
16,540	533,3	534,8	536,9	0,00	98,25	98,66	0,000	0,186	0,193	248	0,2714899	0,1208875
16,299	533,3	534,7	536,9	0,00	100,10	100,24	0,000	0,186	0,193	249	0,2675024	0,1167489
16,194	533,3	534,7	536,9	0,00	100,74	100,72	0,000	0,186	0,193	250	0,2657759	0,1208871
16,484	533,2	534,7	536,8	0,00	98,58	99,19	0,000	0,186	0,193	251	0,2705402	0,1167514
16,195	533,2	534,7	536,8	0,00	100,42	101,14	0,000	0,186	0,194	252	0,2658157	0,1239908
16,467	533,2	534,7	536,8	0,00	98,86	99,08	0,000	0,186	0,193	253	0,270267	0,1208874
16,139	533,2	534,7	536,8	0,00	100,72	101,35	0,000	0,186	0,193	254	0,2648905	0,120876
16,426	533,2	534,6	536,8	0,00	98,99	99,45	0,000	0,186	0,193	255	0,2696035	0,118821
16,135	533,2	534,6	536,8	0,00	100,74	101,17	0,000	0,186	0,193	256	0,264807	0,1208867
16,310	533,2	534,6	536,8	0,00	99,68	100,25	0,000	0,186	0,193	257	0,2677094	0,1167493
16,308	533,2	534,6	536,8	0,00	99,75	100,17	0,000	0,186	0,193	258	0,2676904	0,1239894
16,250	533,1	534,6	536,8	0,00	100,13	100,53	0,000	0,186	0,193	259	0,2667361	0,120887
16,484	533,1	534,6	536,8	0,00	98,60	99,09	0,000	0,186	0,193	260	0,2705565	0,1188213
16,323	533,2	534,6	536,8	0,00	99,84	100,00	0,000	0,186	0,193	261	0,2679363	0,1239918
16,540	533,2	534,6	536,8	0,00	98,32	98,75	0,000	0,186	0,193	262	0,2714849	0,1239901
16,309	533,1	534,6	536,8	0,00	99,80	99,98	0,000	0,186	0,193	263	0,2676927	0,1213508
16,192	533,2	534,6	536,7	0,00	100,67	100,99	0,000	0,186	0,193	264	0,265787	0,1167482
16,201	533,1	534,6	536,8	0,00	100,54	100,86	0,000	0,186	0,193	265	0,2658906	0,1239903
16,540	533,1	534,6	536,8	0,00	98,40	98,78	0,000	0,186	0,193	266	0,2714883	0,1281244
16,654	533,1	534,6	536,8	0,00	97,77	98,03	0,000	0,186	0,193	267	0,2733701	0,1167472
16,483	533,1	534,6	536,8	0,00	98,70	99,22	0,000	0,186	0,193	268	0,2705479	0,1239904
16,191	533,1	534,6	536,8	0,00	100,58	100,96	0,000	0,186	0,194	269	0,265777	0,1167485
16,423	533,1	534,6	536,8	0,00	99,08	99,38	0,000	0,186	0,193	270	0,2696008	0,1191013
16,249	533,1	534,6	536,8	0,00	100,02	100,14	0,000	0,186	0,193	271	0,2667354	0,1188187
16,370	533,1	534,6	536,8	0,00	99,40	99,98	0,000	0,186	0,193	272	0,2687158	0,1136481
16,249	533,1	534,6	536,8	0,00	100,12	100,28	0,000	0,186	0,193	273	0,2667422	0,1208858
16,425	533,1	534,6	536,8	0,00	99,05	99,36	0,000	0,186	0,193	274	0,2695996	0,1136469
16,308	533,1	534,6	536,8	0,00	99,66	100,13	0,000	0,186	0,193	275	0,2676919	0,1208416
16,323	533,1	534,6	536,8	0,00	99,62	100,10	0,000	0,186	0,193	276	0,2679511	0,1188187
16,132	533,1	534,6	536,8	0,00	100,74	101,37	0,000	0,186	0,194	277	0,2648064	0,1188182
16,131	533,1	534,6	536,8	0,00	101,01	101,26	0,000	0,186	0,193	278	0,264804	0,1188202
16,073	533,1	534,6	536,8	0,00	101,24	101,60	0,000	0,186	0,193	279	0,2638401	0,1188183
16,257	533,1	534,6	536,8	0,00	100,22	100,47	0,000	0,186	0,193	280	0,2668602	0,1208874

16,133	533,1	534,6	536,8	0,00	100,59	101,06	0,000	0,186	0,193	281	0,2648066	0,1239885
16,594	533,1	534,6	536,8	0,00	98,00	98,47	0,000	0,185	0,193	282	0,2724276	0,1239903
16,217	533,1	534,6	536,7	0,00	100,10	100,79	0,000	0,186	0,194	283	0,2662453	0,1167474
16,306	533,1	534,6	536,7	0,00	99,72	100,10	0,000	0,186	0,193	284	0,2676907	0,1167407
16,129	533,1	534,6	536,7	0,00	100,99	101,10	0,000	0,186	0,193	285	0,2648079	0,1208857
16,130	533,1	534,6	536,7	0,00	101,04	101,27	0,000	0,186	0,193	286	0,2648068	0,1208888
16,188	533,1	534,6	536,7	0,00	100,47	100,84	0,000	0,186	0,193	287	0,2657759	0,1167464
16,130	533,1	534,6	536,7	0,00	100,90	101,25	0,000	0,186	0,193	288	0,2648064	0,123989
16,249	533,1	534,6	536,7	0,00	100,08	100,51	0,000	0,186	0,193	289	0,2667352	0,1188207
16,288	533,0	534,6	536,7	0,00	99,94	100,21	0,000	0,186	0,193	290	0,2673977	0,1188187
16,421	533,0	534,6	536,7	0,00	99,07	99,35	0,000	0,186	0,193	291	0,2696	0,1239882
16,249	533,0	534,6	536,7	0,00	100,00	100,43	0,000	0,186	0,193	292	0,2667363	0,1239887
16,308	533,0	534,6	536,7	0,00	99,79	100,16	0,000	0,186	0,193	293	0,2676889	0,1167488
16,247	533,0	534,6	536,7	0,00	100,13	100,53	0,000	0,186	0,193	294	0,2667326	0,1188147
16,362	533,0	534,6	536,7	0,00	99,50	99,62	0,000	0,186	0,193	295	0,2686399	0,1260607
16,247	533,0	534,6	536,7	0,00	100,23	100,30	0,000	0,186	0,193	296	0,2667376	0,1188177
16,247	533,0	534,6	536,7	0,00	100,11	100,46	0,000	0,186	0,193	297	0,2667358	0,1188195
16,399	533,0	534,6	536,7	0,00	99,19	99,53	0,000	0,186	0,193	298	0,2692229	0,1229891
16,248	533,0	534,6	536,7	0,00	100,12	100,55	0,000	0,186	0,193	299	0,2667568	0,1239882
16,249	533,0	534,6	536,7	0,00	100,02	100,58	0,000	0,186	0,193	300	0,2667409	0,1188199
16,426	533,0	534,6	536,7	0,00	99,02	99,59	0,000	0,186	0,194	301	0,2695959	0,1188383
16,573	533,0	534,6	536,7	0,00	98,29	98,61	0,000	0,186	0,194	302	0,2720335	0,1167476
16,130	533,0	534,6	536,7	0,00	100,88	101,24	0,000	0,186	0,193	303	0,2648141	0,1188186
16,422	533,0	534,6	536,7	0,00	98,94	99,39	0,000	0,186	0,193	304	0,2695995	0,1188181
16,319	533,0	534,6	536,7	0,00	99,60	100,15	0,000	0,186	0,193	305	0,2679272	0,1239894
16,517	533,0	534,6	536,7	0,00	98,34	99,14	0,000	0,186	0,194	306	0,2711979	0,1191466
16,364	533,0	534,6	536,7	0,00	99,34	99,84	0,000	0,186	0,194	307	0,2686456	0,1188189
16,363	533,0	534,6	536,7	0,00	99,39	99,69	0,000	0,186	0,193	308	0,2686459	0,1239896
15,953	533,0	534,6	536,7	0,00	101,82	102,39	0,000	0,186	0,193	309	0,2618955	0,1167479
16,421	533,0	534,6	536,7	0,00	98,84	99,47	0,000	0,185	0,193	310	0,2695994	0,1188216
16,362	533,0	534,6	536,7	0,00	99,43	99,73	0,000	0,186	0,193	311	0,2686389	0,1118487
16,249	533,0	534,6	536,7	0,00	100,15	100,63	0,000	0,186	0,193	312	0,2667352	0,1188205
16,481	533,0	534,6	536,7	0,00	98,92	99,01	0,000	0,186	0,193	313	0,2705463	0,1187689
16,077	533,0	534,6	536,7	0,00	101,33	101,71	0,000	0,186	0,193	314	0,2639279	0,1260615
16,423	533,0	534,6	536,7	0,00	98,95	99,51	0,000	0,186	0,194	315	0,2695971	0,1260602
16,364	533,0	534,6	536,7	0,00	99,41	99,82	0,000	0,186	0,193	316	0,2686436	0,1208888
16,652	533,0	534,6	536,7	0,00	97,96	98,11	0,000	0,186	0,193	317	0,2733709	0,1208877
16,248	533,0	534,6	536,7	0,00	100,17	100,59	0,000	0,186	0,193	318	0,2667354	0,1167466
16,538	533,0	534,6	536,7	0,00	98,37	98,74	0,000	0,186	0,193	319	0,2714888	0,1239886
16,247	533,0	534,6	536,7	0,00	100,09	100,57	0,000	0,186	0,193	320	0,2667344	0,1115704
16,187	533,0	534,6	536,7	0,00	100,34	101,11	0,000	0,186	0,194	321	0,2657747	0,1208864
16,245	533,0	534,6	536,7	0,00	100,01	100,76	0,000	0,186	0,194	322	0,2667351	0,1188197
16,477	533,0	534,6	536,7	0,00	98,58	99,10	0,000	0,186	0,194	323	0,270546	0,1239907
16,592	533,0	534,6	536,8	0,00	97,97	98,35	0,000	0,186	0,193	324	0,2724314	0,1260602
16,434	533,0	534,6	536,8	0,00	98,72	99,33	0,000	0,185	0,193	325	0,2698325	0,1208846
16,304	533,0	534,6	536,7	0,00	99,76	100,13	0,000	0,186	0,193	326	0,2676885	0,1188184
16,305	533,0	534,6	536,8	0,00	99,93	100,26	0,000	0,186	0,193	327	0,2676913	0,1188198
16,233	533,0	534,6	536,7	0,00	100,07	100,55	0,000	0,186	0,193	328	0,2665314	0,1167487
16,246	533,0	534,6	536,8	0,00	100,05	100,39	0,000	0,186	0,193	329	0,2667355	0,1166315
16,537	533,0	534,6	536,7	0,00	98,35	98,84	0,000	0,186	0,193	330	0,2714892	0,1188154
16,245	533,0	534,6	536,7	0,00	100,06	100,44	0,000	0,186	0,193	331	0,2667355	0,1188184
16,245	533,0	534,6	536,8	0,00	99,88	100,62	0,000	0,186	0,193	332	0,2667362	0,1239812
16,431	533,0	534,6	536,8	0,00	98,93	99,35	0,000	0,186	0,193	333	0,2697875	0,1186761
16,475	533,0	534,6	536,8	0,00	98,56	99,05	0,000	0,186	0,193	334	0,2705317	0,1208873
16,245	533,0	534,6	536,8	0,00	100,24	100,46	0,000	0,186	0,193	335	0,266735	0,120885
16,023	533,0	534,6	536,8	0,00	101,48	101,77	0,000	0,186	0,193	336	0,2630471	0,1188185
16,072	533,0	534,6	536,8	0,00	101,16	101,50	0,000	0,186	0,193	337	0,2638395	0,1188177
16,650	533,0	534,6	536,8	0,00	97,75	97,93	0,000	0,186	0,193	338	0,2733718	0,1208877
16,594	533,0	534,6	536,8	0,00	98,12	98,47	0,000	0,186	0,193	339	0,2724291	0,1239896
16,324	533,0	534,6	536,8	0,00	99,66	100,10	0,000	0,186	0,194	340	0,2680342	0,1110696
16,245	533,0	534,6	536,8	0,00	100,18	100,46	0,000	0,186	0,193	341	0,2667177	0,1208849
16,069	533,0	534,6	536,8	0,00	101,11	101,53	0,000	0,186	0,193	342	0,263836	0,1208565
16,568	533,0	534,6	536,8	0,00	98,18	98,51	0,000	0,186	0,193	343	0,2720665	0,1188196
16,427	533,0	534,6	536,7	0,00	98,91	99,33	0,000	0,186	0,193	344	0,2697357	0,1239871
16,074	533,0	534,7	536,8	0,00	101,27	101,52	0,000	0,186	0,193	345	0,2638899	0,1115756
15,947	533,0	534,7	536,7	0,00	101,92	102,46	0,000	0,186	0,193	346	0,2618315	0,1212455
16,142	533,0	534,7	536,8	0,00	100,75	101,05	0,000	0,186	0,193	347	0,2650533	0,1208859
16,129	533,0	534,6	536,7	0,00	100,79	101,16	0,000	0,186	0,193	348	0,2648262	0,1188191
16,420	533,0	534,7	536,8	0,00	99,08	99,51	0,000	0,186	0,193	349	0,2695996	0,1260604
16,247	533,0	534,7	536,8	0,00	100,19	100,48	0,000	0,186	0,193	350	0,2667359	0,1208845
16,350	533,0	534,6	536,7	0,00	99,45	100,06	0,000	0,186	0,193	351	0,2683849	0,1188201
16,245	533,0	534,6	536,7	0,00	100,07	100,36	0,000	0,186	0,193	352	0,2667348	0,1188205
16,820	533,0	534,7	536,8	0,00	96,56	97,14	0,000	0,186	0,193	353	0,2761587	0,1208806
16,361	533,0	534,7	536,8	0,00	99,47	99,76	0,000	0,186	0,193	354	0,2686466	0,1208874
16,070	533,0	534,7	536,8	0,00	101,16	101,65	0,000	0,186	0,193	355	0,2638493	0,1188189
16,479	533,0	534,7	536,8	0,00	98,42	98,96	0,000	0,185	0,193	356	0,2705425	0,1260581
16,493	533,0	534,7	536,7	0,00	98,48	99,00	0,000	0,185	0,193	357	0,2707875	0,1208873
16,592	533,0	534,7	536,8	0,00	97,97	98,40	0,000	0,186	0,193	358	0,2724098	0,1208892
16,239	533,0	534,7	536,8	0,00	100,08	100,64	0,000	0,186	0,193	359	0,2666204	0,1187868
16,070	533,0	534,7	536,7	0,00	101,37	101,67	0,000	0,186	0,194	360	0,2638386	0,1239875
16,306	533,0	534,7	536,8	0,00	99,68	100,21	0,000	0,186	0,193	361	0,2676918	0,1208388
16,383	533,0	534,7	536,8	0,00	99,37	99,58	0,000	0,186	0,193	362	0,2689451	0,1208796
16,010	533,0	534,7	536,8	0,00	101,74	101,76	0,000	0,186	0,193	363	0,2628633	0,1198033
16,247	533,0	534,7	536,8	0,00	100,10	100,45	0,000	0,186	0,193	364	0,2667352	0,1183031
16,421	533,0	534,7	536,8	0,00	99,03	99,35	0,000	0,186	0,193	365	0,2695991	0,1188189
16,467	533,0	534,7	536,8	0,00	98,84	99,28	0,000	0,186	0,193	366	0,2703506	0,1239886
16,421	533,0	534,7	536,8	0,00	98,93	99,53	0,000	0,186	0,194	367	0,2695998	0,1208133
16,189	533,0	534,7	536,8	0,00	100,32	100,89	0,000	0,185	0,193	368	0,2657756	0,116749
16,248	533,0	534,7	536,8	0,00	100,09	100,47	0,000	0,186	0,193	369	0,2667355	0,1208868
16,248	533,0	534,7	536,8	0,00	100,10	100,53	0,000	0,186	0,193	370	0,2667357	0,1208871
16,250	533,0	534,7	536,8	0,00	100,08	100,49	0,000	0,186	0,193	371	0,266743	0,1217534
16,303	533,0	534,7	536,8	0,00	99,76	100,06	0,000	0,186	0,193	372	0,2676609	0,111635
16,618	533,0	534,7	536,8	0,00	97,89	98,37	0,000	0,186	0,193	373	0,2728151	0,1208852
16,306	533,0	534,7	536,8	0,00	99,66	100,14	0,000	0,186	0,193	374	0,2676923	0,1208904
16,422	533,0	534,7	536,8	0,00	99,05	99,41	0,000	0,186	0,193	375	0,2695976	0,1208868
16,248	533,0	534,7	536,8	0,00	100,23	100,33	0,000	0,186	0,193	376	0,2667359	0,1208853

16,189	533,0	534,7	536,8	0,00	100,45	100,99	0,000	0,186	0,193	377	0,2657755	0,1188192
16,247	533,0	534,7	536,8	0,00	100,19	100,36	0,000	0,186	0,193	378	0,2667474	0,1167492
16,363	533,0	534,7	536,8	0,00	99,49	99,75	0,000	0,186	0,193	379	0,2686473	0,1167476
16,540	533,0	534,7	536,8	0,00	98,22	98,90	0,000	0,186	0,194	380	0,2715675	0,1188184
16,356	533,0	534,7	536,8	0,00	99,53	99,76	0,000	0,186	0,193	381	0,2685385	0,1239891
16,478	533,0	534,7	536,8	0,00	98,68	99,18	0,000	0,186	0,193	382	0,2705456	0,1188186
16,536	533,0	534,7	536,8	0,00	98,25	98,76	0,000	0,186	0,193	383	0,2714878	0,1167491
16,361	533,0	534,7	536,8	0,00	99,57	99,61	0,000	0,186	0,193	384	0,268622	0,1208857
16,247	533,0	534,7	536,8	0,00	100,02	100,36	0,000	0,186	0,193	385	0,2667366	0,1259879
16,363	533,0	534,7	536,8	0,00	99,50	99,81	0,000	0,186	0,193	386	0,2686459	0,1239893
16,246	533,0	534,7	536,8	0,00	100,10	100,49	0,000	0,186	0,193	387	0,2667335	0,1167482
16,304	533,0	534,7	536,8	0,00	99,82	100,22	0,000	0,186	0,193	388	0,2676911	0,1136791
16,422	533,0	534,7	536,8	0,00	99,08	99,57	0,000	0,186	0,194	389	0,2695968	0,1188196
16,646	533,0	534,7	536,8	0,00	97,75	98,14	0,000	0,186	0,194	390	0,273321	0,1208856
16,419	533,0	534,7	536,8	0,00	98,78	99,39	0,000	0,186	0,193	391	0,269596	0,1188842
16,372	533,0	534,7	536,8	0,00	99,23	99,70	0,000	0,185	0,193	392	0,2688166	0,1208859
16,478	533,1	534,7	536,8	0,00	98,63	99,22	0,000	0,186	0,193	393	0,2705272	0,1188185
16,304	533,1	534,7	536,8	0,00	99,94	100,09	0,000	0,186	0,193	394	0,2676922	0,1183361
16,477	533,1	534,7	536,8	0,00	98,65	99,11	0,000	0,186	0,193	395	0,2705449	0,1239895
16,246	533,1	534,7	536,8	0,00	100,07	100,69	0,000	0,186	0,194	396	0,2667361	0,1208851
16,247	533,1	534,7	536,8	0,00	100,19	100,56	0,000	0,186	0,194	397	0,2667319	0,1208969
16,245	533,1	534,7	536,8	0,00	100,00	100,41	0,000	0,186	0,193	398	0,2667356	0,120869
16,474	533,1	534,7	536,8	0,00	98,62	98,88	0,000	0,186	0,193	399	0,2704931	0,120885
16,244	533,1	534,7	536,8	0,00	100,02	100,33	0,000	0,186	0,193	400	0,2667353	0,1208855
16,420	533,1	534,7	536,8	0,00	98,97	99,42	0,000	0,186	0,193	401	0,2695979	0,1188656
16,418	533,1	534,7	536,8	0,00	98,99	99,51	0,000	0,186	0,193	402	0,2695987	0,120885
16,215	533,1	534,7	536,8	0,00	100,23	100,77	0,000	0,186	0,194	403	0,2662297	0,1167487
16,420	533,1	534,7	536,8	0,00	99,01	99,49	0,000	0,186	0,193	404	0,2695989	0,1167481
16,536	533,1	534,7	536,8	0,00	98,38	98,72	0,000	0,186	0,193	405	0,2714824	0,1208857
16,244	533,1	534,8	536,8	0,00	100,02	100,45	0,000	0,186	0,193	406	0,2667322	0,1208848
16,305	533,1	534,7	536,8	0,00	99,65	100,21	0,000	0,186	0,193	407	0,2676925	0,1208856
16,128	533,1	534,7	536,8	0,00	100,87	101,34	0,000	0,186	0,194	408	0,2648127	0,1167499
16,129	533,0	534,7	536,8	0,00	100,80	101,29	0,000	0,186	0,194	409	0,2648182	0,1167476
16,069	533,1	534,7	536,8	0,00	101,23	101,54	0,000	0,186	0,193	410	0,263838	0,1208856
16,674	533,1	534,7	536,8	0,00	97,50	97,82	0,000	0,186	0,193	411	0,2737794	0,1208795
16,610	533,1	534,7	536,8	0,00	97,70	98,14	0,000	0,186	0,193	412	0,2727098	0,1188184
16,419	533,1	534,7	536,8	0,00	99,02	99,52	0,000	0,186	0,193	413	0,2696042	0,1208874
16,300	533,1	534,8	536,8	0,00	99,84	100,06	0,000	0,186	0,193	414	0,267688	0,1167479
16,533	533,1	534,8	536,8	0,00	98,35	98,69	0,000	0,186	0,193	415	0,2714873	0,1136456
16,477	533,1	534,8	536,8	0,00	98,66	99,08	0,000	0,186	0,193	416	0,2705616	0,1239898
16,126	533,1	534,8	536,8	0,00	100,98	101,26	0,000	0,186	0,193	417	0,2648072	0,1136424
16,473	533,1	534,8	536,8	0,00	98,66	99,06	0,000	0,186	0,193	418	0,2705449	0,1208984
16,534	533,1	534,8	536,8	0,00	98,33	98,76	0,000	0,186	0,193	419	0,2714824	0,123988
16,477	533,1	534,8	536,8	0,00	98,70	98,91	0,000	0,186	0,193	420	0,2705453	0,1260626
16,244	533,1	534,8	536,8	0,00	100,20	100,46	0,000	0,186	0,193	421	0,2667352	0,1167452
16,243	533,1	534,7	536,8	0,00	100,13	100,41	0,000	0,186	0,193	422	0,2667357	0,1239884
16,295	533,1	534,7	536,8	0,00	99,85	100,05	0,000	0,186	0,193	423	0,2676096	0,1167504
16,300	533,1	534,7	536,8	0,00	99,76	100,18	0,000	0,186	0,193	424	0,2676951	0,1208847
16,358	533,1	534,7	536,8	0,00	99,31	99,72	0,000	0,186	0,193	425	0,2686449	0,1208851
16,367	533,1	534,7	536,8	0,00	99,40	99,69	0,000	0,186	0,193	426	0,2687945	0,1208824
16,239	533,1	534,7	536,8	0,00	99,70	100,48	0,000	0,185	0,193	427	0,2667066	0,1208872
16,241	533,1	534,7	536,8	0,00	100,02	100,64	0,000	0,185	0,194	428	0,2667344	0,1115807
16,298	533,1	534,7	536,8	0,00	99,66	99,97	0,000	0,186	0,193	429	0,2676879	0,1188183
16,405	533,1	534,8	536,8	0,00	98,95	99,41	0,000	0,186	0,193	430	0,2694328	0,1208924
16,239	533,1	534,7	536,8	0,00	100,12	100,35	0,000	0,186	0,193	431	0,2667258	0,1259996
16,299	533,1	534,7	536,8	0,00	99,65	100,09	0,000	0,186	0,193	432	0,2676895	0,1188185
16,240	533,1	534,7	536,8	0,00	100,16	100,49	0,000	0,186	0,193	433	0,266735	0,1188196
16,405	533,1	534,8	536,8	0,00	99,02	99,47	0,000	0,186	0,193	434	0,2694572	0,118818
16,122	533,1	534,8	536,8	0,00	100,62	101,24	0,000	0,186	0,193	435	0,2648063	0,1188199
16,242	533,1	534,7	536,8	0,00	100,32	100,58	0,000	0,186	0,194	436	0,2667336	0,1239877
16,187	533,0	534,7	536,8	0,00	100,29	100,75	0,000	0,186	0,193	437	0,2658683	0,1239655
16,416	533,0	534,7	536,7	0,00	98,97	99,37	0,000	0,186	0,193	438	0,2695994	0,1208863
16,239	533,1	534,7	536,8	0,00	99,92	100,45	0,000	0,186	0,193	439	0,266734	0,118969
16,414	533,1	534,7	536,7	0,00	98,78	99,38	0,000	0,185	0,193	440	0,2695987	0,1260611
16,584	533,1	534,7	536,7	0,00	97,90	98,32	0,000	0,185	0,193	441	0,2724188	0,1188202
16,237	533,0	534,7	536,7	0,00	99,87	100,39	0,000	0,186	0,193	442	0,266726	0,126061
16,067	533,0	534,7	536,7	0,00	101,03	101,55	0,000	0,185	0,193	443	0,2638393	0,1188177
16,709	533,0	534,7	536,7	0,00	97,27	97,94	0,000	0,186	0,194	444	0,2743025	0,1260613
16,286	533,0	534,7	536,7	0,00	99,84	100,25	0,000	0,186	0,194	445	0,2673651	0,1239891
16,305	533,0	534,7	536,7	0,00	99,78	99,92	0,000	0,186	0,193	446	0,2676908	0,1239916
16,247	533,0	534,7	536,7	0,00	100,22	100,53	0,000	0,186	0,193	447	0,2667331	0,11387
16,178	533,0	534,7	536,7	0,00	100,56	100,92	0,000	0,186	0,193	448	0,2656414	0,1239879
16,482	533,0	534,7	536,7	0,00	98,68	99,10	0,000	0,186	0,193	449	0,2705722	0,1188183
16,248	533,0	534,7	536,7	0,00	100,01	100,44	0,000	0,186	0,193	450	0,2667353	0,1198306
16,365	533,0	534,7	536,7	0,00	99,43	99,88	0,000	0,186	0,193	451	0,2686454	0,1167468
16,251	533,0	534,7	536,7	0,00	100,09	100,42	0,000	0,186	0,193	452	0,26687	0,1208844
16,591	533,0	534,7	536,7	0,00	97,79	98,30	0,000	0,186	0,193	453	0,2724462	0,1188182
16,126	533,0	534,7	536,7	0,00	100,86	101,23	0,000	0,186	0,193	454	0,2648085	0,1238922
16,468	533,0	534,7	536,7	0,00	98,64	99,10	0,000	0,186	0,193	455	0,2703798	0,1208843
16,393	533,0	534,7	536,7	0,00	99,14	99,69	0,000	0,186	0,193	456	0,2691658	0,120885
16,126	533,0	534,7	536,7	0,00	100,94	101,09	0,000	0,186	0,193	457	0,264805	0,1188186
16,246	533,0	534,7	536,7	0,00	99,97	100,54	0,000	0,186	0,193	458	0,2667325	0,1254154
16,116	533,0	534,7	536,7	0,00	100,83	101,31	0,000	0,186	0,193	459	0,2646509	0,118477
16,242	533,0	534,7	536,7	0,00	100,01	100,65	0,000	0,186	0,194	460	0,2667568	0,1239886
16,589	533,0	534,7	536,7	0,00	97,98	98,49	0,000	0,186	0,194	461	0,2724259	0,1188179
16,472	533,0	534,7	536,7	0,00	98,51	98,91	0,000	0,186	0,193	462	0,2706339	0,116746
15,937	533,0	534,7	536,7	0,00	101,96	102,33	0,000	0,186	0,193	463	0,2618452	0,1208861
16,236	533,0	534,7	536,7	0,00	100,05	100,52	0,000	0,186	0,193	464	0,2667327	0,1188197
16,237	533,0	534,7	536,7	0,00	100,16	100,40	0,000	0,186	0,193	465	0,2667337	0,1142418
16,468	533,0	534,6	536,7	0,00	98,65	99,01	0,000	0,186	0,193	466	0,2705439	0,1208858
16,057	533,0	534,6	536,7	0,00	100,95	101,44	0,000	0,186	0,193	467	0,2638385	0,1208279
16,118	533,0	534,6	536,7	0,00	100,92	101,26	0,000	0,186	0,193	468	0,2648056	0,1167477
16,351	532,9	534,6	536,7	0,00	99,40	99,75	0,000	0,186	0,193	469	0,2686401	0,1239893
16,174	532,9	534,6	536,7	0,00	100,30	100,86	0,000	0,186	0,193	470	0,2657732	0,119445
16,234	532,9	534,6	536,6	0,00	100,13	100,30	0,000	0,186	0,193	471	0,2667556	0,1188197
16,174	533,0	534,6	536,6	0,00	100,21	100,78	0,000	0,186	0,193	472	0,2657731	0,11682

16,115	532,9	534,6	536,6	0,00	100,70	101,39	0,000	0,186	0,194	473	0,2647861	0,1208849
16,284	532,9	534,6	536,6	0,00	99,81	100,15	0,000	0,186	0,194	474	0,2675959	0,1260601
16,173	532,9	534,6	536,6	0,00	100,35	100,65	0,000	0,186	0,193	475	0,2657728	0,116751
16,234	532,9	534,6	536,6	0,00	100,10	100,44	0,000	0,186	0,193	476	0,2667321	0,1239895
16,297	532,9	534,6	536,6	0,00	99,65	100,20	0,000	0,186	0,193	477	0,2676893	0,1208865
16,415	532,9	534,6	536,6	0,00	98,88	99,52	0,000	0,186	0,194	478	0,269596	0,1188206
16,180	532,9	534,6	536,6	0,00	100,44	100,91	0,000	0,186	0,194	479	0,2657715	0,1188173
16,586	532,9	534,6	536,6	0,00	97,94	98,43	0,000	0,186	0,194	480	0,2724215	0,1188171
16,239	532,9	534,6	536,6	0,00	100,03	100,65	0,000	0,186	0,194	481	0,2667318	0,1208843
16,063	532,9	534,6	536,6	0,00	101,06	101,62	0,000	0,186	0,194	482	0,2638496	0,120469
16,355	532,9	534,6	536,6	0,00	99,31	99,75	0,000	0,186	0,193	483	0,2686421	0,1167463
16,179	532,9	534,6	536,6	0,00	100,36	100,69	0,000	0,186	0,193	484	0,2657689	0,1239894
16,260	532,9	534,5	536,6	0,00	99,94	100,41	0,000	0,186	0,193	485	0,2671133	0,1208366
16,402	532,9	534,5	536,5	0,00	98,81	99,26	0,000	0,186	0,193	486	0,2695279	0,1208839
16,521	532,9	534,5	536,5	0,00	98,28	98,67	0,000	0,186	0,193	487	0,271483	0,1188165
16,346	532,9	534,5	536,6	0,00	99,21	99,74	0,000	0,186	0,193	488	0,2686428	0,1239875
16,346	532,9	534,5	536,5	0,00	99,39	99,69	0,000	0,186	0,193	489	0,2686424	0,1208847
16,374	532,9	534,5	536,5	0,00	99,13	99,54	0,000	0,186	0,193	490	0,2691124	0,1208878
16,169	532,9	534,5	536,5	0,00	100,36	100,80	0,000	0,186	0,193	491	0,2657672	0,1187224
16,113	532,9	534,5	536,5	0,00	100,71	100,90	0,000	0,186	0,193	492	0,264804	0,1208858
16,527	532,9	534,5	536,5	0,00	98,27	98,64	0,000	0,186	0,193	493	0,2716134	0,1136549
16,454	532,8	534,5	536,5	0,00	98,68	99,03	0,000	0,186	0,193	494	0,2704266	0,1208842
16,053	532,8	534,5	536,5	0,00	101,17	101,56	0,000	0,186	0,193	495	0,2638345	0,1188166
16,634	532,8	534,5	536,5	0,00	97,61	98,00	0,000	0,186	0,193	496	0,2733633	0,1208884
16,400	532,8	534,5	536,5	0,00	99,00	99,55	0,000	0,186	0,194	497	0,2695173	0,1188192
16,178	532,8	534,5	536,5	0,00	100,34	100,81	0,000	0,186	0,194	498	0,2658344	0,1208855
16,177	532,8	534,5	536,5	0,00	100,25	100,84	0,000	0,186	0,193	499	0,2657703	0,1208864
16,117	532,8	534,5	536,5	0,00	100,92	101,21	0,000	0,186	0,193	500	0,2648039	0,1239871
16,236	532,8	534,5	536,5	0,00	100,26	100,67	0,000	0,186	0,194	501	0,2667317	0,1167468
16,234	532,8	534,5	536,5	0,00	99,83	100,69	0,000	0,186	0,194	502	0,266763	0,1232854
16,000	532,8	534,5	536,5	0,00	101,50	102,04	0,000	0,186	0,194	503	0,2628669	0,1239886
16,233	532,8	534,5	536,4	0,00	100,11	100,43	0,000	0,186	0,193	504	0,2667336	0,1167466
16,114	532,8	534,4	536,5	0,00	100,78	101,22	0,000	0,186	0,193	505	0,2647994	0,1208869
16,291	532,8	534,4	536,4	0,00	99,79	100,19	0,000	0,186	0,194	506	0,2676733	0,1208854
16,174	532,8	534,4	536,4	0,00	100,41	100,80	0,000	0,186	0,193	507	0,2657698	0,1208848
16,498	532,8	534,4	536,4	0,00	98,33	98,90	0,000	0,186	0,193	508	0,2710937	0,1208868
16,232	532,8	534,4	536,4	0,00	100,20	100,34	0,000	0,186	0,193	509	0,2667314	0,1208864
16,292	532,8	534,4	536,4	0,00	99,59	100,04	0,000	0,186	0,193	510	0,267689	0,1169628
16,056	532,8	534,4	536,4	0,00	101,07	101,52	0,000	0,186	0,193	511	0,2638349	0,1188177
16,635	532,8	534,4	536,4	0,00	97,65	97,95	0,000	0,186	0,193	512	0,2733666	0,1167514
16,077	532,8	534,4	536,4	0,00	100,96	101,37	0,000	0,186	0,193	513	0,2641861	0,1239889
16,407	532,8	534,4	536,4	0,00	99,07	99,52	0,000	0,186	0,193	514	0,2695857	0,1167474
16,058	532,8	534,4	536,4	0,00	101,08	101,50	0,000	0,186	0,193	515	0,2638357	0,1208855
15,942	532,8	534,4	536,4	0,00	101,85	102,44	0,000	0,186	0,194	516	0,2619582	0,1208861
16,461	532,8	534,4	536,4	0,00	98,48	98,96	0,000	0,186	0,194	517	0,270544	0,1188193
16,116	532,7	534,4	536,4	0,00	100,71	101,32	0,000	0,186	0,193	518	0,264803	0,1208737
16,525	532,8	534,3	536,4	0,00	98,43	98,71	0,000	0,186	0,194	519	0,2714838	0,1188176
16,209	532,8	534,3	536,4	0,00	100,32	100,95	0,000	0,186	0,194	520	0,2663772	0,1167478
16,350	532,7	534,3	536,4	0,00	99,39	99,77	0,000	0,186	0,194	521	0,2686539	0,1239892
16,230	532,7	534,3	536,4	0,00	100,07	100,61	0,000	0,186	0,194	522	0,2667348	0,1208867
16,287	532,8	534,3	536,4	0,00	99,71	100,16	0,000	0,186	0,194	523	0,2676859	0,1208844
16,518	532,7	534,3	536,4	0,00	98,25	98,83	0,000	0,186	0,194	524	0,2714834	0,1208859
16,407	532,7	534,3	536,4	0,00	99,12	99,41	0,000	0,186	0,194	525	0,2695837	0,1208854
16,230	532,7	534,3	536,4	0,00	100,14	100,42	0,000	0,186	0,193	526	0,2667303	0,1208842
16,403	532,7	534,3	536,3	0,00	99,19	99,28	0,000	0,186	0,193	527	0,269595	0,1208825
16,447	532,7	534,3	536,3	0,00	98,68	99,22	0,000	0,186	0,193	528	0,2703541	0,1281289
16,230	532,7	534,3	536,3	0,00	100,00	100,36	0,000	0,186	0,193	529	0,2667279	0,1188179
16,306	532,7	534,3	536,3	0,00	99,53	100,03	0,000	0,186	0,193	530	0,2680377	0,1167561
16,286	532,7	534,3	536,3	0,00	99,63	99,98	0,000	0,186	0,193	531	0,2676873	0,1136468
16,194	532,7	534,3	536,3	0,00	100,44	100,59	0,000	0,186	0,193	532	0,2661771	0,1208847
16,460	532,7	534,2	536,3	0,00	98,68	99,12	0,000	0,186	0,193	533	0,2705404	0,1239846
16,460	532,7	534,3	536,3	0,00	98,64	99,14	0,000	0,186	0,194	534	0,2705427	0,1188604
16,285	532,7	534,3	536,3	0,00	99,69	100,14	0,000	0,186	0,194	535	0,2676871	0,1260593
16,228	532,7	534,3	536,3	0,00	99,98	100,44	0,000	0,186	0,194	536	0,2667398	0,1239878
16,573	532,7	534,3	536,3	0,00	97,83	98,31	0,000	0,186	0,193	537	0,2724231	0,1188176
16,048	532,7	534,3	536,3	0,00	101,04	101,54	0,000	0,186	0,193	538	0,2638347	0,1260147
16,139	532,7	534,2	536,3	0,00	100,63	101,01	0,000	0,186	0,194	539	0,2653199	0,1239874
16,229	532,6	534,2	536,3	0,00	100,23	100,42	0,000	0,186	0,193	540	0,2667299	0,1188198
16,226	532,6	534,2	536,3	0,00	99,86	100,46	0,000	0,186	0,193	541	0,2667295	0,118967
16,436	532,6	534,2	536,3	0,00	98,72	99,21	0,000	0,186	0,194	542	0,2702128	0,1208868
16,434	532,6	534,2	536,3	0,00	98,79	99,17	0,000	0,186	0,194	543	0,2701848	0,115699
16,170	532,6	534,2	536,3	0,00	100,47	100,98	0,000	0,186	0,194	544	0,2657879	0,116759
16,283	532,6	534,2	536,3	0,00	99,74	100,05	0,000	0,186	0,194	545	0,2676855	0,1260601
16,457	532,6	534,2	536,2	0,00	98,64	99,10	0,000	0,186	0,194	546	0,2705398	0,1208853
16,453	532,6	534,2	536,3	0,00	98,70	99,08	0,000	0,186	0,194	547	0,2704955	0,1260624
16,284	532,6	534,2	536,2	0,00	99,85	100,14	0,000	0,186	0,194	548	0,2677404	0,123991
16,342	532,6	534,2	536,2	0,00	99,13	99,90	0,000	0,186	0,194	549	0,2686384	0,1208852
16,224	532,6	534,2	536,2	0,00	100,14	100,43	0,000	0,186	0,194	550	0,26673	0,120886
16,426	532,6	534,2	536,2	0,00	98,83	99,23	0,000	0,186	0,194	551	0,2700691	0,1208841
16,226	532,6	534,2	536,2	0,00	100,04	100,55	0,000	0,186	0,194	552	0,2667579	0,1239842
16,399	532,6	534,1	536,2	0,00	99,05	99,42	0,000	0,186	0,194	553	0,2695911	0,1167502
16,103	532,6	534,1	536,2	0,00	100,86	101,08	0,000	0,186	0,193	554	0,2648031	0,1167478
16,393	532,6	534,1	536,2	0,00	99,03	99,34	0,000	0,186	0,193	555	0,2695245	0,1208865
16,225	532,6	534,1	536,2	0,00	100,03	100,47	0,000	0,186	0,193	556	0,2667308	0,1192847
16,222	532,6	534,1	536,2	0,00	100,09	100,29	0,000	0,186	0,193	557	0,2667287	0,1208877
16,179	532,6	534,1	536,2	0,00	100,25	100,60	0,000	0,186	0,193	558	0,2660794	0,1281264
16,281	532,6	534,1	536,2	0,00	99,76	100,07	0,000	0,186	0,193	559	0,2676627	0,1188182
16,224	532,5	534,1	536,2	0,00	100,10	100,61	0,000	0,186	0,194	560	0,2667221	0,1260607
16,397	532,5	534,1	536,2	0,00	98,93	99,38	0,000	0,186	0,194	561	0,2695896	0,1208842
16,045	532,6	534,1	536,2	0,00	101,19	101,45	0,000	0,186	0,193	562	0,2638342	0,1171981
16,220	532,6	534,1	536,2	0,00	99,92	100,57	0,000	0,186	0,194	563	0,2667125	0,1188185
16,045	532,6	534,1	536,2	0,00	101,15	101,53	0,000	0,186	0,194	564	0,2638328	0,1208856
16,278	532,6	534,1	536,2	0,00	99,72	100,17	0,000	0,186	0,194	565	0,267686	0,125955
16,167	532,6	534,1	536,2	0,00	100,25	100,60	0,000	0,186	0,193	566	0,2658982	0,1239901
16,120	532,5	534,1	536,2	0,00	100,63	101,12	0,000	0,186	0,193	567	0,2650815	0,1188179
16,100	532,5	534,1	536,2	0,00	100,74	101,24	0,000	0,186	0,194	568	0,2647983	0,1188173

16,217	532,5	534,1	536,2	0,00	99,88	100,66	0,000	0,186	0,194	569	0,266729	0,1190822
16,270	532,5	534,0	536,1	0,00	99,84	100,17	0,000	0,186	0,194	570	0,2675835	0,1239518
16,507	532,5	534,0	536,2	0,00	98,31	98,61	0,000	0,186	0,194	571	0,2714969	0,1239882
16,218	532,5	534,0	536,2	0,00	100,00	100,39	0,000	0,186	0,193	572	0,2667196	0,1188106
16,277	532,5	534,0	536,2	0,00	99,59	99,99	0,000	0,186	0,193	573	0,267686	0,1281269
16,743	532,5	534,0	536,1	0,00	96,83	97,12	0,000	0,186	0,193	574	0,2754153	0,1208869
16,273	532,5	534,0	536,1	0,00	99,59	100,11	0,000	0,186	0,193	575	0,2676847	0,1237153
16,274	532,5	534,0	536,1	0,00	99,75	100,21	0,000	0,186	0,194	576	0,2676848	0,1239882
16,618	532,5	534,0	536,1	0,00	97,55	98,18	0,000	0,186	0,194	577	0,2733623	0,1257561
16,323	532,5	534,0	536,1	0,00	99,27	99,74	0,000	0,186	0,194	578	0,2685261	0,1208849
16,332	532,5	534,0	536,1	0,00	99,36	99,57	0,000	0,186	0,193	579	0,2686407	0,1239914
16,097	532,5	534,0	536,1	0,00	100,84	101,20	0,000	0,186	0,193	580	0,2648025	0,1208851
16,039	532,5	534,0	536,1	0,00	101,22	101,48	0,000	0,186	0,194	581	0,2638335	0,1188194
16,148	532,5	534,0	536,1	0,00	100,50	100,95	0,000	0,186	0,194	582	0,2655972	0,1208861
16,560	532,5	534,0	536,1	0,00	98,17	98,34	0,000	0,186	0,194	583	0,2723841	0,1260576

Average	Average	Average	Average								Average	Average
16,71	Inlet +	Inlet +	Inlet +								0,269	-0,128
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	98,07	101,40	101,58	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	**Proportional Rates**			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st Hr	**PR1**	**PR2**				Time		negative val
Ft/Sec	Deg. R	Deg. R	Deg. R	**%**	**%**	**%**	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
16,231	529,4	529,8	529,9				0,175	0,186	0,194	0	0,2671455	0,1312312
15,897	529,5	529,9	529,9	95,56	103,21	103,85	0,176	0,185	0,194	1	0,2608849	0,1353684
16,511	529,5	529,9	529,9	92,95	100,49	100,90	0,176	0,185	0,194	2	0,2695231	0,1302136
16,154	529,5	529,9	529,9	93,82	101,77	102,20	0,175	0,185	0,194	3	0,2647765	0,1332976
16,303	529,5	529,8	529,9	93,73	101,22	101,60	0,176	0,185	0,193	4	0,2666995	0,1281242
16,268	529,5	529,8	529,9	94,11	101,79	102,10	0,176	0,185	0,193	5	0,265934	0,1299048
16,157	529,6	529,8	529,9	94,68	102,62	103,17	0,175	0,185	0,194	6	0,2637861	0,1312446
15,988	529,7	529,9	530,0	95,74	103,79	104,23	0,175	0,185	0,194	7	0,2608567	0,1312329
15,761	529,7	530,0	530,0	97,26	105,61	105,85	0,175	0,185	0,193	8	0,2569301	0,1312319
16,143	529,7	530,0	530,1	95,16	103,18	103,84	0,175	0,185	0,194	9	0,2629131	0,1281025
16,446	529,8	530,0	530,2	93,61	101,45	101,83	0,175	0,185	0,194	10	0,2676623	0,128123
16,469	529,8	530,1	530,2	93,77	101,37	102,08	0,175	0,185	0,194	11	0,2676583	0,1405389
16,503	529,9	530,1	530,3	98,38	101,69	102,36	0,183	0,185	0,194	12	0,2676657	0,1353717
16,518	529,9	530,2	530,3	98,53	101,82	102,35	0,183	0,185	0,194	13	0,2676632	0,1239898
16,546	530,0	530,2	530,4	99,06	101,95	102,42	0,184	0,185	0,194	14	0,2676728	0,1353668
16,453	530,1	530,3	530,5	99,65	102,96	103,53	0,184	0,185	0,194	15	0,2657393	0,1353695
16,475	530,2	530,3	530,6	99,92	102,93	103,46	0,184	0,185	0,194	16	0,265756	0,1384747
16,815	530,3	530,4	530,6	98,52	101,55	101,87	0,184	0,185	0,193	17	0,2705241	0,1353723
16,457	530,4	530,4	530,7	100,15	103,85	104,27	0,183	0,185	0,193	18	0,2645528	0,1353714
16,466	530,5	530,5	530,7	101,13	103,62	104,20	0,185	0,185	0,193	19	0,2647835	0,1332992
16,472	530,5	530,5	530,8	101,20	103,61	104,25	0,185	0,185	0,194	20	0,2647842	0,1353728
16,232	530,6	530,6	530,9	101,67	104,75	105,47	0,183	0,185	0,193	21	0,2611067	0,1312376
16,474	530,6	530,7	531,0	100,08	103,63	103,86	0,183	0,185	0,193	22	0,2648524	0,1366036
16,639	530,7	530,8	531,1	99,52	102,51	102,85	0,184	0,185	0,193	23	0,2676707	0,1405438
16,398	530,7	530,9	531,3	100,49	104,08	104,56	0,183	0,185	0,193	24	0,2637866	0,1384774
16,572	530,8	531,0	531,4	99,03	102,80	103,22	0,183	0,185	0,193	25	0,2667512	0,1333027
16,744	530,9	531,1	531,5	97,93	101,39	101,84	0,183	0,185	0,193	26	0,2696644	0,1436487
16,681	530,9	531,1	531,6	98,55	101,80	102,08	0,183	0,185	0,193	27	0,2688199	0,1353751
16,592	531,0	531,2	531,7	98,99	102,13	102,55	0,184	0,185	0,193	28	0,2676709	0,1384778
16,643	531,0	531,3	531,8	98,85	101,58	102,14	0,184	0,185	0,193	29	0,2686257	0,1353845
17,020	531,0	531,4	532,0	95,39	99,13	99,56	0,182	0,185	0,193	30	0,2750187	0,1457161
16,745	531,1	531,5	532,0	97,85	100,87	101,39	0,184	0,185	0,193	31	0,2705306	0,1384771
16,788	531,1	531,5	532,1	97,60	100,44	100,89	0,184	0,185	0,193	32	0,2714457	0,1360412
16,829	531,1	531,4	532,1	96,74	99,97	100,13	0,183	0,185	0,193	33	0,2724154	0,1312358
16,955	531,1	531,5	532,1	96,14	99,39	99,65	0,183	0,185	0,193	34	0,2742894	0,1477855
16,549	531,1	531,6	532,2	99,08	101,80	102,27	0,184	0,185	0,193	35	0,2677703	0,1333022
16,667	531,1	531,7	532,3	97,85	100,91	101,36	0,183	0,185	0,193	36	0,2695953	0,1384759
17,173	531,2	531,8	532,4	99,95	103,37	103,76	0,183	0,185	0,193	37	0,270531	0,1353732
17,022	531,2	531,9	532,5	102,22	105,34	105,70	0,183	0,185	0,193	38	0,2667228	0,1332949
16,621	531,2	531,9	532,6	100,27	103,57	103,84	0,183	0,185	0,193	39	0,2657601	0,1281315
16,703	531,3	531,9	532,6	98,74	101,84	102,34	0,183	0,185	0,193	40	0,2686311	0,1312339
16,387	531,3	531,9	532,6	100,56	103,60	103,73	0,183	0,185	0,193	41	0,2638278	0,1322181
16,572	531,4	531,9	532,7	99,34	102,64	102,93	0,183	0,185	0,192	42	0,2667304	0,1352908
16,979	531,4	531,9	532,7	97,04	99,90	100,23	0,183	0,185	0,193	43	0,2734372	0,1312384
16,573	531,4	531,9	532,7	99,68	102,86	103,08	0,184	0,185	0,193	44	0,2667283	0,1333022
16,507	531,4	532,0	532,8	100,06	102,72	103,22	0,184	0,185	0,193	45	0,2657649	0,1316592
16,948	531,5	532,0	532,9	96,87	100,21	100,64	0,183	0,184	0,193	46	0,2728005	0,1281318
16,449	531,5	532,0	532,9	99,75	103,38	103,70	0,182	0,185	0,193	47	0,2647071	0,1333047
16,764	531,5	532,0	533,0	96,89	101,79	101,68	0,180	0,185	0,192	48	0,2695878	0,1333021
16,943	531,5	532,0	533,0	97,70	100,58	100,74	0,184	0,185	0,192	49	0,2724207	0,1353723
16,867	531,5	532,0	532,9	97,98	101,37	101,51	0,183	0,185	0,193	50	0,2709829	0,1333084
17,067	531,6	532,0	533,0	96,83	99,86	100,04	0,183	0,185	0,193	51	0,2742647	0,1312412
16,899	531,6	532,0	533,0	98,05	100,94	101,25	0,184	0,185	0,192	52	0,2714765	0,1345288
16,895	531,6	532,0	533,1	98,34	100,69	101,34	0,184	0,184	0,193	53	0,2714801	0,1312366
16,420	531,6	532,1	533,1	100,56	103,82	103,97	0,183	0,184	0,193	54	0,2638333	0,1353749
16,896	531,7	532,1	533,1	97,92	100,99	101,39	0,183	0,185	0,193	55	0,2714784	0,1333152
16,720	531,7	532,2	533,2	98,89	101,86	102,22	0,183	0,185	0,193	56	0,268638	0,1260646
16,933	531,8	532,3	533,3	96,96	100,32	100,76	0,182	0,184	0,193	57	0,2724217	0,1239895
16,528	531,8	532,4	533,4	99,66	103,12	103,61	0,182	0,184	0,193	58	0,2654557	0,1281319
16,672	531,9	532,5	533,5	99,35	102,35	102,57	0,183	0,184	0,192	59	0,267683	0,1246827
16,446	531,9	532,5	533,5	100,60	103,99	104,31	0,183	0,184	0,192	60	0,2638368	0,1239933
16,866	531,8	532,5	533,7	0,01	101,42	101,65	0,000	0,185	0,192	61	0,2705428	0,1293517
16,999	531,7	532,6	533,9	0,01	100,66	100,88	0,000	0,185	0,192	62	0,2726188	0,1333044
16,686	531,6	532,6	534,1	0,01	102,30	102,59	0,000	0,184	0,192	63	0,2676713	0,1280936
16,686	531,6	532,7	534,3	0,00	102,32	102,57	0,000	0,184	0,192	64	0,2676905	0,1384777
16,807	531,6	532,7	534,3	0,00	101,89	101,70	0,000	0,185	0,192	65	0,2695974	0,1353798
17,056	531,6	532,6	534,4	0,00	100,12	100,14	0,000	0,185	0,192	66	0,2737458	0,1296897
16,687	531,5	532,6	534,5	0,00	102,53	102,58	0,000	0,185	0,192	67	0,2676812	0,1312393
17,074	531,5	532,7	534,6	0,00	99,76	99,89	0,000	0,184	0,192	68	0,2743031	0,1312451
16,794	531,5	532,8	534,7	0,00	101,54	101,92	0,000	0,184	0,192	69	0,269756	0,1312363
16,745	531,4	532,9	534,8	0,00	101,99	101,91	0,000	0,184	0,192	70	0,2687885	0,1333072
16,610	531,5	532,9	534,9	0,00	102,76	102,64	0,000	0,185	0,192	71	0,2667358	0,1333056
16,702	531,5	532,9	535,0	0,00	102,12	102,39	0,000	0,184	0,192	72	0,2679153	0,1309342
16,741	531,5	533,0	535,1	0,00	102,10	102,03	0,000	0,184	0,192	73	0,2684181	0,131237
17,046	531,5	533,0	535,1	0,00	100,34	100,33	0,000	0,184	0,192	74	0,2733672	0,1312378
16,748	531,4	533,0	535,1	0,00	102,11	102,03	0,000	0,184	0,192	75	0,2686502	0,1260647
16,813	531,5	533,0	535,2	0,00	101,63	101,68	0,000	0,184	0,192	76	0,2696975	0,1260657
16,888	531,4	533,0	535,2	0,00	101,37	101,24	0,000	0,185	0,192	77	0,2708679	0,1281342
16,627	531,5	533,0	535,3	0,00	102,65	102,85	0,000	0,184	0,192	78	0,2667412	0,1332139
16,689	531,5	533,1	535,3	0,00	102,54	102,31	0,000	0,184	0,192	79	0,2676866	0,1241283
16,928	531,5	533,2	535,4	0,00	100,90	101,05	0,000	0,184	0,192	80	0,2714898	0,1312369
16,888	531,5	533,2	535,4	0,00	101,25	101,24	0,000	0,184	0,192	81	0,2707482	0,1312384
16,929	531,6	533,2	535,5	0,00	101,01	100,82	0,000	0,184	0,192	82	0,271493	0,1312911
16,871	531,6	533,2	535,5	0,00	101,29	101,57	0,000	0,184	0,192	83	0,2705454	0,1281319
16,919	531,7	533,3	535,5	0,00	100,87	100,82	0,000	0,184	0,192	84	0,2714651	0,1312397
16,922	531,7	533,4	535,6	0,00	100,78	100,89	0,000	0,184	0,192	85	0,2714928	0,1262129
16,802	531,7	533,4	535,6	0,00	101,52	101,46	0,000	0,184	0,192	86	0,2696034	0,1281442
17,091	531,7	533,5	535,7	0,00	99,90	99,77	0,000	0,184	0,192	87	0,2743103	0,1240041
16,800	531,8	533,5	535,8	0,00	101,30	101,42	0,000	0,184	0,191	88	0,2695624	0,1312418

16,864	531,8	533,5	535,8	0,00	101,36	101,24	0,000	0,184	0,191	89	0,2704528	0,1260654
16,686	531,8	533,6	535,9	0,00	102,14	102,28	0,000	0,184	0,192	90	0,2676974	0,1240023
16,883	531,8	533,6	535,9	0,00	101,13	101,17	0,000	0,184	0,192	91	0,27078	0,1239915
16,685	531,8	533,7	536,0	0,00	102,10	102,41	0,000	0,184	0,192	92	0,2676991	0,1281455
16,626	531,9	533,7	536,0	0,00	102,46	102,73	0,000	0,184	0,192	93	0,2667437	0,1281319
16,618	531,9	533,7	536,0	0,00	102,48	102,47	0,000	0,184	0,192	94	0,2667452	0,1239953
17,084	531,9	533,7	536,1	0,00	99,61	99,76	0,000	0,184	0,192	95	0,2743134	0,1260651
16,900	531,9	533,7	536,0	0,00	100,65	100,64	0,000	0,184	0,192	96	0,271501	0,1281336
16,631	531,9	533,7	536,0	0,00	102,17	102,14	0,000	0,184	0,191	97	0,2673619	0,1281345
16,951	531,9	533,7	536,1	0,00	100,39	100,42	0,000	0,184	0,192	98	0,2725194	0,1260682
16,586	531,9	533,7	536,0	0,00	102,33	102,51	0,000	0,184	0,192	99	0,266752	0,1281339
16,638	531,9	533,7	536,0	0,00	101,85	101,96	0,000	0,184	0,192	100	0,2677015	0,1239956
16,974	531,9	533,6	536,1	0,00	99,75	100,15	0,000	0,184	0,192	101	0,2730535	0,1281336
16,811	531,9	533,6	536,0	0,00	100,93	100,90	0,000	0,184	0,192	102	0,2705571	0,1260649
16,921	531,9	533,6	536,0	0,00	100,22	100,09	0,000	0,184	0,192	103	0,2724383	0,1260553
16,852	531,9	533,6	536,0	0,00	100,44	100,36	0,000	0,184	0,191	104	0,2714981	0,1208895
16,581	532,0	533,7	536,0	0,00	102,07	102,25	0,000	0,184	0,192	105	0,2669894	0,1136539
16,901	532,0	533,7	536,0	0,00	100,04	99,89	0,000	0,184	0,192	106	0,2724317	0,1309892
16,559	532,0	533,8	536,1	0,00	102,37	102,10	0,000	0,184	0,191	107	0,266749	0,1260654
16,905	532,0	533,8	536,1	0,00	99,87	100,10	0,000	0,184	0,192	108	0,2724394	0,118825
16,611	532,0	533,8	536,1	0,00	101,87	101,99	0,000	0,184	0,192	109	0,2677009	0,1209003
16,542	532,0	533,8	536,1	0,00	101,96	102,08	0,000	0,184	0,192	110	0,266766	0,1167654
16,895	532,0	533,8	536,1	0,00	99,70	99,84	0,000	0,184	0,191	111	0,2724401	0,1260672
16,775	532,0	533,8	536,1	0,00	100,74	100,53	0,000	0,184	0,191	112	0,2705431	0,1259794
16,596	532,0	533,8	536,1	0,00	101,49	101,60	0,000	0,184	0,191	113	0,2676997	0,126064
16,819	532,0	533,9	536,2	0,00	100,22	100,29	0,000	0,184	0,192	114	0,2714961	0,1167489
16,827	532,0	533,9	536,2	0,00	100,33	100,19	0,000	0,184	0,192	115	0,2714963	0,1167508
16,811	532,0	533,9	536,2	0,00	99,99	100,13	0,000	0,184	0,191	116	0,2714971	0,1208891
16,758	532,0	534,0	536,3	0,00	100,46	100,60	0,000	0,184	0,192	117	0,2705559	0,1208896
16,916	532,0	534,0	536,3	0,00	99,31	99,28	0,000	0,184	0,191	118	0,2733764	0,1188042
16,576	532,0	534,0	536,3	0,00	101,49	101,43	0,000	0,184	0,191	119	0,2677018	0,1239931
16,754	532,0	533,9	536,2	0,00	100,53	100,76	0,000	0,184	0,192	120	0,2705536	0,1188228
16,932	531,9	533,8	536,2	0,00	99,11	99,30	0,000	0,184	0,192	121	0,273375	0,1239904
16,917	531,9	533,7	536,1	0,00	99,50	99,42	0,000	0,184	0,191	122	0,2733756	0,1187972
16,864	531,9	533,6	536,1	0,00	99,75	99,76	0,000	0,184	0,192	123	0,2723881	0,1188257
16,922	531,8	533,6	536,0	0,00	99,54	99,58	0,000	0,184	0,192	124	0,2733741	0,1167517
16,918	531,8	533,6	536,0	0,00	99,29	99,29	0,000	0,184	0,192	125	0,2733753	0,1208889
16,937	531,8	533,6	536,0	0,00	99,27	99,48	0,000	0,184	0,192	126	0,2737	0,1188117
16,630	531,8	533,6	536,1	0,00	101,23	101,12	0,000	0,184	0,192	127	0,2686668	0,1208878
16,854	531,8	533,7	536,1	0,00	99,51	99,63	0,000	0,184	0,191	128	0,2724335	0,1242566
16,903	531,8	533,7	536,1	0,00	99,22	99,29	0,000	0,184	0,191	129	0,2733759	0,1260627
16,735	531,7	533,6	536,1	0,00	100,33	100,52	0,000	0,184	0,192	130	0,2704534	0,1188233
16,974	531,7	533,5	536,0	0,00	99,13	98,86	0,000	0,184	0,191	131	0,2743097	0,1208889
16,741	531,7	533,4	535,9	0,00	100,59	100,51	0,000	0,184	0,191	132	0,2705565	0,116752
16,789	531,6	533,3	535,8	0,00	100,13	99,98	0,000	0,184	0,192	133	0,2714956	0,1208943
16,492	531,6	533,3	535,8	0,00	101,81	101,74	0,000	0,184	0,191	134	0,2667416	0,1167544
16,545	531,5	533,3	535,8	0,00	101,26	101,46	0,000	0,184	0,192	135	0,2676978	0,1167505
16,956	531,5	533,3	535,7	0,00	98,70	98,66	0,000	0,184	0,191	136	0,2743088	0,1260638
16,373	531,5	533,4	535,8	0,00	102,62	102,49	0,000	0,184	0,191	137	0,2648123	0,1167301
16,718	531,6	533,4	535,8	0,00	100,32	100,40	0,000	0,184	0,192	138	0,2705513	0,1191391
16,831	531,5	533,4	535,9	0,00	99,65	99,56	0,000	0,184	0,192	139	0,2724358	0,1115788
16,842	531,6	533,5	535,9	3,69	99,72	99,60	0,007	0,184	0,191	140	0,2724351	0,1208876
16,544	531,8	533,5	535,8	0,01	101,47	101,42	0,000	0,184	0,192	141	0,2676544	0,116749
16,604	531,8	533,4	535,7	0,00	101,01	100,96	0,000	0,184	0,191	142	0,2686632	0,1260058
16,767	531,7	533,4	535,7	0,00	99,86	99,86	0,000	0,184	0,191	143	0,2714933	0,1208895
16,654	531,7	533,3	535,7	0,00	100,48	100,58	0,000	0,184	0,191	144	0,2696042	0,1260633
17,051	531,6	533,2	535,6	0,00	98,43	98,17	0,000	0,184	0,192	145	0,2761657	0,1239914
16,764	531,6	533,2	535,6	0,00	100,00	99,91	0,000	0,184	0,192	146	0,271493	0,1260642

Average	Average	Average	Average								Average	Average
16,88	Inlet +	Inlet +	Inlet +								0,272	-0,121
	Outlet	Outlet	Outlet	Average	Average	Average	#1st Hr	#1	#2			
Tunnel	Temp.	Temp.	Temp.	98,38	100,80	101,53	System 1st Hr	System 1	System 2		SQRT	tunnel static
Velocity	Meter 1st Hr	Meter 1	Meter 2	**Proportional Rates**			Vol.Std.	Vol.Std.	Vol.Std.		Delta-P	pressure
				PR1st Hr	**PR1**	**PR2**				Time		neg value
Ft/Sec	Deg. R	Deg. R	Deg. R	**%**	**%**	**%**	(ft3)	(ft3)	(ft3)	min	(in H2O)2	(in H2O)
16,776	531,1	532,5	534,1				0,184	0,225	0,191	0	0,2699706	0,118819
16,789	531,5	532,9	534,3	97,43	101,34	101,84	0,184	0,205	0,191	1	0,271231	0,1208882
16,658	531,6	533,1	534,3	98,71	102,87	103,77	0,183	0,184	0,192	2	0,2677062	0,1238754
16,833	531,7	533,2	534,3	97,88	101,72	103,02	0,183	0,184	0,192	3	0,2705462	0,1260613
16,747	531,8	533,3	534,3	99,30	103,68	104,51	0,183	0,184	0,192	4	0,2676884	0,1239896
16,567	531,9	533,3	534,4	99,31	103,02	104,25	0,184	0,184	0,192	5	0,266705	0,1240117
16,563	532,0	533,3	534,4	99,08	102,96	103,78	0,183	0,184	0,192	6	0,2667322	0,1208867
16,602	532,1	533,4	534,4	99,16	103,24	104,26	0,183	0,184	0,192	7	0,2667338	0,1239923
16,584	532,2	533,5	534,5	99,45	103,78	105,08	0,182	0,184	0,192	8	0,2657756	0,118822
16,879	532,3	533,6	534,5	98,25	102,38	103,44	0,183	0,184	0,192	9	0,2699863	0,1265247
17,233	532,4	533,7	534,6	96,87	100,47	101,50	0,183	0,184	0,192	10	0,2752327	0,1208882
16,820	532,6	533,8	534,7	98,63	103,26	103,99	0,182	0,184	0,192	11	0,2686473	0,1239922
16,885	532,7	533,8	534,8	98,04	102,48	103,48	0,182	0,184	0,192	12	0,2698438	0,1281317
16,707	532,8	533,9	534,8	99,87	103,90	104,80	0,183	0,184	0,192	13	0,2667415	0,1333045
16,670	533,0	534,0	534,8	100,06	104,55	105,37	0,182	0,184	0,192	14	0,2657751	0,1312908
16,986	533,1	534,0	534,9	98,12	102,06	103,20	0,182	0,184	0,192	15	0,270759	0,1312859
16,799	533,1	533,9	534,9	99,50	103,60	104,58	0,183	0,184	0,192	16	0,2676735	0,131237
16,990	533,2	534,0	534,9	98,07	102,69	103,44	0,182	0,184	0,192	17	0,2705494	0,1312383
17,046	533,3	534,0	535,0	98,08	102,46	102,84	0,183	0,184	0,191	18	0,2714894	0,1281362
16,753	533,3	534,0	535,0	100,15	104,12	105,05	0,183	0,184	0,192	19	0,2667407	0,1260666
16,933	533,3	534,0	535,0	99,13	102,95	103,96	0,184	0,184	0,192	20	0,2698735	0,1312383
17,280	533,4	534,0	535,0	96,36	101,11	101,96	0,182	0,184	0,192	21	0,2752392	0,1260677
16,746	533,4	534,1	535,1	99,52	104,06	105,04	0,182	0,184	0,192	22	0,2667445	0,1312385
16,999	533,5	534,2	535,2	98,89	102,55	103,42	0,183	0,184	0,192	23	0,2705687	0,1333069
17,237	533,6	534,2	535,2	97,66	101,09	102,25	0,183	0,184	0,192	24	0,2743016	0,1353734
17,227	533,6	534,2	535,3	96,91	101,15	102,18	0,182	0,184	0,192	25	0,2743135	0,1309889
16,816	533,6	534,3	535,3	98,91	103,81	104,64	0,182	0,184	0,192	26,0	0,2678191	0,1353783
17,175	533,7	534,4	535,3	98,39	101,50	102,54	0,184	0,184	0,192	27	0,2733797	0,1308563
17,167	533,8	534,5	535,4	97,50	101,34	102,53	0,183	0,184	0,192	28	0,2733834	0,1281364
16,878	534,0	534,7	535,6	99,58	103,38	104,24	0,183	0,184	0,192	29	0,2686557	0,1312489
17,048	534,1	534,9	535,8	97,14	102,49	103,29	0,180	0,184	0,192	30	0,2712006	0,1312395
16,940	534,2	535,1	535,9	99,45	102,89	104,02	0,183	0,184	0,192	31	0,2694427	0,1333051
17,202	534,4	535,2	536,0	97,36	101,60	102,56	0,182	0,184	0,192	32	0,2733825	0,1384785
16,843	534,5	535,2	536,1	99,51	103,92	104,45	0,182	0,184	0,191	33	0,2677062	0,1239965
16,928	534,5	535,3	536,1	99,33	103,13	104,13	0,183	0,184	0,191	34	0,2691769	0,1312393
17,310	534,6	535,3	536,2	97,08	100,82	101,70	0,183	0,184	0,192	35	0,2752481	0,1312431
17,025	534,6	535,4	536,3	98,56	102,58	103,56	0,182	0,184	0,191	36	0,2705638	0,1324727
17,141	534,7	535,5	536,4	97,83	101,74	102,79	0,182	0,183	0,191	37	0,272447	0,1312398
16,981	534,7	535,5	536,4	98,71	102,78	103,67	0,182	0,183	0,191	38	0,2699108	0,1260691
16,905	534,8	535,4	536,4	99,23	103,37	104,32	0,182	0,184	0,191	39	0,2686624	0,1209166
17,089	534,8	535,5	536,5	97,90	102,37	103,13	0,182	0,184	0,191	40	0,271507	0,1281378
17,379	534,9	535,6	536,6	96,40	100,54	101,37	0,182	0,184	0,191	41	0,2761298	0,1312393
17,193	534,9	535,5	536,6	97,32	101,56	102,34	0,182	0,184	0,191	42	0,2733691	0,1333057
17,021	534,9	535,6	536,6	98,65	102,30	103,54	0,183	0,183	0,191	43	0,2705662	0,1312401
17,194	534,9	535,5	536,6	96,72	101,65	102,46	0,181	0,183	0,191	44	0,2732593	0,1188295
17,080	534,8	535,5	536,6	98,20	102,11	102,99	0,182	0,183	0,191	45	0,2715132	0,1281329
16,771	534,8	535,5	536,6	99,60	104,03	104,79	0,182	0,183	0,191	46	0,2667568	0,1281354
16,717	534,8	535,4	536,6	99,84	104,41	105,18	0,182	0,184	0,191	47	0,2657958	0,1281345
17,045	534,8	535,4	536,6	98,32	102,31	103,33	0,182	0,183	0,191	48	0,27095	0,1239968
17,081	534,8	535,4	536,6	97,86	102,34	102,94	0,182	0,184	0,191	49	0,271509	0,12434
16,895	534,8	535,4	536,6	99,17	103,34	104,11	0,182	0,184	0,191	50	0,2686664	0,1260388
17,129	534,8	535,4	536,6	97,68	102,03	102,53	0,182	0,184	0,191	51	0,2724517	0,1281345
17,110	534,7	535,4	536,6	97,77	101,88	102,65	0,182	0,184	0,191	52	0,2722432	0,128134
16,930	534,7	535,4	536,6	98,33	102,72	103,58	0,182	0,184	0,191	53	0,2696193	0,120898
17,203	534,4	535,1	536,4	96,87	101,28	101,95	0,182	0,184	0,191	54	0,2739028	0,130327
16,999	534,5	535,2	536,4	99,13	102,20	103,37	0,184	0,183	0,191	55	0,2705723	0,1208941
17,118	534,6	535,3	536,5	96,89	101,76	102,73	0,181	0,183	0,192	56	0,2724893	0,1239979
17,041	534,6	535,3	536,5	97,72	101,92	103,00	0,182	0,184	0,192	57	0,2715122	0,1239984
17,165	534,5	535,2	536,4	97,11	101,38	102,06	0,182	0,184	0,191	58	0,2733968	0,1260683
16,807	534,6	535,3	536,4	99,76	103,33	104,41	0,183	0,183	0,191	59	0,2677302	0,1261196
16,986	534,7	535,4	536,5	98,32	102,57	103,24	0,182	0,184	0,191	60	0,2705724	0,123995
17,156	534,9	535,5	536,6	97,24	101,26	102,05	0,182	0,184	0,191	61	0,2733966	0,126068
17,088	534,7	535,6	536,8	0,02	101,59	102,55	0,000	0,183	0,191	62	0,2723366	0,1239953
17,089	534,5	535,6	537,0	0,01	101,60	102,47	0,000	0,183	0,191	63	0,272458	0,1260702
16,972	534,5	535,7	537,2	0,01	102,09	103,17	0,000	0,183	0,191	64	0,2705748	0,1300022
16,702	534,4	535,7	537,4	0,00	103,73	104,64	0,000	0,183	0,191	65	0,2663307	0,1239995
17,145	534,4	535,7	537,5	0,00	101,22	101,84	0,000	0,183	0,191	66	0,2734052	0,1260704
17,072	534,3	535,8	537,7	0,00	101,51	101,95	0,000	0,184	0,191	67	0,272458	0,1260695
16,896	534,3	535,8	537,8	0,00	102,52	103,23	0,000	0,184	0,191	68	0,2696313	0,1188317
16,952	534,3	535,8	537,8	0,00	101,97	102,79	0,000	0,183	0,191	69	0,2705828	0,1188287
16,834	534,3	535,8	537,8	0,00	103,04	103,68	0,000	0,184	0,191	70	0,2686771	0,1188298
17,415	534,2	535,7	537,8	0,00	99,34	99,99	0,000	0,184	0,191	71	0,2780407	0,1188288
16,976	534,1	535,7	537,9	0,00	101,87	102,37	0,000	0,184	0,191	72	0,2712682	0,1167533
16,997	534,1	535,6	537,8	0,00	101,64	102,33	0,000	0,184	0,191	73	0,2715945	0,1238685
17,210	534,0	535,6	537,8	0,00	99,91	100,87	0,000	0,183	0,191	74	0,2752649	0,1216504
16,983	533,9	535,6	537,8	0,00	101,61	102,29	0,000	0,183	0,191	75	0,2715202	0,113658
17,038	533,9	535,6	537,8	0,00	101,07	101,74	0,000	0,183	0,191	76	0,2724595	0,118826
17,370	533,8	535,6	537,8	0,00	99,05	99,78	0,000	0,183	0,191	77	0,2780376	0,1188275
17,081	533,8	535,6	537,8	0,00	100,89	101,46	0,000	0,184	0,191	78	0,2734001	0,1260697
16,905	533,7	535,5	537,8	0,00	101,93	102,71	0,000	0,184	0,191	79	0,2705748	0,1116283
16,782	533,7	535,5	537,8	0,00	102,48	103,37	0,000	0,183	0,191	80	0,2686762	0,1208957
17,134	533,7	535,5	537,7	0,00	100,43	101,00	0,000	0,183	0,191	81	0,2743345	0,1136567
16,856	533,6	535,5	537,7	0,00	101,99	102,50	0,000	0,183	0,191	82	0,2699933	0,1167555
16,942	533,6	535,6	537,8	0,00	101,31	102,04	0,000	0,183	0,191	83	0,2715264	0,1208943
16,817	533,7	535,6	537,9	0,00	102,02	102,83	0,000	0,183	0,191	84	0,2696301	0,1043431
17,214	533,7	535,8	538,0	0,00	99,36	100,15	0,000	0,183	0,191	85	0,2761895	0,111582
16,991	533,7	536,0	538,1	0,00	100,75	101,60	0,000	0,183	0,191	86	0,2724599	0,1136552
16,930	533,8	536,1	538,2	0,00	101,16	101,79	0,000	0,183	0,191	87	0,271517	0,1189826
16,815	533,8	536,1	538,3	0,00	101,67	102,68	0,000	0,183	0,191	88	0,2698334	0,1188229

17,026	533,9	536,2	538,3	0,00	100,55	101,17	0,000	0,183	0,191	89	0,2733413	0,1187587
17,155	534,0	536,3	538,4	0,00	99,83	100,31	0,000	0,183	0,191	90	0,2752619	0,1136569
16,621	534,0	536,3	538,5	0,00	102,97	103,46	0,000	0,183	0,190	91	0,2667627	0,1167575
16,919	534,1	536,3	538,5	0,00	101,38	101,70	0,000	0,184	0,191	92	0,2715388	0,120895
17,086	534,1	536,4	538,6	0,00	100,01	100,63	0,000	0,183	0,191	93	0,2743207	0,1167549
17,082	534,1	536,4	538,6	0,00	99,98	100,60	0,000	0,183	0,191	94	0,2743326	0,118827
16,887	534,2	536,3	538,6	0,00	101,08	101,83	0,000	0,183	0,191	95	0,2711757	0,1208928
16,778	534,2	536,3	538,6	0,00	101,49	102,42	0,000	0,183	0,191	96	0,2696294	0,1115844
16,835	534,2	536,2	538,5	0,00	101,32	101,94	0,000	0,183	0,191	97	0,270575	0,1167545
16,713	534,2	536,1	538,5	0,00	102,02	102,55	0,000	0,183	0,191	98	0,2686759	0,1167703
16,827	534,2	536,0	538,5	0,00	101,23	101,92	0,000	0,183	0,191	99	0,2705683	0,1096513
16,943	534,1	536,0	538,4	0,00	100,44	101,19	0,000	0,183	0,191	100	0,2724683	0,1117563
16,641	534,1	536,0	538,4	0,00	102,34	103,06	0,000	0,183	0,191	101	0,2677211	0,1115855
16,714	534,1	535,9	538,4	0,00	101,64	102,64	0,000	0,183	0,191	102	0,268877	0,1137137
16,876	534,1	535,9	538,4	0,00	100,84	101,43	0,000	0,183	0,191	103	0,2715644	0,1188245
16,694	534,1	535,9	538,4	0,00	101,93	102,83	0,000	0,183	0,191	104	0,2686741	0,1167555
16,707	534,1	535,9	538,4	0,00	101,77	102,47	0,000	0,183	0,191	105	0,2689672	0,1149509
16,618	534,1	535,8	538,3	0,00	102,10	102,83	0,000	0,183	0,191	106	0,2677177	0,1133902
17,147	534,1	535,8	538,3	0,00	99,03	99,71	0,000	0,183	0,191	107	0,2761886	0,1136593
16,801	534,0	535,8	538,3	0,00	101,18	101,75	0,000	0,183	0,191	108	0,2705698	0,1136554
17,146	534,0	535,8	538,2	0,00	99,07	99,65	0,000	0,183	0,191	109	0,2761862	0,113654
16,914	534,0	535,7	538,2	0,00	100,57	101,07	0,000	0,183	0,191	110	0,2724487	0,1167556
16,614	534,0	535,7	538,2	0,00	102,16	102,90	0,000	0,183	0,191	111	0,2677149	0,1164521
16,737	534,0	535,7	538,2	0,00	101,74	101,94	0,000	0,184	0,191	112	0,2697119	0,1208913
16,959	534,0	535,7	538,2	0,00	100,05	100,82	0,000	0,184	0,191	113	0,2732294	0,1167544
16,724	533,9	535,7	538,1	0,00	101,31	102,09	0,000	0,183	0,191	114	0,2696227	0,1167547
16,486	533,9	535,6	538,1	0,00	102,95	103,54	0,000	0,183	0,191	115	0,2657972	0,1147171
16,748	533,8	535,5	538,0	0,00	101,17	101,79	0,000	0,183	0,191	116	0,270111	0,1163559
16,775	533,7	535,5	537,9	0,00	101,04	101,68	0,000	0,183	0,191	117	0,2705676	0,1167545
16,835	533,7	535,5	537,9	0,00	100,72	101,42	0,000	0,183	0,191	118	0,271508	0,1109692
16,827	533,6	535,4	537,8	0,00	100,69	101,22	0,000	0,183	0,191	119	0,2715127	0,1167549
16,768	533,6	535,4	537,8	0,00	101,13	101,81	0,000	0,184	0,191	120	0,27057	0,1136599
16,827	533,5	535,3	537,7	0,00	100,47	101,54	0,000	0,183	0,191	121	0,2715106	0,1188218
16,587	533,5	535,3	537,7	0,00	102,12	102,83	0,000	0,183	0,191	122	0,2677158	0,1167536
16,992	533,4	535,2	537,6	0,00	99,76	100,35	0,000	0,184	0,191	123	0,2743083	0,1188247
16,872	533,4	535,2	537,6	0,00	100,26	100,96	0,000	0,184	0,191	124	0,2724305	0,1136532
16,985	533,3	535,2	537,5	0,00	99,48	100,25	0,000	0,183	0,191	125	0,2743249	0,1167521
16,511	533,3	535,2	537,5	0,00	102,33	103,08	0,000	0,183	0,191	126	0,2667561	0,1136624
16,862	533,3	535,2	537,5	0,00	100,21	100,82	0,000	0,183	0,191	127	0,2724511	0,1167502
17,096	533,4	535,3	537,6	0,00	99,01	99,43	0,000	0,184	0,191	128	0,2761858	0,1167521
16,819	533,4	535,3	537,6	0,00	100,42	100,95	0,000	0,184	0,191	129	0,2717754	0,1188228
16,910	533,4	535,4	537,7	0,00	100,07	100,28	0,000	0,184	0,191	130	0,2733898	0,1167524
16,914	533,5	535,5	537,7	0,00	99,86	100,33	0,000	0,184	0,191	131	0,2733987	0,1188232
16,791	533,5	535,5	537,8	0,00	100,38	101,13	0,000	0,183	0,191	132	0,2715082	0,1115801
16,849	533,6	535,6	537,9	0,00	100,25	100,78	0,000	0,184	0,191	133	0,2724502	0,1167529
16,901	533,6	535,6	537,9	0,00	99,78	100,33	0,000	0,184	0,191	134	0,2733704	0,1095169
16,492	533,6	535,6	537,9	0,00	102,26	102,77	0,000	0,184	0,191	135	0,2667577	0,1167509
16,903	533,7	535,6	537,9	0,00	99,64	100,33	0,000	0,183	0,191	136	0,2733885	0,1188204
16,855	533,7	535,7	538,0	0,00	99,84	100,61	0,000	0,183	0,191	137	0,2725965	0,1188268
16,953	533,8	535,7	538,0	0,00	99,29	100,01	0,000	0,183	0,191	138	0,2743136	0,1167508
16,544	533,8	535,7	538,0	0,00	101,96	102,60	0,000	0,184	0,191	139	0,2677108	0,1167524
16,721	533,8	535,7	538,0	0,00	100,56	101,26	0,000	0,183	0,191	140	0,2705665	0,1167515
17,007	533,8	535,8	538,0	0,00	99,06	99,51	0,000	0,183	0,191	141	0,2752466	0,1113422
16,658	533,9	535,8	538,0	0,00	101,03	101,73	0,000	0,183	0,191	142	0,2696192	0,1136498
16,768	533,9	535,8	538,0	0,00	100,37	100,89	0,000	0,183	0,191	143	0,2715036	0,1208895
16,480	533,9	535,8	538,1	0,00	102,10	102,73	0,000	0,184	0,191	144	0,266848	0,1136506
16,711	533,9	535,7	538,0	0,00	100,32	101,15	0,000	0,183	0,191	145	0,2706601	0,1167567
16,652	533,9	535,6	538,0	0,00	100,96	101,72	0,000	0,183	0,191	146	0,2696151	0,1115792
16,805	533,8	535,5	537,9	0,00	100,19	100,55	0,000	0,184	0,191	147	0,2723116	0,1172918
16,638	533,8	535,5	537,9	0,00	101,07	101,59	0,000	0,184	0,191	148	0,2695925	0,1167511
16,872	533,7	535,5	537,9	0,00	99,51	100,35	0,000	0,184	0,191	149	0,2733857	0,1115799
16,634	533,7	535,5	537,8	0,00	101,16	101,68	0,000	0,184	0,191	150	0,2694306	0,1136618
16,826	533,7	535,4	537,8	0,00	99,78	100,41	0,000	0,183	0,191	151	0,2725367	0,1167552
17,048	533,7	535,3	537,7	0,00	98,61	99,21	0,000	0,183	0,191	152	0,2761778	0,1220476
16,990	533,6	535,3	537,7	0,00	99,12	99,71	0,000	0,184	0,191	153	0,2752477	0,1115793
16,809	533,6	535,3	537,7	0,00	99,72	100,58	0,000	0,184	0,191	154	0,2724843	0,1137995
16,758	533,6	535,2	537,7	0,00	100,27	100,97	0,000	0,183	0,191	155	0,2715588	0,1188222
16,754	533,6	535,2	537,7	0,00	100,21	100,98	0,000	0,183	0,191	156	0,2715024	0,116752
16,755	533,6	535,2	537,7	0,00	100,45	100,98	0,000	0,184	0,191	157	0,271502	0,1115826
16,842	533,6	535,2	537,7	0,00	99,87	100,45	0,000	0,184	0,191	158	0,272875	0,1136505
16,640	533,5	535,3	537,6	0,00	100,93	101,84	0,000	0,184	0,191	159	0,2696128	0,1187746
16,687	533,6	535,3	537,6	0,00	100,49	101,45	0,000	0,183	0,191	160	0,2705588	0,1208881
16,512	533,6	535,3	537,7	0,00	101,58	102,22	0,000	0,183	0,191	161	0,2677049	0,11365
16,752	533,6	535,4	537,7	0,00	100,26	100,83	0,000	0,183	0,191	162	0,2714959	0,1115782
16,929	533,6	535,5	537,8	0,00	99,18	99,98	0,000	0,183	0,191	163	0,2743146	0,1169527
16,885	533,6	535,5	537,8	0,00	99,30	100,08	0,000	0,183	0,191	164	0,2737831	0,1136498
16,704	533,7	535,5	537,8	0,00	100,40	101,01	0,000	0,183	0,191	165	0,2707756	0,1208864
16,624	533,7	535,5	537,8	0,00	100,84	101,58	0,000	0,183	0,191	166	0,2696102	0,1136541
16,688	533,7	535,4	537,7	0,00	100,52	101,24	0,000	0,183	0,191	167	0,2705595	0,1200967
16,868	533,6	535,3	537,6	0,00	99,40	100,22	0,000	0,183	0,191	168	0,2733822	0,1172339
16,570	533,6	535,2	537,5	0,00	101,22	101,99	0,000	0,183	0,191	169	0,2686657	0,1260584
16,454	533,5	535,0	537,4	0,00	101,90	102,60	0,000	0,183	0,191	170	0,2667457	0,1208943
16,396	533,4	534,9	537,3	0,00	102,44	102,98	0,000	0,183	0,191	171	0,2657958	0,1239916
16,857	533,4	534,9	537,2	0,00	99,76	100,22	0,000	0,184	0,191	172	0,2732515	0,1188292
16,747	533,3	534,8	537,2	0,00	100,48	100,88	0,000	0,184	0,191	173	0,2715005	0,1167503
16,636	533,2	534,6	537,1	0,00	100,77	101,42	0,000	0,184	0,191	174	0,2699529	0,1208882
16,908	533,1	534,6	537,1	0,00	99,27	100,06	0,000	0,184	0,191	175	0,2743155	0,1188257
16,733	533,1	534,6	537,0	0,00	100,27	100,90	0,000	0,184	0,191	176	0,2714983	0,1188219
16,479	533,1	534,6	537,0	0,00	101,85	102,57	0,000	0,184	0,191	177	0,2673518	0,1103914
16,659	533,1	534,6	537,0	0,00	100,52	101,34	0,000	0,184	0,191	178	0,2702253	0,1239932
16,680	533,0	534,5	536,9	0,00	100,82	101,38	0,000	0,184	0,191	179	0,2705572	0,1229439
16,904	533,0	534,5	536,9	0,00	99,19	100,01	0,000	0,184	0,191	180	0,274317	0,1136529
16,786	532,9	534,5	536,9	0,00	100,05	100,49	0,000	0,184	0,191	181	0,2724393	0,1167487
16,679	532,9	534,5	536,9	0,00	100,78	101,58	0,000	0,184	0,191	182	0,2706475	0,12399
16,729	532,8	534,5	536,8	0,00	100,32	100,98	0,000	0,184	0,192	183	0,2714954	0,1208864
16,733	532,8	534,6	536,9	0,00	100,29	101,00	0,000	0,184	0,191	184	0,2714963	0,1239897

16,697	532,9	534,6	536,9	0,00	100,40	101,17	0,000	0,184	0,191	185	0,2708917	0,1208874
16,374	532,9	534,6	536,9	0,00	102,29	102,97	0,000	0,184	0,191	186	0,2657834	0,1167496
16,674	532,9	534,7	537,0	0,00	100,64	101,33	0,000	0,184	0,191	187	0,270557	0,1208891
16,789	533,0	534,7	537,0	0,00	100,11	100,63	0,000	0,184	0,191	188	0,2724372	0,1167498
17,129	533,0	534,7	537,0	0,00	97,84	98,62	0,000	0,184	0,191	189	0,2780235	0,120887
17,129	533,0	534,8	537,1	0,00	97,95	98,55	0,000	0,184	0,191	190	0,2779922	0,1239912
16,657	533,1	534,9	537,1	0,00	100,67	101,19	0,000	0,184	0,191	191	0,2705541	0,1222131
17,356	533,1	534,9	537,2	0,00	96,30	97,14	0,000	0,184	0,191	192	0,2819363	0,1239926
16,900	533,1	535,0	537,2	0,00	99,10	99,95	0,000	0,183	0,191	193	0,2743119	0,1208856
17,009	533,2	535,0	537,2	0,00	98,38	99,17	0,000	0,184	0,191	194	0,2761744	0,1208869
16,878	533,2	535,2	537,3	0,00	99,18	99,81	0,000	0,184	0,191	195	0,2740608	0,1312347
16,650	533,3	535,2	537,3	0,00	100,59	101,38	0,000	0,184	0,191	196	0,2703437	0,12399
16,831	533,3	535,1	537,3	0,00	99,37	100,11	0,000	0,184	0,191	197	0,2733748	0,120888
16,814	533,3	535,1	537,3	0,00	99,42	100,24	0,000	0,183	0,191	198	0,2729932	0,1260615
16,744	533,3	535,1	537,3	0,00	100,31	100,60	0,000	0,184	0,191	199	0,2718285	0,1281286
16,843	533,4	535,0	537,3	0,00	99,57	100,33	0,000	0,184	0,191	200	0,2733919	0,1208867
17,005	533,4	535,1	537,3	0,00	98,39	99,22	0,000	0,184	0,191	201	0,2761451	0,1208886
16,717	533,4	535,0	537,3	0,00	100,22	100,69	0,000	0,184	0,191	202	0,2714895	0,1239899
16,774	533,4	535,0	537,3	0,00	99,87	100,34	0,000	0,184	0,191	203	0,2724092	0,1261085
16,661	533,4	535,0	537,3	0,00	100,35	101,21	0,000	0,184	0,191	204	0,2705533	0,1239895
16,831	533,4	534,9	537,3	0,00	99,46	100,10	0,000	0,184	0,191	205	0,2733773	0,1188216
16,773	533,3	534,9	537,3	0,00	99,85	100,46	0,000	0,184	0,191	206	0,2724372	0,1188271
16,883	533,3	534,9	537,2	0,00	98,85	99,54	0,000	0,184	0,191	207	0,2742803	0,1227533
17,115	533,3	534,9	537,3	0,00	97,66	98,43	0,000	0,183	0,191	208	0,2780158	0,126545
17,170	533,3	534,8	537,3	0,00	97,27	98,11	0,000	0,183	0,191	209	0,2789333	0,1208897
17,109	533,3	534,8	537,2	0,00	97,79	98,42	0,000	0,184	0,191	210	0,278018	0,1281262
16,712	533,3	534,9	537,3	0,00	99,97	100,55	0,000	0,184	0,191	211	0,2714989	0,1260657
17,109	533,3	534,9	537,2	0,00	97,81	98,46	0,000	0,184	0,191	212	0,2780147	0,1260556
16,657	533,3	534,8	537,2	0,00	100,55	100,98	0,000	0,184	0,191	213	0,2706739	0,1208897
16,919	533,2	534,8	537,2	0,00	98,71	99,44	0,000	0,184	0,191	214	0,2750787	0,1281269
16,873	533,2	534,8	537,2	0,00	99,14	99,57	0,000	0,184	0,191	215	0,2743161	0,1312348
17,107	533,2	534,9	537,2	0,00	97,61	98,06	0,000	0,184	0,191	216	0,2780137	0,1281322
16,800	533,3	534,9	537,2	0,00	99,66	99,99	0,000	0,184	0,191	217	0,2731063	0,1167483
17,055	533,3	534,8	537,1	0,00	97,92	98,58	0,000	0,184	0,191	218	0,277177	0,1281291
17,108	533,2	534,7	537,1	0,00	97,71	98,26	0,000	0,184	0,191	219	0,2780097	0,1260629
17,048	533,2	534,6	537,0	0,00	98,16	98,72	0,000	0,184	0,191	220	0,2770481	0,1208877
16,949	533,1	534,6	537,0	0,00	98,75	99,20	0,000	0,184	0,191	221	0,2754994	0,1239893
17,275	533,1	534,5	537,0	0,00	96,93	97,38	0,000	0,184	0,191	222	0,2807643	0,1209591
17,049	533,1	534,5	536,9	0,00	98,08	98,77	0,000	0,184	0,191	223	0,2770935	0,1239877
16,835	533,0	534,5	536,9	0,00	99,36	100,12	0,000	0,184	0,191	224	0,2735845	0,124351
16,986	533,0	534,6	536,9	0,00	98,30	99,10	0,000	0,184	0,191	225	0,2760835	0,1167505
16,825	533,1	534,6	537,0	0,00	99,24	100,05	0,000	0,183	0,191	226	0,273375	0,1208851
17,211	533,1	534,7	537,0	0,00	96,94	97,63	0,000	0,183	0,191	227	0,2798464	0,131241
16,892	533,1	534,8	537,1	0,00	98,99	99,53	0,000	0,184	0,191	228	0,2746131	0,1312332
16,813	533,1	534,9	537,1	0,00	99,17	100,18	0,000	0,184	0,191	229	0,2733797	0,1208871
16,583	533,2	534,9	537,1	0,00	100,78	101,50	0,000	0,184	0,191	230	0,2696038	0,1260624
16,579	533,1	534,8	537,1	0,00	100,69	101,47	0,000	0,184	0,191	231	0,2696011	0,1233619
16,638	533,2	534,8	537,1	0,00	100,28	101,09	0,000	0,184	0,191	232	0,2705547	0,1239889
17,085	533,2	534,8	537,1	0,00	97,62	98,14	0,000	0,184	0,191	233	0,2780156	0,1282502
16,632	533,2	534,9	537,1	0,00	100,08	101,02	0,000	0,183	0,191	234	0,2705509	0,1281274
16,943	533,2	534,9	537,1	0,00	98,67	99,35	0,000	0,184	0,191	235	0,2755389	0,1281273
16,756	533,2	535,0	537,2	0,00	99,57	100,39	0,000	0,184	0,191	236	0,2724324	0,1239864
16,812	533,2	534,9	537,2	0,00	99,26	99,98	0,000	0,184	0,191	237	0,2733752	0,1264348
16,986	533,2	534,8	537,1	0,00	98,30	98,90	0,000	0,184	0,191	238	0,2761674	0,1188221
16,862	533,1	534,7	537,1	0,00	98,93	99,65	0,000	0,184	0,191	239	0,2743085	0,1208869
16,812	533,1	534,7	537,0	0,00	99,27	100,02	0,000	0,184	0,191	240	0,2733924	0,1209086
17,146	533,1	534,7	537,1	0,00	97,54	97,97	0,000	0,184	0,191	241	0,2789248	0,1260603
16,609	533,1	534,8	537,1	0,00	100,49	101,21	0,000	0,184	0,191	242	0,2700756	0,123988
16,746	533,1	534,9	537,2	0,00	99,61	100,26	0,000	0,184	0,191	243	0,2724333	0,1312328
16,800	533,2	535,0	537,2	0,00	99,11	99,90	0,000	0,184	0,191	244	0,2733652	0,1205963

APPENDIX 3: Calibration data

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA PACKAGE

CLIENT	Enerco	PROJECT NUMBER	PI-20350
PRODUCT	Wood heater	SAMPLE ID#	QI-20550
MODEL	WS 110		
STANDARDS	EPA, Method ATM, ASTME2515-11, ASTME 3053-18		

TEST EQUIPMENT

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DATE	CALIBRATION DUE DATE
1	Digital Manometer	Dwyer	EM-006	May 2025	May 2026
2	20 ch. card Thermocouple	Keithley	EM-015/2	Nov 2025	May 2026
3	Scale 0-1000lbs Rough Deck	Rice lake	EM-021	August 2025	August 2026
4	analytical scale 200gr.	Ohaus	EM-051	Nov 2025	May 2026
5	Weight 2kg	N/A	EM-090	March 2022	March 2027
6	Gas analyzer	Siemen's	EM-118	Verif before use	Verif before use
7	Vacuum gauge	Dwyer	EM-126	May 2025	May 2026
8	Vacuum gauge	Dwyer	EM-127	May 2025	May 2026
9	Calibration weight 200g	Troemer	EM-129	March 2022	March 2027
10	Dry gas meter	Am. meter	EM-130	January 2026	July 2026
11	Temperature humidity meter	Fluke	EM-136	January 2026	January 2027
12	Vane anemometer	Omega	EM-153	January 2026	January 2027
13	20 ch. card Thermocouple	Keithley	EM-154/2	Nov 2025	May 2026
14	Chronometer	Extech	EM-175	January 2026	January 2027
15	Dry gas meter	Shinagawa	EM-178	January 2026	July 2026
16	Dry gas meter	Shinagawa	EM-179	January 2026	July 2026
17	Wood scale	Ohaus	EM-204	August 2025	August 2026
18	Weight 10kg	N/A	EM-205	January 2026	January 2030
19	Measuring tape	Stanley	EM-224	May 2025	May 2026
20	Digital Manometer	Dwyer	EM-249	May 2025	May 2026
21	Digital manometer	Dwyer	EM-313	May 2025	May 2026
22	Dry gas meter	Shinagawa	EM-318	January 2026	July 2026
23	Barometer	Control company	EM-333	Dec 2025	June 2026
24	Calibration block	Delmhorst	EM-334	January 2026	January 2027
25	Calibration weight 100mg	Troemer	EM-335	March 2022	March 2027
26	Calibration gas	Praxair	EM-336	June 2022	March 2030
27	Calibration gas	Praxair	EM-338	April 2025	March 2029
28	Vacuum gauge	Dwyer	EM-340	May 2025	May 2026

Instrumentation Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS 2010-02

SCC Accredited LAB

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2025-05-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	0.25"H2O
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	MS-321-LCD	Measurement Type:	Pressure
Serial #:	E47U020014	Range:	0-0.5
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2025-05-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
			Verification of the indicator				
0.0000 "H2O	0.000 "H2O	-0.002 "H2O	-0.002 "H2O	-0.002 "H2O	-0.002 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.250 "H2O	0.247 "H2O	-0.003 "H2O	0.247 "H2O	-0.003 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.5000 "H2O	0.500 "H2O	0.488 "H2O	-0.012 "H2O	0.488 "H2O	-0.012 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.7500 "H2O	0.750 "H2O	0.734 "H2O	-0.016 "H2O	0.734 "H2O	-0.016 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
1.0000 "H2O	1.000 "H2O	0.977 "H2O	-0.023 "H2O	0.977 "H2O	-0.023 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.7500 "H2O	0.7500 "H2O	0.735 "H2O	-0.0150 "H2O	0.735 "H2O	-0.0150 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.5000 "H2O	0.5000 "H2O	0.489 "H2O	-0.0110 "H2O	0.489 "H2O	-0.0110 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.2500 "H2O	0.2500 "H2O	0.248 "H2O	-0.0020 "H2O	0.248 "H2O	-0.0020 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
0.0000 "H2O	0.0000 "H2O	-0.002 "H2O	-0.0020 "H2O	-0.002 "H2O	-0.0020 "H2O	0.25 "H2O	± 0.5 "H2O
Compliant	Verification of the indicator						
			Verification of the analogic output				
0.0000 "H2O	0.0000 V.dc	0.0010 V.dc	0.0010 V.dc	0.0010 V.dc	0.0010 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.2500 "H2O	2.5000 V.dc	2.4987 V.dc	-0.0013 V.dc	2.4987 V.dc	-0.0013 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.5000 "H2O	5.0000 V.dc	4.8891 V.dc	-0.1109 V.dc	4.8891 V.dc	-0.1109 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.7500 "H2O	7.5000 V.dc	7.4895 V.dc	-0.0105 V.dc	7.4895 V.dc	-0.0105 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
1.0000 "H2O	10.0000 V.dc	9.9608 V.dc	-0.0392 V.dc	9.9608 V.dc	-0.0392 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.7500 "H2O	7.5000 V.dc	7.4892 V.dc	-0.0108 V.dc	7.4892 V.dc	-0.0108 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.5000 "H2O	5.0000 V.dc	4.9893 V.dc	-0.0107 V.dc	4.9893 V.dc	-0.0107 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.2500 "H2O	2.5000 V.dc	2.4825 V.dc	-0.0175 V.dc	2.4825 V.dc	-0.0175 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						
0.0000 "H2O	0.0000 V.dc	0.0022 V.dc	+0.0022 V.dc	0.0022 V.dc	+0.0022 V.dc	0.25 V.dc	0.5 V.dc
Compliant	Verification of the analogic output						

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CLAS 2010-02

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-006 2025-05-26

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.		
Comments:		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Benoit Larocque - Tech

2025

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Instrumentation
Saint•Laurent inc.
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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2025-11-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 4.0°F
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	**Input Type:**	Temp
Manufacturer:	Keithley	**Output Type:**	Digitale
Model #:	7700	**Measurement Type:**	Temperature
Serial #:	1213648	**Range:**	Divers
Location:	N/A	**Version:**	**Machine:** N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	thermometre digital 6412	**Certification #:**	6412-15326300
Serial #:	240605643	**Certification Date:**	2024-08-07
Certified by:	itm- Control Company	**Next Certification:**	2026-08-07
Comments:			

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SCC Accredited LAB Accréditation CCN

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2025-11-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	**Comment**						
662.0 °F	662.0 °F	660.3 °F	-1.7 °F	660.3 °F	-1.7 °F	4.0 °F	0.5 °F
Pass	ID. No. 201 (Flue) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.2 °F	-1.8 °F	480.2 °F	-1.8 °F	4.0 °F	0.5 °F
Pass	ID. No. 202 (Right) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.1 °F	-1.9 °F	480.1 °F	-1.9 °F	4.0 °F	0.5 °F
Pass	ID. No. 203 (Back) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	481.0 °F	-1.0 °F	481.0 °F	-1.0 °F	4.0 °F	0.5 °F
Pass	ID. No. 204 (Bottom) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	480.0 °F	-2.0 °F	480.0 °F	-2.0 °F	4.0 °F	0.5 °F
Pass	ID. No. 205 (Top) en type "K" En Loop avec EM-015						
482.0 °F	482.0 °F	479.9 °F	-2.1 °F	479.9 °F	-2.1 °F	4.0 °F	0.5 °F
Pass	ID. No. 206 (Left) en type "K" En Loop avec EM-015						
662.0 °F	662.0 °F	662.5 °F	0.5 °F	662.5 °F	0.5 °F	4.0 °F	0.5 °F
Pass	ID. No. 207 (Catalyst) en type "K" En Loop avec EM-015						
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	-0.2 °F	4.0 °F	0.4 °F
Pass	ID. No. 209 (DGM 1st HR IN) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.7 °F	-0.3 °F	76.7 °F	-0.3 °F	4.0 °F	0.4 °F
Pass	ID. No. 210 (DGM out 1st hr) en type "J" En Loop avec EM-015						
80.0 °F	80.0 °F	79.9 °F	-0.1 °F	79.9 °F	-0.1 °F	4.0 °F	0.4 °F
Pass	ID. No. 211 (wetbulb tunnel) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	77.9 °F	0.9 °F	77.9 °F	0.9 °F	4.0 °F	0.4 °F
Pass	ID. No. 215 (DGM 1 In) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.9 °F	-0.1 °F	76.9 °F	-0.1 °F	4.0 °F	0.4 °F
Pass	ID. No. 216 (DGM 1 out) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	-0.2 °F	4.0 °F	0.4 °F
Pass	ID. No. 217 (DGM 2 In) en type "J" En Loop avec EM-015						
77.0 °F	77.0 °F	77.0 °F	0.0 °F	77.0 °F	0.0 °F	4.0 °F	0.4 °F
Pass	ID. No. 218 (DGM 2 out) en type "J" En Loop avec EM-015						
85.0 °F	85.0 °F	83.7 °F	-1.3 °F	83.7 °F	-1.3 °F	4.0 °F	0.5 °F
Pass	ID. No. 220 (Filter 1st Hour) en type "T" En Loop avec EM-015						

Tested Temperature Probe: Depth: N.A.

Environmental Conditions: Temperature: 20 °C Humidity: 35 %RH

The calibration was carried out at the client on-site using the method of comparison to the standard measurement.

Comments:

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2025-11-26

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-11-26
Next Calibration:	2026-11-26
Certificate Date:	2025-11-26

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

- Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
- The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
- The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
- The results presented in this certificate relate only to objects subject to calibration.
- It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
- The date format used in this certificate is: YYYY-MM-DD.
- Hysteresis is not accounted for in the calibration procedure nor in the uncertainty budget.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Benoit Larocque - Tech

26 nov 2025

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Calibration Certificate ID
CA0011-056-082925-ACC-USI

METTLER TOLEDO

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH 43240
1-800-METTLER

Accredited by the American Association for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1902.01
ISO 17025 Registered
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company:	Services Polytests		
Address:	695-B Rue Gaudette		
City:	Saint-Jean-Sur-Richelieu	Contact:	Danick Power
Zip / Postal:	J3B 7S7		
State / Province:	Quebec		

Weighing Device

Manufacturer:	RICE LAKE	Instrument Type:	Weighing Instrument
Model:	FE1 _ 4 x 4HP-10K	Asset Number:	EM021
Serial No.:	C25969	Terminal Model:	480
Building:	N/A	Terminal Serial No.:	N/A
Floor:	N/A	Terminal Asset No.:	N/A
Room:	N/A		

Range	Max. Capacity	Readability (d)
1	400 kg	0,05 kg

Procedure

Calibration Guideline:	ASTM E898 - 20
METTLER TOLEDO Work Instruction:	SVC-WI-LABTEC-063 V2.0

This calibration certificate including procedures and uncertainty estimation also complies with EURAMET cg-18 v 4.0.

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

The calibration was agreed with the user below the maximum capacity of the balance.

	Temperature		Humidity	
As Found	Start: 22,0 °C	End: 22,0 °C	Start: 49,0 %	End: 49,0 %
As Left	Start: 20,0 °C	End: 20,0 °C	Start: 49,0 %	End: 49,0 %

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date:	26-08-2025
As Left Calibration Date:	29-08-2025
Issue Date:	29-08-2025
Date of next calibration by customer request:	31-08-2026

Authorized A2LA Signatory: Jocelyn Bouchard

Jocelyn Bouchard

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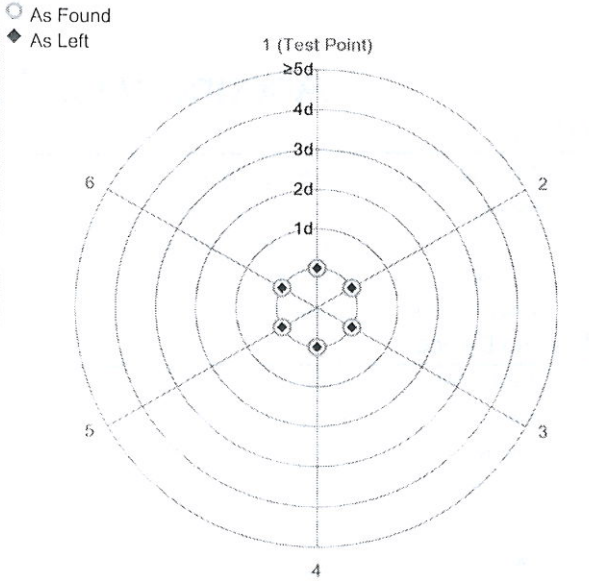
Measurement Results

Repeatability

Test Load: 80 kg

	As Found	As Left
1	80,05 kg	80,00 kg
2	80,05 kg	80,00 kg
3	80,05 kg	80,00 kg
4	80,05 kg	80,00 kg
5	80,05 kg	80,00 kg
6	80,05 kg	80,00 kg

Standard Deviation	0,000 kg	0,000 kg



The "d" in the graph represents the readability of the range/interval in which the test was performed.

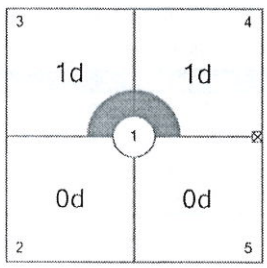
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

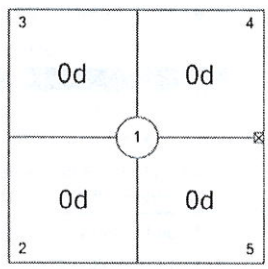
Test Load: 60 kg

Position	As Found	As Left
1	60,00 kg	60,00 kg
2	60,00 kg	60,00 kg
3	60,05 kg	60,00 kg
4	60,05 kg	60,00 kg
5	60,00 kg	60,00 kg

Maximum Deviation	0,05 kg	0,00 kg



As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

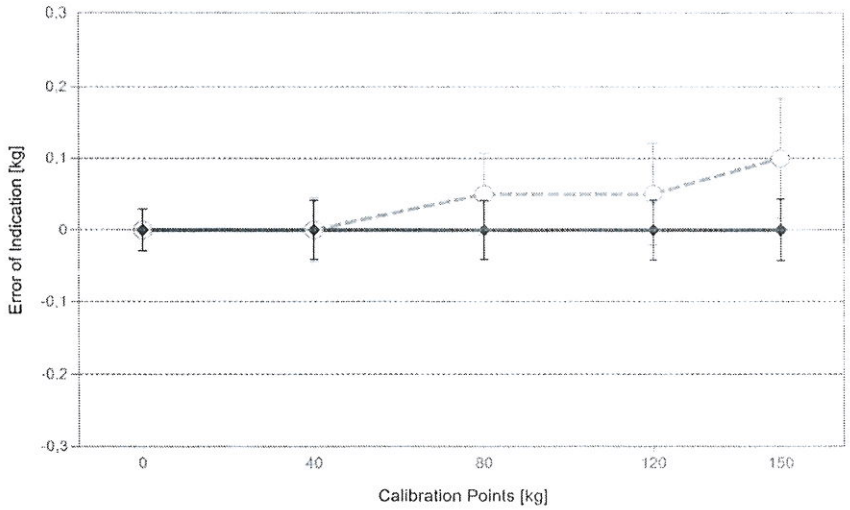
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0,00 kg	0,00 kg	0,029 kg	2
2	40 kg	40,00 kg	0,00 kg	0,045 kg	2
3	80 kg	80,05 kg	0,05 kg	0,057 kg	2
4	120 kg	120,05 kg	0,05 kg	0,071 kg	2
5	150 kg	150,10 kg	0,10 kg	0,084 kg	2
6	0 kg	0,00 kg	0,00 kg	0,029 kg	2

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As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0,00 kg	0,00 kg	0,029 kg	2
2	40 kg	40,00 kg	0,00 kg	0,041 kg	2
3	80 kg	80,00 kg	0,00 kg	0,041 kg	2
4	120 kg	120,00 kg	0,00 kg	0,042 kg	2
5	150 kg	150,00 kg	0,00 kg	0,043 kg	2
6	0 kg	0,00 kg	0,00 kg	0,029 kg	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated. The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML M1

Weight Set No.:	T2 01 à50	Date of Issue:	07-03-2025
Certificate Number:	1411071	Calibration Due Date:	07-03-2026

Weight Set 2: OIML M1

Weight Set No.:	kit inspecteur	Date of Issue:	02-01-2025
Certificate Number:	M24-0627	Calibration Due Date:	02-01-2026

Remarks

N/A

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End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

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Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $10{,}0 \cdot 10^{-6}$ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 21 K

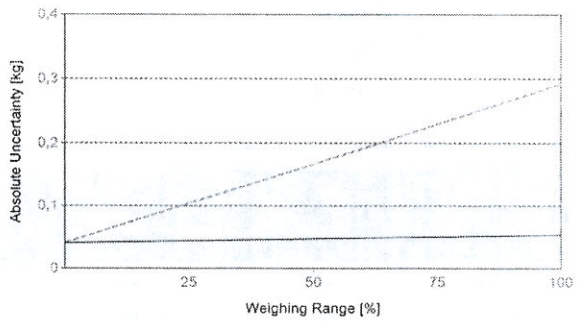
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0,05 kg	150 kg	U_1 = 41 g + 1,68 g/kg · R	U_1 = 41 g + 0,0863 g/kg · R

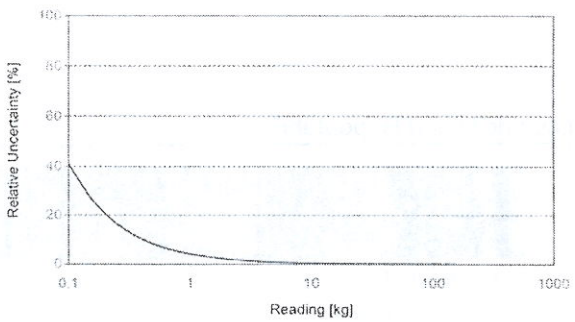
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
1,50 kg	0,044 kg	2,9%	0,041 kg	2,7%
15,00 kg	0,066 kg	0,44%	0,042 kg	0,28%
30,00 kg	0,091 kg	0,30%	0,044 kg	0,15%
75,00 kg	0,17 kg	0,22%	0,047 kg	0,063%
150,00 kg	0,29 kg	0,20%	0,054 kg	0,036%



As Found



As Left

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More information at:
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METTLER TOLEDO Service

Handbook 44 Tolerance Assessment (Maintenance)

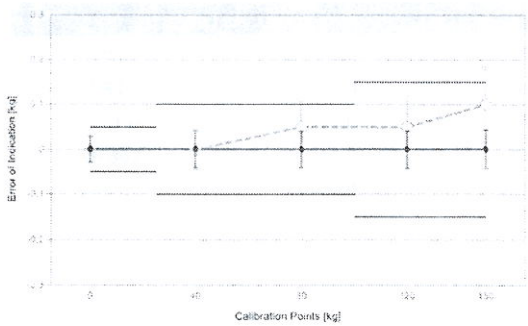
Assessment done without considering measurement uncertainty.
The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

	As Found	As Left
Overall	✓	✓

✓ = Passed
✗ = Failed

Weighing Device

Range	Max. Capacity	Readability (d)	Verification Scale Interval (e)	Class
1	400 kg	0,05 kg	0,05 kg	III



Tolerances according to NIST Handbook 44

Test Load		Tolerance
From	To	
0,00 kg	0,00 kg	0,0125 kg
0,05 kg	25,00 kg	0,05 kg
25,05 kg	100,00 kg	0,1 kg
100,05 kg	150,00 kg	0,15 kg

○ As Found
◆ As Left
— Tolerance

Eccentricity and Repeatability

Test	Test Load	Tolerance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Eccentricity (Max. Error)	60 kg	0,10 kg	0,05 kg	✓	0,00 kg	✓
Eccentricity (Range)	60 kg	0,1 kg	0,05 kg	✓	0,00 kg	✓
Repeatability (Max. Error)	80 kg	0,1 kg	0,05 kg	✓	0,00 kg	✓
Repeatability (Range)	80 kg	0,10 kg	0,00 kg	✓	0,00 kg	✓

Max. Error: Maximum of the absolute values of the individual errors.
Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 kg	0,05 kg	0,00 kg	✓	0,00 kg	✓
2	40 kg	0,10 kg	0,00 kg	✓	0,00 kg	✓
3	80 kg	0,10 kg	0,05 kg	✓	0,00 kg	✓
4	120 kg	0,15 kg	0,05 kg	✓	0,00 kg	✓
5	150 kg	0,15 kg	0,10 kg	✓	0,00 kg	✓
6	0 kg	0,05 kg	0,00 kg	✓	0,00 kg	✓

sept 2025

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Calibration Certificate ID
CA0207-022-110425-ACC-USL

METTLER TOLEDO

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH, 43240
1-800-METTLER

Accredited by the American Association for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1788.01
ISO 17025 Accredited
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company:	Services Polytests		
Address:	695-B Rue Gaudette		
City:	Saint-Jean-Sur-Richelieu	Contact:	Danick Power
Zip / Postal:	J3B 7S7		
State / Province:	Quebec		

Weighing Device

Manufacturer:	Ohaus	Terminal Model:	N/A
Model:	AR2140	Terminal Serial No.:	N/A
Serial No.:	M3658329010091	Terminal Asset No.:	N/A
Instrument Type:	Weighing Instrument	Building:	Main
Asset Number:	EM-051	Floor:	1st
		Room:	N/A

Range	Max. Capacity	Readability (d)
1	210 g	0.0001 g

Procedure

Calibration Guideline:	EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction:	SVC-WI-LABTEC-063 V2.0

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight. As Left 200 g.

	Temperature		Humidity	
As Found	Start: 23.7 °C	End: 23.3 °C	Start: 26.5 %	End: 29.2 %
As Left	Start: 23.3 °C	End: 23.3 °C	Start: 29.2 %	End: 27.1 %

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date:	04-11-2025	Authorized A2LA Signatory:	
As Left Calibration Date:	04-11-2025		
Issue Date:	04-11-2025		Denis Petrov
Date of next calibration by customer request:	30-11-2026		

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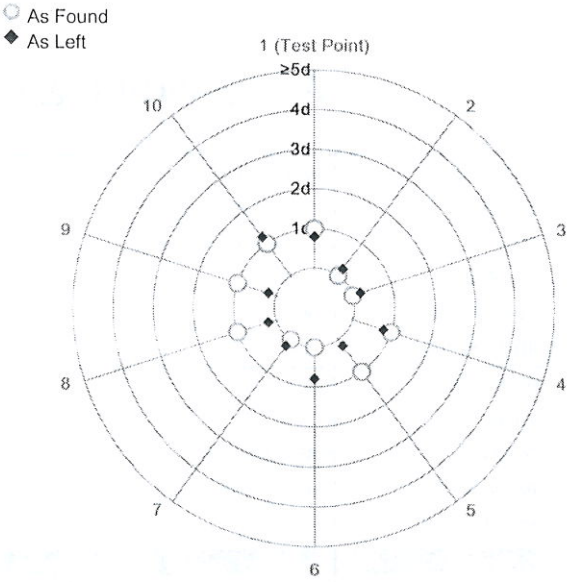
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9997 g	99.9999 g
2	99.9996 g	99.9998 g
3	99.9996 g	99.9998 g
4	99.9997 g	99.9999 g
5	99.9995 g	99.9998 g
6	99.9996 g	99.9999 g
7	99.9996 g	99.9998 g
8	99.9997 g	99.9998 g
9	99.9995 g	99.9998 g
10	99.9995 g	99.9997 g

Standard Deviation	0.00008 g	0.00006 g



The "d" in the graph represents the readability of the range/interval in which the test was performed.

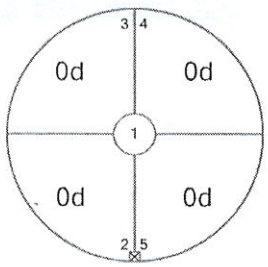
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

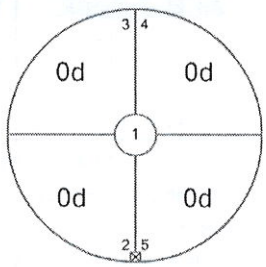
Test Load: 100 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	0.0000 g	0.0000 g



As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

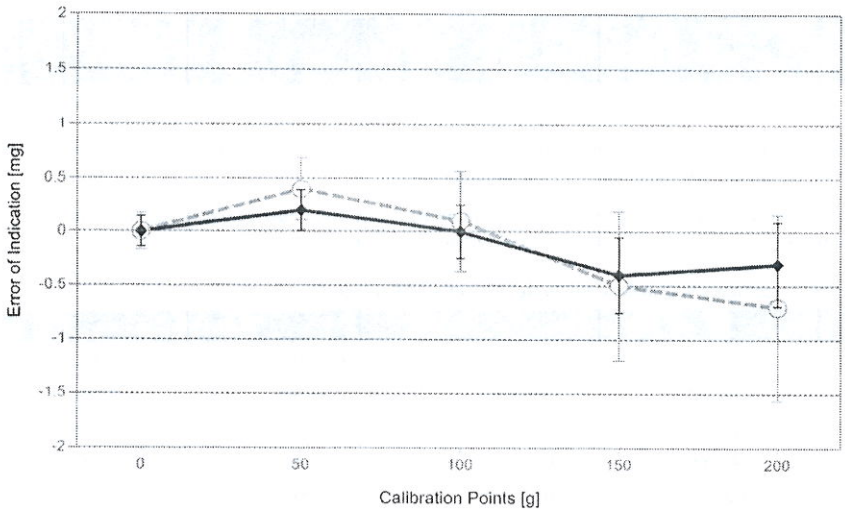
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.17 mg	2
2	50.0000 g	50.0004 g	0.0004 g	0.29 mg	2
3	99.9999 g	100.0000 g	0.0001 g	0.47 mg	2
4	149.9999 g	149.9994 g	-0.0005 g	0.69 mg	2
5	200.0001 g	199.9994 g	-0.0007 g	0.86 mg	2

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As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.14 mg	2
2	50.0000 g	50.0002 g	0.0002 g	0.19 mg	2
3	99.9999 g	99.9999 g	0.0000 g	0.25 mg	2
4	149.9999 g	149.9995 g	-0.0004 g	0.35 mg	2
5	200.0001 g	199.9998 g	-0.0003 g	0.39 mg	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated. The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	496	Date of Issue:	14-10-2025
Certificate Number:	C248325905	Calibration Due Date:	31-10-2026

Remarks

Unit is ready to use.

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

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Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6}$ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 4 K

Linearization of Uncertainty Equation

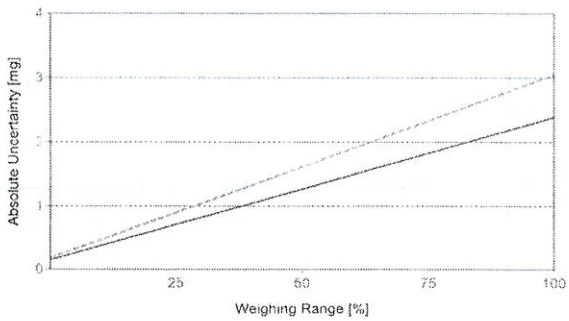
	Range		As Found	As Left
	d	Max		
1	0.0001 g	210 g	$U_1 = 0.18$ mg + 0.0136 mg/g · R	$U_1 = 0.15$ mg + 0.0107 mg/g · R

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

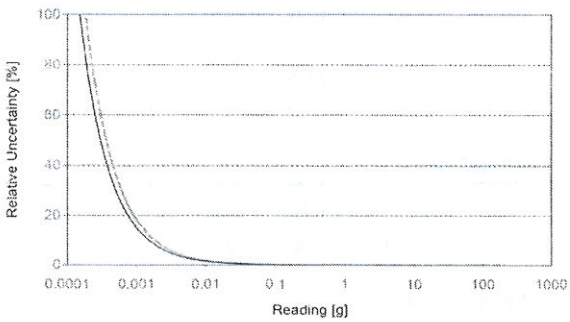
The linear approximation of the uncertainty in use should be regarded as information only. The underlying distribution of the errors of indication does not stipulate a stable approximation function [applies to As Found equation].

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.0210 g	0.18 mg	0.86%	0.15 mg	0.72%
0.2100 g	0.18 mg	0.087%	0.15 mg	0.072%
2.1000 g	0.21 mg	0.0099%	0.17 mg	0.0082%
21.0000 g	0.47 mg	0.0022%	0.37 mg	0.0018%
210.0000 g	3.0 mg	0.0014%	2.4 mg	0.0011%



As Found



As Left

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More information at:
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METTLER TOLEDO Service

Custom Tolerance Assessment

Assessment done without considering measurement uncertainty.

One or more of the measurements from the attached calibration certificate were assessed against customer-defined tolerances.

	As Found	As Left
Overall	✗	✓
Repeatability	✓	✓
Eccentricity	✓	✓
Error of Indication	✗	✓

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9997 g	99.9999 g
2	99.9996 g	99.9998 g
3	99.9996 g	99.9998 g
4	99.9997 g	99.9999 g
5	99.9995 g	99.9998 g
6	99.9996 g	99.9999 g
7	99.9996 g	99.9998 g
8	99.9997 g	99.9998 g
9	99.9995 g	99.9998 g
10	99.9995 g	99.9997 g

Standard Deviation	0.00008 g	0.00006 g
Tolerance	0.00010 g ✓	0.00010 g ✓

Nov 4th 2025

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Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	0.0000 g	0.0000 g
Tolerance	0.0003 g ✓	0.0003 g ✓

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Tolerance
1	0.0000 g	0.0000 g	0.0000 g	0.0001 g ✓
2	50.0000 g	50.0004 g	0.0004 g	0.0002 g ✗
3	99.9999 g	100.0000 g	0.0001 g	0.0004 g ✓
4	149.9999 g	149.9994 g	-0.0005 g	0.0006 g ✓
5	200.0001 g	199.9994 g	-0.0007 g	0.0004 g ✗

As Left

	Reference Value	Indication	Error of Indication	Tolerance
1	0.0000 g	0.0000 g	0.0000 g	0.0001 g ✓
2	50.0000 g	50.0002 g	0.0002 g	0.0002 g ✓
3	99.9999 g	99.9999 g	0.0000 g	0.0004 g ✓
4	149.9999 g	149.9995 g	-0.0004 g	0.0006 g ✓
5	200.0001 g	199.9998 g	-0.0003 g	0.0004 g ✓

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Trust in every measure

ACCREDITATION ISO 17025 TM
SCC Scope Number 668

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-223**
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	**Calibration date :**	04-03-2022

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	**Date approved :**	04-03-2022
Precision class :	ASTM 6	**Next Calibration :**	04-03-2027
Density :	7.95g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	EM-090	**CLAS Certification # :**	2010-01

Test conditions :	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4

NOTES:

For weight calibration, we use the procedure "Comparaison individuelle" PDL-09-MG-001 and the procedure "Détermination des incertitudes" PDL-09-MG-002. This certificate cannot be copied without written approval from Dispersion Laboratory. The results presented in these pages relate only to objects subjected to calibration.n

REMARKS:

March 2022

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-223**
Address :	695 B rue Gaudette	**CCN Accreditation # :**	668
	Saint-Jean-sur-Richelieu, QC	**CLAS Certification # :**	2010-01
	J3B7S7	**Precision class :**	ASTM 6
		Calibration date :	04-03-2022
Mass :	2 kg	**Follow-up date :**	04-03-2027

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
2 kg		EM-090	2.0001384 kg		200 mg	2.0 mg

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ACCREDITATION
ISO 17025
SCC Scope Number 668

CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-223**
Address :	695 B rue Gaudette	**CCN Accreditation # :**	668
	Saint-Jean-sur-Richelieu, QC	**CLAS Certification # :**	2010-01
	J3B7S7	**Precision class :**	ASTM 6
		Calibration date :	04-03-2022
Mass :	2 kg	**Follow-up date :**	04-03-2027

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
2 kg		EM-090	138.4 mg		200 mg	2.0 mg

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of k = 2. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022

Instrumentation Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS NRC·CNRC
CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-126 2025-05-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	1"Hg
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	DPG200	Measurement Type:	Pressure
Serial #:	N.A.	Range:	0-28
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			

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Instrumentation Saint-Laurent inc.
Certified ISO/IEC 17025:2017

CLAS NRC·CNRC CLAS 2010-02

SCC Accredited LAB Accréditée CCN LAB

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-126 2025-05-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
Verification of the indicator							
0.00 "Hg	0.00 "Hg	-0.42 "Hg	-0.42 "Hg	-0.42 "Hg	-0.42 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-8.00 "Hg	-0.50 "Hg	-8.00 "Hg	-0.50 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-15.65 "Hg	-0.65 "Hg	-15.65 "Hg	-0.65 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-23.30 "Hg	-0.80 "Hg	-23.30 "Hg	-0.80 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-28.00 "Hg	-28.00 "Hg	-28.87 "Hg	-0.87 "Hg	-28.87 "Hg	-0.87 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-23.30 "Hg	-0.80 "Hg	-23.30 "Hg	-0.80 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-15.65 "Hg	-0.65 "Hg	-15.65 "Hg	-0.65 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-8.00 "Hg	-0.50 "Hg	-8.00 "Hg	-0.50 "Hg	1.0 "Hg	± 0.5 "Hg
Compliant							
Verification of the analogic output							
0.00 "Hg	10.0000 V.dc	10.0963 V.dc	+0.0963 V.dc	10.0963 V.dc	+0.0963 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-7.50 "Hg	8.0000 V.dc	7.9400 V.dc	-0.0600 V.dc	7.9400 V.dc	-0.0600 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-15.00 "Hg	6.0000 V.dc	5.9201 V.dc	-0.0799 V.dc	5.9201 V.dc	-0.0799 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-22.50 "Hg	4.0000 V.dc	3.9145 V.dc	-0.0855 V.dc	3.9145 V.dc	-0.0855 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-28.00 "Hg	2.5333 V.dc	2.5532 V.dc	+0.0199 V.dc	2.5532 V.dc	+0.0199 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-22.50 "Hg	4.0000 V.dc	3.9145 V.dc	-0.0855 V.dc	3.9145 V.dc	-0.0855 V.dc	0.5 V.dc	0.5 V.dc
Compliant							

Environmental Conditions: Temperature: 21 °C Humidity: 35 %RH

The calibration was carried out at the client on-site using the method of comparison to the standard measurement.

Comments:

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CLAS 2010-02

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-126 2025-05-26

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

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Benoit Larocque - Tech

Ju — 2025

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Instrumentation
Saint•Laurent inc.
Certified ISO/IEC 17025:2017

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CLAS 2010-02

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80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2025-05-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	1"Hg
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	DPG200	Measurement Type:	Pressure
Serial #:	N.A.	Range:	0-28
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	Certification #:	2024009592
Serial #:	258139	Certification Date:	2024-11-22
Certified by:	Alpha Controls	Next Certification:	2025-11-22
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2025-05-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
Verification of the indicator							
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-7.49 "Hg	0.01 "Hg	-7.49 "Hg	0.01 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	-0.03 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-22.53 "Hg	-0.03 "Hg	-22.53 "Hg	-0.03 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-28.00 "Hg	-28.00 "Hg	-28.00 "Hg	0.00 "Hg	-28.00 "Hg	0.00 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-22.53 "Hg	-0.03 "Hg	-22.53 "Hg	-0.03 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	-0.03 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-7.49 "Hg	0.01 "Hg	-7.49 "Hg	0.01 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1.0 "Hg	0.5 "Hg
Compliant							
Verification of the analogic output							
0.00 "Hg	10.0000 V.dc	10.0042 V.dc	0.0042 V.dc	10.0042 V.dc	0.0042 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-7.50 "Hg	8.0000 V.dc	8.0148 V.dc	0.0148 V.dc	8.0148 V.dc	0.0148 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-15.00 "Hg	6.0000 V.dc	6.0014 V.dc	0.0014 V.dc	6.0014 V.dc	0.0014 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-22.50 "Hg	4.0000 V.dc	4.0057 V.dc	0.0057 V.dc	4.0057 V.dc	0.0057 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-28.00 "Hg	2.5333 V.dc	2.5300 V.dc	-0.0033 V.dc	2.5300 V.dc	-0.0033 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-22.50 "Hg	4.0000 V.dc	4.0036 V.dc	0.0036 V.dc	4.0036 V.dc	0.0036 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-15.00 "Hg	6.0000 V.dc	6.0044 V.dc	0.0044 V.dc	6.0044 V.dc	0.0044 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
-7.50 "Hg	8.0000 V.dc	8.0008 V.dc	0.0008 V.dc	8.0008 V.dc	0.0008 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.00 "Hg	10.0000 V.dc	10.0068 V.dc	0.0068 V.dc	10.0068 V.dc	0.0068 V.dc	0.5 V.dc	0.5 V.dc
Compliant							

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CLAS 2010-02

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info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-127 2025-05-26

Environmental Conditions:	Temperature:	21 °C	Humidity:	35 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.				
Comments:				

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

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Benoit Larocque - Tech

5 Jun 2025

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ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-221**
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	**Calibration date :**	04-03-2022

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	**Date approved :**	04-03-2022
Precision class :	ASTM 1	**Next Calibration :**	04-03-2027
Density :	7.95g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	1000026013	**CLAS Certification # :**	2010-01

Test conditions :	Temp °C:	21.05	kPa Pressure:	102.3	Humidity:	49.4

NOTES:

For weight calibration, we use the procedure "Comparaison individuelle" PDL-09-MG-001 and the procedure "Détermination des incertitudes" PDL-09-MG-002. This certificate cannot be copied without written approval from Dispersion Laboratory. The results presented in these pages relate only to objects subjected to calibration.n

REMARKS:

March 2022

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CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-221**
Address :	695 B rue Gaudette	**CCN Accreditation # :**	668
	Saint-Jean-sur-Richelieu, QC	**CLAS Certification # :**	2010-01
	J3B7S7	**Precision class :**	ASTM 1
		Calibration date :	04-03-2022
Mass :	200 g	**Follow-up date :**	04-03-2027

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
200 g*	1000026013	EM-129	199.99954 g	199.99986 g	0.50 mg	0.10 mg

*Applicable only for adjusted masses **Falls outside of the specified class

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ACCREDITATION ISO 17025
SCC Scope Number 668

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-221**
Address :	695 B rue Gaudette	**CCN Accreditation # :**	668
	Saint-Jean-sur-Richelieu, QC	**CLAS Certification # :**	2010-01
	J3B7S7	**Precision class :**	ASTM 1
		Calibration date :	04-03-2022
Mass :	200 g	**Follow-up date :**	04-03-2027

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
200 g*	1000026013	EM-129	-0.46 mg	-0.14 mg	0.50 mg	0.10 mg

*Applicable only for adjusted masses **Falls outside of the specified class

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of k = 2. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022

POLYCONTROLS

CLAS 2009-02

CALIBRATION CERTIFICATE # 27466

Calibration date : 2026-01-12
Certificate issued : 2026-01-12

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Calibration of
Positive displacement flow meter American Meter Company DTM-200A S/N : 99A274209

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months

Hassan Habli
Metrologist

Laboratory Manager

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3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27466

Serial Number:	99A274209	Test stand:	3
Calibration Date:	2026-01-12	Procedure:	POS-CAL-005
Instrument ID:	EM-130	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature	20 °C	Ambient temperature	22.27 °C
Inlet pressure		Ambient pressure	1010.45 mbar
Outlet pressure		Orientation	Vertical
Reference temperature		Seals	
Reference pressure		Valve	
Range	0-200 ACFH		
Output Signal	Afficheur		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ACFH	Device under test ft³	Measured values Pressure PSIA	Temperature °C	Reference ft³	Calculated Reference ft³	Calculated Error ft³	Acceptable Error ft³	Uncertainty k = 2 ft³	TUR
10.5514	1.750	14.663	21.539	1.751	1.757	-0.007	0.035	0.009	>4
119.0120	19.960	14.753	21.240	19.860	19.792	0.168	0.396	0.057	>4
199.2387	33.400	14.912	21.186	33.673	33.193	0.207	0.664	0.095	>4

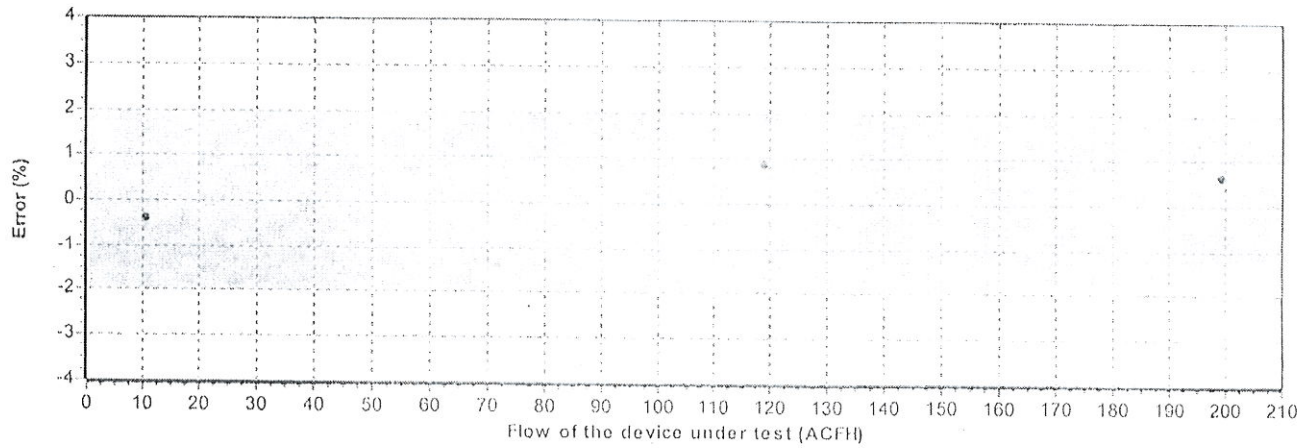
POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27466

Serial Number:	99A274209	Test stand:	3
Calibration Date:	2026-01-12	Procedure:	POS-CAL-005
Instrument ID:	EM-130	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

Fc : 1.00

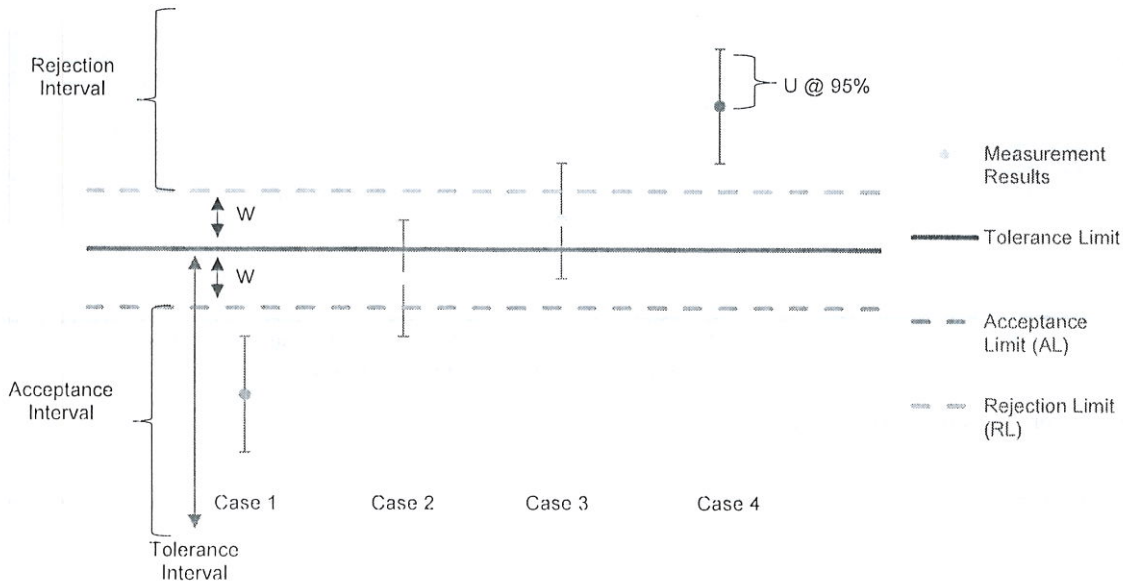
JAN 15th, 2026

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green.*

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red.*

3650-A1, Matte Blvd., Brossard, (Quebec) J4Y 2Z2 Canada – CAN: (450) 444-3600 USA: 1-844-660-7659

Fox Valley Metrology
3114 Medalist Drive
Oshkosh, WI 54902
(920) 426-5894 • Fax (920) 426-8120
https://www.FoxValleyMetrology.com

CERTIFICATE OF CALIBRATION

ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION AND DIMENSIONAL MEASUREMENT
Certificate No. ACT-1272

CERTIFICATION NUMBER	CQ006-30064-489
FOR	Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7
TEST INSTRUMENT	Thermohygrometer
MAKE	Fluke
MODEL	971
RANGE	-4 to 100°F/ 5 to 95%RH
CUSTOMER LOCATION	
CONDITION RECEIVED	In Tolerance
CONDITION RETURNED	In Tolerance
CALIBRATED BY	Joseph Romportl
REVIEWED/ISSUED	A.D. 01/14/2026
CALIBRATION LOCATION	FVM
ENVIRONMENT	71.5°F, 32.5%RH, 28.80inHg
CALIBRATION DATE	01/06/2026
RECALIBRATION DUE	01/06/2027

IDENTIFICATION	EM-136
SERIAL NUMBER	10610860
PURCHASE ORDER #	100642

PROCEDURES FOLLOWED

EL-033A rev. 1

STANDARDS USED

INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL
FVS-275E	16783134	CP168-26178-489	06/30/2026
FVS-471	1012820	CP163-26368-917	06/30/2026

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Temperature	(°F)	(°F)	(°F)	(°F)	(°F)	
	60.0	59.0	61.0	60.3	60.3	3.6E-1
	70.0	69.0	71.0	69.8	69.8	3.6E-1
	80.0	79.0	81.0	79.8	79.8	3.6E-1
Humidity	(RH)	(RH)	(RH)	(RH)	(RH)	
	25.0	22.5	27.5	27.3	27.3	9.0E-1
	50.0	47.5	52.5	49.5	49.5	9.0E-1
	75.0	72.5	77.5	73.2	73.2	9.0E-1

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024
■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.
■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

JAN 27th 2026

GRAFTEL
An ETS Company

CERTIFICATE OF CALIBRATION

Traceable to the SI through the National Institute of Standards and Technology

Calibration Certificate No: 130758

Customer Information

Customer: Services Polytests

Address: 695-B Gaudette St-Jean-sur-richelieu J3B 7S7

Customer PO #: 100643

ACCREDITED
CERT #5827.01

Calibration Procedure Information

Procedure: Air Velocity Calibration Revision #: 1

Calibration Standards Information

Graftel ID	Model #	Description	CAL Due
10187	PTB210	Vaisala Ambient Pressure	6/30/2026
10100	9209	Graftel Temperature	10/31/2028
10171	FC0332-2W	Furness DeltaP Meter, 0 to 0.4"H2O	12/31/2026
10086	FC0332	Furness Controls DeltaP Meter, 0 to 4"H2O	12/31/2026
1A01JMGKP36		Graftel Barometric Pressure, Tank Farm	3/31/2026
T1830459	VAISALA / H MW95D	Vaisala Temp/RH Logger, Velocity Lab	1/31/2026

Calibrated Device Information

Manufacturer: Omega
Model #: HHF143
Instrument ID: EM153
Serial #: 1015949
Comments: Calibration Range: 100-5000 fpm

Description: Anemometer
Rated Accuracy: See Attachments
Range: 40 to 7800 fpm
Calibration Date: 01/20/2026

Method Used: Pitot Tube
Accuracy Specified By: Omega
Condition: Functional
Calibration Due: 01/20/2027

The calibrations within the certificate/report are traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or another National Metrology Institute. The reported calibration uncertainty has a confidence level of 95% (k=2). Acceptance criteria per Simple Acceptance Rule as defined in ILAC G8:2019 with a ≥4:1 TUR. Otherwise, measurement uncertainty is provided prior to the work being performed. It is the responsibility of the user to determine the degree of risk that is required for their application. Graftel Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2017, ANSI/NCSL Z540-1-1994 and ISO 9001. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graftel. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.

Performed By
Philip Davis, Calibration Technician
01/20/2026

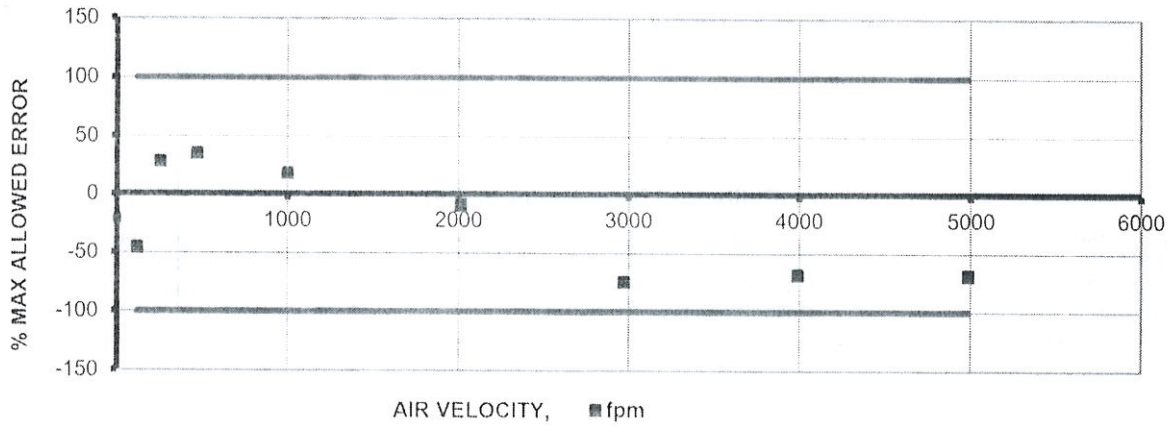
Approved/Issued By
Ehsan Niknafs, Mechanical Design Engineer
01/21/2026

95 Chancellor Drive | Roselle, Illinois 60172 | +1 (847) 364-2600 | Graftel.com

ATTACHMENT TO CALIBRATION CERTIFICATE 130758
AS FOUND / AS LEFT DATA

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty (k=2)	CMC (k=2)	STATUS
Actual Air Velocity							
fpm	fpm	fpm	fpm	fpm	fpm	fpm	STATUS
119	117	118	121	-1	3.1	3.0	Pass
253	249	254	257	1	4.3	4.2	Pass
471	465	473	477	2	6.2	6.2	Pass
999	988	1001	1010	2	11.0	11.0	Pass
2013	1992	2011	2034	-2	20.1	20.1	Pass
2971	2940	2948	3002	-23	28.7	28.7	Pass
3992	3951	3964	4033	-28	37.9	37.9	Pass
4985	4934	4950	5036	-35	46.8	46.8	Pass

ERROR CHART



Instrument Specifications		
Test Fluid:	Air	
Lower Velocity Range:	40	fpm
Upper Velocity Range:	7800	fpm
Velocity Resolution:	1	
Velocity Accuracy:	1% Reading + 1 digit	
Laboratory Ambient Conditions		
Pressure:	14.32	psia
Humidity:	23.56	%RH
Temperature:	73.31	°F

JAN 27th 2026

Instrumentation
Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS 2010-02

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2025-11-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Accuracy:	+\- 4.0°F
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	Input Type:	Temp
Manufacturer:	Keithley	Output Type:	Digitale
Model #:	7700	Measurement Type:	Temperature
Serial #:	1306774	Range:	Divers
Location:	N/A	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	thermometre digital 6412	Certification #:	6412-15326300
Serial #:	240605643	Certification Date:	2024-08-07
Certified by:	itm- Control Company	Next Certification:	2026-08-07
Comments:			

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Instrumentation Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS MRC·CNRC CLAS 2010-02

SCC Accredited LAB Accredited CCN

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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2025-11-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
85.0 °F	85.0 °F	84.5 °F	-0.5 °F	84.5 °F	-0.5 °F	4.0 °F	0.5 °F
Pass	ID. No. 111 (Filter 1) en type "T" En Loop avec EM-154						
85.0 °F	85.0 °F	83.4 °F	-1.6 °F	83.4 °F	-1.6 °F	4.0 °F	0.5 °F
Pass	ID. No. 112 (Filter 2) en type "T" En Loop avec EM-154						
125.0 °F	125.0 °F	124.6 °F	-0.4 °F	124.6 °F	-0.4 °F	4.0 °F	0.4 °F
Pass	ID. No. 113 (Tunnel) en type "J" En Loop avec EM-154						
70.0 °F	70.0 °F	69.4 °F	-0.6 °F	69.4 °F	-0.6 °F	4.0 °F	0.4 °F
Pass	ID. No. 114 (Room) en type "J" En Loop avec EM-154						
100.0 °F	100.0 °F	99.7 °F	-0.3 °F	99.7 °F	-0.3 °F	4.0 °F	0.4 °F
Pass	ID. No. 115 (Dry bulb tunnel) en type "J" En Loop avec EM-154						
70.0 °F	70.0 °F	69.2 °F	-0.8 °F	69.2 °F	-0.8 °F	4.0 °F	0.4 °F
Pass	ID. No. 116 (Analyzer gaz) en type "J" En Loop avec EM-154						

Tested Temperature Probe: Depth: N.A.

Environmental Conditions: Temperature: 21 °C Humidity: 35 %RH

The calibration was carried out at the client on-site using the method of comparison to the standard measurement.

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-11-26
Next Calibration:	2026-11-26
Certificate Date:	2025-11-26

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.
¤ Hysteresis is not accounted for in the calibration procedure nor in the uncertainty budget.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Benoit Larocque - Tech

Nov 26 2025

5F09101 Version: 2025.06.23.E

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https://www.FoxValleyMetrology.com

CERTIFICATE OF CALIBRATION

ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT

Certificate No. ACT-1272

CERTIFICATION NUMBER	CQ002-29356-826
FOR	Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7
TEST INSTRUMENT	Stopwatch
MAKE	Extech Instruments
MODEL	365510
CUSTOMER LOCATION	
CONDITION RECEIVED	In Tolerance
CONDITION RETURNED	In Tolerance
CALIBRATED BY	John Svoboda
REVIEWED/ISSUED	A.D. 01/14/2026
CALIBRATION LOCATION	FVM
ENVIRONMENT	71.9°F, 16.4%RH, 29.10inHg
CALIBRATION DATE	01/02/2026
RECALIBRATION DUE	01/02/2027

IDENTIFICATION	EM-175
SERIAL NUMBER	
PURCHASE ORDER #	100642
PROCEDURES FOLLOWED	EL-019B rev. 1

STANDARDS USED

INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL
FVS-275E	16783134	CP168-26178-489	06/30/2026
FVS-981C	FVS-981C	CP223-55032-826	08/31/2026

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Time Interval	(s)	(s)	(s)	(s)	(s)	
1 minute	60.00	59.50	60.50	60.03	60.03	5.8E-1
	60.00	59.50	60.50	60.02	60.02	5.8E-1
5 minute	300.00	299.50	300.50	300.03	300.03	6.3E-1
	300.00	299.50	300.50	300.01	300.01	6.3E-1

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024
■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.
■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

SAN 27th 2026

POLYCONTROLS

CLAS 2009-02

CALIBRATION CERTIFICATE # 27467

Calibration date : 2026-01-13
Certificate issued : 2026-01-13

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Calibration of
Positive displacement flow meter Shinigawa DCDa-2c S/N : 23544

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months
	Corrected Instrument Readings = Display of the instrument * K factor(0.986)

Hassan Habli
Metrologist

Laboratory Manager

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Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27467

Serial Number:	23544	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature	20 °C	Ambient temperature	22.52 °C
Inlet pressure		Ambient pressure	1009.92 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

Final readings

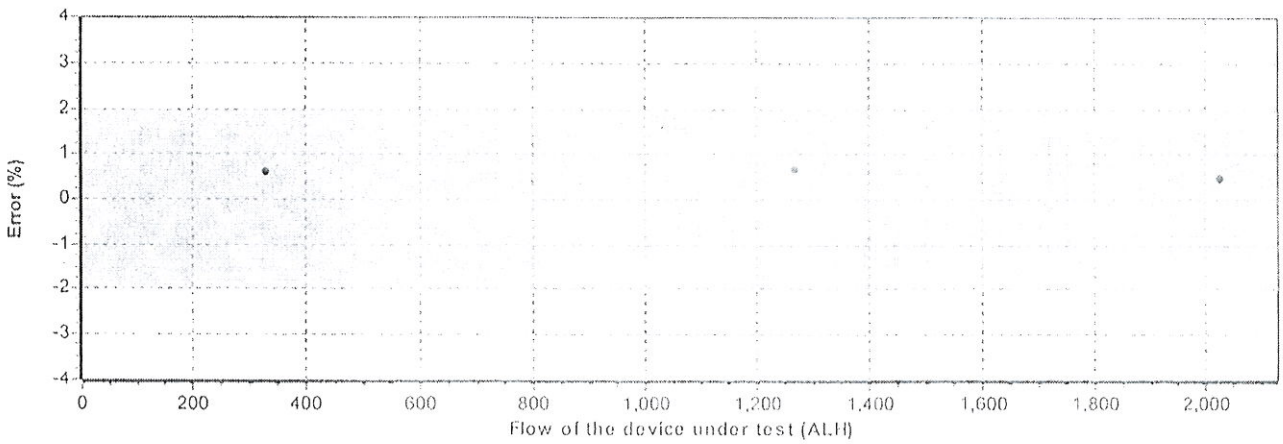
Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
328.815	54.9700	14.663	21.476	54.4400	54.6295	0.3405	1.0926	0.1984	>4
1269.706	212.8300	14.690	21.462	211.1200	211.4595	1.3705	4.2292	0.7678	>4
2029.987	339.2800	14.725	21.502	337.9300	337.7196	1.5604	6.7544	0.9654	>4

POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27467			
Serial Number:	23544	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

Fc: 0.986

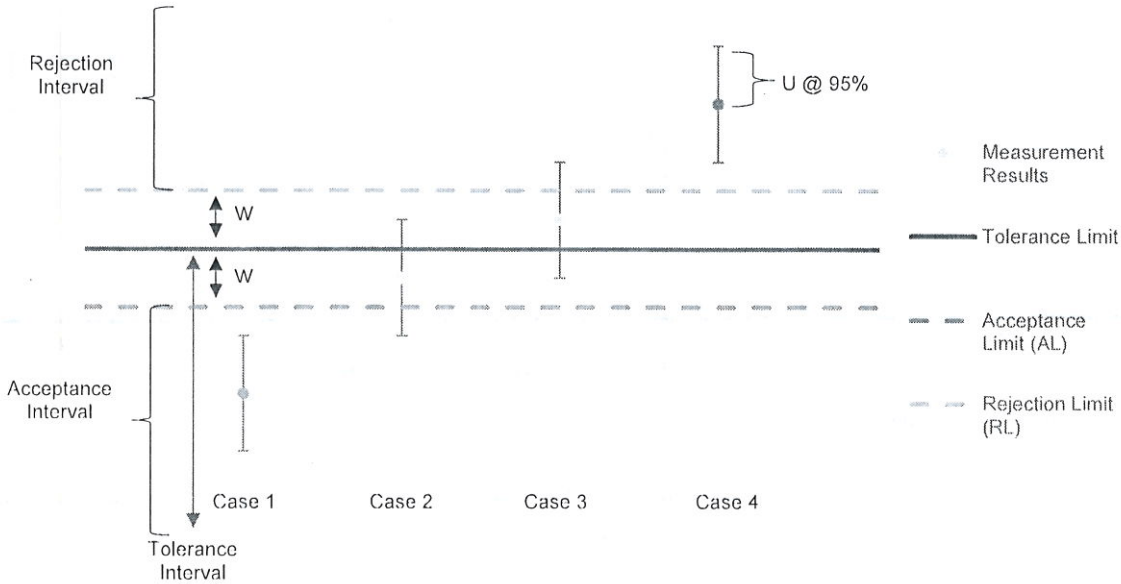
JAN 15th, 2026

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green.*

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red.*

3650-A1, Matte Blvd., Brossard, (Quebec) J4Y 2Z2 Canada – CAN: (450) 444-3600 USA: 1-844-660-7659

POLYCONTROLS

CLAS 2009-02

CALIBRATION CERTIFICATE # 27468

Calibration date : 2026-01-13
Certificate issued : 2026-01-13

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Calibration of
Positive displacement flow meter Shinigawa DCDa-2c S/N : 23543

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months

Hassan Habli
Metrologist

Laboratory Manager

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POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27468

Serial Number:	23543	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature	20 °C	Ambient temperature	22.24 °C
Inlet pressure		Ambient pressure	1010.06 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

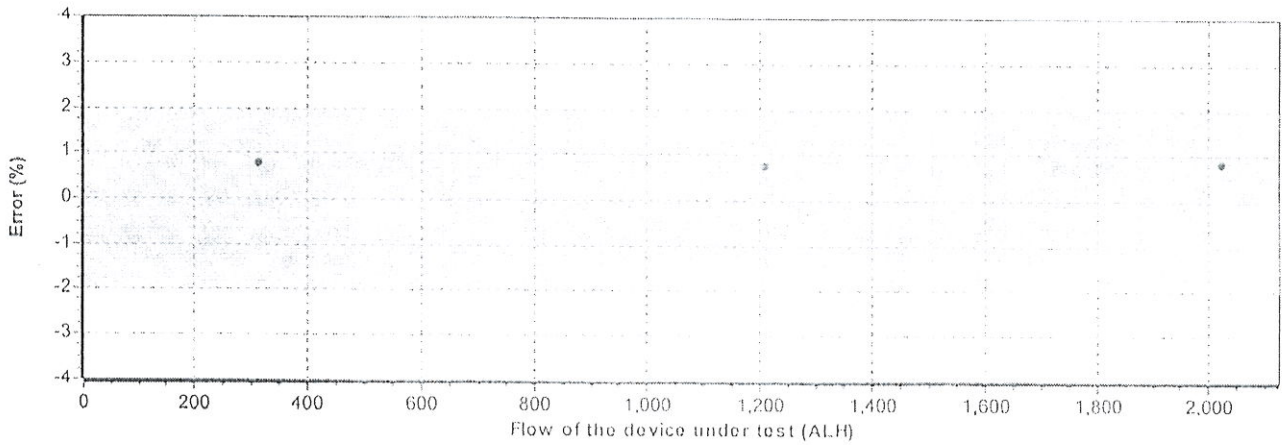
Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
315.2079	52.800	14.667	21.529	52.220	52.399	0.401	1.048	0.190	>4
1212.1752	203.250	14.691	21.154	201.650	201.752	1.498	4.035	0.732	>4
2025.8251	339.850	14.726	21.096	337.830	337.118	2.732	6.742	0.963	>4

POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27468			
Serial Number:	23543	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

Fc : 0.989

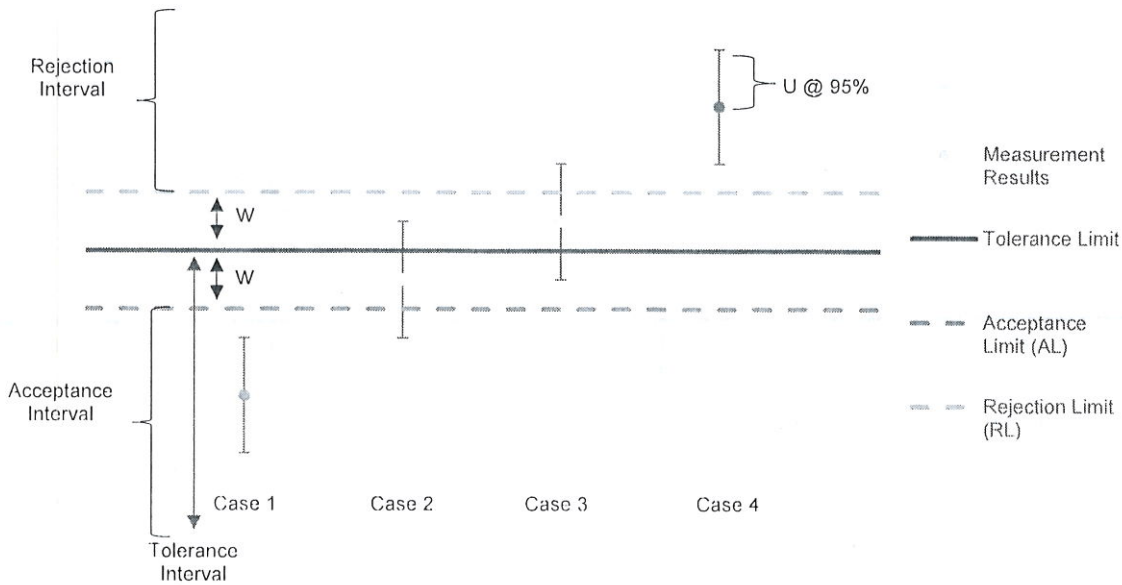
JAN 15, 2026

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green.*

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red.*

3650-A1, Matte Blvd., Brossard, (Quebec) J4Y 2Z2 Canada – CAN: (450) 444-3600 USA: 1-844-660-7659

Calibration Certificate ID
CA0011-060-082925-ACC-USI

METTLER TOLEDO

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH 43240
1-800-METTLER

Accredited by the American Association for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1902.01
ISO 17025 Registered
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company:	Services Polytests		
Address:	695-B Rue Gaudette		
City:	Saint-Jean-Sur-Richelieu	Contact:	Danick Power
Zip / Postal:	J3B 7S7		
State / Province:	Quebec		

Weighing Device

Manufacturer:	Ohaus	Instrument Type:	Weighing Instrument
Model:	Balance	Asset Number:	EM-204
Serial No.:	8336030305	Terminal Model:	N/A
Building:	N/A	Terminal Serial No.:	N/A
Floor:	N/A	Terminal Asset No.:	N/A
Room:	N/A		

Range	Max. Capacity	Readability (d)
1	30000 g	1 g

Procedure

Calibration Guideline:	ASTM E898 - 20
METTLER TOLEDO Work Instruction:	SVC-WI-LABTEC-063 V2.0

This calibration certificate including procedures and uncertainty estimation also complies with EURAMET cg-18 v 4.0.

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

The calibration was agreed with the user below the maximum capacity of the balance.

	Temperature		Humidity	
As Found	Start: 22,0 °C	End: 22,0 °C	Start: 45,0 %	End: 45,0 %
As Left	Start: 22,0 °C	End: 22,0 °C	Start: 45,0 %	End: 45,0 %

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date:	26-08-2025
As Left Calibration Date:	26-08-2025
Issue Date:	29-08-2025
Date of next calibration by customer request:	31-08-2026

Authorized A2LA Signatory: Jocelyn Bouchard

Jocelyn Bouchard

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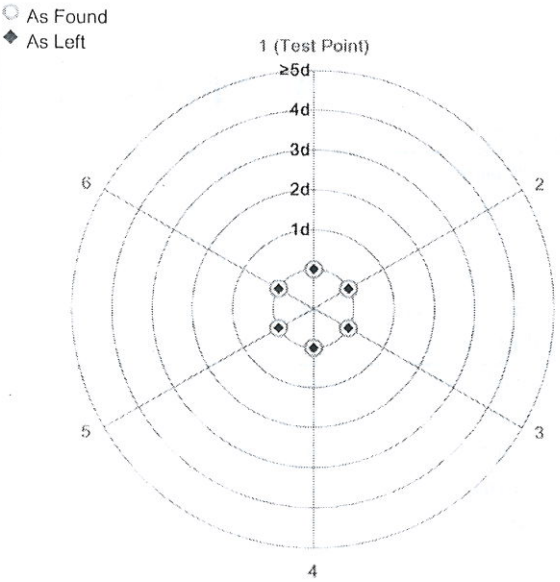
Measurement Results

Repeatability

Test Load: 10000 g

	As Found	As Left
1	10003 g	10001 g
2	10003 g	10001 g
3	10003 g	10001 g
4	10003 g	10001 g
5	10003 g	10001 g
6	10003 g	10001 g

Standard Deviation	0,0 g	0,0 g



The "d" in the graph represents the readability of the range/interval in which the test was performed.

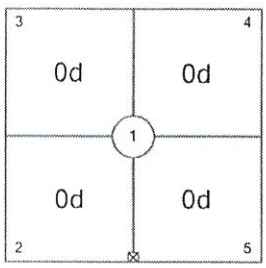
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

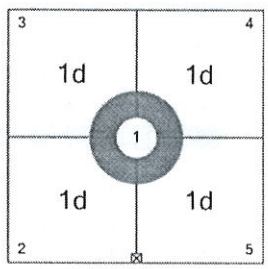
Test Load: 10000 g

Position	As Found	As Left
1	10003 g	10000 g
2	10003 g	10001 g
3	10003 g	10001 g
4	10003 g	10001 g
5	10003 g	10001 g

Maximum Deviation	0 g	1 g



As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

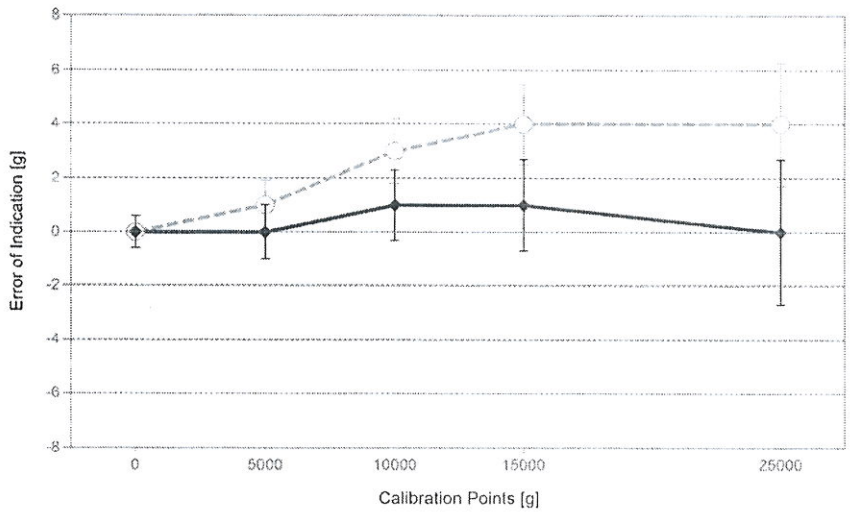
As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 g	0 g	0 g	0,6 g	2
2	5000 g	5001 g	1 g	0,9 g	2
3	10000 g	10003 g	3 g	1,2 g	2
4	15000 g	15004 g	4 g	1,5 g	2
5	25000 g	25004 g	4 g	2,3 g	2
6	0 g	0 g	0 g	0,6 g	2

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As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 g	0 g	0 g	0,6 g	2
2	5000 g	5000 g	0 g	1,0 g	2
3	10000 g	10001 g	1 g	1,3 g	2
4	15000 g	15001 g	1 g	1,7 g	2
5	25000 g	25000 g	0 g	2,7 g	2
6	0 g	0 g	0 g	0,6 g	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated. The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML M1

Weight Set No.:	T2 01 à50	Date of Issue:	07-03-2025
Certificate Number:	1411071	Calibration Due Date:	07-03-2026

Weight Set 2: OIML M1

Weight Set No.:	kit inspecteur	Date of Issue:	02-01-2025
Certificate Number:	M24-0627	Calibration Due Date:	02-01-2026

Remarks

N/A

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End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

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Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $10{,}0 \cdot 10^{-6}$ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 21 K

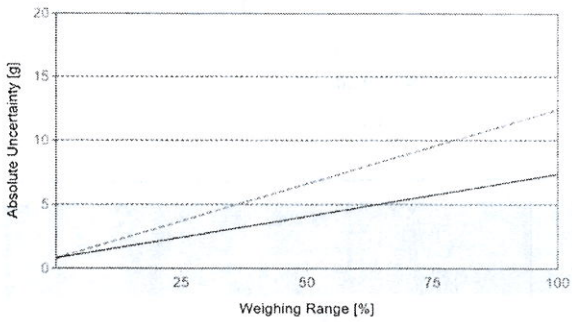
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	1 g	25000 g	U_1 = 816 mg + 0,464 mg/g · R	U_1 = 816 mg + 0,262 mg/g · R

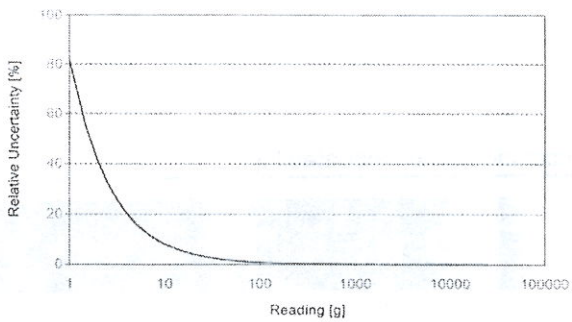
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
25 g	0,83 g	3,3%	0,82 g	3,3%
250 g	0,93 g	0,37%	0,88 g	0,35%
2500 g	2,0 g	0,079%	1,5 g	0,059%
12500 g	6,6 g	0,053%	4,1 g	0,033%
25000 g	12 g	0,050%	7,4 g	0,029%



As Found



As Left

Are you looking for some clarifications on the terms and graphs in your ACC calibration certificate? Do you know how to leverage its full value?

More information at:
www.mt.com/ACC-Cert-Info

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METTLER TOLEDO Service

Handbook 44 Tolerance Assessment (Maintenance)

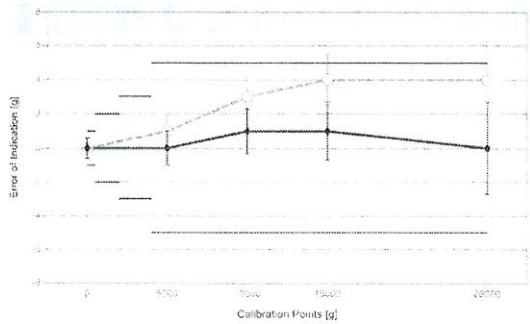
Assessment done without considering measurement uncertainty.
The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

	As Found	As Left
Overall	✓	✓

✓ = Passed
✗ = Failed

Weighing Device

Range	Max. Capacity	Readability (d)	Verification Scale Interval (e)	Class
1	30000 g	1 g	1 g	III



Tolerances according to NIST Handbook 44

Test Load		Tolerance
From	To	
0 g	0 g	0,25 g
1 g	500 g	1 g
501 g	2000 g	2 g
2001 g	4000 g	3 g
4001 g	25000 g	5 g

○ As Found
◆ As Left
— Tolerance

Eccentricity and Repeatability

Test	Test Load	Tolerance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Eccentricity (Max. Error)	10000 g	5 g	3 g	✓	1 g	✓
Eccentricity (Range)	10000 g	5 g	0 g	✓	0 g	✓
Repeatability (Max. Error)	10000 g	5 g	3 g	✓	1 g	✓
Repeatability (Range)	10000 g	5 g	0 g	✓	0 g	✓

Max. Error: Maximum of the absolute values of the individual errors.
Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 g	1 g	0 g	✓	0 g	✓
2	5000 g	5 g	1 g	✓	0 g	✓
3	10000 g	5 g	3 g	✓	1 g	✓
4	15000 g	5 g	4 g	✓	1 g	✓
5	25000 g	5 g	4 g	✓	0 g	✓
6	0 g	1 g	0 g	✓	0 g	✓

Sept 2025

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Fox Valley Metrology
3114 Medalist Drive
Oshkosh, WI 54902
(920) 426-5894 • Fax (920) 426-8120
https://www.FoxValleyMetrology.com

CERTIFICATE OF CALIBRATION

ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT
Certificate No. ACT-1272

CERTIFICATION NUMBER	CQ002-33259-902
FOR	Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7
TEST INSTRUMENT	Weights
MAKE	Standard Weight
MODEL	Standard Weight
CUSTOMER LOCATION	
CONDITION RECEIVED	In Tolerance
CONDITION RETURNED	In Tolerance
CALIBRATED BY	Philip Nikitin
REVIEWED/ISSUED	A.D. 01/14/2026
CALIBRATION LOCATION	FVM
ENVIRONMENT	67.2°F, 17.8%RH, 29.11inHg
CALIBRATION DATE	01/02/2026
RECALIBRATION DUE	01/02/2027

IDENTIFICATION	EM-205
SERIAL NUMBER	
PURCHASE ORDER #	100642
PROCEDURES FOLLOWED	MC-012A rev. 2

STANDARDS USED

INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL
FVS-019V	N/A	C0290-28623-524	10/31/2026
FVS-275M	16787403,2849444 516308752	CP169-26300-489	06/30/2026
FVS-792	14737316	CP190-25619-681	01/31/2026

2030 DP. 4 year calibration

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
NIST 105-1 Class F Conventional Mass Correction				FVS-792	FVS-792	
10 kg	(g) 0.0	(g) -1.0	(g) 1.0	(g) 0.0	(g) 0.0	(g) 6.0E-2

COMMENTS
Test Weights Conventional Mass Correction Reference = C0003-WGHTS-FVM

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024
■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.
■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

JAN 27th 2026

Instrumentation Saint•Laurent inc.

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2025-05-30

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	ISL-022
Required Accuracy:	1/32"
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Ruban à mesurer	Input Type:	Mesure
Manufacturer:	Stanley	Output Type:	N/A
Model #:	Leverlock 12'	Measurement Type:	Inch
Serial #:	N/A	Range:	0 à 12'
Location:	Portable	Version:	Machine: N/A

CALIBRATORS SPECIFICATION			
Calibrator:	tape a mesurer	Certification #:	AB-85010080
Serial #:	25113363	Certification Date:	2025-03-20
Certified by:	Starrett	Next Certification:	2026-03-20
Comments:			

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Instrumentation Saint•Laurent inc.

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(Québec), J0N 1M0
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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-224 2025-05-30

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	
	Comment						
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "	0.00 "	1/32 "	
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "	0.00 "	1/32 "	
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "	0.00 "	1/32 "	
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "	0.00 "	1/32 "	
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "	0.00 "	1/32 "	

Environmental Conditions: Temperature: 22 °C Humidity: 53 %RH

The calibration was carried out in our laboratory using the method of comparison to the standard measurement.

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-30
Next Calibration:	2026-05-30
Certificate Date:	2025-05-30

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

Martin Langlais - Technicien

June 2025

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Instrumentation
Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS
IRC·CNRC
CLAS 2010-02

SCC Accredited LAB
LAB
Accrédité CCN

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2025-05-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	0.25 "H2O
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Voltage
Model #:	MS-321-LCD	Measurement Type:	Pressure
Serial #:	N/A	Range:	0 à 0.10 "H2O
Location:	Banc de test	Version:	Machine: N/A

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			

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Instrumentation Saint-Laurent inc.
Certified ISO/IEC 17025:2017

CLAS NRC·CNRC CLAS 2010-02

SCC Accredited LAB Accredité CCN

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2025-05-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
Verification of the indicator							
0.0000 "H2O	0.0000 "H2O	0.0001 "H2O	0.0001 "H2O	0.0001 "H2O	0.0001 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.1250 "H2O	0.1250 "H2O	0.1282 "H2O	0.0032 "H2O	0.1282 "H2O	0.0032 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.2500 "H2O	0.2500 "H2O	0.2578 "H2O	0.0078 "H2O	0.2578 "H2O	0.0078 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.3750 "H2O	0.3750 "H2O	0.3801 "H2O	0.0051 "H2O	0.3801 "H2O	0.0051 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.5000 "H2O	0.5000 "H2O	0.4999 "H2O	-0.0001 "H2O	0.4999 "H2O	-0.0001 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.3750 "H2O	0.3750 "H2O	0.3802 "H2O	0.0052 "H2O	0.3802 "H2O	0.0052 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.2500 "H2O	0.2500 "H2O	0.2568 "H2O	0.0068 "H2O	0.2568 "H2O	0.0068 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.1250 "H2O	0.1250 "H2O	0.1284 "H2O	0.0034 "H2O	0.1284 "H2O	0.0034 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0000 "H2O	0.0000 "H2O	0.0009 "H2O	0.0009 "H2O	0.0009 "H2O	0.0009 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
Verification of the analogic output							
0.0000 "H2O	0.0000 V.dc	0.0051 V.dc	+0.0051 V.dc	0.0051 V.dc	0.0051 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.1250 "H2O	2.5000 V.dc	2.4066 V.dc	-0.0934 V.dc	2.4066 V.dc	-0.0934 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.2500 "H2O	5.0000 V.dc	4.9750 V.dc	-0.0250 V.dc	4.9750 V.dc	-0.0250 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.3750 "H2O	7.5000 V.dc	7.5006 V.dc	0.0006 V.dc	7.5006 V.dc	0.0006 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.5000 "H2O	10.0000 V.dc	9.9875 V.dc	-0.0125 V.dc	9.9875 V.dc	-0.0125 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.3750 "H2O	7.5000 V.dc	7.5007 V.dc	0.0007 V.dc	7.5007 V.dc	0.0007 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.2500 "H2O	5.0000 V.dc	4.9735 V.dc	-0.0265 V.dc	4.9735 V.dc	-0.0265 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.1250 "H2O	2.5000 V.dc	2.4008 V.dc	-0.0992 V.dc	2.4008 V.dc	-0.0992 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0000 "H2O	0.00 V.dc	0.0050 V.dc	+0.0050 V.dc	0.0050 V.dc	+0.0050 V.dc	0.5 V.dc	0.5 V.dc
Compliant							

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Instrumentation Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS 2010-02

SOC Accredited LAB

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-249 2025-05-26

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.		
Comments:		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

CALIBRATION CONFORMITY		
	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Benoit Larocque - Tech

2025

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Instrumentation
Saint•Laurent inc.
Certified ISO/IEC 17025:2017

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Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-313 2025-05-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	0.25"H2O
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Indicator	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Voltage
Model #:	MS-321-LCD	Measurement Type:	Pressure
Serial #:	N.A.	Range:	0 a 0.1 inchh20
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Fluke Pression 718 1G	Certification #:	2024007082
Serial #:	3562082	Certification Date:	2024-08-23
Certified by:	Alpha Controls	Next Certification:	2025-08-23
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			

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info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-313 2025-05-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
Verification of the indicator							
0.0000 "H2O	0.0000 "H2O	-0.0048 "H2O	-0.0048 "H2O	-0.0028 "H2O	-0.0028 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0250 "H2O	0.0250 "H2O	0.0184 "H2O	-0.0066 "H2O	0.0221 "H2O	-0.0029 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0500 "H2O	0.0500 "H2O	0.0430 "H2O	-0.0070 "H2O	0.0470 "H2O	-0.0030 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0750 "H2O	0.0750 "H2O	0.0654 "H2O	-0.0096 "H2O	0.0711 "H2O	-0.0039 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.1000 "H2O	0.1000 "H2O	0.0859 "H2O	-0.0141 "H2O	0.0886 "H2O	-0.0114 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0750 "H2O	0.0750 "H2O	0.0654 "H2O	-0.0096 "H2O	0.0711 "H2O	-0.0039 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0500 "H2O	0.0500 "H2O	0.0430 "H2O	-0.0070 "H2O	0.0470 "H2O	-0.0030 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0250 "H2O	0.0250 "H2O	0.0184 "H2O	-0.0066 "H2O	0.0221 "H2O	-0.0029 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
0.0000 "H2O	0.0000 "H2O	-0.0048 "H2O	-0.0048 "H2O	-0.0048 "H2O	-0.0048 "H2O	0.25 "H2O	± 0.10 "H2O
Compliant							
Verification of the analogic output							
0.0000 "H2O	0.0000 V.dc	-0.0048 V.dc	-0.0048 V.dc	-0.0008 V.dc	-0.0008 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0250 "H2O	2.5000 V.dc	2.4201 V.dc	-0.0799 V.dc	2.4510 V.dc	-0.0490 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0500 "H2O	5.0000 V.dc	4.8120 V.dc	-0.1880 V.dc	4.9124 V.dc	-0.0876 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0750 "H2O	7.5000 V.dc	7.4910 V.dc	-0.0090 V.dc	7.4910 V.dc	-0.0090 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.1000 "H2O	10.0000 V.dc	10.6707 V.dc	+0.6707 V.dc	10.0119 V.dc	+0.0119 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0750 "H2O	7.5000 V.dc	7.5489 V.dc	0.0489 V.dc	7.5489 V.dc	0.0489 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0500 "H2O	5.0000 V.dc	5.0863 V.dc	0.0863 V.dc	5.0863 V.dc	0.0863 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0250 "H2O	2.500 V.dc	2.3529 V.dc	-0.1471 V.dc	2.3529 V.dc	-0.1471 V.dc	0.5 V.dc	0.5 V.dc
Compliant							
0.0000 "H2O	0.00 V.dc	0.1870 V.dc	+0.1870 V.dc	0.0038 V.dc	+0.0038 V.dc	0.5 V.dc	0.5 V.dc
Compliant							

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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-313 2025-05-26

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.		
Comments:		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Marco Miron - Technicien

Jun 2025

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POLYCONTROLS

CLAS 2009-02

CALIBRATION CERTIFICATE # 27470

Calibration date : 2026-01-13
Certificate issued : 2026-01-13

Services Polytests
695 B Gaudette street
St-Jean-sur-Richelieu, Québec, Canada
J3B 7S7

Calibration of
Positive displacement flow meter Shinigawa DCSDa-2C S/N : S8020

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument
	Initial readings = Final readings, no adjustment
Results	Final readings in tolerance
Remarks	Calibration frequency every 6 months
	Corrected Instrument Readings = Display of the instrument * K factor(1.01)

Hassan Habli
Metrologist

Laboratory Manager

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3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27470

Serial Number:	S8020	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500407509	2026-07-22
Fluke molbloc_125 slpm	2E2-S	254	1500407534	2026-07-22
Fluke molbox 1+	Molbox 1+	755+	1500407578	2026-07-23
RTD Mist	Mist	L00295	2025000737-Rev1	2026-02-03
Module 115 PSI with Baro 163671	Module 100	476714	2025004430	2026-05-27

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	22.28 °C
Inlet pressure		Ambient pressure	1009.66 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy	±2 %O.R.		

Final readings

Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
315.7139	52.166	14.653	21.371	52.370	52.570	-0.404	1.051	0.191	>4
1224.3169	203.010	14.679	21.244	203.160	203.484	-0.474	4.070	0.739	>4
2015.2916	338.754	14.712	21.223	336.060	335.826	2.928	6.717	0.960	>4

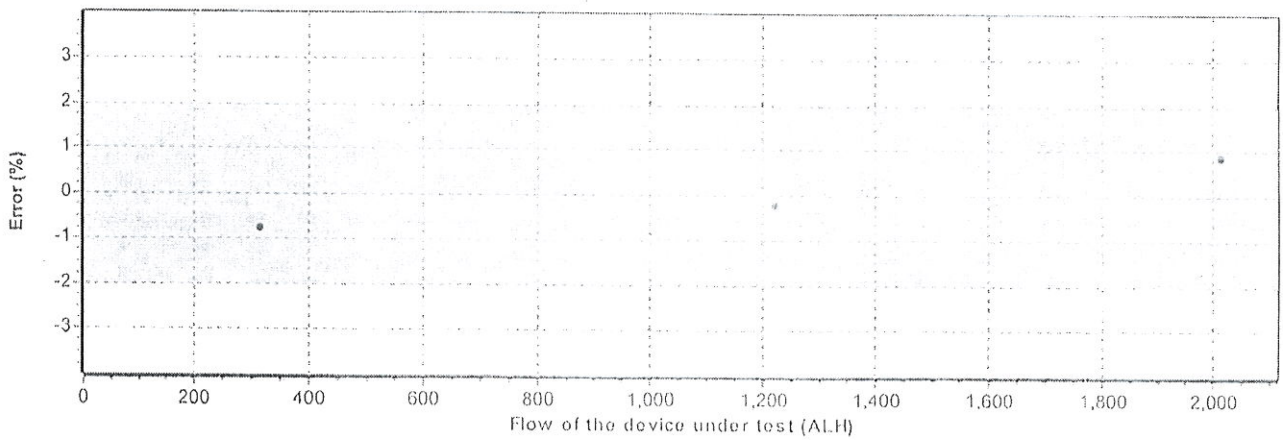
POLYCONTROLS

CLAS 2009-02

Calibration certificate # 27470

Serial Number:	S8020	Test stand:	3
Calibration Date:	2026-01-13	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

Fc : 1.01

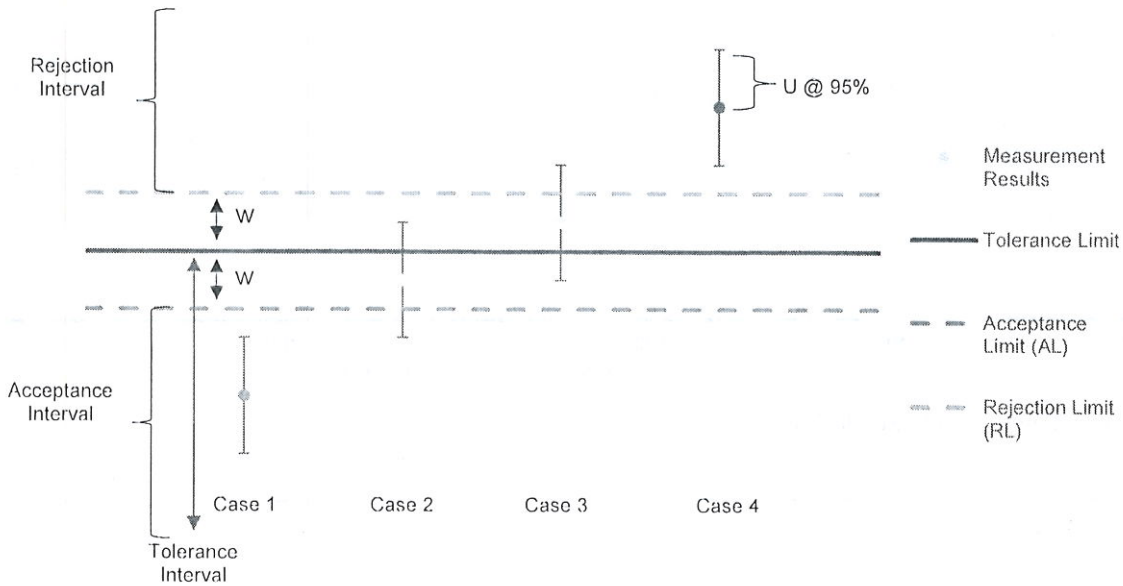
Jan 15th 2026

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – Below acceptance limit AL

Status: In tolerance

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. *Green.*

Case 2 – Below tolerance limit TL, greater than acceptance limit AL

Status: In tolerance-Conditional

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 3 – Greater than tolerance limit, below rejection limit RL

Status: Out of tolerance-Conditional

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. *Yellow.*

Case 4 – Greater than rejection limit RL

Status: Out of tolerance

- The result is inside the rejection interval. Uncertainty is directly taken into account. *Red.*

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CERTIFICATE OF CALIBRATION

ACCREDITED
CALIBRATION
CERT #2260.01

Certificate Number: 2025011438

Manufacturer:	Control Company	***RMA:***	AC25121179
Model:	4199	***PO:***	100640
Description:	Barometer	***Barcode:***	AL00042136
Serial:	210758578	***Received Conditions:***	Pass
ID:	EM 333	***Calibration Date:***	22-Dec-2025
Customer:	SERVICES POLYTESTS 695-B GUADETTE ST-JEAN-SUR-RICHELIEU QC J3B 7S7	***Calibration Due:***	22-Jun-2026
		Temperature:	22.51°C
		Humidity:	30.3%RH

STATEMENT OF UNCERTAINTY: The reported expanded uncertainty of measurement is stated as the standard measurement uncertainty multiplied by the coverage factor K = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 percent. Alpha Controls & Instrumentation Inc. certifies this instrument was calibrated on the date shown using standards traceable to NIST /NRC or accepted intrinsic standards and in compliance with ISO/IEC-17025:2017 and ANSI/NCSL Z540-1.

Statement of compliance is made applying guardbanding strategy and taking measurement uncertainty directly into account as defined in ILAC G8. Guardbanding is limited and compliance to specification is indeterminate when TUR <1.

Tolerance is based on manufacturer specification if not stated otherwise . Calibration results relate to items calibrated only. Functional tests are not covered by our scope of accreditation.

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STANDARDS USED

Description	*Model*	*ID*	*Cal Date*	*Due Date*
Pressure Controller/Calibrator	DH Instruments PPC3	PRE-CAL-04	12-Jun-2025	30-Jun-2026
Reference Pressure Monitor	Fluke RPM4	PRE-MTR-04	12-Jun-2025	30-Jun-2026

Notes: Calibrated in the vertical position.
Adjusted trim pot.

Performed by: Anthony Morra
Technician
(digitally signed on 22-Dec-2025 9:45 am)

QA Reviewed by: Ellie Hejazi
Lab Supervisor
(signed and issued on 22-Dec-2025 9:49 am)

Procedure:
Pressure/Vacuum: CAL VER /DHI PPC3 (2.3.A) **FOUND**
Pass

Test Description	True Value	Test Results	Specification	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
MEASUREMENT UNITS: hPa a							
1008.0	1008.0	1012	±5.0	1003	1013	P	5.9e-001

Procedure:
Pressure/Vacuum: CAL VER /DHI PPC3 (2.3.A) **LEFT**
Pass

Test Description	True Value	Test Results	Specification	Lower Limit	Upper Limit	Status	Uncertainty
PRESSURE TEST							
MEASUREMENT UNITS: hPa a							
1008.0	1008.0	1008	±5.0	1003	1013	P	5.9e-001

END OF CERTIFICATE

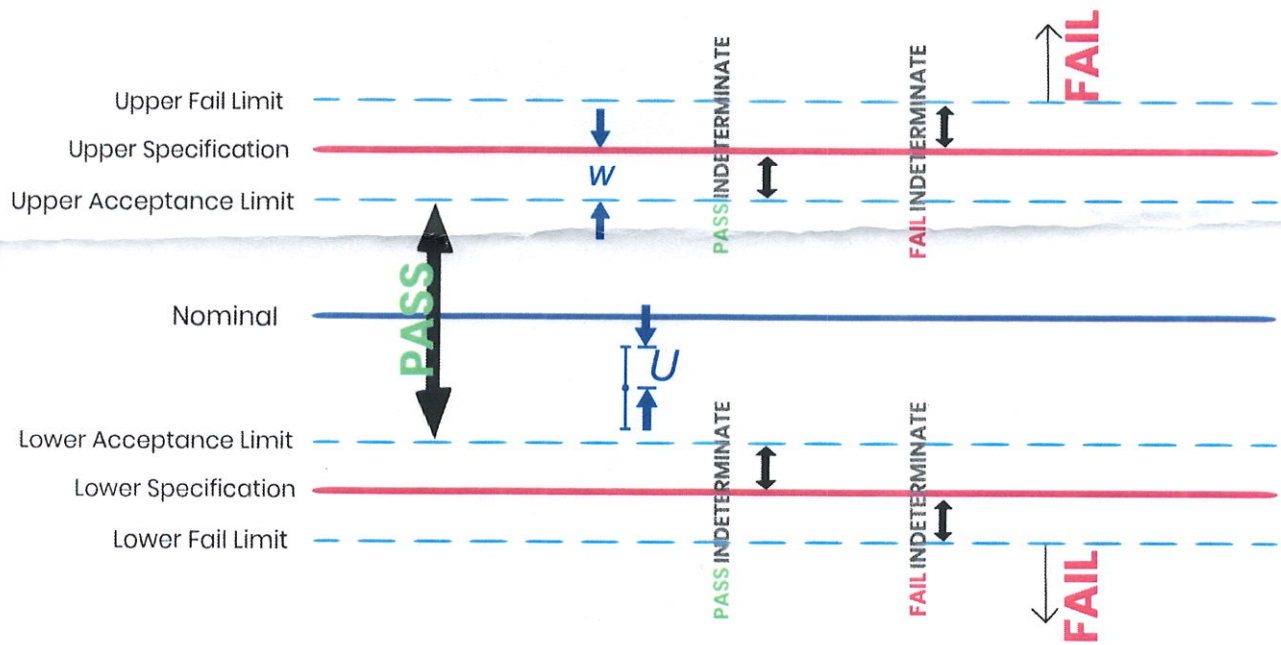
DECISION RULE EXPLANATION

When conformance to specification is made - measurement uncertainty is taken directly into account, as per ILAC-G8:09/2019. The decision rule is based on the Guard Banding approach, where the acceptance limits are reduced by guard band length of '*w*' proportional to the expanded uncertainty value '*U*' with 95% confidence level (k=2). When *w=1U*, then probability of a false acceptance is less than 2.5%.

Statements of conformity are reported as:

Symbol	Definition	Description
P	Pass	The measured result is within the Acceptance limit.
<P>	Pass Indeterminate	The measured result is within Specification, but outside of the Acceptance Limit.
<F>	Fail Indeterminate	The measured result is outside of Specification, but within the Fail Limit.
F	Fail	The measured result is outside of the Fail Limit.

Graphical Representation of Guard Banding:



Fox Valley Metrology
3114 Medalist Drive
Oshkosh, WI 54902
(920) 426-5894 • Fax (920) 426-8120
https://www.FoxValleyMetrology.com

CERTIFICATE OF CALIBRATION

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT
Certificate No. ACT-1272

CERTIFICATION NUMBER	CQ002-28867-826
FOR	Polytests Services Inc. 695 B rue Gaudette St-Jean-sur-Richelieu, QC, Canada J3B 7S7
TEST INSTRUMENT	Resistance Standard
MAKE	Delmhorst Instrument Co.
MODEL	MCS-1
RANGE	(1.1M to 120M) ohms
CUSTOMER LOCATION	
CONDITION RECEIVED	In Tolerance
CONDITION RETURNED	In Tolerance
CALIBRATED BY	John Svoboda
REVIEWED/ISSUED	A.D. 01/14/2026
CALIBRATION LOCATION	FVM
ENVIRONMENT	71.9°F, 16.4%RH, 29.10inHg
CALIBRATION DATE	01/02/2026
RECALIBRATION DUE	01/02/2027

IDENTIFICATION	EM-334
SERIAL NUMBER	
PURCHASE ORDER #	100642
PROCEDURES FOLLOWED	EL-010A rev. 1

STANDARDS USED

INSTRUMENT	SERIAL NUMBER	TRACE NUMBER	NEXT CAL
FVS-275E	16783134	CP168-26178-489	06/30/2026
FVS-A23	MY60098672	CP153-40850-823	06/30/2026

CALIBRATION RESULTS

* DENOTES "OUT OF TOLERANCE"

FEATURE	NOMINAL	LOWER LIMIT	UPPER LIMIT	AS FOUND	AS LEFT	UNCERTAINTY
Resistance	(Mohm)	(Mohm)	(Mohm)	(Mohm)	(Mohm)	(Mohm)
12% 'Pad'	120.00	119.76	120.24	119.77	119.77	6.0E-3
22% 'Pad'	1.100	1.078	1.122	1.097	1.097	6.0E-4

■ This certificate shall not be altered in any form or reproduced, except in full, without prior written approval from originating lab. These results relate only to the item(s) calibrated. Form Revision 10: 06/04/2024
■ Total expanded measurement uncertainties expressed are based on a confidence level of 95%; coverage factor of (k=2). The statement of compliance in this certificate was issued without taking the uncertainty of measurement into consideration. The customer shall assess the results and uncertainty when determining if the results meet their needs. (This is considered "shared responsibility.") Uncertainties expressed in nominal units.
■ The calibrations within the certificate/report are traceable through NIST or another National Metrology Institute to the International System of Units (SI). Calibration was completed in accordance with ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 and ANSI/NCSL Z540.3-2006. Other standards listed upon request.

JAN 27TH 2026

TRANSCAT® CANADA
Trust in every measure

ACCREDITATION ISO 17025 SCC Scope Number 668

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-225**
Address :	695 B rue Gaudette Saint-Jean-sur-Richelieu, QC J3B7S7	**Calibration date :**	14-03-2022

Technician:
Coutu, Daniel

David Llorens, Quality Manager

SERVICE DESCRIPTION:

Masses description :	ASTM E617	**Date approved :**	14-03-2022
Precision class :	ASTM 1	**Next Calibration :**	14-03-2027
Density :	7.96g/cm³	**CCN accreditation # :**	668
Identification (if unique) :	DI000J378	**CLAS Certification # :**	2010-01

Test conditions :	Temp °C:	21.16	kPa Pressure:	100.64	Humidity:	47.97

NOTES:

For weight calibration, we use the procedure "Comparaison individuelle" PDL-09-MG-001 and the procedure "Détermination des incertitudes" PDL-09-MG-002. This certificate cannot be copied without written approval from Dispersion Laboratory. The results presented in these pages relate only to objects subjected to calibration.n

REMARKS:

March 2022

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CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-225**
Address :	695 B rue Gaudette	**CCN Accreditation # :**	668
	Saint-Jean-sur-Richelieu, QC	**CLAS Certification # :**	2010-01
	J3B7S7	**Precision class :**	ASTM 1
		Calibration date :	14-03-2022
Mass :	100 mg	**Follow-up date :**	14-03-2027

CALIBRATION RESULTS, CONVENTIONAL MASS:

Nominal Mass	Serial #	Inventory #	Conventional mass	Conventional mass after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
100mg	DI000J378	EM-335	99.9999 mg		0.010 mg	0.002 mg

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CALIBRATION CERTIFICATE

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www.dispersion.ca 1.866.390.5066

Client :	Polytests	**Certificate Number :**	**157-77C603-225**
Address :	695 B rue Gaudette	**CCN Accreditation # :**	668
	Saint-Jean-sur-Richelieu, QC	**CLAS Certification # :**	2010-01
	J3B7S7	**Precision class :**	ASTM 1
		Calibration date :	14-03-2022
Mass :	100 mg	**Follow-up date :**	14-03-2027

CALIBRATION RESULTS, CORRECTIONS:

Nominal Mass	Serial #	Inventory #	Conventional mass Corrections	Conventional mass Corrections after adjustment	Tolerance ± (mg)	Uncertainties ± (mg)
100mg	DI000J378		-0.0001 mg		0.010 mg	0.002 mg

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

BALANCES

The following balances are used for calibration purposes :

> 5 kg to 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg to 5 kg	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g to 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g to 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

We are also using these balances in our automated procedure :

> 200 g to 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g to 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg to 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Our balances are periodically verified, according to our PDL-11-MG-001 control procedure.

UNCERTAINTIES:

The following uncertainties exist :

1. *Uncertainty associated with the weighting process.*
2. *Uncertainty associated with air density.*
3. *Uncertainty associated with the measurement standard.*
4. *Uncertainty associated with the density of the mass being calibrated.*

The uncertainty of the weighing process includes long-term reproducibility.

Uncertainties specified in this report are expanded uncertainties representing a confidence level of approximately 95% obtained by multiplying the combined standard uncertainty by a coverage factor of k = 2. For more detailed information refer to the GUM (Guide to the Expression of Uncertainty in Measurement, 1995 Edition)

TRACEABILITY

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and their traceability to recognized national measurement standards and to the International System of Units (SI). This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither the CLAS nor the SCC guarantees the accuracy of individual calibration by accredited laboratories.

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ACCREDITATION ISO 17025 TM
SCC Scope Number 668

CALIBRATION CERTIFICATE

9900 Chemin de la Côte-de-Liesse, Montréal, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

USED REFERENCES

Item	Serial #	Manufacturer	Calibration date	Due date
300g Labo	96-0888-50-2	Denver Instrument Company	01-10-2020	31-03-2022
1kg-1mg Labo	MT-01	Mettler Toledo	01-10-2020	31-03-2022
2kg Labo	96-0888-50-3	Denver Instrument Company	01-10-2020	31-03-2022
1kg Labo	96-088850-1	Denver Instrument Company	01-10-2020	31-03-2022
5kg Labo	129099	Mettler Toledo	01-10-2020	31-03-2022
10kg Labo	DI000G991	Dispersion	23-03-2021	31-03-2022
20kg Labo	69976	Mettler Toledo	06-10-2021	31-10-2022
1 mg-10kg	4000028011	Troemner	15-10-2021	31-10-2022
2kg Labo	129098	Mettler Toledo	01-10-2020	31-03-2022

ENVIRONMENTAL CONDITIONS

Item	Serial #	Manufacturer	Calibration date	Due date
THE004	107080	Control Company	04-03-2021	31-03-2022

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA LLC
6141 Easton Road
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: PRIMARY STANDARD

Customer:	AIR LIQUIDE CANADA		
Part Number:	X04NI77P15A0003	Reference Number:	160-402375016-1
Cylinder Number:	EB0118140	Cylinder Volume:	153.0 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2016 PSIG
Analysis Date:	Mar 07, 2022	Valve Outlet:	350
Lot Number:	160-402375016-1		

Expiration Date: Mar 07, 2030

Primary Standard Gas Mixtures are traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

ANALYTICAL RESULTS

Component	Req Conc	Actual Concentration (Mole %)	Analytical Uncertainty
OXYGEN	2.000 %	2.005 %	+/- 0.02%
CARBON MONOXIDE	3.000 %	3.000 %	+/- 0.02%
CARBON DIOXIDE	18.00 %	18.00 %	+/- 0.02%
NITROGEN	Balance		

Notes:GROSS WEIGHT:29.581 KG
NET WEIGHT:5.442 KG
P/N A1336386
PO#89404761

EM-336

JUN 2022

Approved for Release

Air Liquide creative oxygen | Specialty Gases

Your complete laboratory solution



CERTIFICATE OF ANALYSIS

Avril 2025

EM: 338

Customer: SERVICES POLYTESTS INC., (S2232)
695B, GAUDETTE
ST-JEAN SUR RICHELIEU QC
J3B 7S7

Analysis Date:	3/4/2025 4:25:18PM	**Servitrax barcode No:**	T3TLT75
Product code:	A1334811	**Work order number:**	1999873
Grade:	PRIMARY	**Pressure:**	1450 psig
Size:	44		
CGA #:	590	**Volume:**	4.7 M3
		Expiry date:	03/04/2028

COMPONENTS	NOMINAL CONCENTRATION	ANALYSIS RESULTS
CARBON DIOXIDE	10.0000 % Molar	10.00 % Molar
CARBON MONOXIDE	1.0000 % Molar	1.001 % Molar
OXYGEN	10.0000 % Molar	10.00 % Molar
NITROGEN	BALANCE	BALANCE

Analysis performed by:

JASON NGO - LAB TECHNICIAN

Verified by:

This Air Liquide Canada mixture is traceable to NIST

METHOD OF ANALYSIS:

Method of analysis is based on principles of gas chromatography and as documented in Air Liquide Canada operating procedure , where applicable, FID, TCD, PDHID, FT-IR, FPD,NO/NOx and SO2 chemiluminescence , hygrometer, and electrochemical cells and paramagnetic cell. Detectors were used in conjunction with packed or capillary columns calibrated flow meters and dilution calibrated system.

ANALYTICAL ACCURACY:

Quality	Concentration	Blend Tolerance	AA
PRIMARY	5%-50%	+/-1%	+/-1%
	0.5%-5%	+/-2%	
	1ppm-0.5%	+/-5%	
CERTIFIED	5%-50%	+/-5%	+/-2%
	0.5%-5%	+/-10%	+/-2%
	1ppm-0.5%	+/-20%	+/-5%
UNANALYZE	5%-50%	+/-10%	
	<5%	+/-20%	

This mixture was certified by a combination of weight and analysis (depending on component) using scales certified against weights traceable to the Institute for National Measurement Standards (INMS) of the National Research Council of Canada (NRCC), CA3033-007-120224-ACC (Calgary) or calibration standards prepared in that manner.

How to contact us & order

E-mail within your region: specgas.atlantic@airliquide.com specgas.on@airliquide.com specgas.midwest@airliquide.com specgas.qc@airliquide.com specgas.ab@airliquide.com specgas.pacific@airliquide.com

Customer Solution Center: 1 800 217-2688 Online 24/7 through My.Airliquide.ca Air Liquide Mobile App

Instrumentation
Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS 2010-02

80 rue de la montagne
St-Joseph du lac
(Québec), J0N 1M0
Phone: (450) 473-6169
Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-340 2025-05-26

CLIENT	
Company:	Services Polytests Inc
Address:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9106
Required Accuracy:	1.0 inHg
Calibration Frequency:(days)	365

INSTRUMENT SPECIFICATION			
Instrument Type:	Pressure Gauge	Input Type:	Pression
Manufacturer:	Dwyer	Output Type:	Digitale
Model #:	DPG200	Measurement Type:	Pressure
Serial #:	S799031-0001	Range:	-29.93 to 0 inHg
Location:	N.A.	Version:	Machine: N.A.

CALIBRATORS SPECIFICATION			
Calibrator:	Crystal XP2i 300	Certification #:	2024009592
Serial #:	258139	Certification Date:	2024-11-22
Certified by:	Alpha Controls	Next Certification:	2025-11-22
Comments:			
Calibrator:	Fluke 744	Certification #:	2025003258
Serial #:	8180008	Certification Date:	2025-04-07
Certified by:	Alpha Controls	Next Certification:	2026-04-07
Comments:			

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Instrumentation Saint•Laurent inc.
Certified ISO/IEC 17025:2017

CLAS NRC·CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accredité CCN

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St-Joseph du lac
(Québec), J0N 1M0
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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-340 2025-05-26

CALIBRATION RESULTS

Entry Source	Given Value	Initial Value	Ini. Deviation Error	Final Value	Fin. Deviation Error	Accuracy	Uncertainty
Conformity	Comment						
Verification of the indicator							
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-7.42 "Hg	0.08 "Hg	-7.42 "Hg	0.08 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-14.96 "Hg	0.04 "Hg	-14.96 "Hg	0.04 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-22.47 "Hg	0.03 "Hg	-22.47 "Hg	0.03 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-28.00 "Hg	-28.00 "Hg	-27.97 "Hg	0.03 "Hg	-27.97 "Hg	0.03 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-22.50 "Hg	-22.50 "Hg	-22.47 "Hg	0.03 "Hg	-22.47 "Hg	0.03 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-15.00 "Hg	-15.00 "Hg	-14.96 "Hg	0.04 "Hg	-14.96 "Hg	0.04 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
-7.50 "Hg	-7.50 "Hg	-7.42 "Hg	0.08 "Hg	-7.42 "Hg	0.08 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1.0 "Hg	+\- 0.5 "Hg
Compliant							
Verification of the analogic output							
0.00 "Hg	20.00 mA	19.99 mA	-0.01 mA	19.99 mA	-0.01 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-7.50 "Hg	16.00 mA	15.99 mA	-0.01 mA	15.99 mA	-0.01 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-15.00 "Hg	12.00 mA	11.97 mA	-0.03 mA	11.97 mA	-0.03 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-22.50 "Hg	8.00 mA	7.94 mA	-0.06 mA	7.94 mA	-0.06 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-28.00 "Hg	5.00 mA	5.08 mA	+0.08 mA	5.08 mA	+0.08 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-22.50 "Hg	8.00 mA	7.94 mA	-0.06 mA	7.94 mA	-0.06 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-15.00 "Hg	12.00 mA	11.97 mA	-0.03 mA	11.97 mA	-0.03 mA	0.5 mA	+\- 0.0045 mA
Compliant							
-7.50 "Hg	16.00 mA	15.99 mA	-0.01 mA	15.99 mA	-0.01 mA	0.5 mA	+\- 0.0045 mA
Compliant							
0.00 "Hg	20.00 mA	19.99 mA	-0.01 mA	19.99 mA	-0.01 mA	0.5 mA	+\- 0.0045 mA
Compliant							

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Instrumentation Saint•Laurent inc.
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CLAS 2010-02

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Fax: (450) 473-5207
info@instrumentationsaintlaurent.com

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-340 2025-05-26

Environmental Conditions:	Temperature: 21 °C	Humidity: 35 %RH
The calibration was carried out at the client on-site using the method of comparison to the standard measurement.		
Comments:		

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2025-05-26
Next Calibration:	2026-05-26
Certificate Date:	2025-05-26

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO/IEC 17025:2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ The reported expanded measurement uncertainty is stated as the standard measurement uncertainty multiplied by the coverage factor =2 such that the coverage probability corresponds to approximately 95 %.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the accreditation body. Neither CLAS nor the accreditation body guarantee the accuracy of individual calibrations by accredited laboratories.

Benoit Larocque - Tech

Jun 2025

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APPENDIX 4: Unit pre burn

Temps acquisition de données	Flue temp °F	Room temp °F	scale lbs	Right °F	Back °F	Bottom °F	Top °F	Left °F

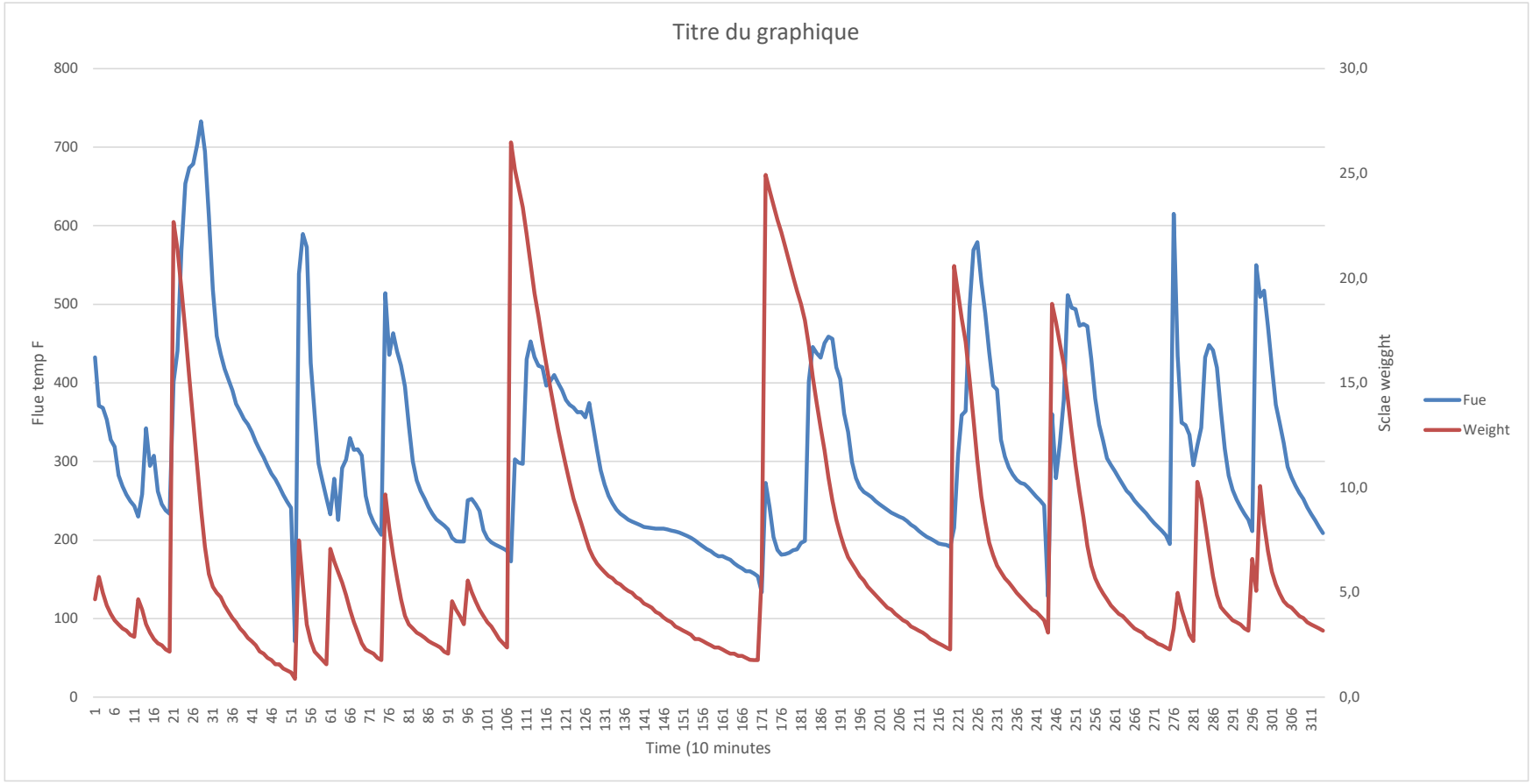
	Flue	Room	weight	right	back	bottom	top	left
0	433	69	4,7	386	404	379	516	425
10	371	70	5,7	416	413	373	462	423
20	368	70	5,0	423	415	370	431	414
30	353	70	4,4	413	415	365	418	415
40	328	69	4,0	401	410	359	386	413
50	319	69	3,7	391	404	354	378	411
60	282	69	3,5	383	396	352	338	402
70	268	69	3,3	371	385	350	315	389
80	258	69	3,2	362	374	349	300	377
90	249	68	3,0	353	364	348	289	366
100	243	69	2,9	345	355	347	280	358
110	230	69	4,7	334	348	346	267	346
120	258	67	4,2	322	337	344	265	332
130	342	68	3,5	325	333	344	349	333
140	294	69	3,1	340	338	345	332	339
150	307	69	2,8	342	339	347	342	340
160	262	68	2,6	340	338	350	305	340
170	245	69	2,5	335	333	352	282	336
180	238	68	2,3	328	327	355	270	327
190	233	68	2,2	323	322	359	262	321
200	401	69	22,7	322	312	349	280	311
210	441	69	21,4	301	296	338	350	298
220	568	68	19,5	298	282	336	540	302
230	654	68	17,5	310	284	339	650	326
240	674	69	15,3	337	299	343	711	356
250	679	69	13,2	366	334	360	720	387
260	702	69	11,1	398	374	379	755	422
270	733	69	9,0	433	413	400	812	462
280	695	70	7,2	469	455	423	790	500
290	612	70	5,9	495	496	450	687	525
300	519	69	5,3	513	525	483	576	532
310	459	69	5,0	510	516	480	485	523
320	437	68	4,8	494	492	474	442	504
330	418	69	4,4	481	473	475	416	486
340	404	69	4,1	469	459	480	399	471
350	390	68	3,8	458	449	485	386	458
360	373	68	3,6	446	441	489	367	444
370	364	69	3,3	438	431	486	354	431
380	354	69	3,1	430	422	481	345	418
390	347	68	2,8	424	414	482	335	407
400	338	68	2,7	418	407	483	327	398
410	325	69	2,5	412	400	482	314	389
420	315	68	2,2	401	391	484	304	379
430	305	68	2,1	389	383	485	294	368
440	294	68	1,9	377	374	484	284	358
450	284	68	1,8	365	364	475	274	348
460	277	68	1,6	353	354	464	266	337
470	268	68	1,6	340	345	453	258	327
480	258	67	1,4	329	337	443	249	317
490	249	68	1,3	319	327	431	240	308
500	241	68	1,2	307	317	422	232	297
510	71	68	0,9	72	72	73	71	72
520	539	63	7,5	100	89	75	272	97
530	589	68	5,4	163	123	88	571	150
540	572	69	3,5	249	169	106	659	238
550	425	69	2,7	322	226	134	532	301
560	360	68	2,2	356	269	162	447	333
570	297	68	2,0	362	290	198	367	341
580	275	69	1,8	357	297	238	325	338
590	253	68	1,6	352	300	264	301	330
600	233	68	7,1	345	300	287	278	321
610	278	68	6,5	335	291	286	312	306
620	226	69	6,0	326	288	297	276	295
630	291	69	5,5	314	274	292	285	282
640	302	69	4,9	315	268	293	283	277
650	330	69	4,2	330	279	302	345	285
660	315	68	3,6	350	302	307	350	302
670	316	69	3,1	360	321	308	361	316
680	308	69	2,6	362	333	302	354	329
690	256	68	2,3	356	340	304	319	334

700	234	68	2,2	341	335	309	283	324
710	223	68	2,1	326	330	312	262	311
720	214	68	1,9	313	326	317	250	302
730	207	69	1,8	303	322	319	240	293
740	514	68	9,7	302	323	296	404	288
750	436	69	8,1	319	337	290	523	321
760	463	69	6,8	340	353	289	530	352
770	440	69	5,7	372	370	288	532	380
780	422	69	4,7	402	392	292	512	400
790	395	69	3,9	423	407	292	477	408
800	345	69	3,5	433	421	301	433	409
810	300	69	3,3	422	418	317	371	399
820	276	68	3,1	404	407	331	333	386
830	262	69	3,0	388	396	342	311	372
840	253	69	2,8	375	386	354	296	363
850	242	69	2,7	364	379	353	285	354
860	234	69	2,6	351	371	352	274	344
870	226	68	2,5	340	362	348	265	336
880	222	68	2,4	330	354	346	257	328
890	218	68	2,2	321	348	346	252	321
900	214	69	2,1	315	342	345	247	316
910	203	69	4,6	305	335	341	238	306
920	198	68	4,2	294	324	334	229	294
930	198	69	3,9	285	314	329	226	283
940	198	68	3,5	279	308	326	225	277
950	251	69	5,6	278	333	317	270	287
960	252	69	5,0	283	348	312	285	301
970	245	69	4,6	284	344	312	279	304
980	237	68	4,2	279	335	311	272	306
990	212	68	3,9	274	330	312	256	305
1000	202	69	3,6	269	326	319	241	298
1010	197	68	3,4	265	323	320	233	290
1020	194	68	3,1	263	323	325	228	283
1030	192	66	2,8	261	322	329	223	278
1040	189	68	2,6	261	320	331	221	275
1050	186	69	2,4	259	316	329	216	271
1060	173	69	26,5	258	316	337	200	266
1070	302	67	25,2	258	302	314	323	265
1080	298	69	24,3	261	292	317	323	269
1090	297	69	23,4	265	283	311	325	276
1100	430	69	22,1	279	280	305	472	291
1110	453	69	20,7	308	291	305	530	324
1120	433	69	19,3	340	311	308	521	353
1130	422	69	18,2	368	329	314	500	366
1140	420	69	17,0	391	336	317	509	364
1150	396	69	15,9	417	346	328	479	364
1160	402	69	14,8	431	358	337	469	368
1170	410	69	13,8	442	372	344	483	378
1180	400	69	12,8	450	384	350	479	385
1190	391	69	11,9	453	394	358	468	390
1200	378	69	11,0	455	403	363	456	391
1210	372	69	10,3	453	409	368	446	393
1220	369	69	9,5	451	416	375	444	398
1230	362	69	8,9	446	420	377	436	401
1240	363	69	8,3	442	424	379	433	403
1250	356	69	7,7	438	426	385	425	403
1260	374	69	7,1	435	425	388	443	404
1270	345	69	6,7	434	427	396	434	413
1280	314	69	6,4	438	425	401	388	404
1290	289	69	6,2	436	422	404	356	391
1300	271	69	6,0	423	414	396	328	378
1310	256	69	5,8	407	403	385	310	367
1320	247	69	5,7	392	393	372	295	357
1330	239	68	5,5	378	384	365	283	348
1340	234	68	5,4	366	377	356	276	341
1350	230	68	5,2	356	371	351	270	336
1360	226	69	5,1	349	367	354	265	332
1370	223	69	5,0	342	362	353	261	328
1380	221	69	4,8	336	356	349	258	325
1390	219	68	4,7	331	352	343	256	322
1400	217	68	4,5	326	348	343	253	320
1410	216	69	4,4	322	344	345	250	319
1420	215	69	4,3	318	342	351	249	323
1430	214	69	4,1	315	340	354	248	325
1440	214	68	4,0	313	339	355	248	325

1450	214	68	3,8	310	338	354	248	324
1460	213	68	3,7	307	338	357	247	323
1470	212	69	3,6	304	337	359	245	322
1480	211	69	3,4	302	336	365	243	322
1490	209	69	3,3	299	335	365	241	322
1500	207	68	3,2	295	334	364	240	320
1510	205	68	3,1	292	332	360	238	317
1520	203	68	3,0	288	331	350	235	314
1530	200	68	2,8	284	329	347	231	310
1540	196	68	2,8	281	327	347	227	306
1550	192	68	2,7	276	324	342	223	301
1560	188	68	2,6	270	320	337	218	295
1570	186	68	2,5	264	317	332	214	287
1580	182	68	2,4	259	313	332	210	280
1590	179	68	2,4	255	310	332	206	275
1600	179	68	2,3	250	307	329	204	268
1610	177	68	2,2	248	303	323	202	262
1620	175	68	2,1	246	299	314	199	256
1630	170	68	2,1	243	295	310	196	249
1640	167	68	2,0	239	291	309	191	244
1650	164	68	2,0	234	285	303	187	237
1660	160	68	1,9	229	280	295	184	231
1670	160	68	1,8	224	277	289	182	226
1680	157	68	1,8	221	273	284	180	222
1690	154	68	1,8	217	269	281	177	217
1700	134	68	5,9	103	118	138	97	99
1710	273	68	24,9	125	124	128	289	121
1720	242	68	24,2	145	133	127	259	142
1730	204	68	23,5	162	140	129	241	153
1740	187	68	22,8	166	144	138	216	157
1750	181	68	22,2	167	146	149	204	159
1760	182	68	21,5	169	148	160	201	161
1770	184	68	20,8	171	151	171	203	165
1780	187	67	20,1	175	155	181	206	169
1790	188	67	19,4	180	161	189	208	174
1800	196	67	18,8	184	169	201	215	182
1810	199	67	18,0	189	175	217	221	191
1820	402	67	16,8	197	182	231	354	204
1830	445	67	15,3	235	204	237	524	258
1840	438	67	14,0	280	238	241	524	314
1850	432	67	12,9	324	264	243	536	337
1860	451	67	11,8	361	289	244	526	351
1870	459	68	10,5	387	322	247	553	381
1880	456	68	9,4	407	353	249	559	411
1890	420	68	8,5	421	379	255	525	430
1900	404	68	7,8	425	397	262	495	436
1910	361	67	7,2	427	407	270	452	435
1920	338	67	6,7	424	407	281	415	426
1930	299	67	6,4	417	399	295	370	411
1940	279	67	6,1	407	390	312	339	395
1950	267	67	5,8	396	383	330	318	382
1960	261	67	5,6	389	379	344	307	373
1970	258	67	5,3	384	377	357	301	367
1980	254	66	5,1	380	377	369	297	364
1990	249	66	4,9	376	378	379	292	360
2000	246	66	4,7	370	378	390	287	356
2010	242	66	4,5	365	380	398	282	352
2020	238	66	4,3	360	382	407	277	349
2030	235	66	4,2	356	383	412	274	346
2040	232	66	4,0	351	384	412	270	342
2050	230	66	3,8	348	384	411	268	338
2060	227	66	3,7	345	384	408	265	335
2070	224	66	3,6	340	383	407	262	332
2080	220	66	3,4	336	381	403	257	328
2090	216	65	3,3	331	376	398	252	324
2100	212	65	3,2	325	371	390	248	318
2110	208	65	3,1	319	365	383	243	312
2120	204	65	2,9	313	360	376	239	306
2130	202	65	2,8	307	354	372	235	301
2140	199	65	2,7	302	349	365	231	298
2150	196	65	2,6	296	344	359	227	293
2160	195	65	2,5	291	339	354	225	289
2170	194	65	2,4	287	335	347	224	286
2180	191	65	2,3	283	331	341	221	283
2190	216	65	20,6	283	329	332	208	278

2200	308	65	19,3	275	319	319	320	280
2210	359	65	18,1	266	308	311	398	283
2220	364	65	17,0	275	301	306	391	283
2230	495	65	15,2	289	308	300	565	303
2240	569	65	13,3	312	332	292	692	352
2250	579	65	11,3	340	362	285	746	402
2260	529	66	9,6	370	396	280	697	440
2270	488	66	8,4	394	426	280	624	463
2280	439	66	7,4	411	445	283	574	471
2290	396	66	6,8	420	451	289	502	466
2300	391	65	6,3	422	447	299	486	454
2310	327	65	6,0	421	441	313	418	443
2320	306	65	5,7	411	434	330	376	432
2330	292	65	5,5	410	427	350	353	421
2340	283	65	5,2	412	422	369	338	412
2350	277	65	5,0	411	418	387	328	404
2360	272	64	4,8	408	415	403	321	397
2370	271	64	4,6	408	414	416	318	392
2380	267	64	4,4	409	411	424	313	387
2390	261	64	4,2	409	408	429	308	381
2400	255	64	4,1	405	402	428	302	374
2410	250	64	3,9	398	395	425	296	366
2420	244	64	3,7	389	387	421	289	359
2430	128	61	3,1	66	66	66	71	65
2440	360	58	18,8	88	79	66	333	94
2450	279	63	17,9	122	102	71	319	127
2460	323	64	16,9	140	123	79	338	159
2470	378	64	15,9	159	146	89	365	197
2480	512	64	14,3	195	172	100	557	237
2490	496	65	12,6	247	207	113	594	281
2500	494	65	11,1	292	246	125	594	321
2510	473	64	9,8	325	283	140	570	354
2520	475	64	8,6	348	314	156	565	378
2530	472	65	7,2	376	345	177	577	402
2540	430	65	6,3	403	375	198	536	418
2550	380	64	5,7	425	397	224	471	426
2560	347	64	5,3	436	410	255	424	426
2570	326	64	5,0	440	417	291	395	424
2580	304	65	4,7	439	419	324	366	420
2590	296	65	4,4	434	418	350	349	414
2600	288	64	4,2	429	417	371	338	407
2610	279	64	4,0	421	415	386	328	400
2620	271	64	3,9	414	410	399	319	393
2630	263	65	3,7	405	403	402	309	385
2640	257	65	3,5	394	396	403	301	377
2650	250	64	3,3	385	388	404	293	370
2660	244	64	3,2	376	380	397	286	363
2670	239	64	3,1	368	371	393	279	355
2680	234	65	2,9	360	363	397	273	349
2690	227	64	2,8	351	355	388	266	342
2700	222	64	2,7	342	347	385	258	334
2710	217	63	2,5	332	339	382	251	326
2720	212	64	2,5	324	332	386	245	320
2730	206	64	2,4	315	325	378	239	312
2740	195	63	2,3	305	316	373	228	303
2750	615	67	3,3	104	91	67	555	102
2760	434	68	5,0	194	147	79	446	197
2770	349	67	4,2	267	193	101	415	250
2780	346	67	3,6	307	227	127	387	278
2790	334	67	3,0	324	253	150	382	298
2800	295	68	2,7	335	276	180	351	313
2810	320	67	10,3	330	283	201	337	312
2820	343	67	9,5	310	277	211	350	302
2830	433	68	8,3	315	274	213	453	306
2840	448	69	7,0	346	294	215	525	329
2850	441	69	5,8	385	323	219	533	362
2860	419	69	4,9	415	355	228	520	393
2870	365	66	4,3	425	380	238	460	411
2880	316	68	4,1	417	384	255	396	410
2890	282	69	3,9	401	377	271	344	396
2900	264	69	3,7	384	369	286	316	381
2910	252	69	3,6	369	362	302	298	367
2920	242	67	3,5	357	355	312	285	354
2930	233	68	3,3	347	348	317	274	342
2940	226	68	3,2	338	341	322	264	330

2950	211	68	6,6	329	335	324	252	320
2960	550	69	5,1	335	331	289	487	329
2970	509	69	10,1	377	362	285	484	369
2980	517	70	8,3	404	386	299	637	401
2990	472	70	7,0	434	406	294	596	424
3000	421	70	6,0	455	422	297	537	437
3010	372	69	5,4	461	434	308	465	436
3020	348	69	4,9	459	434	314	427	428
3030	324	69	4,6	455	429	325	399	420
3040	293	69	4,4	440	420	328	360	409
3050	280	66	4,3	422	408	336	335	398
3060	269	68	4,1	409	397	340	321	388
3070	260	69	3,9	396	387	340	310	381
3080	252	68	3,8	383	378	346	298	371
3090	241	68	3,6	372	369	347	287	361
3100	233	69	3,5	360	358	340	276	349
3110	225	69	3,4	348	346	334	266	337
3120	217	69	3,3	335	335	325	256	325
3130	209	69	3,2	323	324	322	246	315


Titre du graphique
Flue temp F
Sclae weigght
Time (10 minutes
Fue
Weight
800
700
600
500
400
300
200
100
0
30,0
25,0
20,0
15,0
10,0
5,0
0,0

Temps acquisition de données	Flue temp °F	Room temp °F	scale lbs	Right °F	Back °F	bottom °F	Top °F	Left °F
1	602,27	70,23	22,49	257,52	226,56	129,20	676,29	217,05
2	503,49	70,44	24,95	263,09	234,95	135,55	637,02	222,46
3	545,04	69,68	24,68	267,81	242,12	139,30	628,44	227,01
4	575,30	69,63	24,48	271,65	248,96	144,05	629,71	231,38
5	607,62	69,42	24,28	275,33	255,38	148,77	644,36	234,32
6	621,93	69,18	23,98	278,44	260,51	153,66	662,74	237,24
7	614,07	69,91	23,78	280,81	265,21	157,68	672,84	239,77
8	601,03	69,59	23,58	282,68	268,29	162,47	675,01	240,76
9	602,90	69,44	23,38	284,05	270,18	166,45	677,64	241,69
10	607,45	68,89	23,18	285,34	270,90	170,06	684,64	242,47
11	615,50	69,58	22,98	286,54	270,85	174,02	692,05	242,20
12	629,04	69,47	22,78	287,72	270,01	177,67	703,81	242,18
13	641,83	69,19	22,48	288,83	268,66	180,33	717,29	242,50
14	649,64	69,49	22,28	290,10	267,15	183,43	730,78	241,83
15	656,06	69,04	22,08	291,18	265,41	185,94	743,87	241,95
16	662,06	69,41	21,78	292,71	263,57	187,86	756,17	242,05
17	668,62	69,57	21,48	293,97	261,83	189,96	768,75	241,99
18	669,80	69,40	21,28	295,43	260,38	191,26	779,36	242,21
19	671,12	68,85	20,98	296,95	258,98	192,57	786,13	242,21
20	667,49	68,88	20,78	298,53	258,13	194,16	790,59	242,88
21	665,19	69,40	20,58	300,42	257,17	195,51	794,11	243,50
22	661,92	69,50	20,38	302,09	256,62	196,31	795,94	244,63
23	657,80	69,33	20,09	304,01	256,11	197,73	794,80	245,37
24	652,99	69,31	19,88	305,91	255,76	199,31	794,12	246,13
25	651,07	68,49	19,68	307,78	255,70	200,55	792,22	247,06
26	649,26	69,04	19,48	309,51	255,62	201,91	789,93	247,92
27	647,28	68,37	19,28	311,35	255,65	202,75	788,24	248,41
28	648,12	69,26	18,98	313,08	255,72	203,38	786,09	250,02
29	648,82	69,41	18,78	314,94	255,91	204,12	787,25	251,43
30	651,39	70,33	18,58	316,87	256,11	205,04	786,66	252,47
31	654,02	71,15	18,38	318,57	256,38	205,33	788,97	253,15
32	659,09	71,64	18,15	320,92	256,90	206,39	792,03	254,47
33	660,51	71,81	17,97	322,69	257,39	207,38	795,34	255,22
34	664,72	70,75	17,68	324,65	258,05	208,85	797,12	255,55
35	673,49	68,98	17,48	326,46	258,48	210,05	803,29	255,86
36	681,10	69,46	17,18	328,26	259,20	211,94	808,19	256,50
37	686,69	68,52	16,98	330,02	259,85	213,67	815,25	257,31
38	691,76	69,11	16,68	332,22	260,76	214,88	821,14	258,44
39	697,77	69,86	16,48	334,00	261,65	216,87	828,01	260,46
40	699,71	71,00	16,23	336,30	262,76	218,79	833,65	261,98
41	697,54	72,25	15,98	338,47	263,94	219,26	837,43	263,38
42	695,50	72,85	15,78	340,62	265,15	220,16	839,90	265,56
43	694,60	73,71	15,48	343,04	266,64	221,55	840,51	267,36
44	693,58	73,98	15,28	345,80	268,03	222,77	841,81	269,77
45	693,88	74,14	15,08	348,09	269,69	224,81	843,61	271,48
46	694,17	74,22	14,78	350,51	271,40	227,19	845,16	272,82
47	696,89	74,54	14,58	352,88	273,05	229,07	847,48	274,94
48	697,76	74,30	14,28	355,11	274,97	231,54	850,28	276,66
49	696,86	74,48	14,08	357,31	276,84	232,81	850,94	278,50
50	694,89	74,68	13,88	359,63	278,98	235,16	852,84	280,15
51	692,31	74,67	13,68	362,11	281,23	237,86	851,26	282,13
52	688,31	74,70	13,38	364,42	283,63	240,73	849,47	284,33
53	686,68	74,64	13,18	366,50	286,03	243,03	848,00	285,77
54	684,89	75,23	12,98	368,76	288,53	245,88	846,32	287,67
55	683,09	75,20	12,78	371,08	291,10	248,54	844,37	288,99
56	682,00	75,90	12,53	373,65	293,88	251,27	842,15	291,62
57	681,35	76,51	12,38	375,63	296,69	252,69	841,88	293,08
58	684,01	75,78	12,08	377,95	299,73	255,81	842,59	295,24
59	685,77	75,53	11,88	379,95	302,69	258,01	844,12	296,78
60	684,98	75,54	11,68	381,99	305,71	261,27	845,91	298,31
61	684,68	75,13	11,48	383,69	308,84	265,09	845,57	300,01
62	685,21	75,05	11,28	385,67	311,97	268,03	845,19	301,64
63	685,69	75,59	11,08	387,64	315,56	270,84	845,96	303,11
64	676,96	75,58	10,88	389,70	318,64	275,26	846,36	304,57
65	660,52	75,98	10,68	391,43	321,68	277,43	836,86	306,43
66	649,03	75,21	10,53	392,86	324,79	281,85	824,82	307,44
67	640,63	76,30	10,38	394,76	327,86	282,77	813,43	310,02
68	634,62	75,26	10,18	395,96	331,02	284,28	803,10	311,25
69	626,84	75,80	9,98	397,58	334,15	289,44	791,22	312,54
70	616,30	75,73	9,83	398,75	337,28	293,23	777,89	313,91
71	607,72	75,82	9,68	399,78	340,24	297,02	765,26	315,44
72	601,13	75,30	9,48	400,80	343,32	298,76	752,33	316,93
73	594,50	75,28	9,38	401,59	346,24	302,36	740,23	317,66
74	589,30	75,44	9,28	402,91	349,05	304,64	728,89	318,80
75	582,96	75,77	9,08	404,21	351,99	305,24	717,15	320,79
76	578,36	75,68	8,98	404,31	354,85	310,26	706,87	321,31
77	572,45	75,75	8,88	404,53	357,42	314,78	697,48	321,97
78	569,09	75,56	8,68	404,72	360,10	316,07	689,33	322,87
79	568,24	75,51	8,58	405,06	362,48	320,50	683,30	323,98
80	566,17	75,88	8,48	404,99	365,17	321,70	678,05	324,49
81	563,03	75,55	8,28	405,13	367,45	324,66	671,96	325,34
82	560,97	75,65	8,18	404,75	370,09	328,53	666,63	325,38

Setting mmaximum output

For All Usable Firebox Volumes - High Fire Test Only

Nominal Requ	10	lb/ft3				
Usable Firebo	2,28	ft3				
Total Nom. Lo	22,80	lb				
Total Load W	21,70	to	23,90	lb		
Core Target V	10,30	to	14,80	lb		
Remainder Lo	8,00	to	12,50	lb		
					Mid-Point	
Core Load Pc	3,40	to	5,70	lb	4,55	
Remainder Lo	2,30	to	12,50	lb	7,40	
	Pc. #					
Core Load Pie	1	3,42	lb	In Range		
	2	4,24	lb	In Range		
	3	4,46	lb	In Range		
Core Load Total. Wt. Actual		12,12	lb	In Range		
	Pc. #					
Remainder Lo	1	2,74	lb	In Range		
(1 to 3 Pcs.)	2	2,75	lb	In Range		
	3	4,95	lb	In Range		
Remainder Load Tot. Wt. Act		10,44	lb	In Range		
Total Load Wt. Actual		22,56	lb	In Range		
Core % of Total Wt.		54%		In Range	45-65%	
Remainder % of Total Wt.		46%		In Range	35-55%	
Actual Load % of Nominal Target		99%		In Range	95-105%	
Actual Fuel Load Density		9,9	lb/ft3			
Kindling and Start-up Fuel						
Maximim Kindling Wt. (20% of Tot. Load Wt.)		4,51	lb			
Actual Kindling Wt.		4,40	lb	In Range	19,5%	
Maximum Start-up Fuel Wt. (30% of Tot. Load Wt.)		6,77	lb			
Actual Start-up Fuel Wt.		6,60	lb	In Range	29,3%	
Allowable Res	2,3	to	4,5	lb	Mid-Point	
Actual Residual Start-up Fuel Wt.		2,9	lb	In Range	3,4	
Total Wt. All Fuel Added (wet basis)		33,56	lb			
High Fire Test	Low		High		Mid-Point	
Based on Fue	2,0	to	2,5	lb	2,3	
Actual Fuel Load Ending Wt.		2,1	lb	In Range		

Load pieces Length in. 15 in.

Fuel Piece Moisture Reading (%-dry basis)			
1	2	3	Ave.
	19		19,0
	19		19,0
	19		19,0
	19		19,0
20	19	20	19,7
20	20	20	20,0
Total Load Ave. MC (%-dry basis)			19,3
Total Load Ave. MC % (wet basis)			16,2
Total Test Load Weight (dry basis)			
Kindling Moisture (%-dry basis)			
9	9	9	9,0
Start-up Fuel Moisture Readings (%-dry basis)			
20	20	20	20,0
Total Wt. All Fuel Added (dry basis)			
Total Wt. All Fuel Burned (dry basis)			
Total Wt. All Fuel Burned (wet basis)			

83	559,63	75,67	8,08	405,17	372,53	328,95	662,48	326,63
84	559,20	75,55	7,88	405,24	375,10	331,65	659,84	326,47
85	558,50	75,20	7,78	405,84	377,37	333,15	657,00	328,43
86	552,21	75,16	7,67	406,14	379,90	331,97	652,65	328,66
87	545,59	75,60	7,58	406,20	382,12	338,07	647,02	328,33
88	534,85	75,74	7,48	405,94	384,43	339,36	639,96	329,36
89	528,68	75,15	7,38	405,74	386,60	344,56	632,50	329,92
90	524,16	75,62	7,24	405,47	388,84	346,05	625,03	331,17
91	521,04	75,71	7,08	405,05	391,13	351,53	618,87	330,80
92	521,77	75,66	7,07	404,11	393,34	354,93	612,26	331,93
93	520,75	75,57	6,97	402,99	395,17	354,13	605,58	332,35
94	520,26	75,34	6,88	401,97	397,16	358,18	601,99	332,16
95	521,25	75,32	6,78	400,62	398,59	361,28	599,88	332,53
96	516,24	75,52	6,68	399,34	400,18	360,10	595,27	333,19
97	511,74	75,22	6,58	397,78	401,25	366,68	591,47	333,51
98	506,81	75,36	6,48	396,19	402,64	369,70	586,73	333,22
99	498,76	75,04	6,37	395,83	403,94	371,76	580,44	334,05
100	493,10	74,90	6,27	394,52	405,34	373,28	574,59	334,03
101	487,29	74,94	6,18	393,32	406,79	374,26	568,87	334,60
102	485,59	74,82	6,18	391,99	408,38	377,18	562,54	334,47
103	482,21	74,58	6,08	391,11	409,56	378,78	557,30	335,40
104	479,56	74,57	5,98	389,56	411,27	381,71	553,08	334,17
105	476,53	74,56	5,98	388,34	412,91	384,04	548,55	334,98
106	472,76	74,39	5,88	386,44	414,70	384,64	544,54	334,77
107	471,74	74,74	5,87	384,70	416,28	387,70	539,96	334,01
108	469,18	74,30	5,77	382,89	417,91	389,07	536,31	334,33
109	467,68	74,29	5,67	380,75	419,14	389,14	532,90	333,95
110	465,93	74,49	5,61	379,01	420,31	392,89	529,48	333,50
111	464,96	74,69	5,57	377,24	421,19	391,42	526,44	333,63
112	465,04	74,46	5,48	375,32	421,63	393,87	523,96	333,31
113	463,20	74,39	5,48	373,40	422,06	394,37	522,15	332,39
114	459,98	74,32	5,38	371,43	421,98	395,78	520,23	331,76
115	455,39	74,32	5,29	369,63	421,91	396,53	516,69	332,43
116	452,50	74,26	5,28	367,48	422,06	400,99	513,50	331,23
117	446,51	74,49	5,17	365,98	421,89	400,17	509,49	331,14
118	443,49	74,33	5,17	364,07	421,52	403,11	505,40	331,03
119	442,45	74,74	5,07	362,02	421,36	406,09	502,20	330,13
120	443,33	74,36	4,97	360,20	420,79	407,88	500,16	329,34
121	443,71	74,34	4,97	358,56	420,23	406,64	497,47	328,66
122	441,99	74,28	4,97	356,65	420,07	411,35	494,93	328,13
123	442,25	74,03	4,87	355,04	419,72	413,93	492,66	327,35
124	440,70	74,34	4,87	353,25	419,28	416,03	489,52	326,72
125	438,77	74,57	4,78	351,78	418,83	418,57	486,85	326,43
126	437,00	74,59	4,78	350,10	418,39	419,15	484,56	326,09
127	436,11	75,11	4,68	348,77	417,79	420,98	481,98	325,75
128	432,59	75,11	4,68	347,30	417,63	424,85	479,18	325,37
129	431,29	74,63	4,57	345,74	417,31	429,25	476,00	324,05
130	427,71	74,68	4,57	344,44	417,16	431,30	472,85	323,87
131	425,65	74,77	4,51	343,12	416,92	433,17	470,05	323,74
132	421,74	74,61	4,47	341,78	416,82	437,34	466,25	322,72
133	411,19	74,83	4,47	340,49	416,59	443,80	460,85	322,97
134	404,51	74,57	4,38	339,48	416,37	446,42	456,04	322,57
135	399,88	74,63	4,37	338,16	416,19	451,05	448,97	321,97
136	394,28	74,62	4,28	336,88	416,34	453,28	443,35	321,36
137	389,72	74,35	4,27	335,79	416,48	453,86	437,15	321,39
138	383,39	74,42	4,27	334,39	416,80	458,23	431,48	320,87
139	374,17	74,02	4,27	333,15	416,99	460,02	425,52	320,52
140	366,27	74,03	4,17	331,80	417,10	460,86	418,71	320,13
141	359,02	74,07	4,17	330,34	417,32	464,04	411,53	319,22
142	354,41	74,00	4,17	328,98	417,23	466,28	404,02	318,60
143	349,10	73,73	4,17	327,21	417,06	466,15	397,12	317,36
144	344,58	73,80	4,08	325,96	416,47	464,65	390,46	316,21
145	339,47	74,05	4,08	324,03	416,05	469,00	384,45	314,70
146	335,18	73,81	4,08	322,61	415,42	468,93	377,26	312,82
147	331,66	73,92	4,08	320,84	414,55	466,75	372,37	310,82
148	328,19	73,79	3,97	319,13	413,47	471,28	366,41	309,05
149	325,74	73,45	3,97	339,42	411,80	475,23	361,32	336,49
150	322,97	73,43	3,97	348,39	410,54	470,51	356,28	346,44
151	259,77	73,88	28,60	357,48	415,63	478,76	342,17	355,29
152	243,05	73,76	28,33	364,29	418,26	483,31	326,12	362,29
153	268,19	73,72	28,21	369,29	417,72	483,42	319,08	367,12
154	280,07	73,72	28,19	373,02	416,38	481,36	314,57	369,84
155	313,05	73,54	27,98	375,57	413,99	483,73	318,51	372,23
156	405,45	73,55	27,78	376,70	411,17	484,62	340,70	372,79
157	548,85	73,76	27,49	376,84	407,07	477,97	404,53	372,45
158	610,19	74,17	27,18	376,24	402,91	464,78	487,79	371,41
159	615,57	74,09	26,98	374,89	398,33	457,87	536,77	369,79
160	484,65	74,12	26,93	373,72	394,98	468,76	532,80	368,43
161	598,96	73,63	26,38	372,95	389,79	465,75	565,99	367,04
162	684,04	74,08	25,99	371,61	384,98	462,88	633,22	364,90
163	705,74	74,41	25,68	370,25	380,36	462,83	685,68	363,59
164	728,67	75,06	25,38	368,58	375,96	459,40	731,59	362,11
165	739,86	74,88	24,99	366,98	371,47	451,92	769,95	361,02
166	750,87	74,73	24,68	365,74	367,59	448,49	802,27	360,02
167	639,29	75,15	24,38	364,56	364,53	457,91	812,36	359,85
168	567,43	75,17	24,24	363,15	361,66	458,35	788,41	359,64
169	528,61	74,95	23,98	361,76	359,48	458,21	756,97	359,41
170	507,84	74,80	23,88	360,88	357,14	458,11	729,95	359,85

minimum output setting

For Usable Firebox Volumes up to 3.0 ft3 - Low and Medium Fire

Nominal Requ	12	lb/ft3				
Usable Firebo	2,28	ft3				
Total Nom. Lo	27,36	lb				
Total Load Wt	25,99	to	28,73	lb		
Core Target W	12,312	to	17,78	lb		
Remainder Lo	9,58	to	15,05	lb		
					Mid-Point	
Core Load Fu	4,10	to	6,84	lb	5,47	
Remainder Lo	2,74	to	8,21	lb	5,47	
	Pc. #					
Core Load Pie	1	5,34	lb	In Range		
	2	4,77	lb	In Range		
	3	4,84	lb	In Range		
Core Load Total. Wt. Actual		14,95	lb	In Range		
	Pc. #					
Remainder Lo	1	3,24	lb	In Range		
(2 or 3 Pcs.)	2	4,18	lb	In Range		

Fuel Piece Moisture Reading (%-dry basis)			
1	2	3	Ave.
	19	24	21,5
	18	29	23,5
	19	18	18,5
	22	19	20,5
	18	21	19,5

171	500,90	74,67	23,68	359,48	355,26	457,16	708,56	359,77
172	490,06	74,70	23,48	358,41	353,48	456,37	693,34	360,25
173	479,67	74,59	23,38	357,42	351,61	453,12	676,67	360,49
174	464,36	74,43	23,18	356,39	349,66	452,34	658,30	360,46
175	450,94	74,41	23,08	355,48	347,83	450,80	640,48	360,20
176	440,51	74,41	22,98	354,87	346,36	448,02	625,43	360,27
177	431,65	74,49	22,86	354,35	344,79	447,12	609,14	359,90
178	419,52	74,60	22,68	353,19	343,01	445,15	593,26	359,37
179	412,20	74,43	22,58	351,91	341,85	443,84	579,05	358,75
180	405,43	74,24	22,38	351,32	340,22	443,05	565,84	357,75
181	397,72	74,16	22,28	350,40	338,70	441,16	553,89	356,93
182	395,01	74,21	22,18	349,43	337,39	436,90	544,02	355,63
183	391,78	74,91	21,98	348,62	336,01	435,38	535,18	354,56
184	389,82	74,36	21,88	347,69	334,42	433,95	527,38	353,17
185	393,10	74,55	21,78	346,64	333,02	425,30	522,57	351,88
186	400,67	74,26	21,58	345,58	331,51	426,00	522,87	350,65
187	409,24	74,51	21,48	344,39	330,09	421,54	524,98	349,00
188	418,34	73,95	21,38	343,76	328,79	421,54	530,88	347,52
189	429,10	74,55	21,18	342,74	327,47	413,67	536,49	346,44
190	441,26	74,08	21,08	341,72	326,19	416,24	548,00	345,01
191	454,50	74,15	20,88	340,94	325,08	410,00	561,12	343,56
192	467,67	74,53	20,68	340,12	323,98	411,25	578,06	342,51
193	479,26	74,22	20,48	340,02	323,03	405,85	595,00	342,06
194	486,99	74,71	20,28	339,16	322,16	406,00	611,69	341,31
195	494,07	74,79	20,18	338,54	321,41	405,77	627,74	341,61
196	500,49	74,86	19,98	338,38	320,87	403,49	642,61	341,73
197	501,94	74,81	19,78	337,94	320,38	399,13	651,77	342,12
198	505,50	74,84	19,58	337,73	319,97	397,21	662,82	342,48
199	507,12	74,87	19,38	337,57	319,59	396,68	670,20	343,27
200	508,35	74,06	19,18	337,48	319,46	394,62	676,35	343,96
201	512,22	74,96	19,08	337,54	319,32	389,47	683,97	344,87
202	512,61	74,34	18,88	338,15	319,36	390,31	689,12	345,96
203	514,87	75,07	18,68	338,23	319,41	390,20	696,20	346,40
204	522,88	74,95	18,48	338,87	319,47	385,03	707,71	347,69
205	524,54	75,20	18,28	339,50	319,75	382,30	712,57	348,57
206	528,30	75,60	18,08	339,97	319,99	384,06	721,38	349,75
207	533,91	75,19	17,88	340,50	320,30	381,27	730,97	351,04
208	539,95	75,65	17,68	341,52	320,64	378,57	740,06	352,44
209	545,84	75,25	17,48	341,89	321,11	376,97	750,43	353,49
210	551,10	75,51	17,28	342,64	321,54	376,26	762,07	355,17
211	555,60	75,39	17,08	343,53	321,91	372,26	772,12	356,24
212	557,79	75,60	16,88	344,33	322,49	371,98	779,91	357,31
213	557,70	75,93	16,78	345,01	323,09	368,96	785,32	358,67
214	557,05	75,80	16,48	345,76	323,71	368,52	786,93	359,73
215	556,64	76,05	16,28	346,70	324,38	366,10	790,24	361,26
216	554,95	76,04	16,18	347,48	325,24	368,70	789,17	362,87
217	550,29	75,93	15,98	348,56	326,07	367,80	786,55	364,41
218	546,71	75,57	15,78	349,44	326,84	363,89	782,40	365,85
219	542,77	75,54	15,58	350,42	327,82	364,07	779,01	367,23
220	539,48	75,73	15,38	351,23	328,71	364,04	773,98	369,07
221	537,56	76,21	15,27	352,25	329,70	363,76	770,64	370,62
222	536,00	76,09	15,08	353,32	330,68	360,02	767,72	372,48
223	534,33	76,09	14,88	354,34	331,78	358,99	765,87	373,99
224	532,50	76,22	14,68	355,34	332,74	359,27	761,96	375,99
225	531,73	76,03	14,48	356,28	334,00	356,56	759,23	377,73
226	528,09	76,21	14,38	357,13	334,93	355,30	756,53	379,17
227	524,10	76,22	14,18	358,03	336,06	353,93	752,53	380,62
228	519,59	75,99	14,08	358,90	337,33	355,17	746,76	382,08
229	512,87	76,29	13,88	359,69	338,50	353,02	739,79	383,73
230	510,23	76,21	13,71	360,37	339,53	350,00	733,35	385,26
231	508,66	75,83	13,58	361,42	340,80	349,57	727,29	386,58
232	505,85	75,75	13,48	362,14	342,02	347,85	723,12	387,92
233	503,43	76,08	13,28	363,01	343,24	347,70	718,40	389,22
234	501,12	75,82	13,08	363,58	344,36	343,61	711,84	390,87
235	495,91	75,64	12,98	364,51	345,40	347,56	707,20	391,94
236	494,42	76,04	12,88	365,21	346,54	348,81	703,77	393,62
237	499,84	75,81	12,68	366,07	347,80	346,23	705,50	394,57
238	495,77	75,91	12,55	366,54	348,97	343,00	704,79	395,67
239	491,61	75,60	12,38	366,89	350,02	346,09	703,40	396,57
240	486,26	75,58	12,28	367,64	351,15	342,90	697,10	397,71
241	480,73	75,73	12,18	368,16	352,15	341,72	690,99	398,21
242	475,04	75,89	11,98	368,39	353,12	341,91	683,24	399,19
243	470,14	75,89	11,88	368,96	354,04	337,24	675,95	399,98
244	464,14	75,46	11,78	369,28	354,99	340,06	668,21	400,90
245	459,12	75,31	11,68	369,61	355,88	334,53	657,95	401,76
246	455,48	75,07	11,58	369,78	356,66	337,87	648,93	402,25
247	452,43	75,10	11,48	369,66	357,54	335,40	641,19	402,74
248	449,21	75,02	11,38	369,81	358,34	337,05	634,28	403,41
249	446,54	75,67	11,28	369,99	359,01	334,78	629,22	403,86
250	443,81	75,80	11,18	370,06	359,78	334,76	622,08	404,11
251	439,40	75,67	10,98	370,03	360,58	335,40	616,53	404,59
252	433,52	75,71	10,90	370,34	361,30	335,00	608,59	404,87
253	430,33	75,53	10,88	370,55	362,07	334,70	600,95	405,09
254	427,50	75,44	10,69	370,74	362,71	333,88	594,40	405,06
255	425,70	75,22	10,68	370,62	363,63	332,74	587,69	405,24
256	422,85	75,82	10,58	370,58	364,27	335,90	583,28	405,02
257	421,31	75,32	10,48	370,65	364,95	334,00	577,64	405,08

	3	6,27	lb	In Range	
Remainder Load Piece Weight Ratio - Small/Large		52%		In Range	≤ 67%
Remainder Load Tot. Wt. Act		13,69	lb	In Range	
Total Load Wt. Actual		28,64	lb	In Range	
Core % of Total Wt.		52%		In Range	45-65%
Remainder % of Total Wt.		48%		In Range	35-55%
Actual Load % of Nominal Target		105%		In Range	95-105%
Actual Fuel Load Density		12,6	lb/ft3		
Allowable Cha	2,9	to	5,7		Mid-Point
Actual Charcoal Bed Wt.		5,0	lb	In Range	4,3
Actual Fuel Load Ending Wt.			lb	Valid Test	≥ 90%
Total Wt. of Fuel Burned During Test Run lb.		28,6	lb		
Load pieces Length in.		15	in.		

20	21	20	20,3
Total Load Ave. MC % (dry basis)			20,6
Total Load Ave. MC % (wet basis)			17,1
Total Test Load Weight (dry basis)			
Total Fuel Weight Burned During Test Run (dry basis)			

258	419,61	75,44	10,38	370,83	365,51	335,92	574,68	404,84
259	418,90	75,53	10,28	370,89	366,26	338,34	570,93	404,97
260	417,75	75,63	10,18	370,99	366,87	337,16	568,42	404,61
261	418,03	75,28	10,08	371,22	367,39	337,65	566,51	404,44
262	417,17	74,92	9,98	371,41	368,08	338,46	565,00	404,31
263	416,38	75,40	9,88	371,42	368,65	335,66	563,09	404,24
264	414,52	75,63	9,77	371,41	369,32	332,97	561,09	404,27
265	415,32	75,57	9,68	371,83	369,81	335,76	560,81	404,33
266	415,51	75,79	9,58	371,97	370,38	335,51	559,60	404,24
267	417,15	75,81	9,48	371,87	371,02	338,38	560,28	404,15
268	418,68	75,49	9,38	372,14	371,72	336,28	561,18	404,18
269	418,60	75,87	9,28	372,44	372,48	339,10	562,01	404,23
270	419,34	75,06	9,17	372,36	373,14	338,40	562,77	403,98
271	420,09	75,19	9,07	372,73	373,77	335,76	565,22	404,02
272	420,94	75,35	8,98	372,68	374,38	334,27	566,71	403,27
273	422,34	75,16	8,88	372,35	375,14	335,36	567,76	402,59
274	424,26	75,02	8,78	372,41	375,76	336,30	570,63	402,64
275	424,19	75,50	8,68	372,00	376,53	335,75	573,22	402,36
276	425,41	74,58	8,58	372,27	377,37	338,01	575,20	402,24
277	427,24	75,15	8,47	372,10	378,13	334,93	577,65	402,35
278	429,37	75,44	8,37	372,15	378,74	338,06	580,65	402,30
279	429,66	75,68	8,28	372,31	379,61	337,53	582,20	402,26
280	429,52	75,45	8,18	372,61	380,38	336,23	584,14	402,16
281	428,20	75,53	8,08	372,83	381,21	337,08	584,96	402,21
282	425,87	75,75	7,98	373,22	382,10	337,60	584,05	402,40
283	422,88	75,58	7,87	373,48	383,04	337,83	581,59	402,63
284	419,87	75,39	7,77	373,75	384,17	335,52	579,32	403,10
285	415,77	75,72	7,74	374,65	385,14	334,93	575,22	403,96
286	411,78	75,53	7,58	375,34	386,30	334,63	570,81	404,44
287	408,56	75,55	7,58	376,15	387,06	338,38	567,31	404,73
288	406,73	75,57	7,48	376,92	388,22	337,54	562,89	405,22
289	402,73	75,54	7,38	377,22	389,27	337,91	557,81	405,45
290	399,25	75,59	7,28	377,70	390,35	335,13	552,73	405,72
291	395,23	75,63	7,17	377,81	391,32	335,69	548,63	405,87
292	391,37	75,61	7,17	378,28	392,28	335,43	543,53	406,01
293	386,49	75,43	7,07	378,60	393,53	338,64	538,14	406,01
294	383,77	75,52	7,07	379,11	394,45	339,07	534,27	405,98
295	381,18	75,41	6,97	379,63	395,66	337,65	529,96	405,97
296	379,31	75,44	6,88	380,01	396,53	337,80	526,61	405,67
297	377,74	75,40	6,88	380,39	397,61	338,75	523,02	405,63
298	377,55	75,44	6,78	380,69	398,59	338,12	520,02	405,13
299	376,67	75,41	6,68	381,16	399,62	338,65	517,56	405,01
300	375,99	75,53	6,68	381,41	400,55	339,59	515,12	404,71
301	375,32	75,35	6,58	381,77	401,41	341,65	513,03	404,56
302	375,11	75,32	6,57	382,20	402,49	341,24	511,35	404,12
303	374,31	75,33	6,47	382,69	403,34	341,58	510,29	403,97
304	373,88	75,35	6,37	383,01	404,11	341,64	509,99	403,86
305	372,95	75,44	6,37	383,59	405,01	341,80	508,79	403,61
306	368,69	75,37	6,27	383,97	405,75	341,31	507,27	403,58
307	363,45	75,27	6,18	384,30	406,26	341,81	503,63	403,34
308	363,58	75,20	6,18	384,62	406,83	342,09	501,87	403,02
309	362,22	75,22	6,08	385,08	407,40	342,59	499,32	402,90
310	359,12	75,34	6,08	385,32	407,84	343,03	495,91	402,48
311	354,14	75,24	6,05	385,57	408,40	340,68	491,52	401,97
312	345,72	75,11	5,98	385,64	408,52	343,53	485,56	401,63
313	336,28	75,07	5,98	386,11	408,91	344,49	477,74	400,77
314	329,48	75,08	5,97	386,24	408,86	346,14	468,32	400,01
315	322,54	75,27	5,87	386,40	409,20	346,14	459,30	399,07
316	316,41	75,07	5,87	386,66	409,26	346,04	450,43	398,31
317	310,31	75,05	5,87	386,57	409,31	346,95	441,97	397,14
318	306,06	75,07	5,87	387,06	409,34	347,72	434,34	396,03
319	301,57	75,11	5,77	386,58	409,40	348,13	426,80	394,86
320	297,94	74,90	5,77	386,45	409,43	348,56	419,78	393,74
321	295,01	74,97	5,77	386,21	409,40	348,58	413,08	392,37
322	291,27	74,91	5,77	385,98	409,39	347,87	407,13	391,24
323	288,35	75,00	5,67	385,40	409,43	349,74	401,39	390,00
324	285,64	74,76	5,67	384,72	409,42	349,51	396,28	388,59
325	283,60	74,75	5,67	383,97	409,41	352,04	391,44	387,23
326	281,78	74,74	5,67	383,29	409,44	352,26	386,47	386,01
327	278,45	74,72	5,67	382,60	409,50	353,34	382,13	384,82
328	276,60	74,71	5,57	381,91	409,53	354,41	377,97	383,34
329	275,09	74,78	5,57	381,19	409,57	353,34	373,74	382,02
330	273,62	74,65	5,57	380,34	409,69	353,57	370,15	380,78
331	271,21	74,76	5,49	379,44	409,83	355,10	366,94	379,52
332	269,41	74,50	5,48	378,56	409,96	355,46	363,78	378,26
333	268,39	74,59	5,48	377,62	409,96	357,98	361,17	377,07
334	267,43	74,61	5,48	376,74	410,12	358,05	358,00	375,82
335	265,50	74,41	5,48	375,65	410,33	358,18	355,69	374,56
336	263,79	74,57	5,48	374,59	410,35	358,57	353,31	373,43
337	263,06	74,72	5,38	373,76	410,49	360,00	350,67	372,19
338	261,74	74,61	5,38	373,15	410,46	360,94	348,24	371,18
339	260,48	74,55	5,38	372,27	410,46	362,23	345,95	369,89
340	259,09	74,46	5,38	371,12	410,50	363,26	343,96	368,87
341	258,08	74,51	5,38	370,46	410,59	364,27	342,02	367,74
342	257,47	74,57	5,27	369,48	410,47	365,56	340,19	366,67
343	258,78	74,43	5,27	368,66	410,49	365,70	339,67	365,83
344	258,40	74,31	5,27	367,93	410,48	366,68	338,85	365,00
345	256,61	74,46	5,27	367,41	410,41	366,51	337,68	363,89
346	254,20	74,23	5,17	366,66	410,34	368,10	336,61	363,08

347	252,61	74,46	5,17	366,05	410,31	367,75	335,38	362,38
348	251,55	74,26	5,17	365,59	410,15	368,86	334,12	361,69
349	250,58	74,25	5,17	365,09	410,08	369,06	332,48	360,85
350	249,19	74,37	5,10	364,63	409,76	369,68	331,20	360,23
351	248,37	74,20	5,07	364,05	409,68	370,61	329,68	359,36
352	247,74	74,11	5,07	363,51	409,37	371,01	328,28	358,84
353	246,96	74,19	5,07	362,67	409,14	370,45	326,90	358,46
354	245,58	74,18	5,07	362,36	408,89	370,52	325,70	357,51
355	244,81	74,26	5,07	361,41	408,54	370,21	324,23	356,94
356	243,72	74,18	4,97	360,93	408,13	370,40	322,80	356,29
357	243,20	74,40	4,97	360,28	407,76	370,58	321,46	355,72
358	242,32	74,32	4,97	359,92	407,46	370,62	319,90	355,23
359	241,93	74,20	4,97	359,28	406,94	371,68	319,02	354,71
360	241,11	73,98	4,87	358,73	406,70	371,36	317,81	354,01
361	240,11	74,02	4,87	357,97	406,21	371,53	316,27	353,49
362	239,54	74,10	4,87	357,48	405,89	371,38	315,32	352,98
363	239,79	74,08	4,87	356,80	405,40	371,30	314,63	352,48
364	238,67	74,28	4,87	356,33	405,00	371,83	313,55	351,82
365	238,92	74,02	4,78	355,79	404,56	371,60	312,44	351,47
366	238,65	74,09	4,78	355,37	404,10	371,97	311,56	350,98
367	238,62	73,96	4,78	354,99	403,80	371,11	310,58	350,50
368	238,13	74,09	4,78	354,47	403,46	371,45	310,18	350,16
369	236,99	74,12	4,78	354,24	403,16	371,33	309,25	349,67
370	236,65	74,18	4,74	353,49	402,92	370,05	308,67	349,28
371	236,31	74,13	4,67	353,16	402,62	369,87	307,72	348,88
372	236,18	74,17	4,67	352,62	402,20	369,93	307,00	348,77
373	235,78	74,11	4,67	352,05	401,92	369,45	306,12	348,34
374	235,28	74,05	4,67	352,01	401,83	369,36	305,77	348,01
375	234,41	74,07	4,57	351,32	401,70	368,73	304,81	347,86
376	234,03	73,87	4,57	351,10	401,45	368,97	304,06	347,63
377	233,61	74,06	4,57	350,49	401,40	368,85	303,26	347,16
378	232,65	73,90	4,57	349,52	401,33	367,53	302,66	346,93
379	232,39	73,64	4,57	349,32	401,26	367,47	301,46	346,70
380	231,83	73,88	4,57	349,09	400,98	368,28	300,69	346,53
381	230,63	73,91	4,57	348,57	400,95	368,28	299,91	346,47
382	230,37	74,06	4,47	348,17	400,80	368,29	298,98	346,03
383	229,62	73,92	4,47	347,75	400,78	367,73	298,31	345,81
384	228,87	73,60	4,47	347,24	400,70	367,66	297,30	345,70
385	228,47	73,75	4,47	346,80	400,49	367,72	296,37	345,40
386	228,58	73,85	4,47	346,58	400,29	366,87	295,72	345,28
387	227,94	73,90	4,46	346,18	400,06	367,09	294,83	345,12
388	227,27	73,48	4,39	345,95	399,79	367,10	293,75	345,02
389	227,25	73,72	4,37	345,61	399,51	366,91	293,22	345,23
390	226,85	73,71	4,37	345,67	399,24	366,74	292,66	345,06
391	226,60	73,73	4,37	345,02	398,82	366,79	292,14	344,67
392	226,30	73,65	4,27	344,81	398,52	366,55	291,19	344,53
393	225,83	73,80	4,37	344,28	398,15	366,26	290,73	344,43
394	225,52	73,62	4,27	343,82	397,72	366,01	290,23	344,15
395	225,27	73,50	4,27	343,10	397,33	365,87	289,63	343,59
396	224,33	73,79	4,27	342,35	396,86	365,25	289,31	343,39
397	224,11	73,55	4,27	341,92	396,39	365,07	288,58	342,92
398	223,22	73,59	4,27	341,15	396,00	365,09	287,73	342,65
399	222,79	73,38	4,27	340,66	395,49	364,61	287,21	342,38
400	222,33	73,46	4,17	340,43	395,11	364,49	286,52	342,07
401	222,32	73,35	4,17	340,03	394,65	364,58	285,84	341,85
402	222,06	73,40	4,17	339,52	394,17	364,75	285,19	341,62
403	221,63	73,37	4,17	339,29	393,82	364,82	284,28	341,35
404	221,14	73,32	4,09	338,61	393,41	364,85	283,83	341,11
405	220,73	73,57	4,13	338,80	393,10	364,70	283,16	341,12
406	220,62	73,69	4,07	338,42	392,61	364,61	282,35	340,96
407	220,60	73,39	4,07	338,33	392,36	364,56	282,14	341,03
408	220,18	73,25	4,07	338,37	391,99	364,45	281,67	341,00
409	219,54	73,44	4,07	337,95	391,65	364,45	281,22	340,65
410	219,95	73,17	4,07	337,72	391,29	364,50	280,87	340,45
411	219,23	73,22	3,98	337,58	390,96	364,38	280,57	340,15
412	219,54	73,19	4,03	337,20	390,65	364,40	280,13	339,98
413	219,55	73,24	3,97	336,82	390,25	364,48	279,78	339,73
414	219,27	73,24	3,97	336,70	390,06	364,57	279,20	339,60
415	218,70	73,15	3,97	336,33	389,70	364,56	279,09	339,36
416	218,67	73,13	3,97	336,26	389,51	364,57	278,79	339,09
417	218,15	72,95	3,90	336,17	389,28	364,40	278,34	338,88
418	218,24	73,01	3,87	336,24	388,94	364,61	277,83	338,77
419	218,36	72,94	3,87	336,26	388,69	364,51	278,05	338,68
420	217,96	72,97	3,87	336,05	388,53	364,68	277,55	338,41
421	217,98	72,97	3,87	335,61	388,37	364,67	277,18	338,02
422	218,13	72,92	3,87	335,37	388,21	364,70	277,36	337,82
423	217,85	72,96	3,77	335,09	388,00	364,80	276,82	337,38
424	217,91	73,01	3,77	335,01	387,94	364,74	276,53	337,21
425	217,59	72,96	3,77	335,21	387,75	364,91	276,48	337,22
426	217,47	72,94	3,77	335,28	387,79	365,03	276,13	337,52
427	217,50	72,80	3,77	335,93	387,62	364,86	276,22	337,53
428	217,35	72,96	3,67	335,97	387,57	365,04	276,20	337,42
429	217,22	72,89	3,67	336,39	387,64	365,35	275,59	337,23
430	217,33	72,83	3,67	336,52	387,53	365,55	275,31	337,11
431	217,10	72,77	3,67	336,55	387,54	365,62	275,30	337,01
432	217,57	72,89	3,67	336,29	387,47	365,86	275,13	336,77
433	217,12	72,74	3,67	336,42	387,62	366,00	275,35	336,62
434	216,77	72,79	3,57	336,47	387,69	366,17	275,55	336,33
435	217,16	72,94	3,57	336,48	387,71	366,04	275,30	336,01

436	217,17	72,69	3,57	336,70	387,82	366,43	275,09	336,10
437	216,80	72,79	3,57	336,99	387,97	366,73	274,85	335,98
438	217,19	72,66	3,57	337,20	388,09	366,73	274,97	335,65
439	217,02	72,74	3,54	337,44	388,31	366,70	274,83	335,45
440	217,13	72,91	3,47	337,66	388,54	367,08	274,96	335,22
441	216,79	72,80	3,47	338,01	388,79	367,44	274,73	335,21
442	216,81	72,75	3,47	338,41	389,20	367,81	274,80	335,16
443	217,28	72,79	3,47	338,64	389,35	368,06	274,64	334,90
444	217,65	72,90	3,47	338,74	389,87	368,19	274,82	334,60
445	217,44	72,83	3,47	338,69	390,15	368,46	274,59	334,48
446	217,13	72,92	3,43	339,06	390,67	368,52	275,01	334,19
447	217,53	72,71	3,37	338,98	390,99	368,92	274,65	334,01
448	217,21	72,90	3,37	339,26	391,48	369,18	274,63	334,02
449	216,88	72,84	3,37	339,28	391,97	369,14	274,35	333,64
450	216,74	72,57	3,37	339,54	392,42	369,26	273,90	333,54
451	216,30	72,67	3,37	339,78	392,68	369,56	274,16	333,25
452	216,44	72,54	3,27	340,13	393,19	369,45	273,93	333,08
453	216,39	72,78	3,27	340,03	393,50	369,35	273,72	332,87
454	216,47	72,60	3,27	340,39	393,90	369,70	273,56	332,68
455	215,90	72,62	3,27	340,53	394,11	369,87	273,42	332,45
456	216,20	72,68	3,27	340,50	394,28	369,79	273,38	332,33
457	216,12	72,64	3,27	341,06	394,41	369,93	273,41	332,30
458	216,11	72,63	3,27	341,38	394,63	369,81	273,60	331,95
459	216,05	72,72	3,17	340,95	394,81	370,14	273,24	331,83
460	216,27	72,77	3,17	341,17	394,84	370,01	273,34	331,75
461	215,67	72,53	3,17	341,35	394,96	369,80	273,13	331,60
462	215,69	72,59	3,17	341,41	395,06	370,00	273,05	331,47
463	215,48	72,42	3,17	341,54	395,15	369,83	273,06	331,39
464	215,68	72,53	3,07	341,79	395,26	369,92	273,05	331,35
465	215,87	72,53	3,07	341,75	395,33	370,06	272,94	331,09
466	216,02	72,53	3,07	341,65	395,48	369,97	273,05	331,12
467	215,83	72,50	3,07	341,86	395,60	369,92	272,95	330,90
468	214,67	72,61	3,03	341,90	395,84	369,79	272,73	330,85
469	213,90	72,49	3,07	342,00	396,10	369,51	272,58	330,77
470	213,24	72,46	2,97	341,81	396,18	369,67	272,34	330,69
471	212,65	72,38	2,98	341,91	396,16	369,41	271,72	330,45
472	211,85	72,40	2,97	342,13	395,92	369,12	271,44	330,40
473	211,81	72,35	2,97	341,90	395,68	369,04	271,06	330,00
474	211,40	72,46	2,97	342,12	395,27	369,23	270,57	330,01
475	210,97	72,35	2,97	342,19	394,83	369,26	270,29	329,75
476	211,26	72,27	2,97	342,45	394,26	369,13	269,80	329,56
477	210,92	72,42	2,97	342,19	393,67	369,11	269,26	329,57
478	210,18	72,42	2,87	342,48	393,09	369,20	268,60	329,44
479	209,81	72,45	2,97	342,46	392,41	369,10	268,08	329,09
480	209,71	72,27	2,87	342,71	391,63	368,81	267,76	329,01
481	209,41	72,30	2,87	342,51	391,02	368,81	267,39	328,53
482	209,49	72,42	2,87	342,90	390,23	368,22	267,25	328,44
483	209,05	72,14	2,87	342,97	389,59	368,50	266,57	328,16
484	209,10	72,14	2,87	342,99	388,80	368,37	266,43	327,80
485	208,61	72,20	2,77	342,86	388,18	368,26	266,20	327,38
486	208,35	72,42	2,77	342,71	387,59	368,12	265,65	326,95
487	208,21	72,25	2,77	342,57	386,74	368,18	265,31	326,56
488	208,10	72,14	2,77	342,48	386,01	368,31	265,04	326,00
489	208,29	72,20	2,77	342,66	385,34	368,14	264,75	325,70
490	208,62	72,32	2,77	342,44	384,68	367,98	264,38	325,34
491	208,56	72,17	2,67	342,74	383,99	367,93	264,37	324,98
492	208,41	72,23	2,77	342,71	383,46	367,73	263,97	324,42
493	208,48	72,17	2,67	342,65	382,71	367,60	263,91	323,90
494	208,20	72,15	2,67	343,14	382,07	367,46	263,82	323,41
495	208,87	72,15	2,67	343,07	381,46	367,26	263,66	323,00
496	209,26	72,38	2,67	343,08	380,76	367,28	263,58	322,58
497	209,17	72,18	2,67	343,16	380,22	367,30	263,46	322,16
498	208,90	72,01	2,60	343,45	379,61	367,29	263,07	321,85
499	209,45	71,95	2,57	343,72	379,09	367,08	263,09	321,34
500	209,83	72,06	2,57	343,52	378,59	367,00	263,02	321,00
501	209,47	71,79	2,57	344,12	378,03	366,80	262,58	320,64
502	209,19	72,11	2,57	344,05	377,51	367,03	262,80	320,25
503	209,60	71,94	2,47	344,37	377,04	366,45	262,75	319,87
504	209,23	72,15	2,57	344,08	376,65	366,66	262,98	319,57
505	209,25	72,06	2,57	344,49	376,11	366,35	262,68	319,04
506	208,96	72,03	2,48	344,32	375,73	366,23	262,60	318,64
507	208,76	72,02	2,57	344,78	375,29	366,03	262,87	318,37
508	208,84	72,01	2,47	344,86	374,89	365,83	262,49	318,02
509	208,73	72,08	2,47	344,76	374,46	365,85	262,29	317,81
510	209,00	71,99	2,47	344,66	374,09	365,69	262,17	317,36
511	208,73	72,02	2,37	344,75	373,74	365,57	262,15	317,08
512	208,59	71,99	2,37	344,71	373,30	365,29	262,00	316,79
513	207,85	71,95	2,37	344,43	372,90	364,69	261,77	316,49
514	207,73	71,92	2,37	344,42	372,50	364,48	261,69	316,24
515	207,77	71,87	2,37	344,22	372,27	364,10	261,45	315,93
516	207,33	72,00	2,37	343,93	372,04	363,84	261,19	315,71
517	207,58	71,98	2,37	343,66	371,73	362,93	261,14	315,17
518	207,05	71,87	2,37	342,47	371,46	363,00	260,90	314,25
519	206,55	71,79	2,37	341,66	371,23	362,58	260,57	313,76
520	205,90	71,97	2,27	341,16	370,91	362,09	260,12	313,32
521	205,62	71,74	2,27	340,63	370,66	361,58	259,91	312,90
522	205,53	71,94	2,27	340,31	370,36	360,82	259,47	312,89
523	205,44	72,06	2,27	340,09	370,19	360,49	259,26	312,67
524	204,62	71,82	2,27	339,62	369,91	360,12	258,88	312,43

525	204,70	71,88	2,27	339,12	369,59	359,54	258,66	312,29
526	204,51	71,72	2,27	339,11	369,40	359,09	258,17	311,89
527	204,87	71,68	2,27	338,76	369,14	358,63	258,05	311,92
528	204,19	71,82	2,17	338,13	368,86	358,34	257,52	311,50
529	203,85	71,65	2,17	338,05	368,58	357,94	257,13	311,37
530	203,28	71,77	2,17	337,78	368,39	356,90	256,88	311,24
531	203,66	71,92	2,17	337,02	368,07	356,69	256,47	310,84
532	203,32	71,86	2,08	336,27	367,78	356,03	256,10	310,50
533	202,84	71,90	2,17	335,52	367,37	355,47	255,85	310,04
534	202,83	71,89	2,17	335,15	367,16	354,86	255,49	309,64
535	202,80	71,76	2,07	334,76	366,84	354,55	255,10	309,43
536	202,43	71,72	2,07	334,01	366,28	354,10	254,98	309,13
537	202,56	71,80	2,07	333,41	365,99	353,60	254,87	308,77
538	201,85	71,88	2,07	332,91	365,64	353,12	254,58	308,37
539	202,03	71,76	2,07	332,39	365,25	352,68	254,47	308,05
540	201,48	71,72	2,07	331,53	364,85	352,11	254,01	307,57
541	201,36	71,66	2,07	330,97	364,53	351,45	253,29	307,43
542	201,25	71,81	1,97	330,71	364,08	351,07	253,26	306,98
543	201,56	71,70	1,97	330,19	363,80	350,67	253,03	306,82
544	200,89	71,74	2,07	329,81	363,35	350,40	252,28	306,67
545	200,07	71,60	1,97	329,46	363,00	349,74	252,09	306,49
546	200,21	71,70	1,97	329,01	362,65	349,47	251,97	306,13
547	200,12	71,72	1,97	328,93	362,18	348,99	251,50	306,11
548	199,52	71,75	1,97	328,65	361,71	348,37	251,40	305,93
549	199,86	71,76	1,97	328,33	361,28	348,01	251,12	305,85
550	199,11	71,67	1,87	328,18	360,85	347,66	250,68	305,69
551	198,88	71,62	1,87	328,03	360,62	347,28	250,40	305,29
552	199,50	71,78	1,87	327,69	360,19	346,63	250,07	305,04
553	198,97	71,65	1,87	327,15	359,73	346,50	249,60	304,63
554	198,66	71,66	1,87	326,56	359,31	346,09	249,34	304,41
555	198,20	71,77	1,87	326,16	358,86	345,64	249,07	304,22
556	198,10	71,61	1,87	325,92	358,45	345,18	248,64	303,94
557	197,92	71,56	1,87	325,57	358,11	344,79	248,30	303,56
558	197,72	71,71	1,77	325,26	357,63	344,65	247,98	303,57
559	197,64	71,61	1,81	325,19	357,17	344,14	247,83	303,05
560	197,46	71,59	1,77	324,91	356,79	343,93	247,24	302,78
561	197,04	71,61	1,77	324,35	356,44	343,54	247,27	302,56
562	197,08	71,49	1,77	324,40	356,01	343,23	246,87	302,10
563	196,76	71,51	1,77	324,01	355,70	342,51	246,74	301,96
564	196,95	71,49	1,67	324,09	355,35	342,28	246,24	301,94
565	197,13	71,52	1,77	323,83	354,90	341,78	246,06	301,49
566	197,12	71,62	1,67	323,75	354,55	341,77	245,82	301,40
567	196,70	71,57	1,67	323,55	354,08	341,57	245,74	301,24
568	196,82	71,46	1,67	323,35	353,79	341,21	245,58	301,05
569	196,69	71,55	1,67	323,12	353,44	341,05	245,43	300,73
570	196,58	71,59	1,67	322,59	353,17	340,56	245,16	300,21
571	196,39	71,50	1,67	322,48	352,81	339,94	244,88	299,87
572	196,12	71,48	1,67	322,07	352,34	340,00	244,89	299,54
573	195,97	71,53	1,61	321,82	352,12	339,83	244,59	299,13
574	195,85	71,60	1,57	321,67	351,64	339,49	244,26	298,85
575	195,26	71,55	1,57	321,29	351,21	339,39	244,07	298,38
576	195,19	71,46	1,57	320,66	350,90	338,83	244,08	297,97
577	194,70	71,40	1,57	320,51	350,39	338,47	243,80	297,67
578	194,44	71,47	1,57	320,18	350,16	338,21	243,11	297,53
579	194,58	71,64	1,57	320,50	349,81	338,33	243,15	297,42
580	194,82	71,51	1,57	320,79	349,46	337,94	242,85	297,23
581	194,49	71,38	1,47	321,05	349,03	338,03	242,59	297,20
582	194,33	71,62	1,47	321,15	348,61	337,27	242,28	297,10
583	194,22	71,52	1,47	321,35	348,23	337,22	242,16	296,87
584	193,86	71,36	1,47	321,88	347,87	336,93	241,97	296,82
585	193,34	71,42	1,47	322,01	347,51	336,93	241,47	296,57
586	192,88	71,34	1,47	322,25	347,03	336,45	241,37	296,16
587	193,27	71,31	1,47	322,02	346,57	336,28	240,92	295,83
588	193,31	71,43	1,47	322,08	346,22	336,41	240,75	295,39
589	192,76	71,39	1,37	321,98	345,91	336,11	240,40	294,98
590	192,73	71,47	1,47	321,92	345,50	335,90	240,26	294,70
591	192,85	71,31	1,37	321,80	345,15	335,71	239,86	294,13
592	192,23	71,44	1,37	322,14	344,80	335,40	239,66	293,94
593	192,09	71,35	1,39	322,53	344,45	335,18	239,53	293,88
594	191,49	71,42	1,37	322,87	344,03	335,40	239,22	293,38
595	191,54	71,35	1,37	323,02	343,75	334,77	238,93	293,17
596	191,62	71,41	1,37	323,60	343,25	334,77	238,51	293,16
597	191,32	71,43	1,37	324,34	342,79	334,24	238,33	293,32
598	190,94	71,32	1,31	324,83	342,34	334,21	238,01	293,07
599	191,32	71,34	1,37	324,85	341,99	333,75	237,99	292,98
600	191,08	71,32	1,27	325,22	341,55	333,76	237,86	292,69
601	191,03	71,42	1,27	325,29	341,05	333,73	237,54	292,52
602	191,38	71,42	1,27	325,34	340,70	333,74	237,60	292,12
603	191,51	71,33	1,27	325,25	340,30	333,37	237,41	291,79
604	191,31	71,41	1,27	325,32	339,81	333,13	237,22	291,25
605	190,77	71,24	1,25	324,78	339,41	333,28	236,86	290,89
606	190,87	71,32	1,17	324,59	338,88	332,81	237,09	290,50
607	190,64	71,29	1,19	324,03	338,50	332,57	236,66	290,32
608	190,50	71,30	1,17	323,76	338,10	332,76	236,54	289,69
609	190,30	71,22	1,17	323,12	337,66	332,46	236,38	289,65
610	189,81	71,34	1,17	322,88	337,25	332,34	236,41	289,25
611	189,90	71,20	1,17	322,33	336,90	332,24	236,01	288,87
612	189,66	71,29	1,13	321,91	336,47	332,15	235,84	288,42
613	189,96	71,24	1,17	321,49	336,10	332,13	235,41	288,34

614	189,37	71,24	1,16	320,98	335,61	332,28	235,37	288,10
615	189,27	71,13	1,07	320,84	335,37	331,97	235,26	287,92
616	189,41	71,26	1,07	320,42	334,94	331,50	235,09	287,72
617	189,02	71,32	1,07	320,08	334,65	331,74	234,94	287,45
618	189,29	71,29	1,07	319,91	334,30	331,84	234,53	287,56
619	188,79	71,18	1,07	319,44	333,99	331,86	234,48	287,26
620	189,15	71,23	1,07	319,12	333,68	331,09	234,29	286,99
621	188,91	71,21	1,00	318,24	333,33	331,51	233,84	286,76
622	188,57	71,32	1,07	317,96	332,91	331,26	233,84	286,33
623	188,72	71,11	1,07	317,21	332,61	331,12	233,69	285,96
624	188,84	71,17	0,98	316,47	332,28	331,12	233,62	285,68
625	188,68	71,12	0,97	315,96	331,97	331,16	233,50	285,32
626	188,50	71,11	0,97	315,37	331,60	330,98	233,29	285,11
627	188,16	71,17	0,97	314,93	331,33	331,12	233,28	284,81
628	187,54	71,12	0,97	314,62	331,09	330,64	232,96	284,47
629	187,89	71,22	0,97	314,29	330,72	330,81	232,90	284,40
630	187,59	71,09	0,87	314,10	330,34	330,63	232,65	284,20
631	187,53	71,17	0,92	313,63	330,06	330,86	232,29	284,07
632	187,38	71,14	0,97	313,45	329,84	330,80	231,89	284,07
633	187,33	71,14	0,87	312,94	329,54	330,80	231,83	283,63
634	187,25	71,13	0,87	312,54	329,24	330,92	231,45	283,54
635	187,12	71,10	0,87	312,17	329,00	330,70	231,42	283,05
636	186,88	71,14	0,87	311,48	328,73	330,96	231,09	282,78
637	186,38	71,09	0,87	311,06	328,40	331,11	230,92	282,43
638	186,49	71,10	0,87	310,05	328,14	331,08	230,75	281,91
639	186,42	70,95	0,79	309,66	327,80	331,25	230,63	281,52
640	186,68	71,01	0,87	309,25	327,59	330,69	230,45	281,25
641	185,84	71,05	0,80	308,74	327,32	331,04	230,15	281,01
642	185,77	70,96	0,80	308,37	327,03	331,45	229,89	280,81
643	185,68	70,95	0,77	308,12	326,78	331,48	229,86	280,48
644	185,56	70,98	0,77	307,63	326,52	331,06	229,50	280,42
645	185,14	71,12	0,77	307,50	326,41	331,42	229,27	279,92
646	184,68	70,99	0,77	307,48	326,05	330,68	228,81	279,74
647	184,64	71,04	0,77	307,25	325,82	331,30	228,57	279,57
648	184,21	71,04	0,77	306,93	325,56	331,40	228,14	279,28
649	183,96	70,96	0,77	306,84	325,31	330,72	227,92	279,04
650	183,99	71,03	0,67	306,70	325,04	331,57	227,49	278,68
651	183,54	71,01	0,67	306,37	324,77	331,59	227,06	278,21
652	183,26	71,12	0,67	306,30	324,51	331,47	226,93	277,90
653	183,23	71,03	0,67	305,68	324,26	331,62	226,67	277,43
654	183,16	70,95	0,67	305,21	324,06	331,59	226,38	277,00
655	182,63	70,91	0,67	305,12	323,80	331,77	226,13	276,55
656	183,19	71,01	0,67	304,82	323,56	331,85	225,88	276,10
657	183,07	70,81	0,67	304,76	323,28	331,67	225,77	275,75
658	183,00	70,80	0,58	304,80	323,05	331,34	225,30	275,28
659	182,42	70,81	0,58	304,81	322,90	331,72	225,22	275,07
660	182,57	70,86	0,57	305,06	322,65	331,97	225,02	274,76
661	182,88	70,92	0,57	305,06	322,40	331,96	224,88	274,50
662	182,86	70,97	0,57	305,24	322,14	331,97	224,74	274,09
663	182,39	70,81	0,57	305,56	322,04	331,98	224,61	273,87
664	182,42	70,97	0,57	305,88	321,83	331,54	224,33	273,56
665	182,37	70,90	0,57	306,03	321,71	331,56	224,23	273,26
666	182,04	70,82	0,57	306,54	321,66	331,71	223,91	273,10
667	181,62	70,89	0,47	307,05	321,44	331,16	223,86	272,89
668	181,75	70,88	0,47	307,33	321,37	331,28	223,72	272,43
669	181,51	70,84	0,47	307,92	321,29	331,77	223,71	272,20
670	181,23	70,88	0,47	308,22	321,07	331,87	223,40	271,99
671	181,31	70,90	0,47	308,34	321,02	331,70	223,10	271,39
672	181,65	70,82	0,47	308,96	320,94	331,60	223,09	271,22
673	181,30	70,76	0,47	309,62	320,81	331,62	223,15	271,08
674	181,20	70,81	0,44	310,21	320,79	331,60	222,97	270,78
675	181,24	70,74	0,47	310,45	320,65	331,58	222,90	270,62
676	180,59	70,71	0,41	310,98	320,58	331,51	222,74	270,26
677	180,92	70,68	0,37	311,72	320,60	331,78	222,68	269,89
678	180,91	70,68	0,37	311,82	320,61	331,79	222,46	269,54
679	181,03	70,84	0,37	312,52	320,48	331,19	222,41	269,31
680	181,05	70,79	0,37	313,22	320,42	331,64	222,23	269,13
681	271,61	76,86	26,86	362,08	415,11	445,65	314,14	353,65
682	265,34	76,16	28,19	359,66	414,71	440,67	307,60	353,71
683	275,91	76,29	28,08	358,59	413,16	436,14	303,75	351,40
684	304,65	77,22	27,88	358,68	410,86	433,68	306,39	351,84
685	331,62	77,13	27,78	358,75	407,72	433,44	311,66	352,59
686	362,35	77,03	27,58	356,32	404,15	427,76	324,84	351,13
687	402,38	76,05	27,48	357,23	399,84	428,70	339,06	348,87
688	443,47	77,42	27,23	352,21	394,98	422,89	359,73	348,77
689	490,05	77,07	26,98	350,52	389,36	418,96	388,76	346,55
690	533,90	76,76	26,78	348,96	383,61	418,31	425,30	346,19
691	577,48	77,08	26,57	346,46	378,14	417,34	470,33	344,78
692	600,90	77,56	26,28	343,83	373,34	413,21	517,16	341,55
693	616,81	77,79	26,08	341,93	368,51	411,88	558,84	341,99
694	630,23	77,49	25,78	339,59	363,90	409,08	596,41	341,09
695	644,40	78,78	25,48	336,31	359,83	407,13	628,92	339,39
696	630,57	78,94	25,28	335,77	356,03	407,82	657,34	336,47
697	596,69	78,24	25,08	334,64	352,46	406,79	666,90	336,10
698	581,01	78,40	24,88	334,24	349,25	405,50	670,63	336,22
699	571,08	78,38	24,68	333,00	346,16	405,31	672,29	335,73
700	566,24	78,20	24,48	332,32	343,39	403,85	673,00	333,33

medium setting

For Usable Firebox Volumes up to 3.0 ft3 - Low and Medium Fire

Nominal Requ	12	lb/ft3				
Usable Firebo	2,28	ft3				
Total Nom. Lo	27,36	lb				
Total Load Wt	25,99	to	28,73	lb		
Core Target W	12,312	to	17,78	lb		
Remainder Lo	9,58	to	15,05	lb		
					Mid-Point	
Core Load Fu	4,10	to	6,84	lb	5,47	
Remainder Lo	2,74	to	8,21	lb	5,47	
	Pc. #					
Core Load Pie	1	4,98	lb	In Range		
	2	5,19	lb	In Range		
	3	4,68	lb	In Range		
Core Load Total. Wt. Actual		14,85	lb	In Range		
	Pc. #					
Remainder Lo	1	2,95	lb	In Range		
(2 or 3 Pcs.)	2	4,66	lb	In Range		

Fuel Piece Moisture Reading (%-dry basis)			
1	2	3	Ave.
	21		21,0
	18		18,0
	20		20,0
	21		21,0
	18		18,0

701	565,72	77,87	24,28	331,20	340,80	402,19	676,04	336,24
702	568,36	77,58	24,08	330,88	338,23	401,23	676,40	333,98
703	575,20	78,37	23,88	330,00	336,06	399,07	682,02	333,49
704	587,85	78,65	23,68	329,89	334,02	396,67	687,01	333,57
705	610,87	78,46	23,48	328,59	332,50	395,46	701,16	334,11
706	643,13	78,63	23,13	328,64	331,09	393,09	732,21	334,65
707	648,46	79,44	22,88	328,88	330,29	391,56	753,67	333,71
708	649,79	79,36	22,58	328,46	330,19	390,38	767,15	335,86
709	654,51	78,45	22,38	328,90	330,53	389,39	778,39	336,55
710	658,52	78,71	22,08	328,44	330,74	387,16	789,36	338,13
711	657,46	79,12	21,85	329,82	331,01	384,97	798,36	341,43
712	657,35	79,07	21,58	329,05	331,10	385,19	804,75	342,42
713	656,50	79,96	21,28	330,99	331,27	381,91	811,36	345,66
714	655,02	79,40	20,98	331,67	331,52	381,31	814,56	346,58
715	652,48	79,50	20,78	333,33	331,98	380,32	816,08	348,45
716	651,73	79,14	20,58	334,30	332,38	376,58	816,23	352,20
717	648,80	78,59	20,28	334,66	332,79	376,10	815,89	353,01
718	647,45	79,89	20,08	336,03	333,32	373,46	815,04	355,33
719	645,81	78,97	19,78	336,85	333,88	371,91	812,60	357,06
720	643,14	80,03	19,58	338,42	334,52	369,66	811,11	360,06
721	641,37	79,37	19,38	339,68	335,09	369,13	809,35	362,87
722	639,63	78,94	19,08	340,93	335,85	366,93	807,89	364,55
723	638,43	79,98	18,88	343,26	336,45	365,16	806,27	367,80
724	638,49	79,73	18,68	345,11	337,01	362,38	806,37	369,74
725	637,21	79,52	18,48	346,51	337,49	360,91	805,49	371,36
726	635,95	79,32	18,20	346,91	337,75	358,98	804,70	373,57
727	635,52	79,65	17,98	347,86	338,09	357,77	804,57	376,26
728	634,20	79,91	17,78	348,99	338,38	356,68	804,47	378,95
729	633,76	79,44	17,58	351,67	338,67	354,80	803,13	379,66
730	632,45	80,43	17,29	352,02	339,00	353,09	803,11	381,54
731	631,92	79,87	17,18	352,86	339,57	350,80	801,61	384,53
732	631,45	79,81	16,88	354,81	340,32	350,71	800,61	386,12
733	629,61	78,80	16,68	354,87	340,99	350,18	798,96	385,26
734	629,98	78,75	16,48	356,79	341,76	348,97	799,26	388,00
735	629,88	80,00	16,28	357,80	342,59	347,94	798,81	390,04
736	632,02	79,59	15,99	359,73	343,61	347,55	800,82	392,24
737	633,97	79,85	15,78	361,42	344,36	346,85	803,41	395,03
738	635,48	79,96	15,58	363,08	345,48	344,91	804,67	396,00
739	636,76	80,09	15,38	364,43	346,67	344,77	806,64	396,32
740	636,95	80,71	15,12	364,18	347,96	345,24	807,29	398,07
741	637,85	80,71	14,98	365,39	349,22	343,32	808,77	399,32
742	636,59	80,82	14,68	366,58	350,28	341,32	808,90	400,44
743	635,52	80,12	14,48	366,81	351,59	341,35	809,14	401,49
744	634,25	80,35	14,28	368,17	352,86	340,38	808,17	403,63
745	633,07	80,26	14,08	369,25	354,44	339,22	806,32	404,58
746	630,17	80,47	13,88	371,02	356,03	338,28	804,34	406,66
747	628,38	80,26	13,68	371,74	357,43	338,80	801,58	408,99
748	627,35	81,38	13,48	373,51	359,19	337,04	799,01	409,55
749	627,72	79,97	13,28	374,07	360,93	336,25	798,42	410,68
750	627,80	79,87	13,08	376,77	363,12	335,50	797,50	413,54
751	629,24	81,66	12,88	376,85	365,41	333,93	799,09	414,66
752	632,09	80,90	12,59	378,75	368,05	335,22	802,52	418,85
753	635,77	81,05	12,43	379,80	370,43	331,47	806,61	420,48
754	637,89	80,98	12,18	381,23	372,73	332,05	812,70	419,84
755	640,62	81,42	12,08	382,94	375,18	331,92	818,42	421,51
756	645,19	80,90	11,78	383,97	377,79	330,30	823,45	424,74
757	646,37	80,55	11,58	385,77	379,98	328,95	829,04	424,34
758	647,96	80,69	11,38	386,20	382,23	329,15	832,14	425,74
759	641,66	81,76	11,18	387,54	384,36	328,44	829,59	426,42
760	633,36	81,51	10,98	389,08	386,26	327,50	824,06	428,26
761	623,31	81,13	10,88	392,81	388,30	327,19	816,18	431,76
762	613,30	81,54	10,68	392,84	390,26	326,46	805,31	433,32
763	604,54	81,19	10,48	395,16	392,21	325,77	793,84	435,08
764	598,15	81,26	10,28	396,05	394,50	326,20	782,12	434,55
765	593,02	81,19	10,18	398,97	396,79	326,63	773,37	437,40
766	590,05	80,97	9,98	400,79	399,31	324,90	765,93	438,22
767	588,56	81,60	9,88	401,74	401,82	325,02	761,13	439,75
768	587,14	80,76	9,78	403,00	404,34	325,17	754,85	441,63
769	585,62	81,62	9,58	403,00	406,93	324,23	750,08	440,56
770	583,12	81,72	9,38	404,25	409,66	324,74	746,50	444,10
771	580,36	80,15	9,28	406,17	412,10	325,25	743,89	445,59
772	574,41	80,89	9,10	407,46	414,63	325,64	739,13	445,48
773	567,39	81,61	8,98	409,09	417,40	326,03	733,32	448,61
774	562,93	80,23	8,88	412,09	420,41	324,30	726,96	449,15
775	560,27	81,31	8,78	412,21	423,50	323,67	721,74	450,55
776	557,02	81,12	8,58	414,62	426,42	323,71	716,97	450,85
777	555,40	81,28	8,48	413,92	429,32	323,62	712,67	453,59
778	556,58	79,06	8,37	417,58	432,29	325,51	710,07	455,56
779	557,24	80,86	8,18	418,04	435,06	323,20	708,19	452,36
780	558,96	81,18	8,08	416,96	438,15	323,33	708,44	454,77
781	554,81	79,15	7,98	419,56	440,75	323,21	707,63	454,54
782	548,40	79,51	7,88	422,18	443,27	322,67	704,80	454,81
783	543,20	80,41	7,77	422,56	445,54	322,95	699,63	456,52
784	538,88	81,14	7,58	421,66	448,06	323,10	692,57	456,51
785	535,31	79,82	7,48	422,61	451,10	321,39	687,56	457,34
786	530,99	78,56	7,38	427,26	453,76	321,02	682,57	459,79
787	529,55	80,79	7,28	426,80	456,58	321,23	675,60	462,89

	3	5,95	lb	In Range	
Remainder Load Piece Weight Ratio - Small/Large		50%		In Range	≤ 67%
Remainder Load Tot. Wt. Act		13,56	lb	In Range	
Total Load Wt. Actual		28,41	lb	In Range	
Core % of Total Wt.		52%		In Range	45-65%
Remainder % of Total Wt.		48%		In Range	35-55%
Actual Load % of Nominal Target		104%		In Range	95-105%
Actual Fuel Load Density		12,5	lb/ft3		
Allowable Cha	2,9	to	5,6		Mid-Point
Actual Charcoal Bed Wt.		4,0	lb	In Range	4,3
Actual Fuel Load Ending Wt.			lb	Valid Test	≥ 90%
Total Wt. of Fuel Burned During Test Run lb.		28,4	lb		
Load pieces Length in.		15	in.		

21	21	21	21,0
Total Load Ave. MC % (dry basis)			19,8
Total Load Ave. MC % (wet basis)			16,5
Total Test Load Weight (dry basis)			
Total Fuel Weight Burned During Test Run (dry basis)			

788	526,21	78,11	7,18	429,92	459,24	322,27	671,23	460,82
789	526,83	79,63	7,07	428,63	462,02	320,77	666,10	460,78
790	524,81	78,76	6,97	430,68	464,32	320,74	664,07	464,18
791	521,95	77,48	6,88	431,67	467,11	321,16	660,67	463,05
792	519,19	77,28	6,78	433,05	469,67	319,51	656,79	461,30
793	518,19	78,02	6,68	434,77	472,16	319,70	653,19	461,65
794	520,94	77,51	6,58	435,32	474,53	319,18	651,49	463,76
795	520,97	77,76	6,47	438,41	475,58	323,85	650,98	462,56
796	517,22	77,54	6,37	437,31	476,58	321,42	649,54	461,60
797	513,36	79,42	6,27	435,33	477,20	321,14	647,28	463,94
798	508,67	80,37	6,18	436,88	478,12	322,15	642,91	467,55
799	503,77	79,21	6,08	438,26	478,75	321,61	638,74	464,37
800	500,34	78,04	5,98	439,29	479,99	321,87	634,38	468,02
801	496,98	77,23	5,87	439,95	481,17	321,37	628,71	465,65
802	493,50	78,17	5,87	440,51	482,79	321,77	625,40	467,86
803	488,69	78,12	5,77	439,99	484,41	322,55	619,92	469,23
804	484,58	78,49	5,67	442,12	486,05	322,73	613,97	466,63
805	482,06	77,54	5,57	442,25	487,60	322,96	608,74	468,61
806	477,26	77,99	5,55	443,45	489,06	323,80	603,88	468,35
807	471,64	77,59	5,48	443,46	490,40	324,98	597,75	466,07
808	464,85	78,31	5,38	444,35	491,44	325,71	592,14	467,46
809	458,04	77,60	5,38	445,34	492,14	325,56	583,06	465,53
810	450,98	77,51	5,28	446,18	493,02	325,54	575,38	464,26
811	444,89	77,67	5,28	445,21	493,31	325,40	567,19	465,48
812	440,13	77,34	5,17	446,18	493,78	325,41	558,41	462,67
813	439,33	77,39	5,17	446,42	494,02	325,83	551,85	460,39
814	437,20	77,45	5,07	445,74	493,95	326,38	546,12	460,03
815	433,26	77,16	4,97	445,84	493,91	327,24	540,37	459,88
816	426,29	78,24	4,97	446,23	493,89	327,45	533,01	457,26
817	420,13	78,75	4,97	446,16	493,47	328,54	525,49	457,29
818	414,64	77,89	4,87	445,77	492,37	329,76	517,57	457,35
819	408,84	77,29	4,87	444,96	491,27	329,62	510,62	456,19
820	402,65	76,70	4,78	446,68	489,91	330,28	502,50	454,67
821	396,87	77,82	4,78	446,13	488,17	337,38	494,17	452,82
822	392,10	77,47	4,78	445,58	486,62	333,77	488,09	453,22
823	387,18	79,43	4,68	444,19	484,94	333,47	480,84	451,38
824	383,46	78,17	4,68	445,40	483,02	334,03	474,08	449,44
825	379,76	77,28	4,68	444,23	481,18	338,60	467,04	447,92
826	375,80	78,25	4,57	443,74	479,61	334,71	461,64	448,58
827	373,40	78,13	4,57	441,89	478,08	336,65	455,82	443,81
828	369,93	78,26	4,47	441,98	476,70	335,91	450,57	442,45
829	364,93	77,36	4,47	442,02	475,38	338,31	446,17	441,08
830	362,16	76,71	4,47	440,35	473,95	339,93	439,71	436,68
831	358,55	76,67	4,37	438,69	472,49	339,63	436,17	437,54
832	356,37	77,50	4,37	437,22	471,12	340,45	429,89	433,68
833	352,57	77,45	4,37	437,48	469,47	345,22	426,48	433,50
834	351,13	77,58	4,27	435,45	468,18	344,52	422,45	433,35
835	349,49	77,77	4,27	435,14	467,06	341,68	418,99	432,52
836	347,01	78,28	4,27	433,14	465,75	343,30	414,25	429,24
837	345,36	77,57	4,17	432,66	464,55	342,20	410,93	426,74
838	342,97	77,57	4,17	431,38	463,25	342,34	407,32	424,11
839	341,47	77,07	4,17	430,21	462,11	340,61	403,65	421,71
840	339,70	77,44	4,08	427,35	460,98	340,60	399,89	422,22
841	338,21	77,44	4,08	426,20	459,95	340,39	397,26	418,72
842	337,42	79,65	4,08	423,86	458,77	341,47	393,69	417,25
843	336,04	78,31	3,97	424,54	457,92	339,93	391,57	417,37
844	334,73	77,92	3,97	423,00	457,03	340,17	388,83	413,66
845	333,61	77,97	3,97	421,93	456,26	340,47	386,53	415,03
846	332,93	77,82	3,87	420,55	455,46	342,82	383,39	411,75
847	333,64	78,64	3,87	419,61	454,94	342,10	382,09	409,58
848	332,99	77,53	3,77	419,52	454,60	341,32	380,57	407,94
849	331,31	78,61	3,84	417,06	453,96	340,90	378,37	407,88
850	329,18	78,89	3,77	416,43	453,16	341,68	376,42	406,91
851	327,35	77,87	3,77	414,13	452,29	342,91	372,35	404,60
852	325,36	78,92	3,69	414,30	451,79	341,31	371,50	405,29
853	323,93	78,07	3,67	414,61	450,76	346,75	369,06	402,52
854	322,48	79,60	3,67	413,45	450,73	344,64	366,98	401,37
855	321,71	77,81	3,67	412,95	450,24	342,40	365,06	401,19
856	320,18	79,18	3,57	409,74	449,85	341,69	363,16	400,79
857	318,30	79,18	3,57	410,64	449,68	342,30	361,27	400,68
858	316,98	78,19	3,57	409,86	449,25	343,35	359,63	396,43
859	315,34	77,66	3,57	408,48	449,05	344,15	357,53	394,61
860	314,35	77,89	3,57	407,14	448,96	346,30	354,93	393,66
861	313,56	79,06	3,47	405,89	448,88	343,89	353,96	394,07
862	312,14	78,37	3,47	405,67	448,57	344,75	353,05	394,82
863	311,34	77,57	3,47	405,11	448,56	344,35	352,08	392,29
864	310,80	77,62	3,47	404,45	448,36	346,23	349,90	390,92
865	310,01	77,66	3,37	402,91	448,41	347,25	348,71	389,96
866	309,47	79,50	3,37	401,54	448,43	344,52	347,69	390,26
867	308,43	78,07	3,37	399,82	448,46	342,94	346,32	386,71
868	307,78	77,65	3,37	399,76	448,69	342,82	345,48	386,97
869	306,37	76,99	3,27	399,73	448,94	342,70	344,62	384,99
870	305,69	77,45	3,27	399,31	449,25	343,42	343,19	385,11
871	304,56	78,16	3,27	397,21	449,60	344,29	341,53	385,07
872	304,60	77,84	3,27	397,67	449,90	343,21	341,04	383,72
873	303,56	78,08	3,27	396,24	450,27	342,43	340,04	382,00
874	303,11	77,10	3,17	395,94	450,46	344,08	339,05	381,16
875	302,53	77,00	3,17	396,09	451,06	343,20	338,15	378,78
876	301,51	77,05	3,07	394,45	451,62	342,96	337,82	377,89

877	301,91	77,05	3,07	394,52	451,99	344,21	336,85	378,56
878	301,60	77,18	3,07	394,50	452,65	342,47	335,55	376,88
879	300,83	79,92	3,07	392,45	453,08	343,25	334,94	377,11
880	300,31	77,63	2,97	393,05	453,40	346,01	334,10	375,55
881	299,83	77,45	3,00	392,19	454,13	344,40	333,62	376,03
882	299,14	78,48	2,97	392,69	454,80	343,95	332,97	374,30
883	298,60	77,61	2,97	391,98	455,25	348,52	332,09	372,75
884	298,31	77,18	2,97	392,35	455,86	348,64	331,46	372,36
885	297,99	76,85	2,97	390,74	456,63	346,57	330,89	371,36
886	297,39	76,85	2,87	391,64	457,21	348,94	330,71	370,81
887	297,13	77,36	2,87	390,73	458,04	347,39	330,14	372,42
888	297,02	76,60	2,87	389,44	458,56	348,91	329,55	369,25
889	297,29	78,63	2,87	390,34	459,20	348,05	328,36	370,85
890	297,38	77,58	2,77	389,11	459,78	345,93	328,29	369,55
891	296,23	77,06	2,81	389,31	460,30	345,42	327,71	369,00
892	296,02	76,99	2,77	389,86	460,97	345,62	327,58	369,06
893	296,24	76,86	2,77	388,93	461,59	346,31	326,96	369,85
894	296,28	78,34	2,67	388,53	462,34	345,92	326,49	367,98
895	295,43	77,75	2,67	387,38	462,86	350,50	325,27	367,12
896	294,30	77,15	2,67	387,71	463,68	354,75	324,95	366,44
897	293,76	77,00	2,67	388,43	464,76	351,26	324,98	365,66
898	292,12	76,96	2,67	387,87	465,32	352,41	325,01	365,01
899	290,87	76,76	2,67	386,33	465,52	350,50	324,49	364,82
900	290,83	76,94	2,57	387,28	465,35	348,84	324,04	365,43
901	289,52	76,91	2,57	387,47	464,69	348,09	323,27	363,94
902	289,08	76,67	2,57	387,98	464,24	347,90	322,92	363,72
903	288,88	76,73	2,48	387,83	463,65	347,78	322,21	363,68
904	289,62	76,78	2,47	387,69	463,14	347,52	321,69	363,56
905	288,51	77,20	2,47	387,73	462,59	347,01	321,31	364,40
906	288,32	77,23	2,47	385,53	462,18	347,29	320,96	363,40
907	288,54	76,99	2,47	384,96	461,86	347,51	320,50	363,16
908	288,37	77,27	2,47	385,25	461,51	347,99	320,30	363,68
909	288,70	76,97	2,37	384,89	461,26	347,60	319,81	362,98
910	288,60	77,25	2,37	384,30	461,08	347,00	319,21	363,21
911	288,64	77,38	2,37	384,49	460,97	347,37	319,08	363,24
912	288,54	77,30	2,37	384,58	460,91	347,19	318,41	361,89
913	288,33	77,07	2,27	383,86	460,95	347,77	318,02	361,44
914	288,58	77,51	2,27	383,46	460,99	347,13	317,51	361,06
915	288,02	77,23	2,27	383,31	461,03	347,11	317,35	360,80
916	287,88	76,97	2,27	382,74	461,06	347,24	316,97	361,14
917	286,75	77,90	2,27	381,20	461,14	347,43	316,62	359,75
918	285,82	77,29	2,20	382,15	461,27	346,98	316,16	360,03
919	286,43	77,07	2,17	381,63	461,30	347,35	315,92	359,31
920	286,68	77,09	2,17	380,98	461,26	347,69	315,27	358,59
921	286,71	77,21	2,17	380,35	461,24	347,22	314,91	359,17
922	286,45	77,06	2,17	380,54	461,47	347,11	315,17	358,52
923	286,65	76,71	2,07	380,05	461,41	346,85	314,71	356,88
924	286,82	77,24	2,07	379,12	461,44	346,56	314,43	356,74
925	286,40	76,99	2,07	379,44	461,60	347,24	314,05	357,35
926	286,37	77,31	2,07	378,82	461,77	346,91	313,87	356,66
927	286,14	77,96	2,07	377,74	461,74	347,33	313,45	354,73
928	285,80	77,24	1,97	377,69	461,87	347,55	313,17	356,04
929	285,82	77,46	1,97	377,71	462,01	347,35	313,06	354,93
930	285,48	77,03	1,97	376,74	462,28	346,66	312,91	354,82
931	286,27	77,09	1,97	376,57	462,40	346,94	312,97	354,87
932	285,95	77,19	1,87	377,27	462,53	347,28	312,78	354,44
933	285,73	76,95	1,87	375,35	462,78	347,09	312,66	354,78
934	286,21	76,90	1,87	376,72	462,98	347,13	312,54	352,98
935	286,41	77,20	1,87	376,51	463,14	347,38	312,16	354,08
936	286,66	77,18	1,79	376,22	463,38	347,01	312,03	354,28
937	286,33	77,40	1,77	375,08	463,56	346,98	311,88	353,59
938	285,94	77,00	1,77	374,41	463,74	346,94	312,08	353,32
939	286,49	77,59	1,77	374,71	463,94	347,31	311,93	353,47
940	286,91	77,08	1,77	375,04	464,42	347,49	312,10	353,30
941	287,11	76,81	1,67	375,04	464,85	345,98	312,51	352,26
942	287,31	77,14	1,67	374,72	465,30	346,40	312,73	352,57
943	288,08	77,31	1,67	374,53	465,78	347,01	312,87	352,60
944	288,54	77,62	1,67	373,97	466,32	346,39	312,89	351,75
945	288,98	77,11	1,57	374,61	466,80	345,59	312,73	351,72
946	289,55	77,41	1,57	372,96	467,21	345,40	312,84	350,79
947	288,94	77,21	1,57	373,77	467,82	345,35	313,38	350,02
948	289,39	77,34	1,57	373,20	468,29	345,27	313,82	350,14
949	290,15	77,25	1,57	373,04	468,91	345,36	313,62	350,86
950	290,05	77,31	1,57	373,68	469,39	344,96	313,90	351,84
951	290,01	77,63	1,47	372,61	469,92	345,33	314,27	352,20
952	289,61	76,98	1,47	373,13	470,44	344,90	314,37	351,27
953	289,68	76,98	1,47	373,65	471,35	344,79	314,73	349,77
954	290,31	77,09	1,47	372,91	471,98	345,16	314,86	351,57
955	290,34	76,85	1,45	371,69	472,67	345,28	314,73	351,52
956	289,89	77,15	1,37	372,52	473,29	344,82	314,75	351,05
957	289,96	77,11	1,37	373,67	473,72	345,20	314,95	351,33
958	289,66	76,97	1,37	373,38	474,20	344,82	314,84	349,33
959	289,94	76,90	1,28	372,80	474,69	344,79	314,95	350,68
960	289,77	77,32	1,27	373,35	475,19	344,50	315,08	349,95
961	289,09	76,99	1,27	373,28	475,54	345,18	314,52	350,54
962	289,41	76,61	1,27	372,22	475,80	344,92	314,39	350,86
963	289,11	76,94	1,27	373,18	475,96	344,47	314,23	350,67
964	288,58	76,74	1,19	373,23	476,09	344,20	313,99	348,29
965	287,81	76,74	1,17	372,59	476,12	344,25	313,67	349,33

966	287,46	76,98	1,17	373,75	476,37	344,27	313,66	349,84
967	287,23	77,01	1,17	373,35	476,36	344,41	313,12	350,03
968	286,78	76,82	1,17	372,44	476,25	345,15	313,10	350,47
969	285,88	77,10	1,17	372,01	476,23	344,38	312,95	349,03
970	284,89	76,54	1,07	371,69	476,28	344,44	313,11	349,26
971	285,11	77,21	1,07	372,59	476,20	344,23	312,71	349,32
972	283,99	77,07	1,07	372,32	476,24	344,48	312,26	349,96
973	283,43	76,93	1,07	373,55	476,15	344,22	312,26	348,63
974	283,59	77,09	1,05	371,95	475,61	344,09	312,17	347,03
975	283,32	77,17	0,97	373,02	475,31	343,90	311,64	348,50
976	282,17	76,92	0,97	373,14	474,75	343,66	311,40	347,61
977	281,69	77,72	0,97	373,82	474,16	343,68	310,91	347,11
978	281,33	76,89	0,97	372,90	473,41	343,27	310,35	347,28
979	280,70	76,79	0,97	373,05	472,37	343,65	309,83	347,12
980	280,18	76,77	0,97	372,03	471,68	343,41	309,44	347,05
981	280,43	77,06	0,87	371,91	470,65	343,10	309,00	345,74
982	279,51	76,79	0,87	371,89	469,45	342,91	308,11	345,02
983	278,66	76,55	0,87	371,92	468,09	343,08	307,73	343,66
984	277,68	76,70	0,87	372,74	466,73	342,93	307,22	345,18
985	276,71	76,89	0,87	372,35	465,24	343,12	306,74	345,03
986	276,23	76,87	0,82	372,98	463,93	342,88	305,86	344,86
987	276,42	76,66	0,77	372,04	462,38	342,82	305,80	344,59
988	275,35	76,87	0,77	371,23	460,92	342,61	304,82	342,89
989	275,19	76,78	0,77	371,47	459,61	342,41	303,90	342,58
990	274,74	76,89	0,77	370,74	457,97	342,15	303,60	342,50
991	274,42	76,74	0,77	370,60	456,46	342,25	302,84	341,99
992	273,57	77,05	0,77	371,15	455,15	341,96	301,88	340,71
993	272,53	76,54	0,77	370,26	453,55	341,62	300,98	339,45
994	271,43	76,72	0,67	369,46	451,81	341,53	300,19	339,38
995	271,12	76,57	0,67	370,08	450,56	341,16	299,65	338,95
996	270,15	76,59	0,67	368,94	448,72	340,74	298,72	338,69
997	268,42	76,53	0,67	368,37	447,18	340,77	297,63	337,14
998	268,51	76,96	0,64	367,31	445,50	340,50	296,77	337,14
999	267,63	76,66	0,64	367,02	443,93	340,01	295,84	335,68
1000	266,41	76,73	0,57	366,73	442,25	339,61	295,38	335,19
1001	265,50	76,90	0,57	366,60	440,65	338,86	294,62	333,89
1002	264,50	76,68	0,57	365,54	439,07	339,34	293,63	333,53
1003	263,99	76,83	0,57	365,21	437,53	338,58	292,66	332,67
1004	262,73	76,65	0,57	364,48	435,85	338,53	291,78	332,04
1005	261,85	76,28	0,57	364,32	434,38	339,25	291,01	331,46
1006	261,06	76,50	0,57	363,69	432,82	339,16	289,79	330,91
1007	260,89	76,21	0,47	363,40	431,28	338,21	289,00	330,85
1008	260,00	76,67	0,47	362,52	429,83	337,77	287,95	330,56
1009	259,39	76,52	0,47	362,25	428,33	337,09	287,23	329,99
1010	258,47	76,36	0,47	361,23	427,04	336,60	286,43	327,85
1011	257,63	76,31	0,47	360,94	425,55	336,31	285,54	327,71
1012	257,19	76,37	0,47	359,87	424,00	336,02	284,83	326,24
1013	257,16	76,33	0,37	359,41	422,72	336,31	284,17	325,76
1014	256,37	76,45	0,43	358,84	421,46	335,73	283,16	325,11
1015	255,74	76,44	0,37	357,53	420,28	335,15	282,57	324,35
1016	255,47	76,29	0,37	357,67	418,92	334,58	281,53	323,40
1017	254,86	76,31	0,37	356,57	417,83	334,33	281,08	322,23
1018	254,28	76,42	0,37	356,07	416,72	333,86	280,43	321,96
1019	253,99	76,38	0,37	355,67	415,72	333,57	279,50	321,21
1020	253,33	76,14	0,27	354,91	414,58	332,74	279,05	320,55
1021	252,74	76,51	0,27	354,92	413,49	332,48	278,04	320,08
1022	252,31	76,36	0,27	354,75	412,58	332,12	277,71	319,54
1023	251,94	76,28	0,27	354,54	411,62	331,49	277,32	318,54
1024	251,96	76,40	0,27	353,53	410,75	331,43	276,65	317,93
1025	251,57	76,31	0,27	352,33	409,85	331,52	275,74	317,09
1026	251,15	76,36	0,27	352,45	409,05	331,20	275,31	316,64
1027	250,95	76,21	0,25	352,15	408,23	330,73	274,87	315,32
1028	249,89	75,96	0,27	351,43	407,52	330,18	274,19	314,69
1029	249,76	76,14	0,17	350,84	406,76	330,32	273,40	314,18
1030	249,21	76,14	0,17	350,77	406,08	331,08	272,90	313,83
1031	248,58	76,18	0,17	349,52	405,52	330,10	272,22	312,98
1032	248,52	76,21	0,17	349,41	404,98	329,82	271,95	312,37
1033	248,36	76,38	0,17	348,79	404,34	329,61	271,00	311,86
1034	247,65	76,54	0,11	348,63	403,82	329,28	270,45	311,33
1035	246,61	75,98	0,07	348,01	403,27	328,28	270,05	310,90
1036	245,94	76,05	0,07	348,12	402,62	327,99	269,50	310,16
1037	246,26	76,03	0,07	347,21	401,95	327,40	269,27	309,18
1038	246,66	76,07	0,07	346,86	401,53	327,10	268,39	308,29
1039	246,14	75,78	0,07	346,41	401,03	326,80	268,06	308,04
1040	245,44	76,09	0,06	346,38	400,61	327,34	267,30	307,72
1041	245,27	76,05	0,07	346,43	399,99	325,83	267,04	307,27
1042	245,33	76,05	0,00	344,90	399,54	325,52	266,81	306,32

APPENDIX 5: Participants

Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
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APPENDIX 6: Drawings and specifications

APPENDIX 7: Operator's manual

INSTALLER: LEAVE THIS MANUAL WITH THE APPLIANCE. CONSUMER: SAVE THESE INSTRUCTIONS.

CANYON LODGE®
SIGNATURE HEARTH SERIES BY MR. HEATER

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

C110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD FIRE STOVE



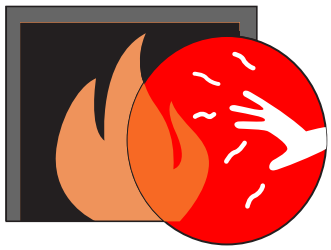
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-800-251-0001
66762 REV E

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SPECIFICATIONS

Model #	C110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Heat Transfer Efficiency (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.
** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

Wood Stove Efficiency Reference:
1. Measured per CSA B415.1-10
2. Higher Heating Value of the fuel
3. Lower Heating Value of the fuel
4. Low Burn Rate & Extended Burn Time
5. Heat transfer efficiency represents the appliance's ability to convert the energy contained in the solid fuels into energy transferred to the room in the form of heat and does not take into account the chemical losses during combustion.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

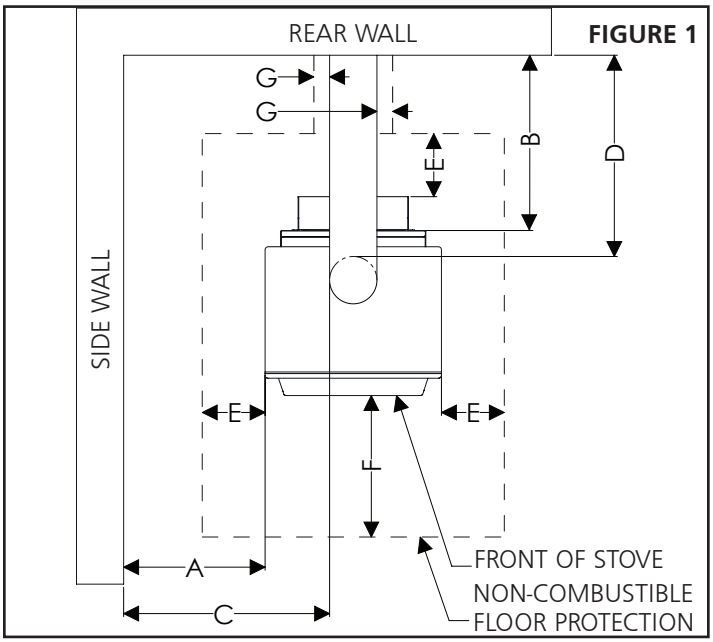


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

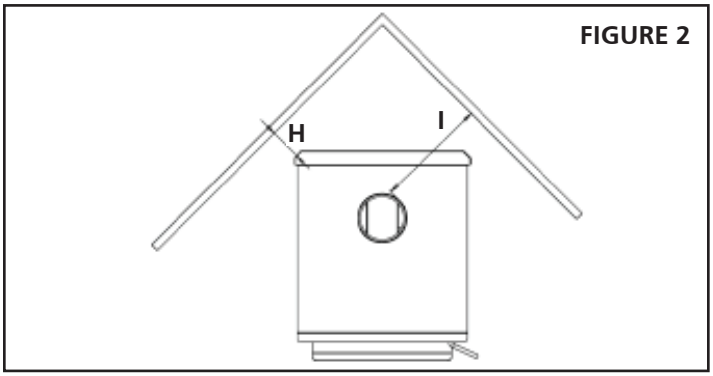


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308) (Not Included)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

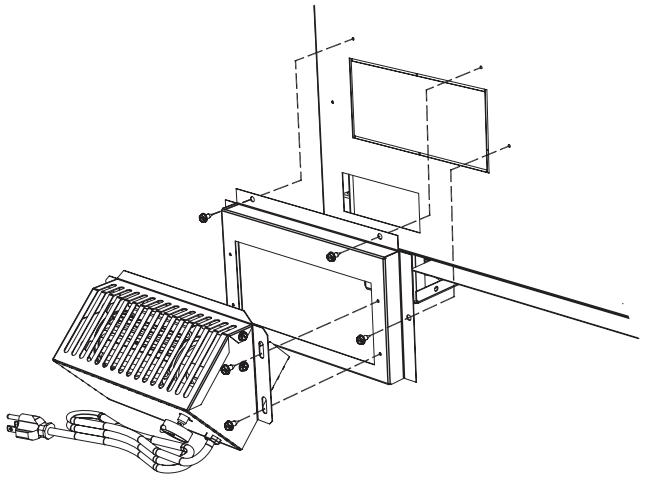


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Cleveland Iron Works with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: For Canadian residential and transportable homes or structures installations, where passage through a wall, or partition of combustible construction is desired, the installation must conform to CAN/CSA-B365. See Figure 4.

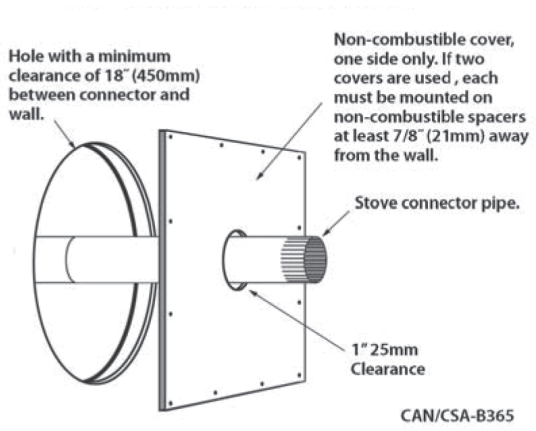


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

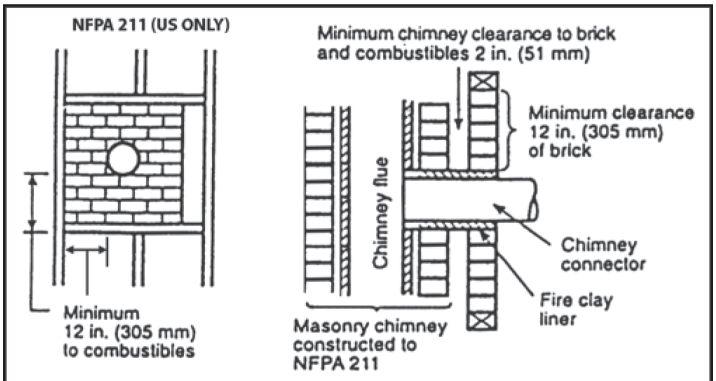


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

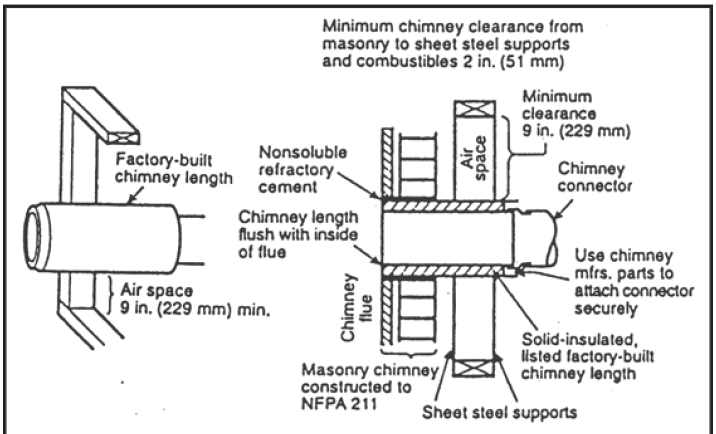


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

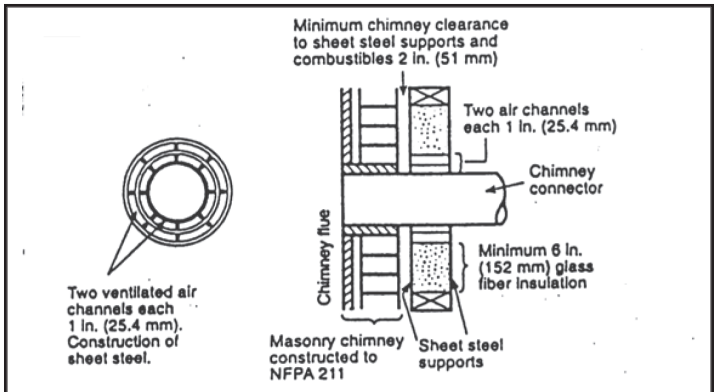


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

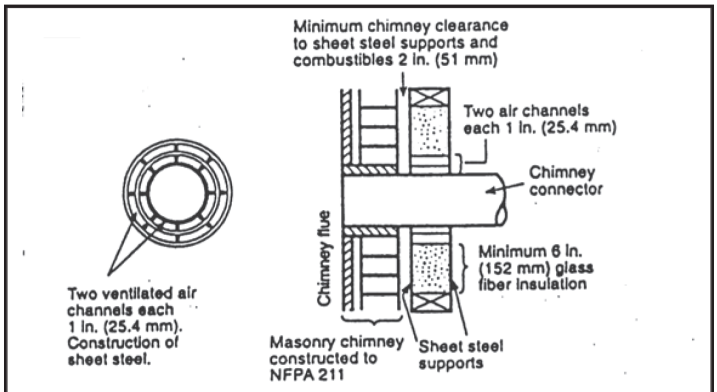


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Cleveland Iron Works, Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - The duct must have a minimum diameter of 4 inches (10.2 cm).
  - The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

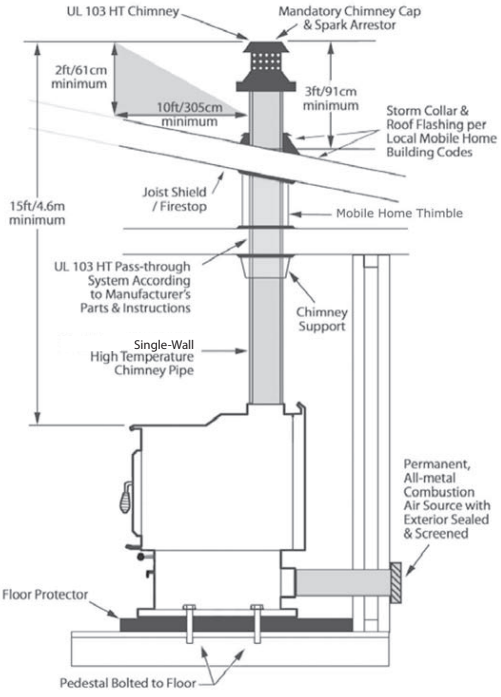


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

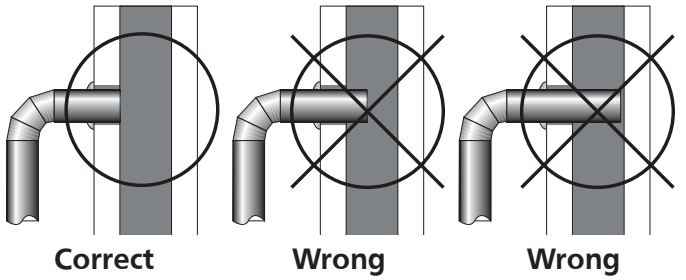


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

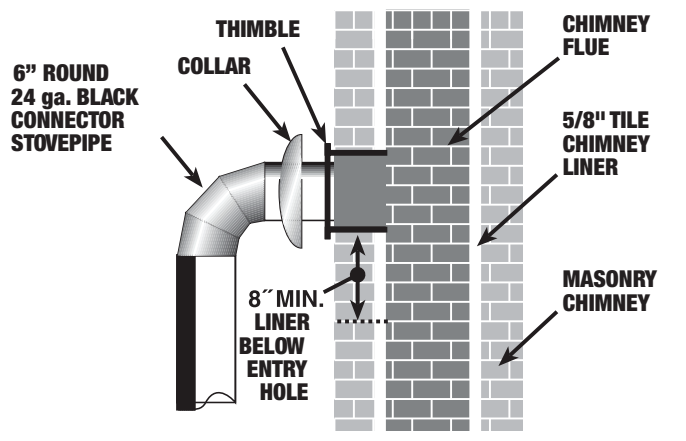


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

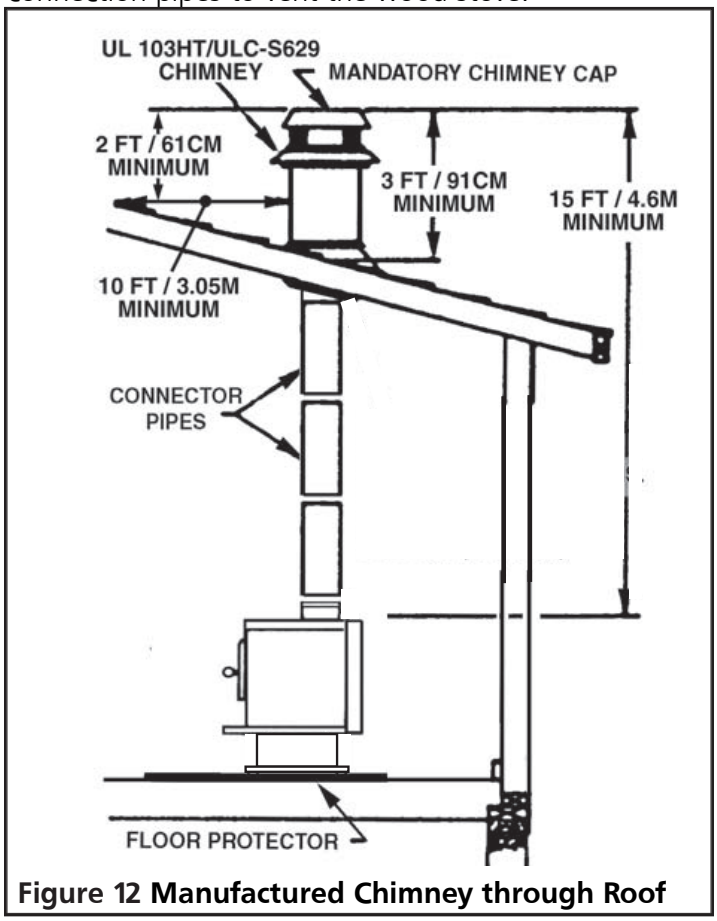


Figure 12 Manufactured Chimney through Roof

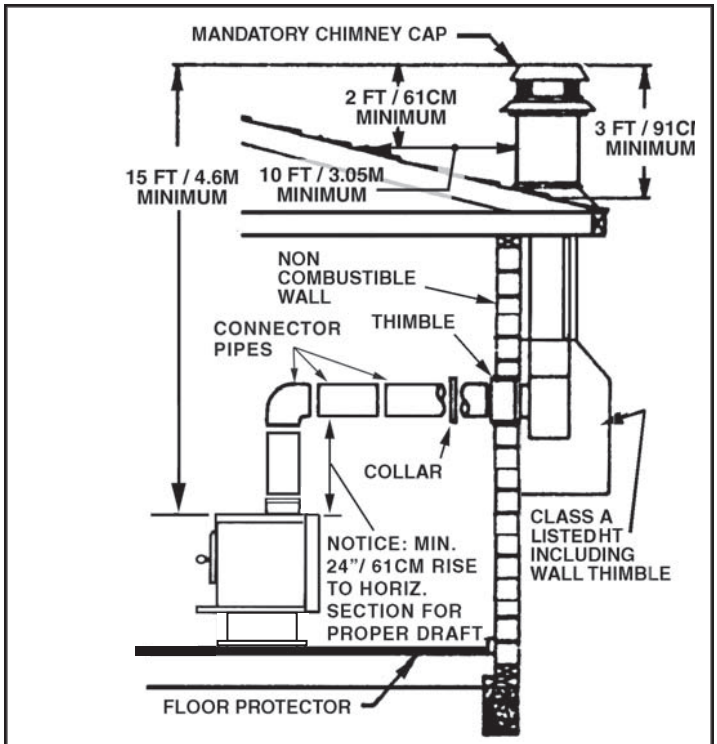


Figure 13
Manufactured Chimney through Masonry Wall

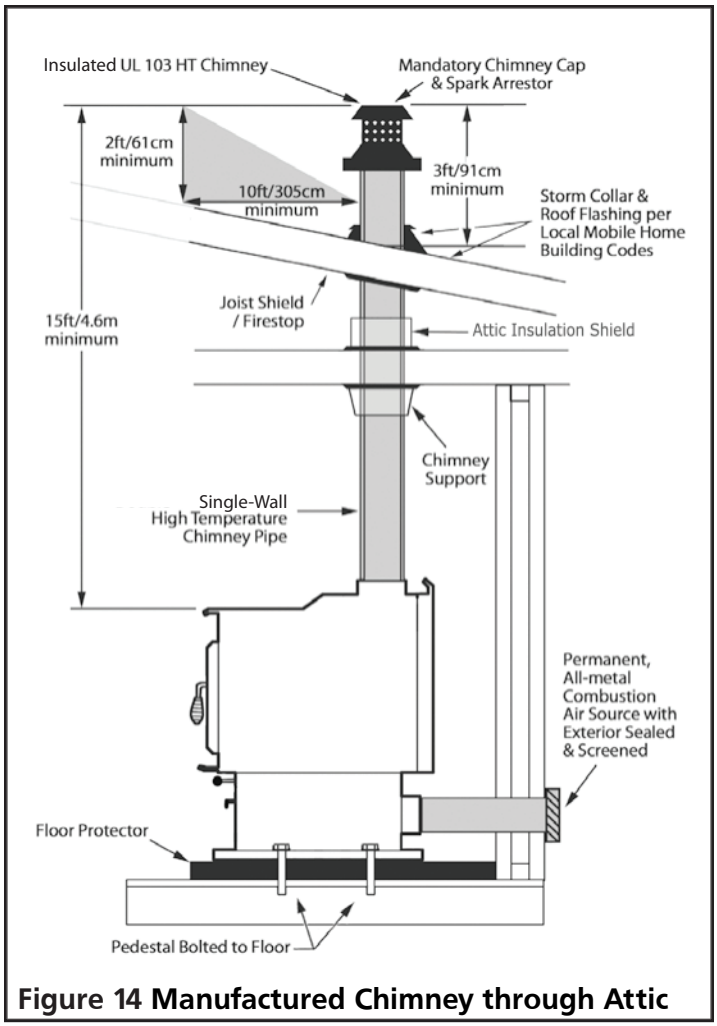


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

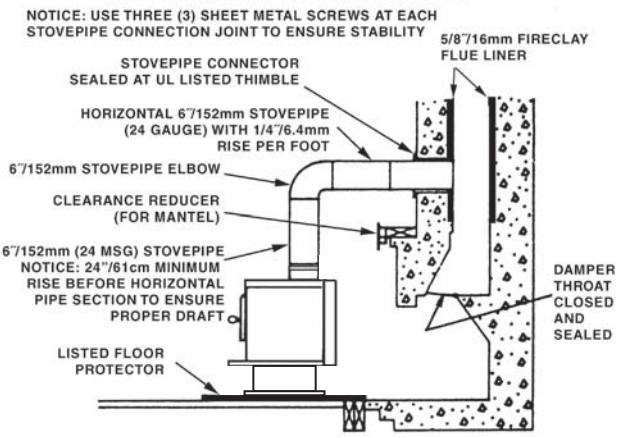


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

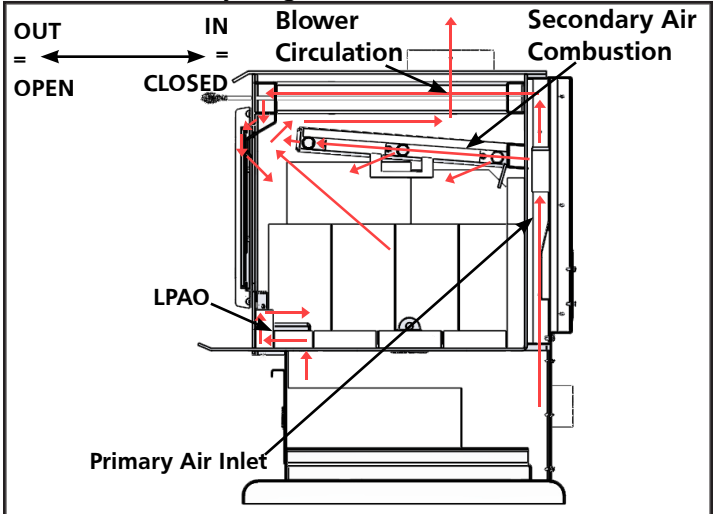


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

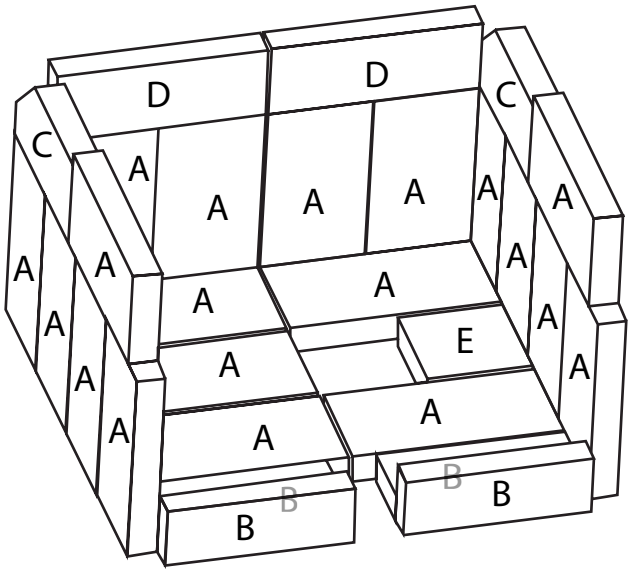


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes. The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page <?>.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.
2. GET OUT OF THE HOUSE OR BUILDING.
3. CALL THE FIRE DEPARTMENT.

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page <?>.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase a Cleveland Ironworks Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE CLEVELAND IRONWORKS WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

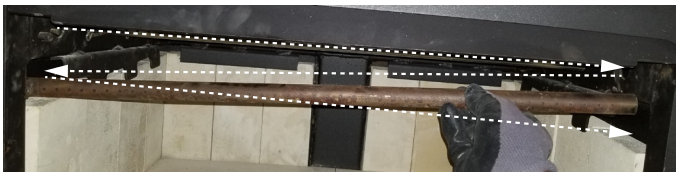


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

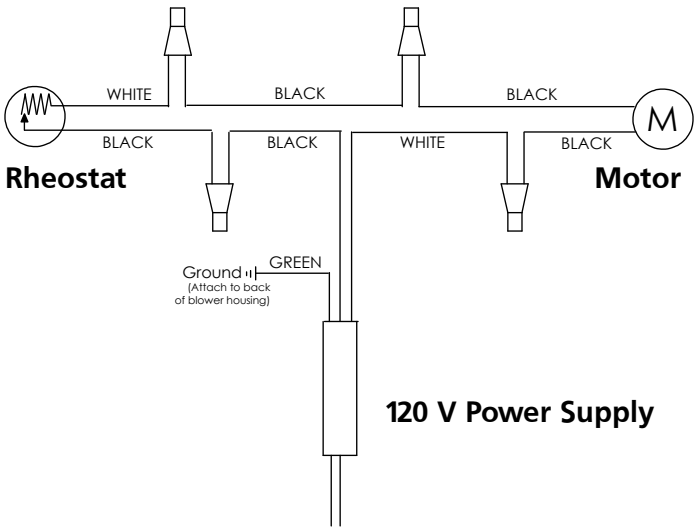
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



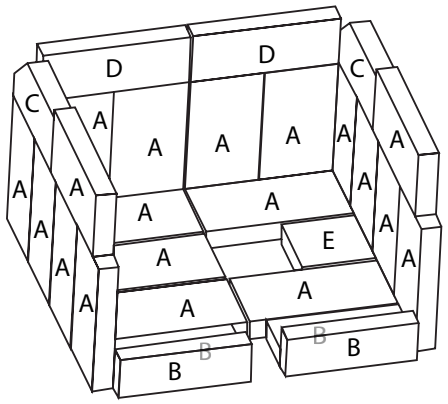
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

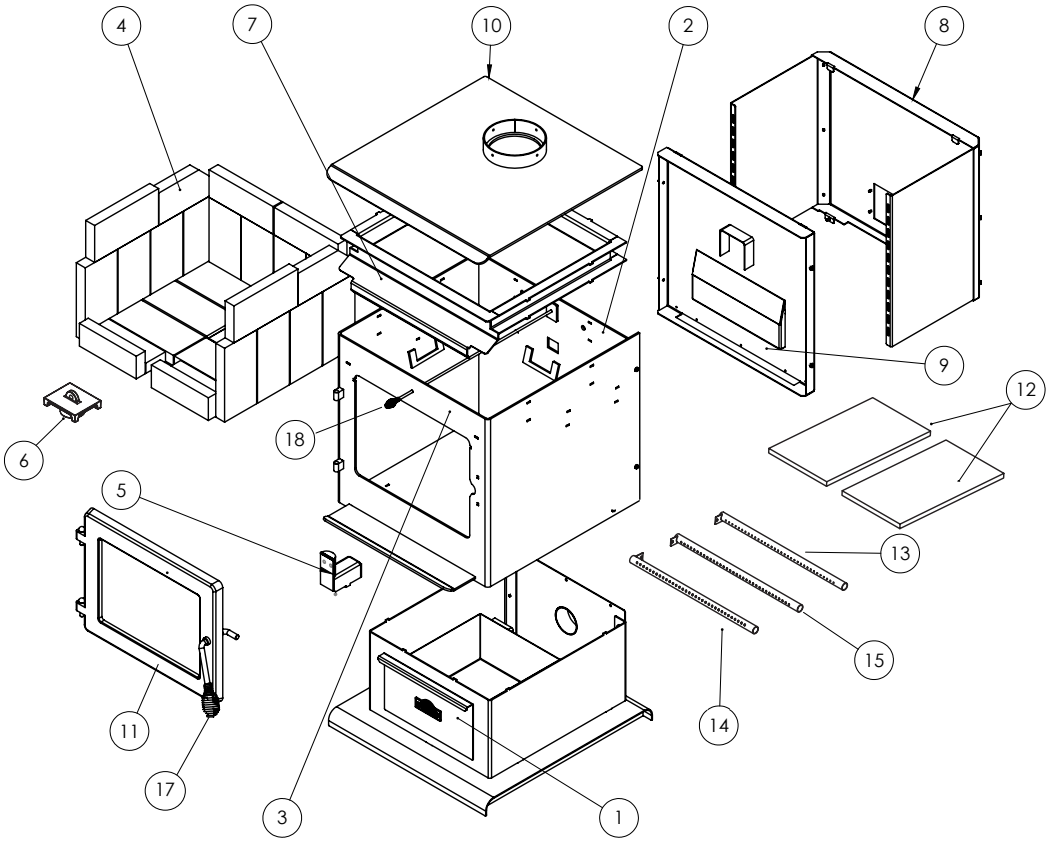
SERVICE PARTS MODEL C110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66914	8" x 2.5" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	66835	Ash Pan
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields
9	N/A	Blower Panel
10	N/A	Top

ITEM NO.	PART NUM.	DESCRIPTION
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)
17	66836	Spring Handle
18	66853	Flue Spring Handle
*	66860	Door Pin (Not Shown)

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CANYON LODGE®
SIGNATURE HEARTH SERIES BY MR. HEATER

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

C110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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INSTALLER: LEAVE THIS MANUAL WITH THE APPLIANCE. CONSUMER: SAVE THESE INSTRUCTIONS.

	OPERATING INSTRUCTIONS AND OWNER'S MANUAL	Model #
		D110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD FIRE STOVE



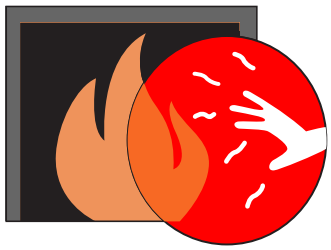
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-800-251-0001

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SPECIFICATIONS

Model #	D110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.
** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

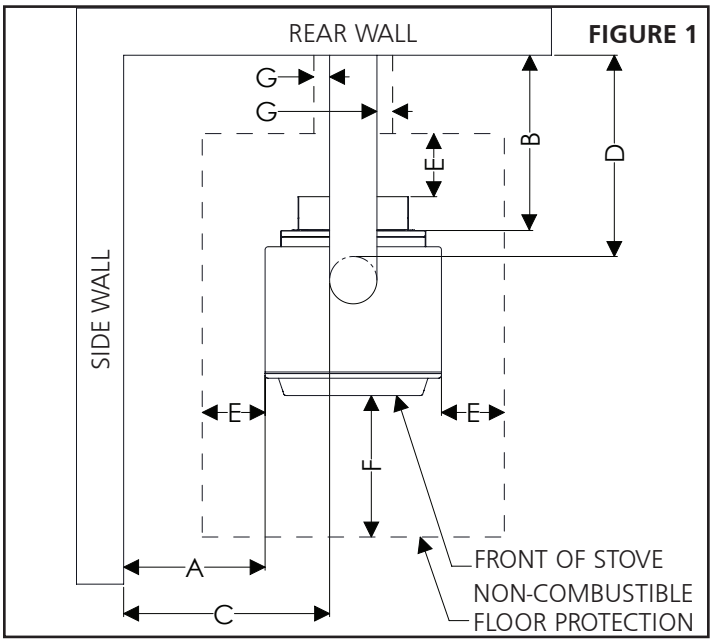


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

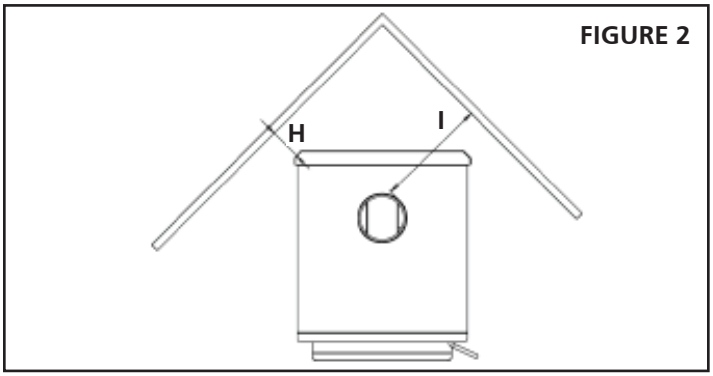


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated. Check inside the stove to find the blower contained in protective packaging.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

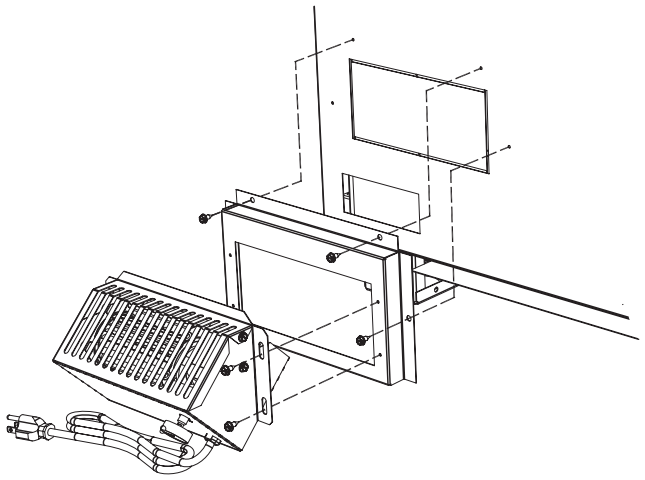


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Enerco Group with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: In Canada, installation must conform to CAN/CSA-B365 when passing through combustible construction, illustrated in Figure 4 on next page.

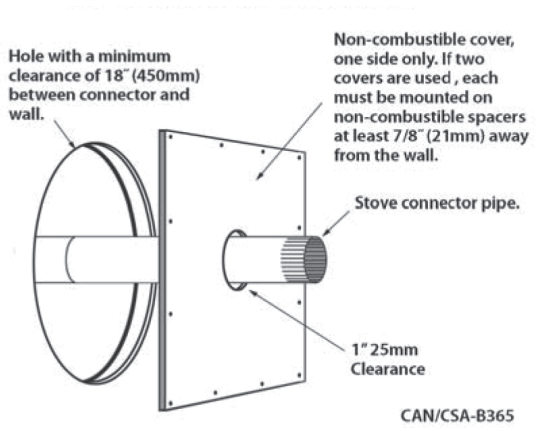


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

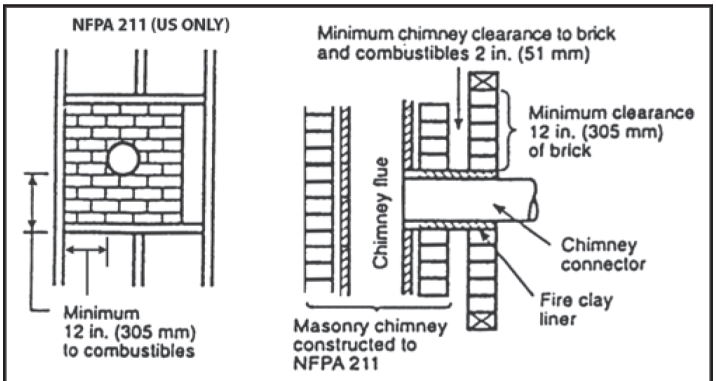


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

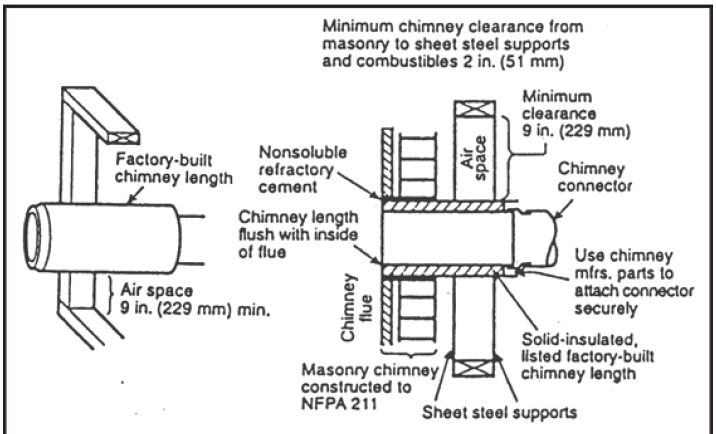


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

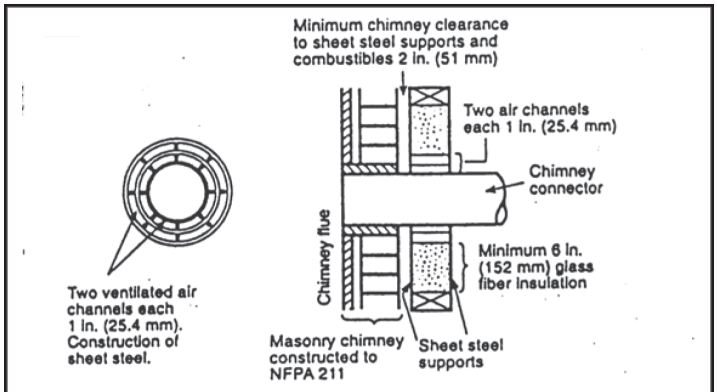


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

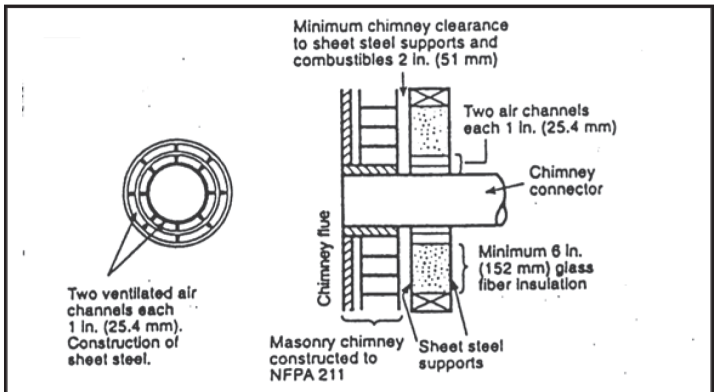


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - — The duct must have a minimum diameter of 4 inches (10.2 cm).
  - — The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - — The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - — The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - — A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

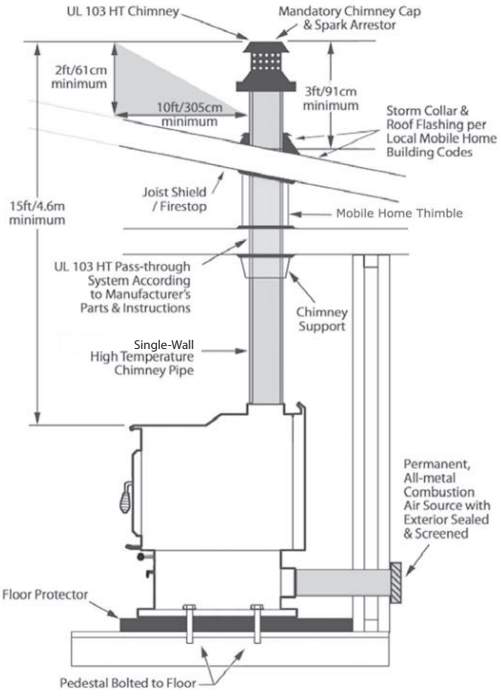


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

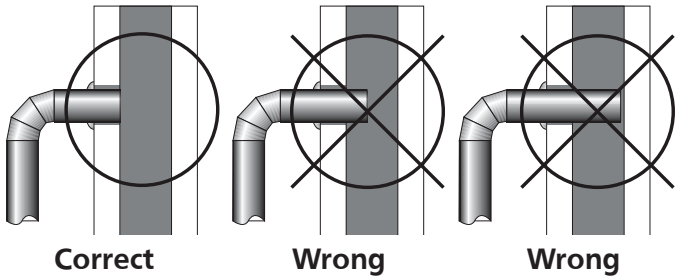


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

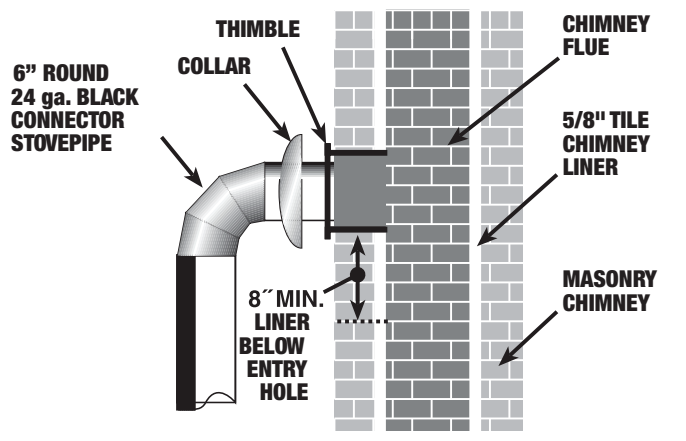


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

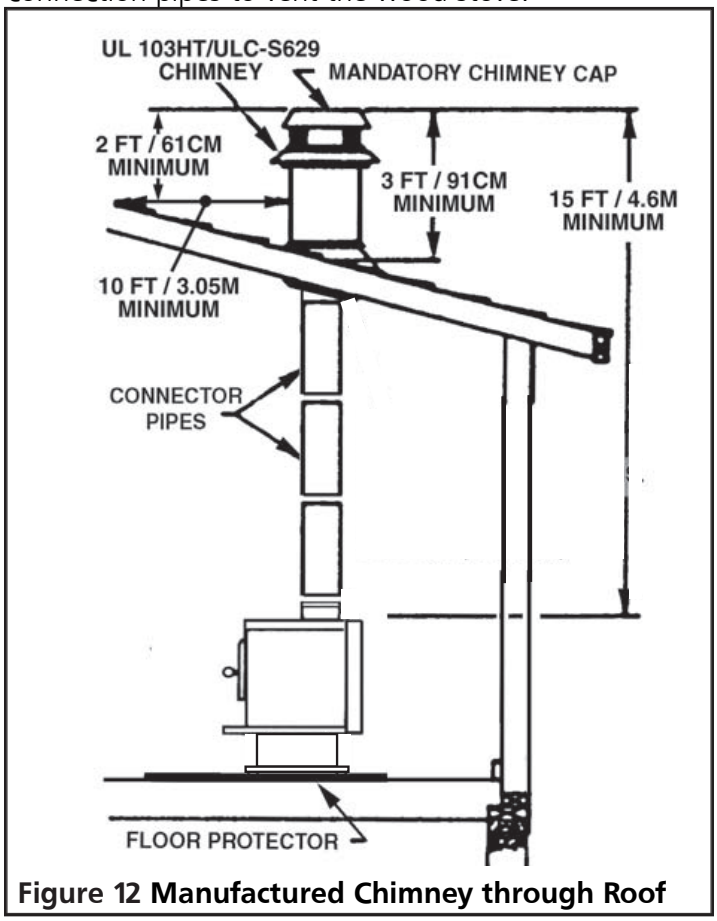


Figure 12 Manufactured Chimney through Roof

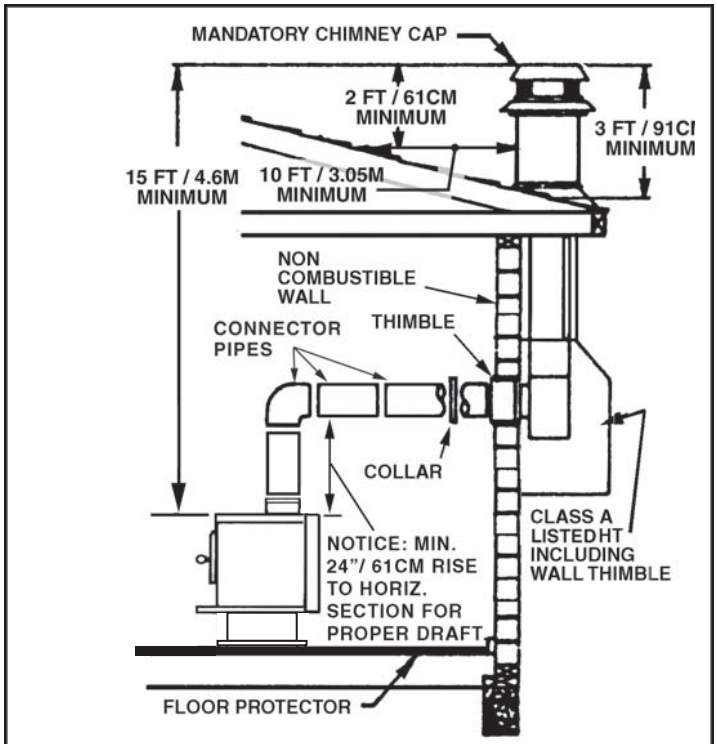


Figure 13
Manufactured Chimney through Masonry Wall

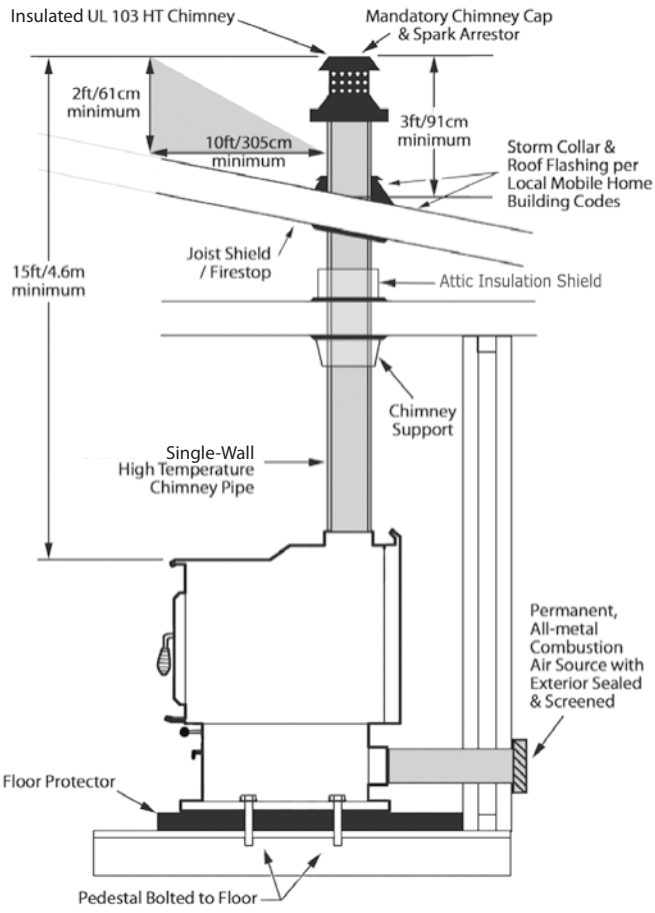


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

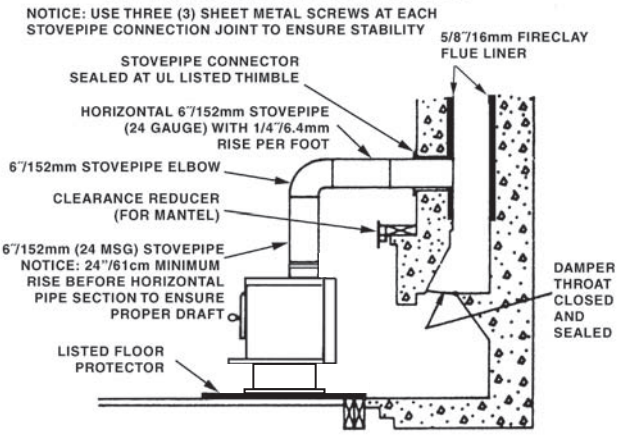


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

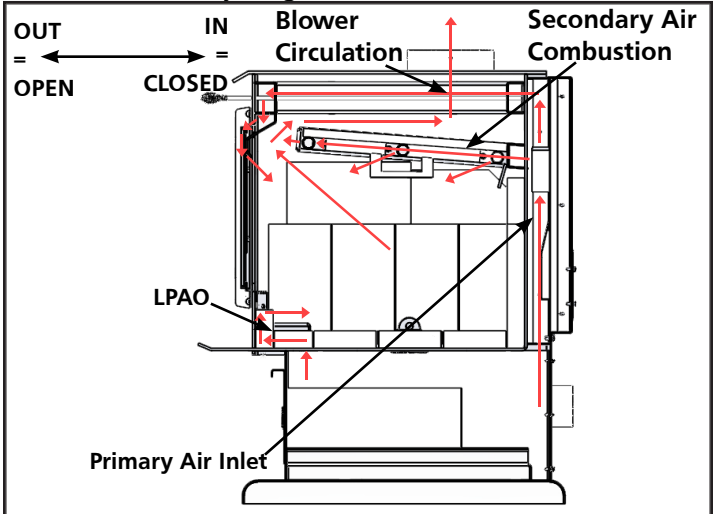


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

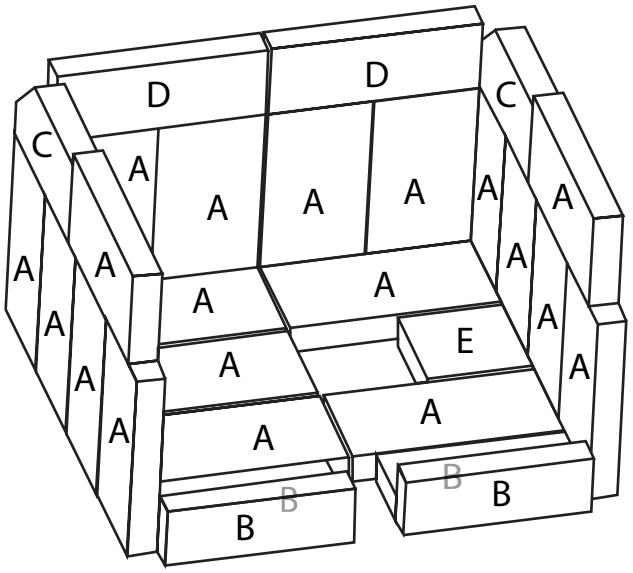


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes. The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page <?>.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.
2. GET OUT OF THE HOUSE OR BUILDING.
3. CALL THE FIRE DEPARTMENT.

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page <?>.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase an Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

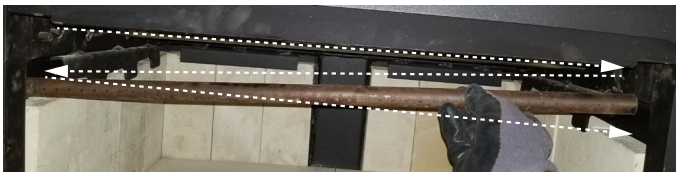


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

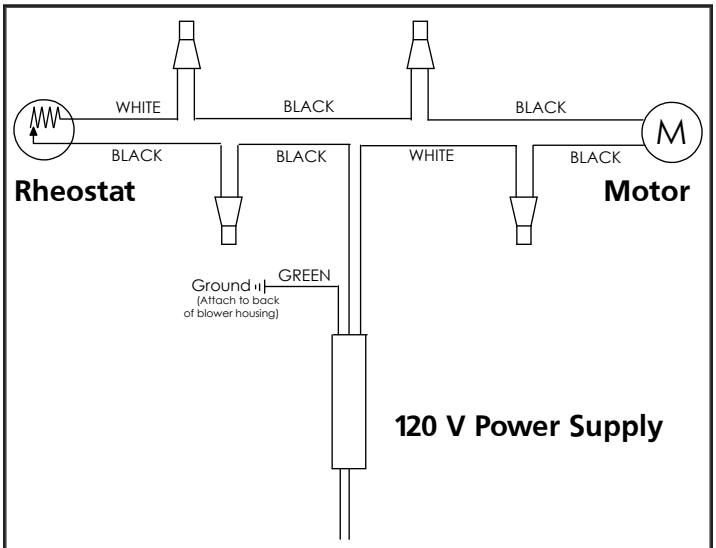
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



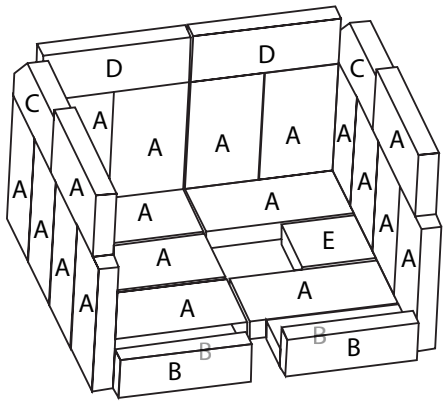
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

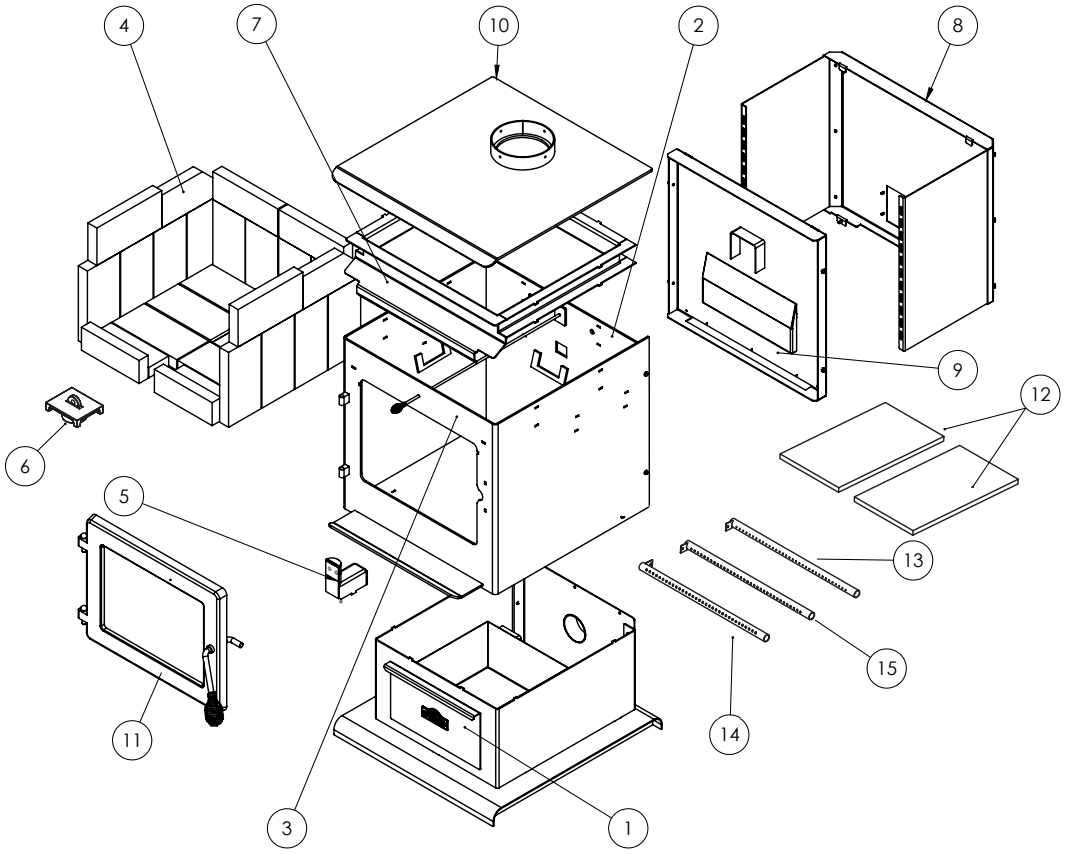
SERVICE PARTS MODEL D110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66711	8" x 2.75" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	N/A	Ash Bin
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields

ITEM NO.	PART NUM.	DESCRIPTION
9	N/A	Blower Panel
10	N/A	Top
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)

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OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

D110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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	OPERATING INSTRUCTIONS AND OWNER'S MANUAL	Model #
		J110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD FIRE STOVE



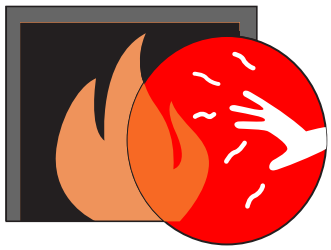
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-800-251-0001 66764 REV B

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SAFETY PRECAUTIONS.....4
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CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION.....7
ADDITIONAL MOBILE HOME REQUIREMENTS....9
CHIMNEY REQUIREMENTS.....10
VENTILATION.....13
OPERATION.....14
MAINTENANCE.....18
TROUBLESHOOTING.....21
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SPECIFICATIONS

Model #	J110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.

** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

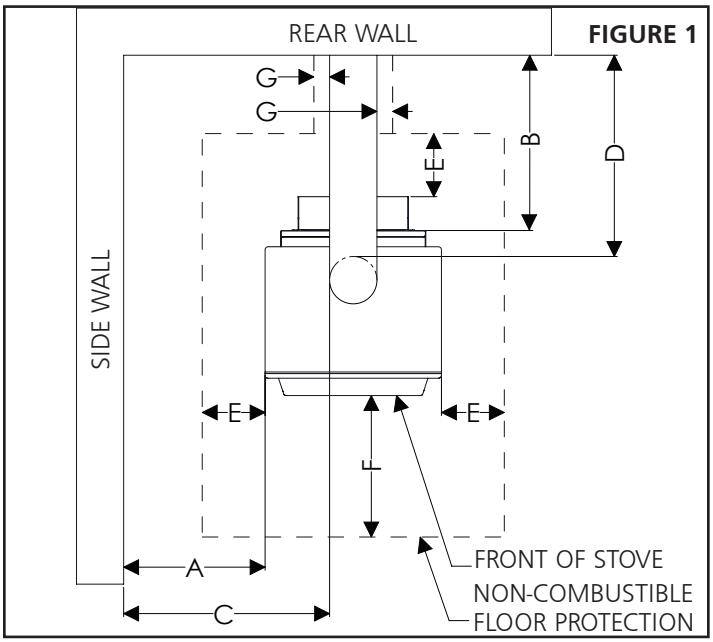


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

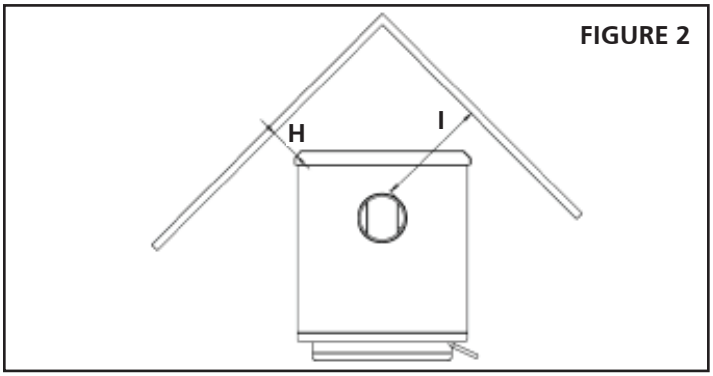


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated. Check inside the stove to find the blower contained in protective packaging.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

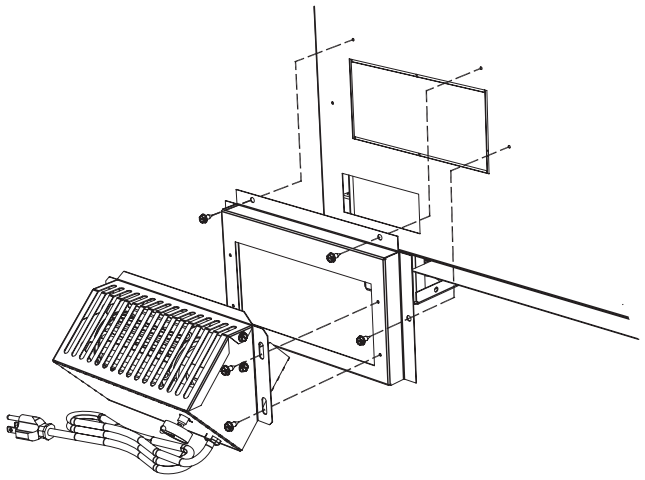


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Enerco Group with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: In Canada, installation must conform to CAN/CSA-B365 when passing through combustible construction, illustrated in Figure 4 on next page.

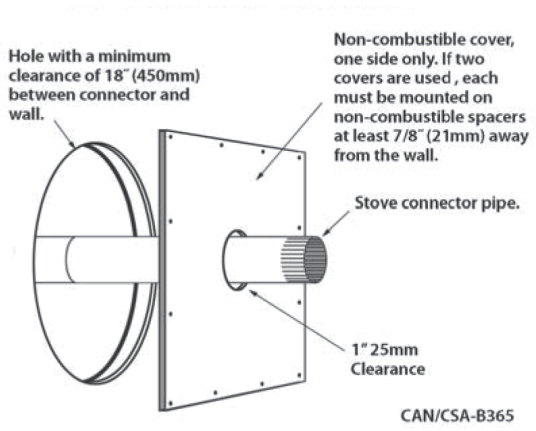


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

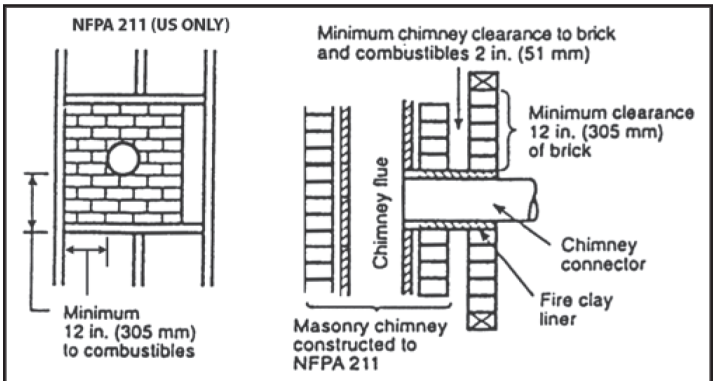


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

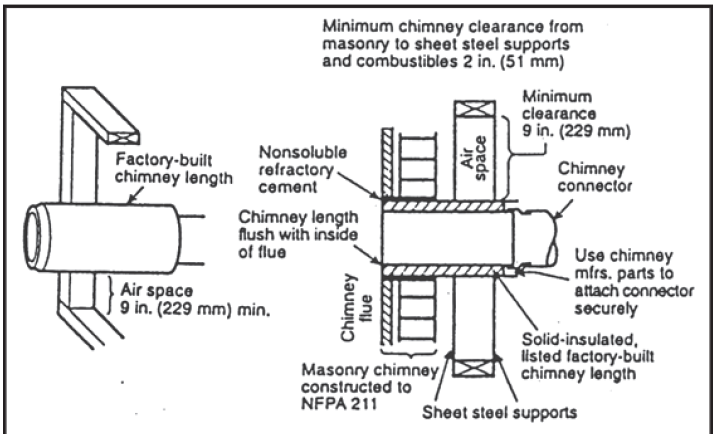


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

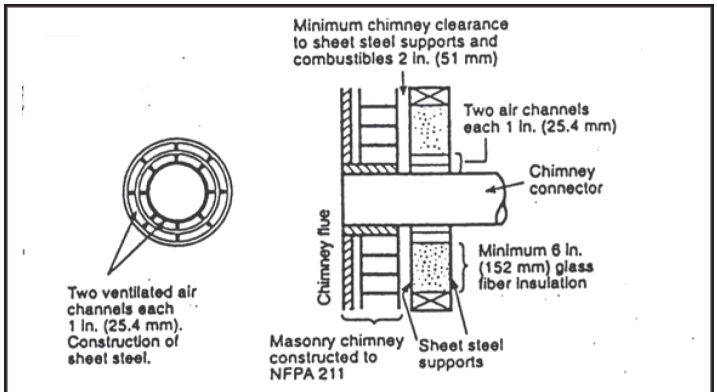


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

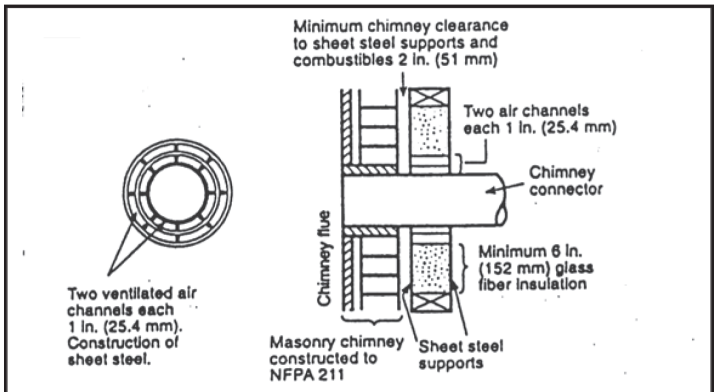


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - — The duct must have a minimum diameter of 4 inches (10.2 cm).
  - — The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - — The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - — The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - — A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

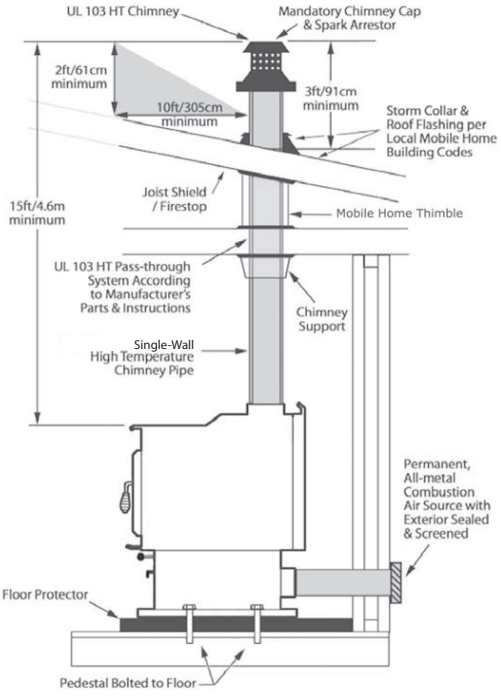


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

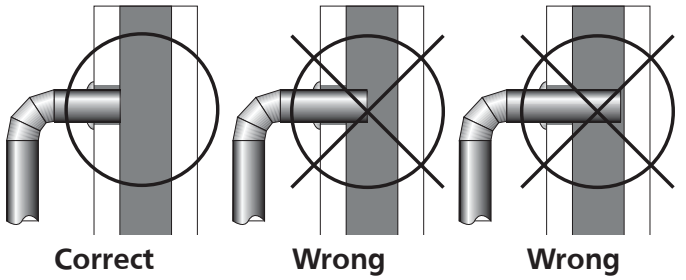


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

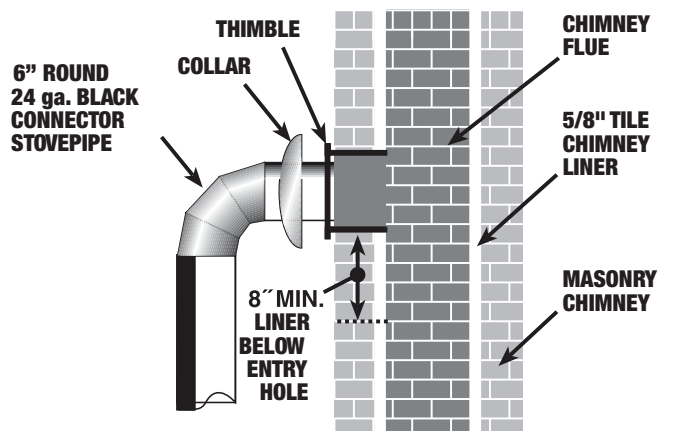


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

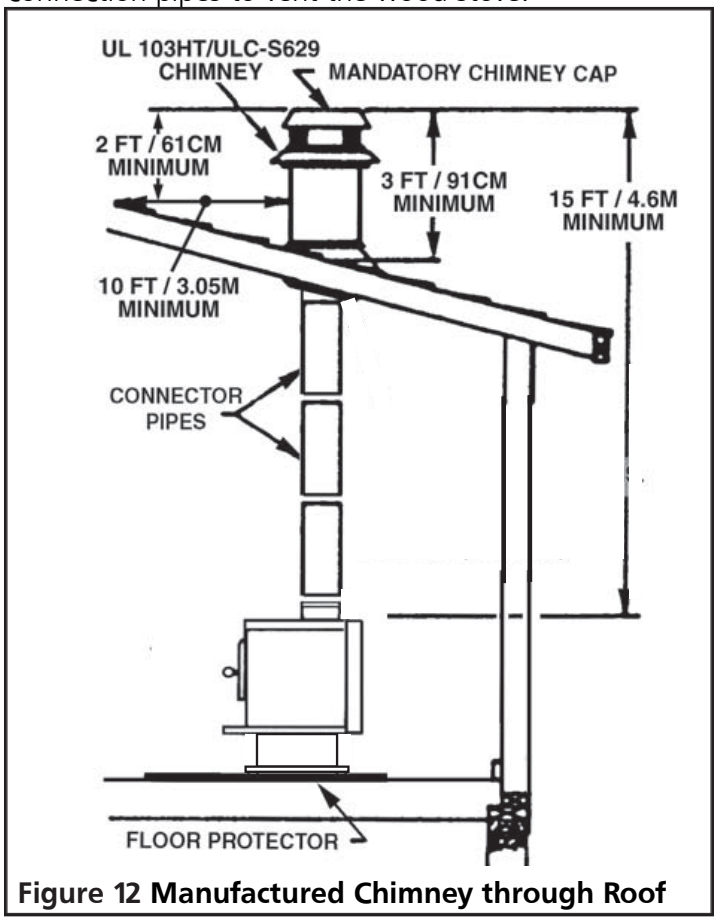


Figure 12 Manufactured Chimney through Roof

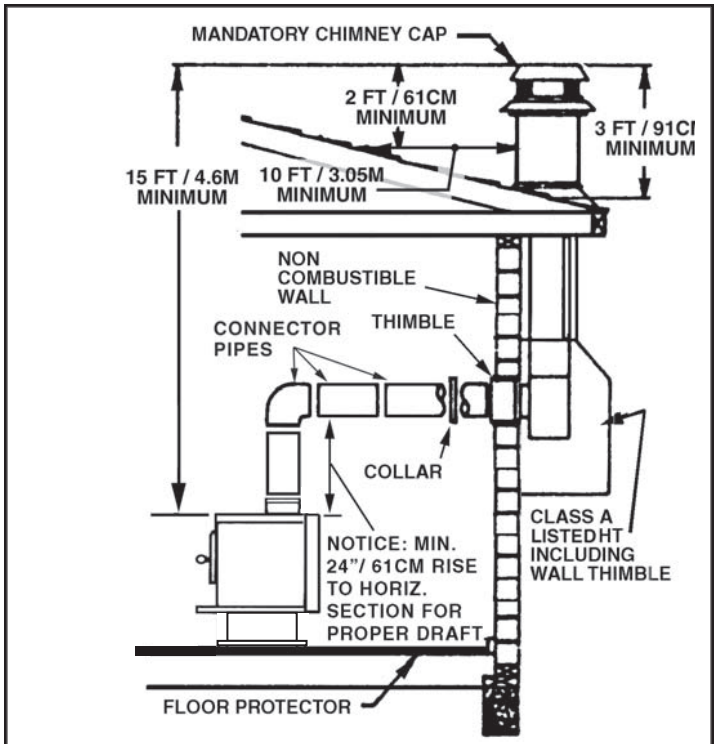


Figure 13
Manufactured Chimney through Masonry Wall

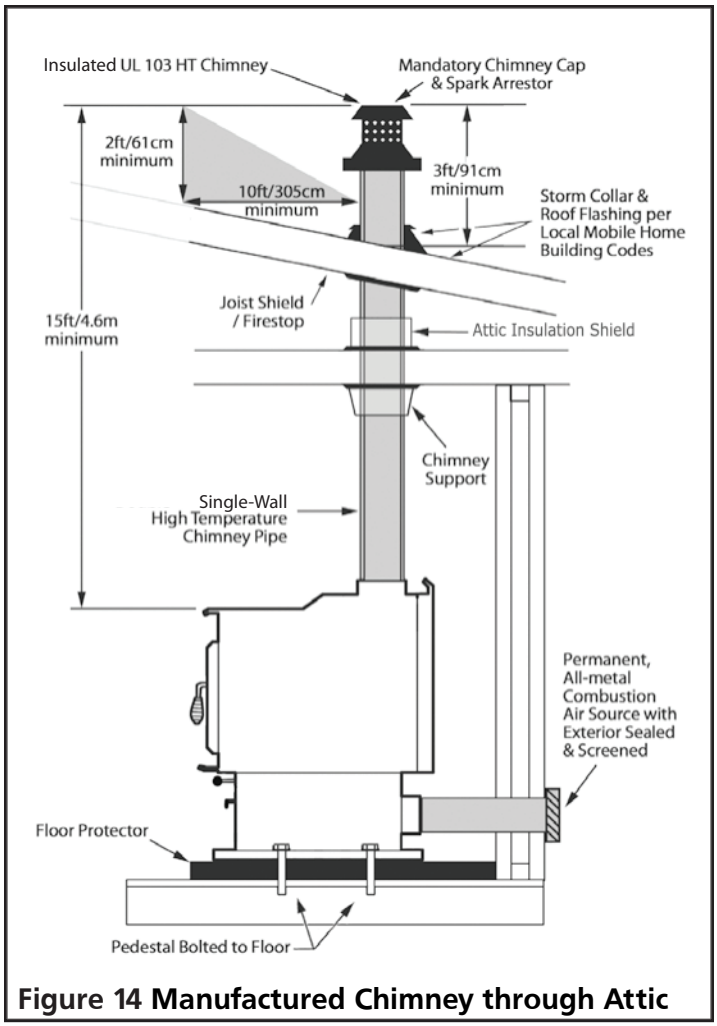


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

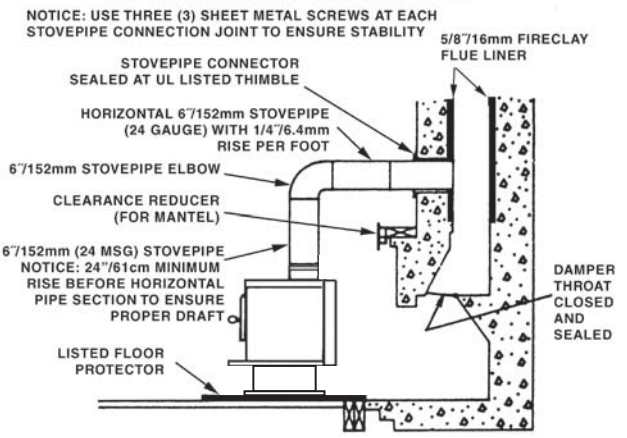


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

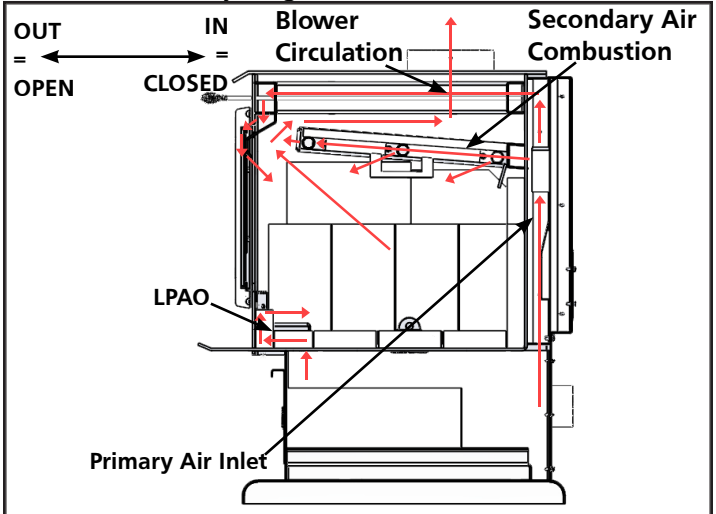


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

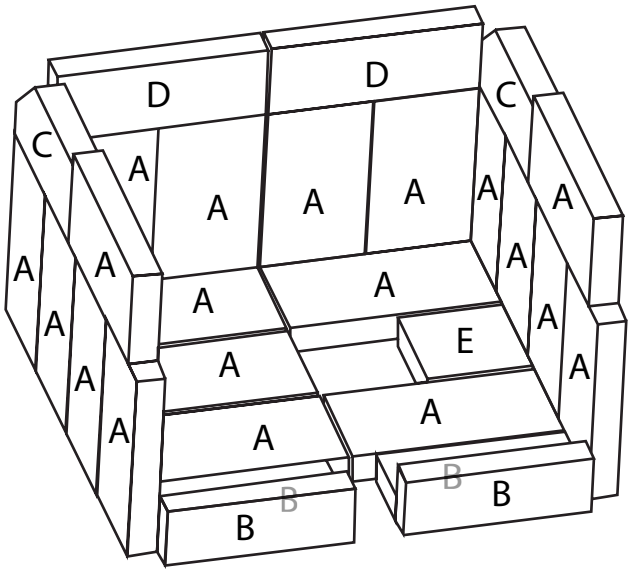


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes.

The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page <?>.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings. Immediately close the load door and set the air control to maximum open (all the way out).
5. After 5 minutes set the control to the medium air flow position which is 3/8 pulled from fully closed.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase an Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

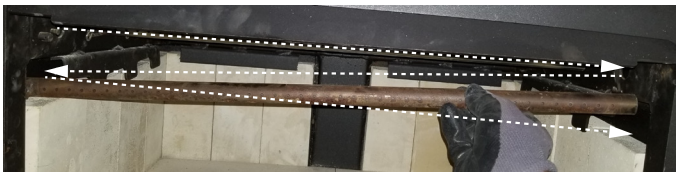


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

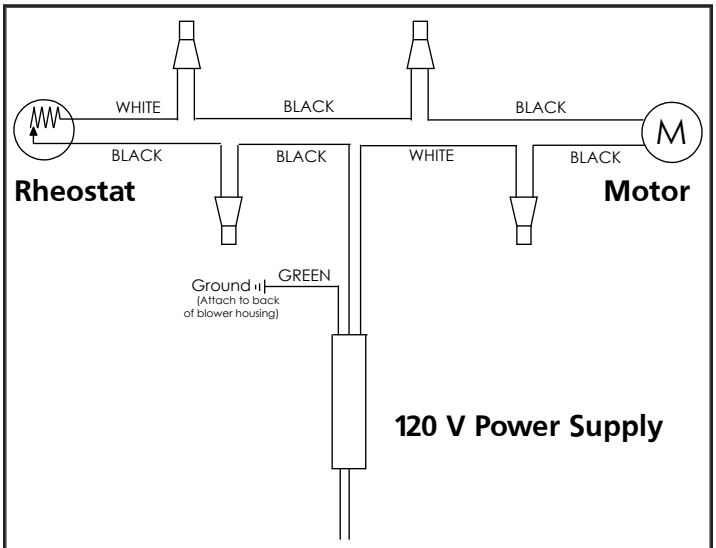
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



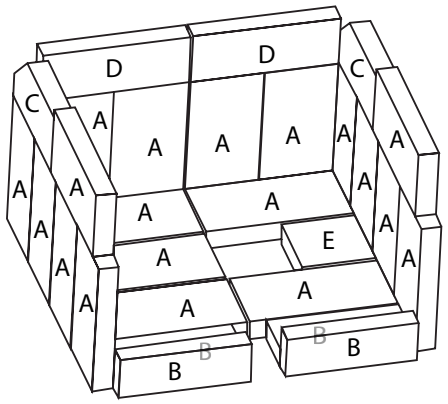
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

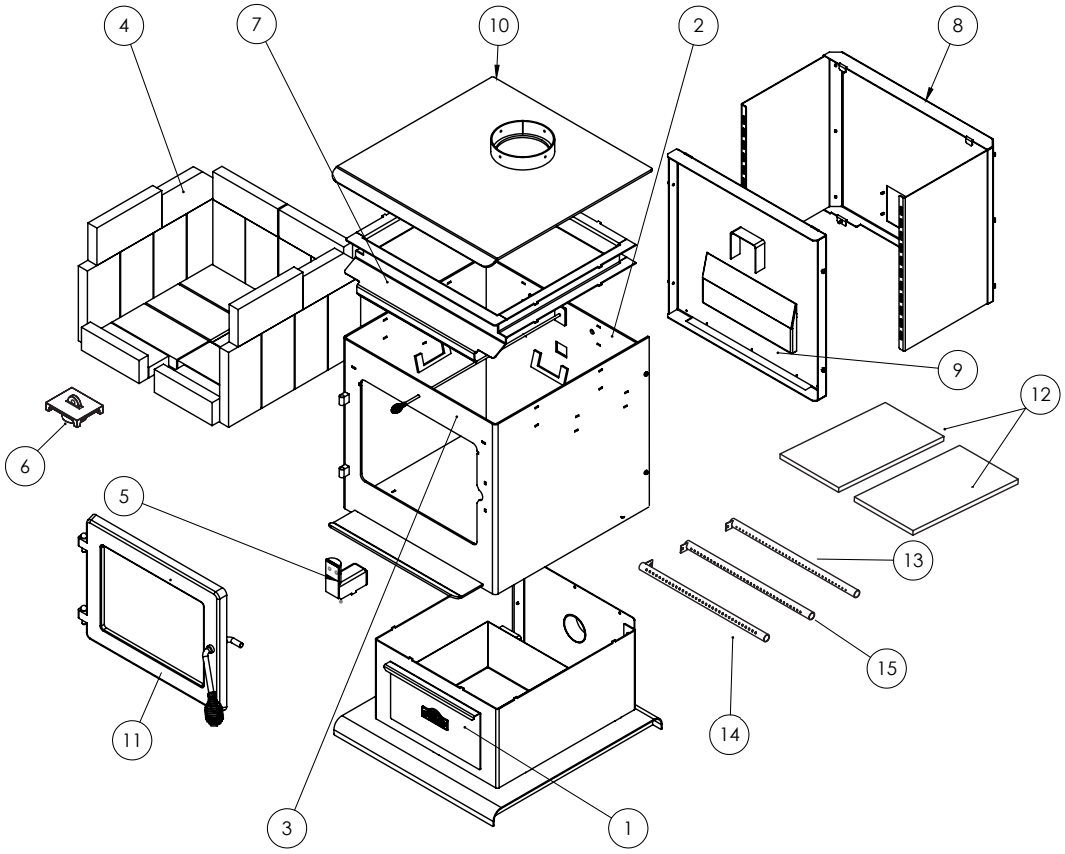
SERVICE PARTS MODEL J110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66711	8" x 2.75" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	N/A	Ash Bin
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields

ITEM NO.	PART NUM.	DESCRIPTION
9	N/A	Blower Panel
10	N/A	Top
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)

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OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

J110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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MASTER FORGE™

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

WS110
(ITEM# 4976278)

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD STOVE



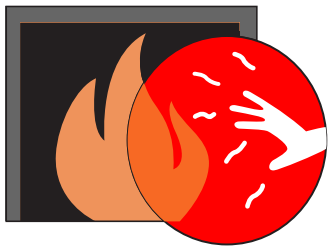
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-833-950-1184

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov.

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SPECIFICATIONS

Model #	WS110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.
** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

Wood Stove Efficiency Reference:
1. Measured per CSA B415.1-10
2. Higher Heating Value of the fuel
3. Lower Heating Value of the fuel
4. Low Burn Rate & Extended Burn Time
5. Heat transfer efficiency represents the appliance's ability to convert the energy contained in the solid fuels into energy transferred to the room in the form of heat and does not take into account the chemical losses during combustion.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

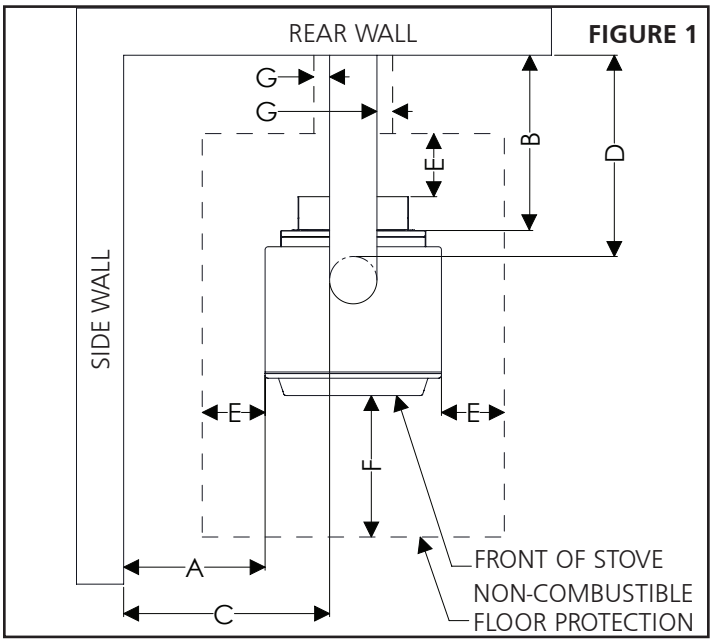


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

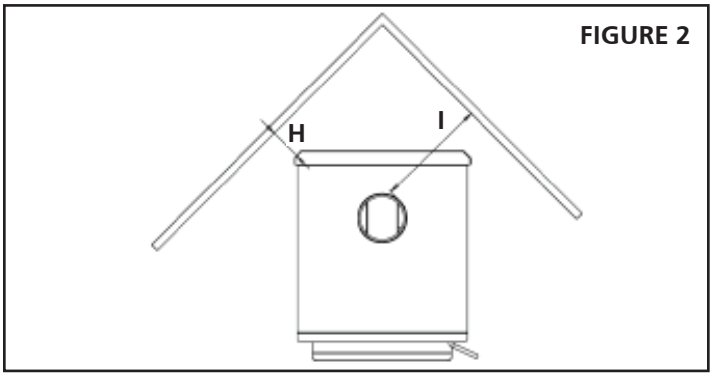


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500330) (Not Included)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

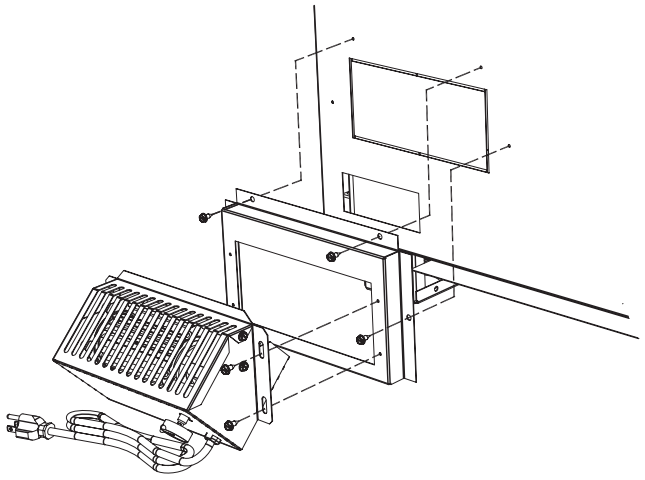


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. only. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (The stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Master Forge with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group at 1-833-950-1184
  • Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows, the integrity of the draft can be best protected by using non-adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: In Canada, installation must conform to CAN/CSA-B365 when passing through combustible construction, illustrated in Figure 4 on next page.

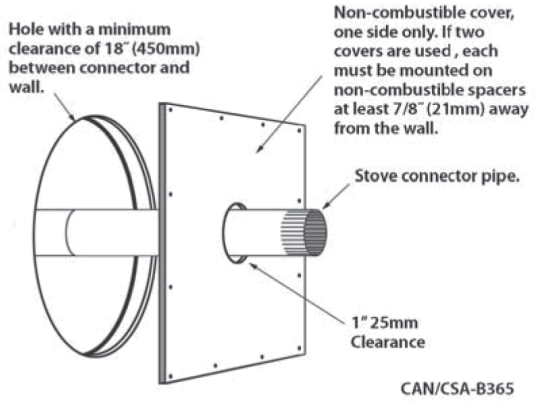


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

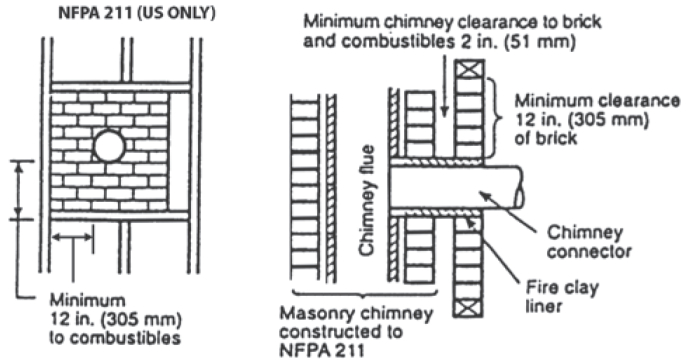


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

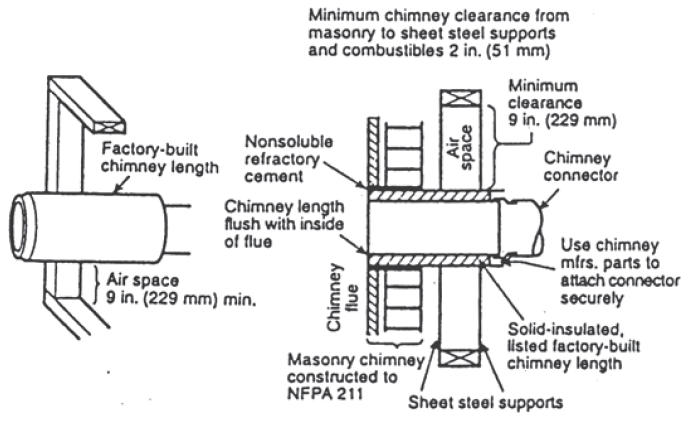


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

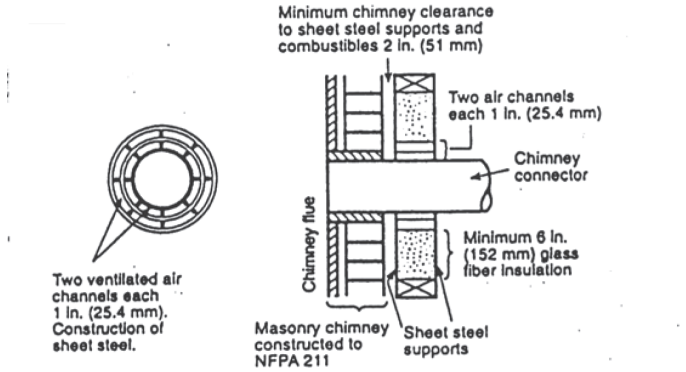


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

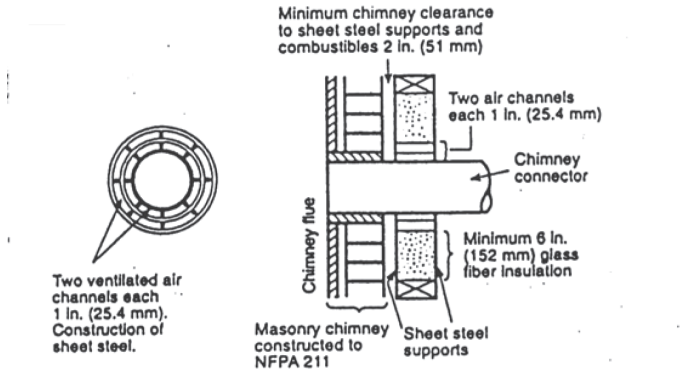


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove for connecting this unit to outside combustion air, provided the following rules are followed:
  - — The duct must have a minimum diameter of 4 inches (10.2 cm).
  - — The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - — The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - — The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - — A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

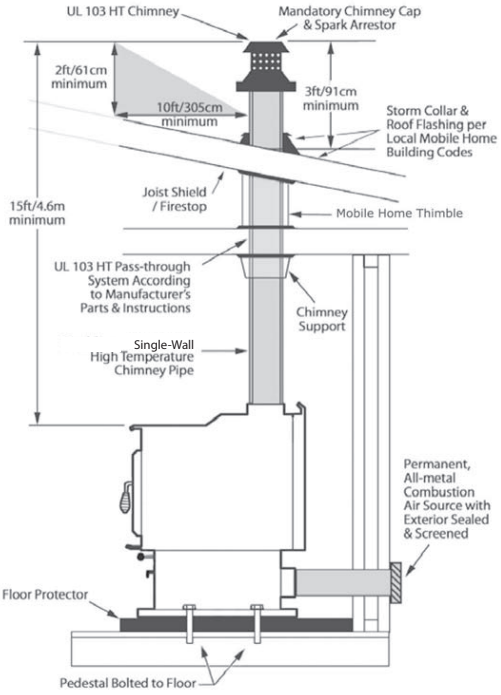


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap.
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

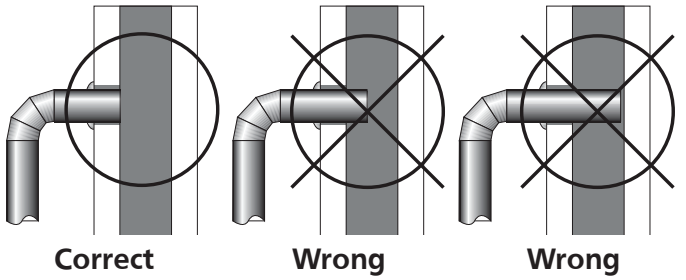


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney.
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

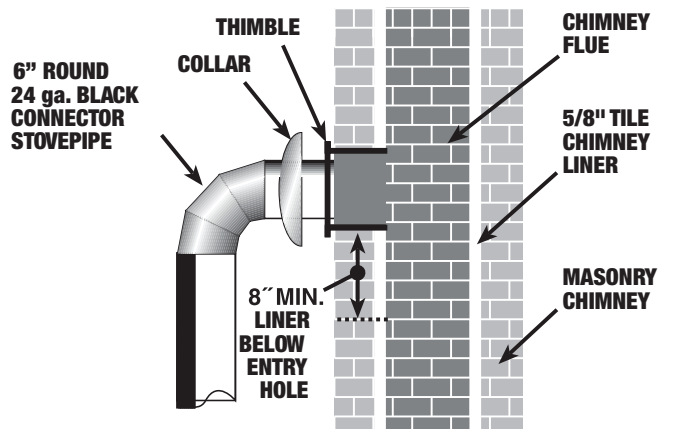


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimneys are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

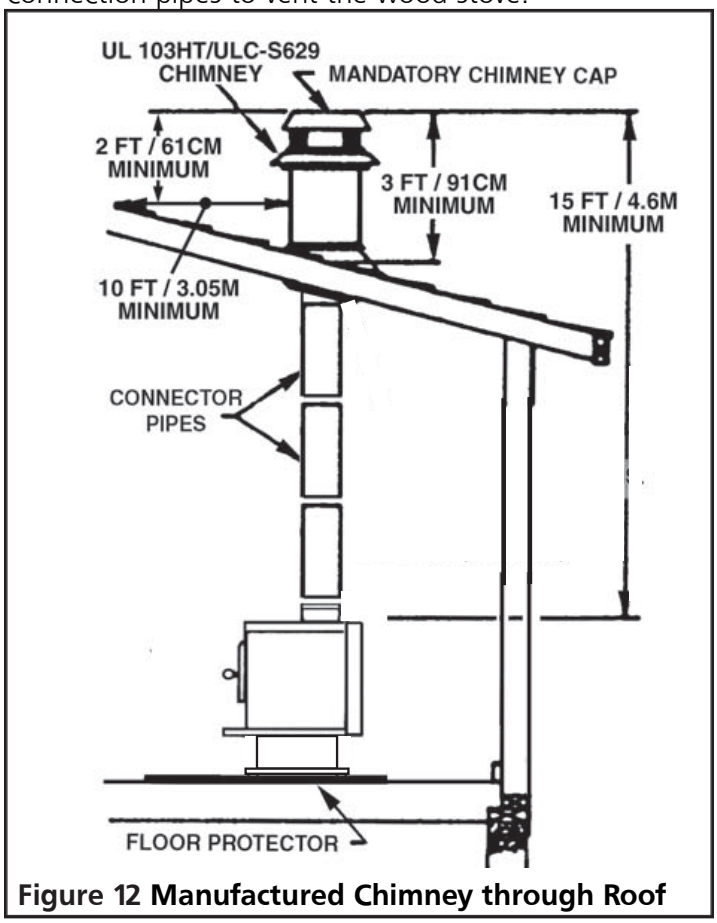


Figure 12 Manufactured Chimney through Roof

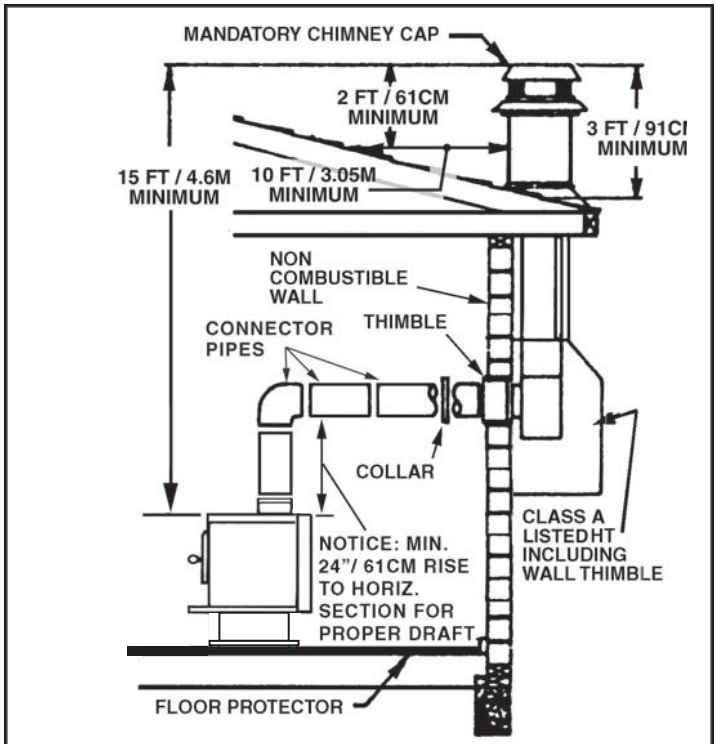


Figure 13
Manufactured Chimney through Masonry Wall

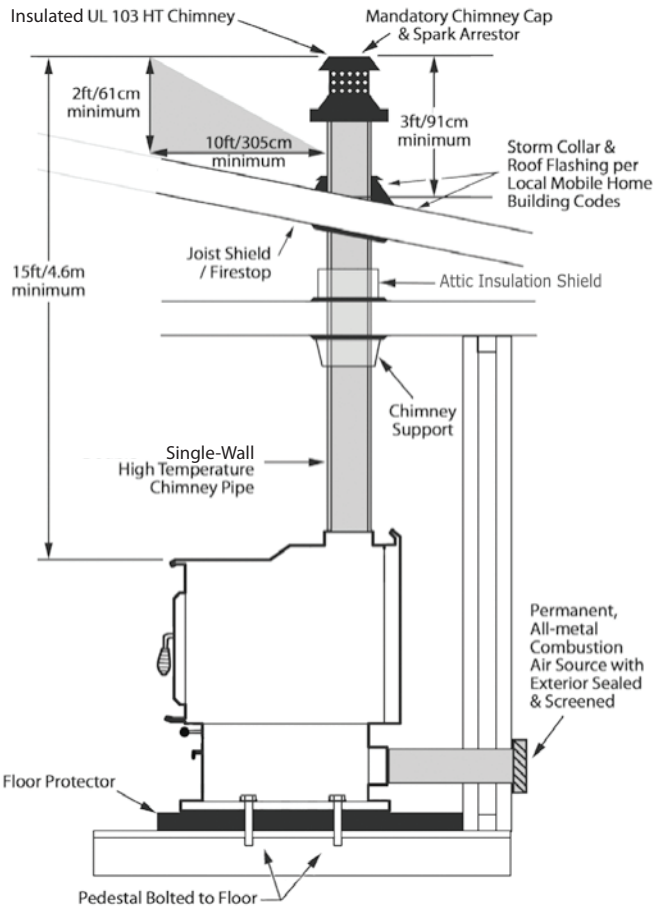


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound.
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay.
   - Be at least 5/8 inch (16 mm) thick.
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10).
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

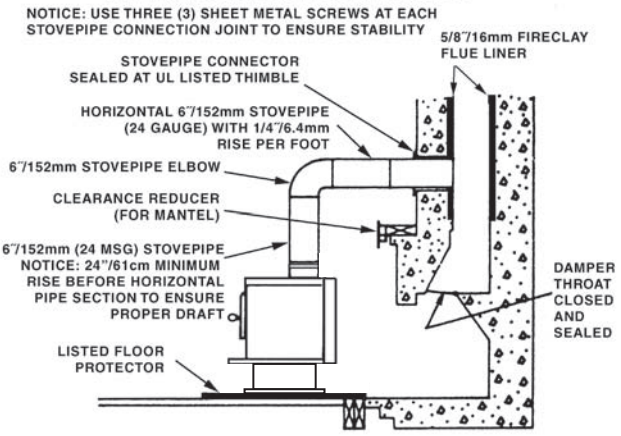


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

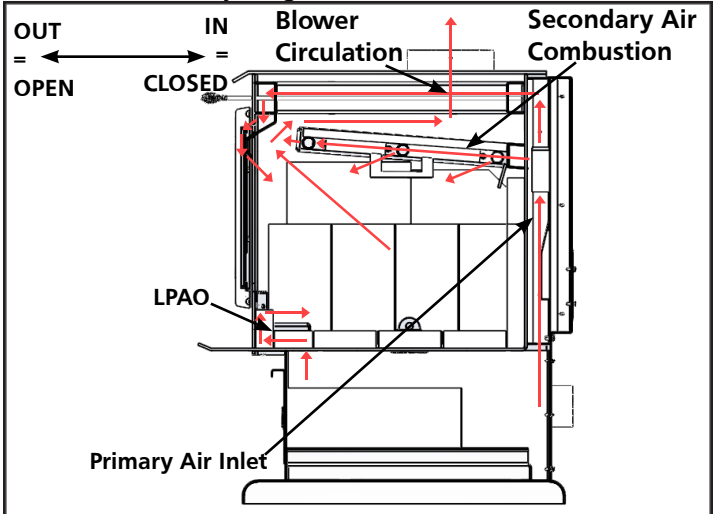


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight-fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause back-puffing into the room and 'plugging' of the chimney.
Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.
An uncontrollable burn or excessive temperature indicates excessive draft.
Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATE STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

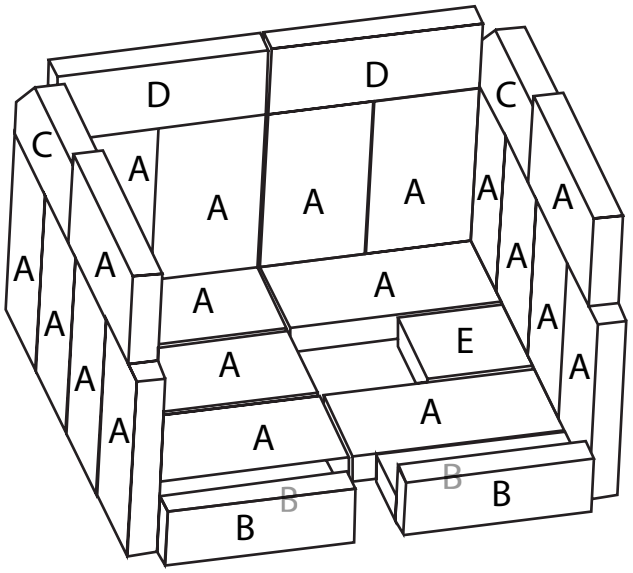


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE STOVE.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well-ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes.

The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page 18.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.
2. GET OUT OF THE HOUSE OR BUILDING.
3. CALL THE FIRE DEPARTMENT.

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug, remove ash bin, and empty into a suitable container.
3. Ashes should be placed in a metal container with a tight-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE MASTER FORGE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in. (381 mm) x 11.25 in. (285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away, and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall, this pattern looks like the letter Z. See Figure 20.

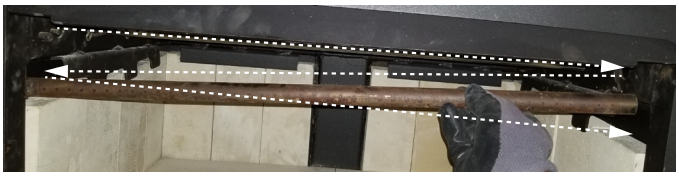


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

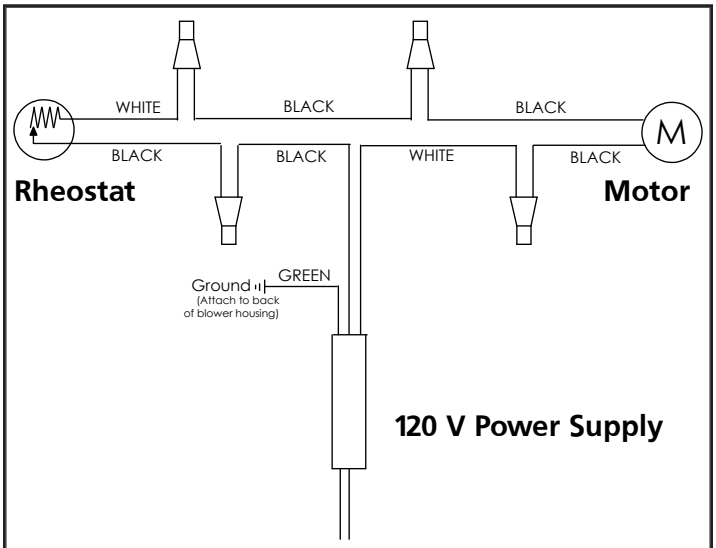
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as described above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



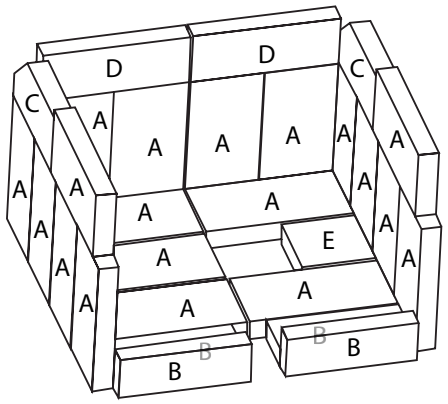
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

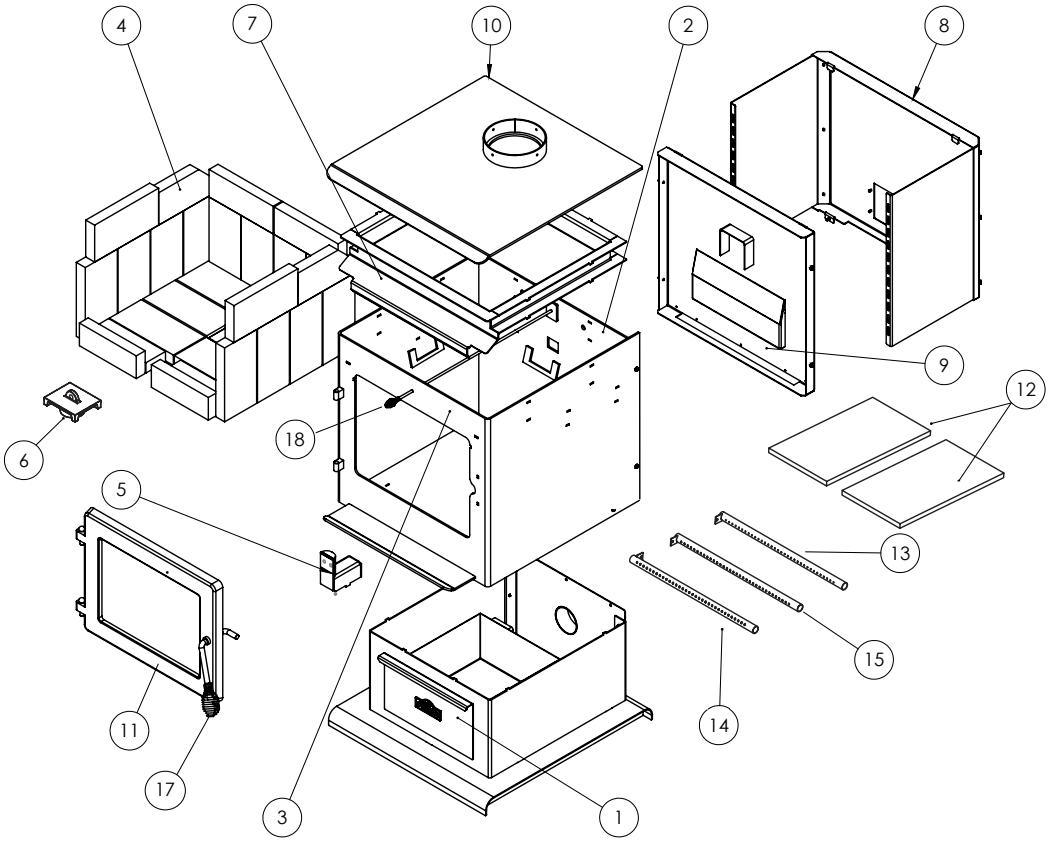
SERVICE PARTS MODEL WS110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66914	8" x 2.5" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	66835	Ash Bin
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields
9	N/A	Blower Panel
10	N/A	Top

ITEM NO.	PART NUM.	DESCRIPTION
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)
17	66836	Spring Handle
18	66853	Flue Spring Handle
*	66860	Door Pin (Not Shown)

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MASTER FORGE™

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

WS110
(ITEM# 4976278)

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY MASTER FORGE LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-833-950-1184
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five-year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-833-950-1184.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically, there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135
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Printed in Thailand

INSTALLER: LEAVE THIS MANUAL WITH THE APPLIANCE. CONSUMER: SAVE THESE INSTRUCTIONS.

CLEVELAND IRON WORKS

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

H110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

HURON WOOD FIRE STOVE



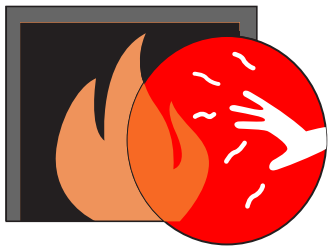
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION.....7
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SPECIFICATIONS

Model #	H110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.

** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

Wood Stove Efficiency Reference:

1. Measured per CSA B415.1-10
2. Higher Heating Value of the fuel
3. Lower Heating Value of the fuel
4. Low Burn Rate & Extended Burn Time
5. Heat transfer efficiency represents the appliance's ability to convert the energy contained in the solid fuels into energy transferred to the room in the form of heat and does not take into account the chemical losses during combustion.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

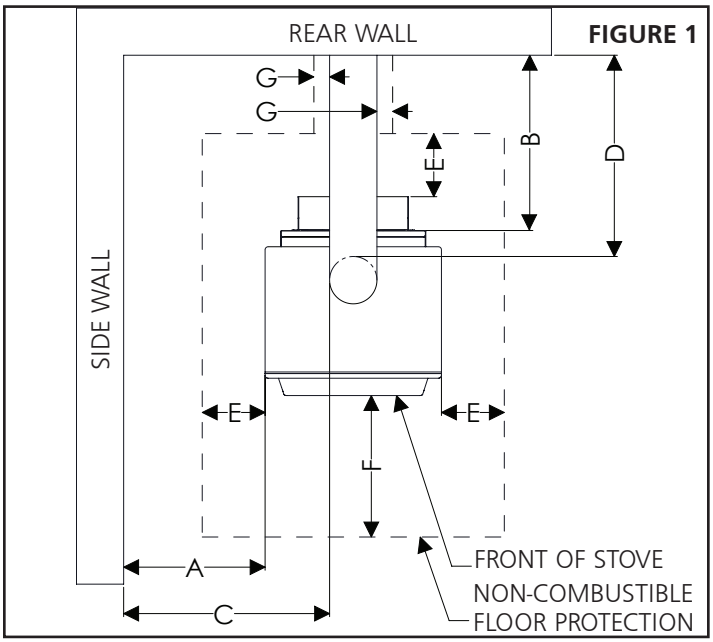


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

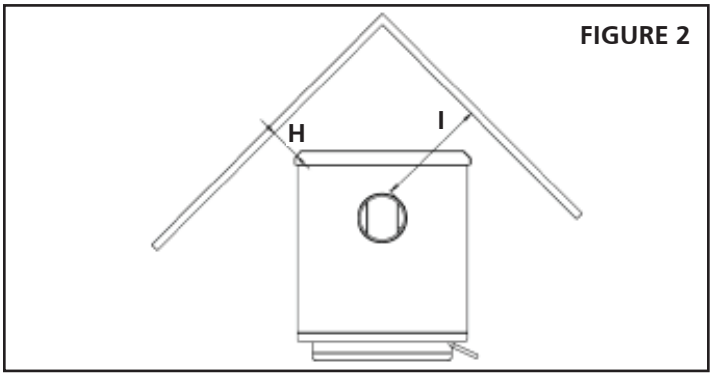


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308) (Not Included)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

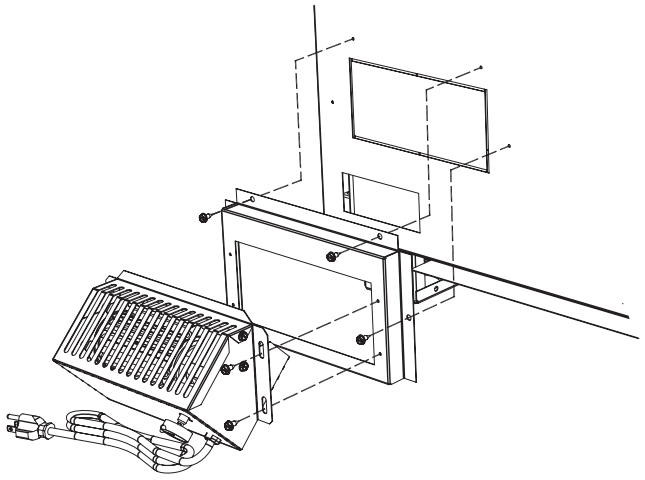


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Cleveland Iron Works with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: For Canadian residential and transportable homes or structures installations, where passage through a wall, or partition of combustible construction is desired, the installation must conform to CAN/CSA-B365. See Figure 4.

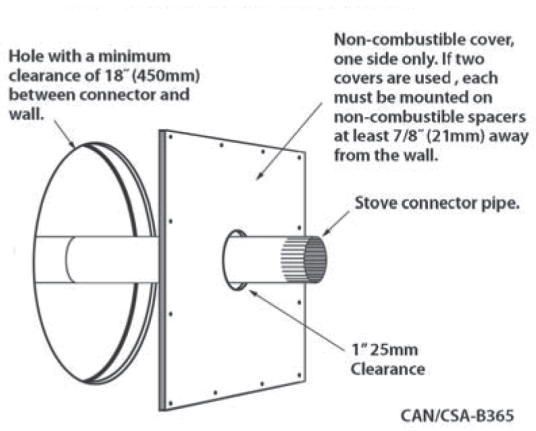


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

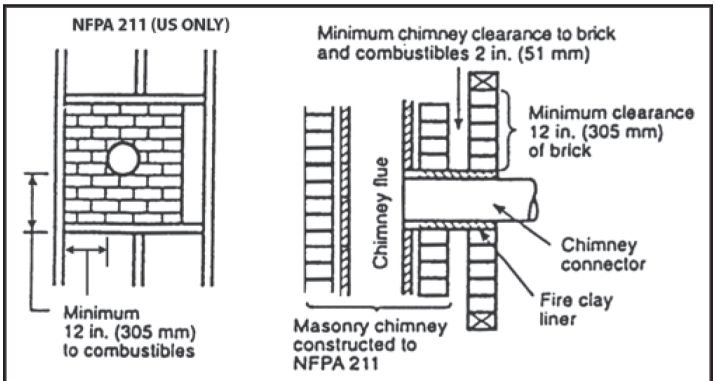


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

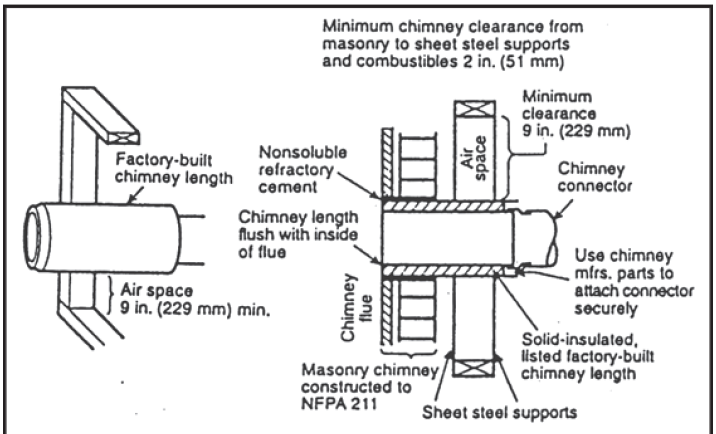


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

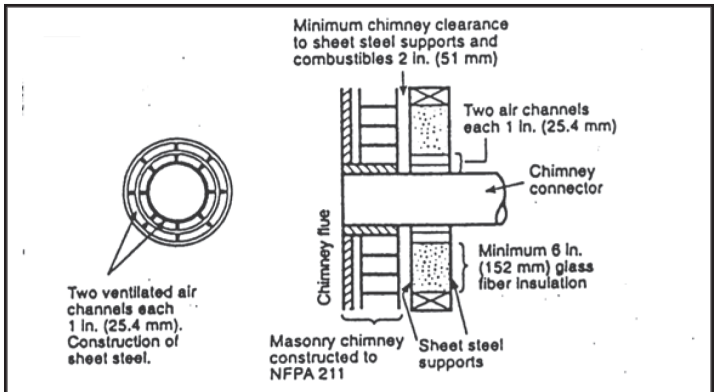


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

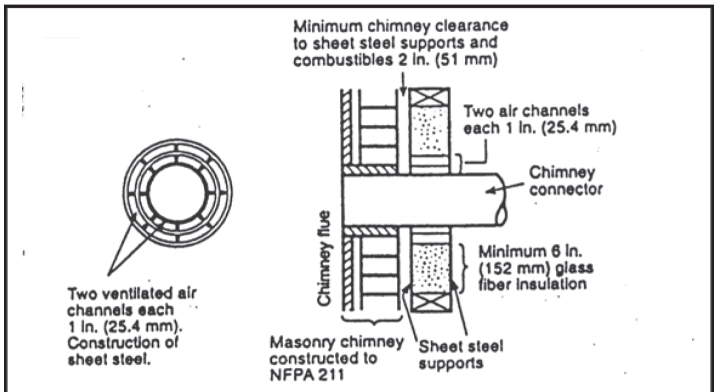


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Cleveland Iron Works, Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - The duct must have a minimum diameter of 4 inches (10.2 cm).
  - The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

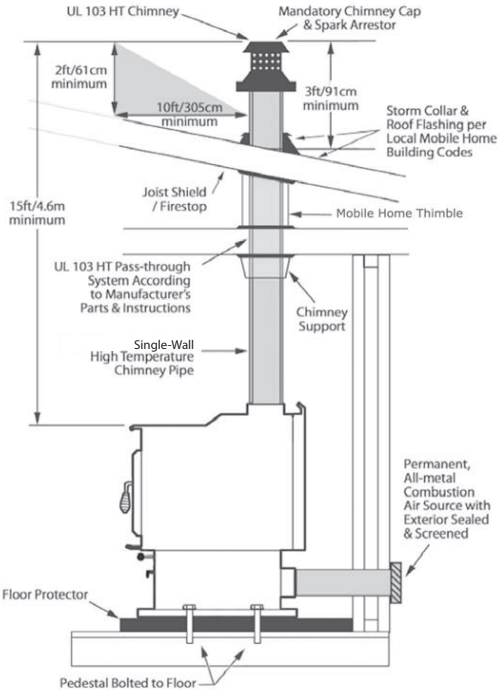


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

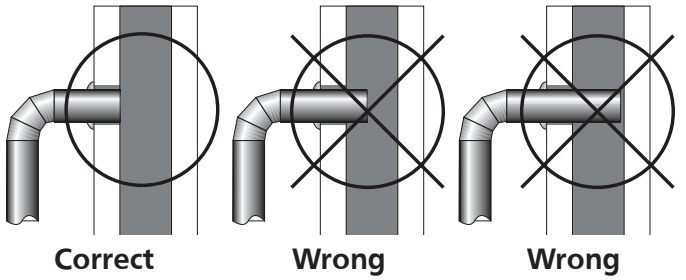


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

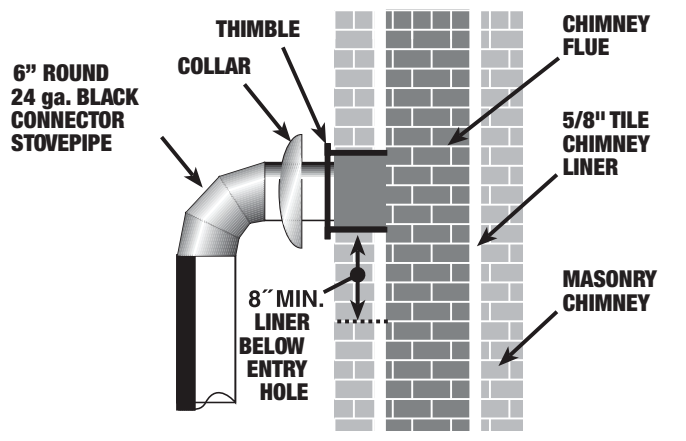


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

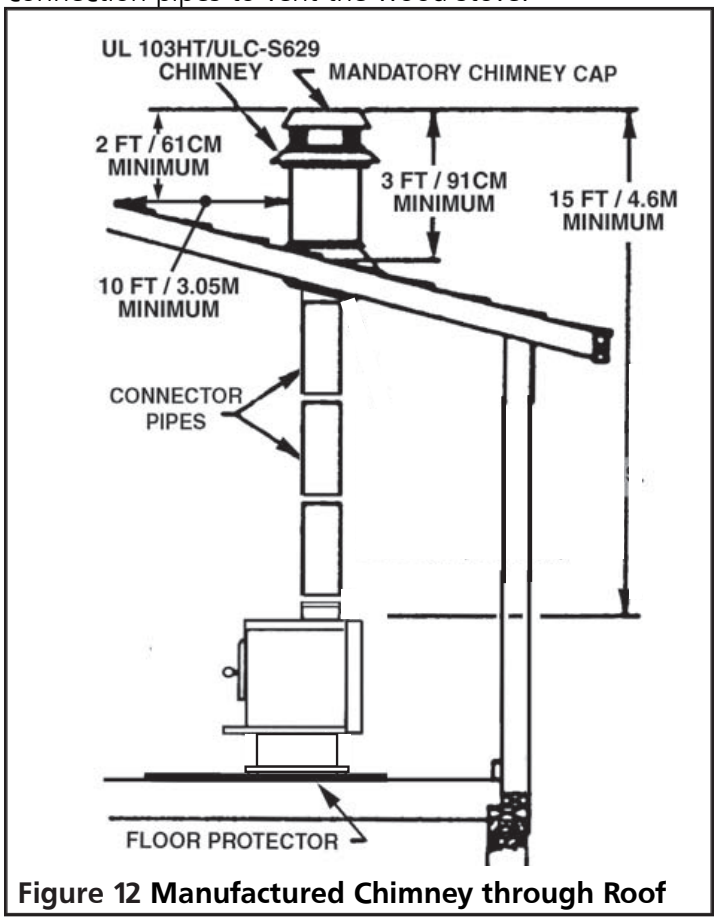


Figure 12 Manufactured Chimney through Roof

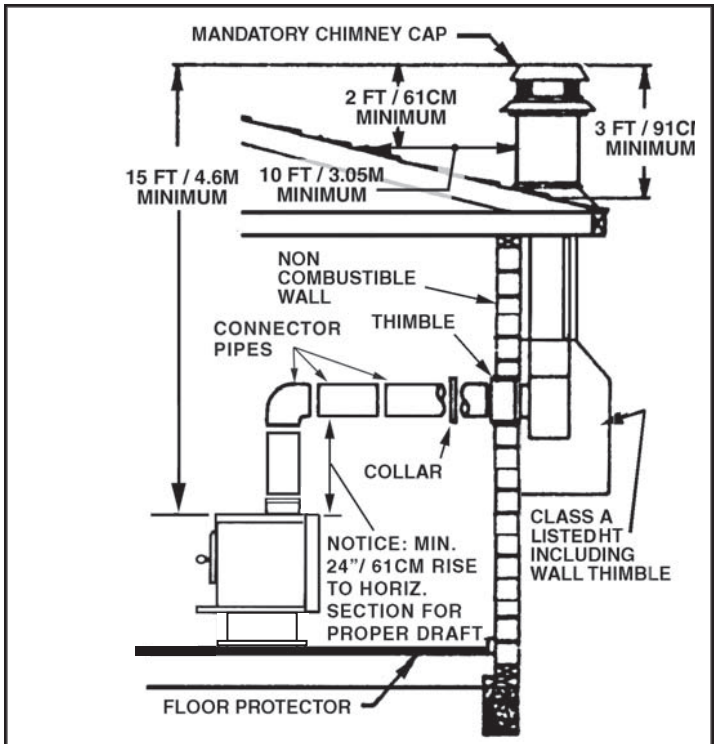


Figure 13
Manufactured Chimney through Masonry Wall

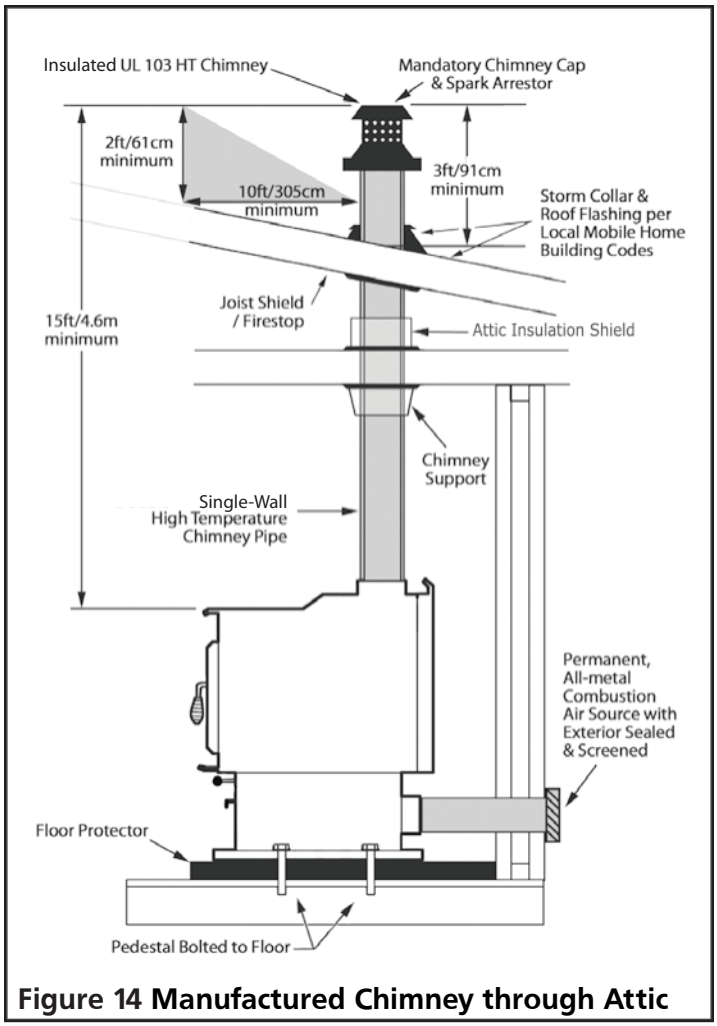


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

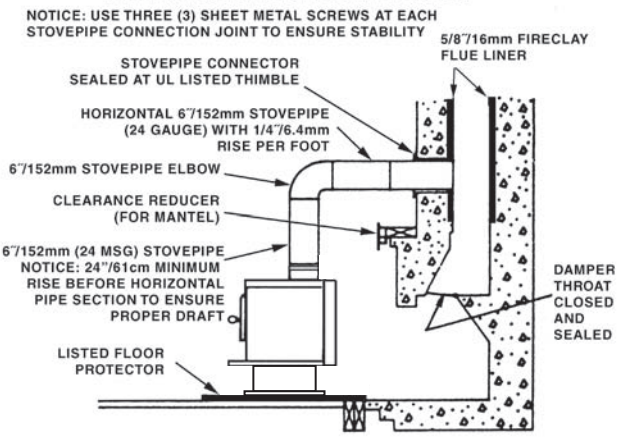


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

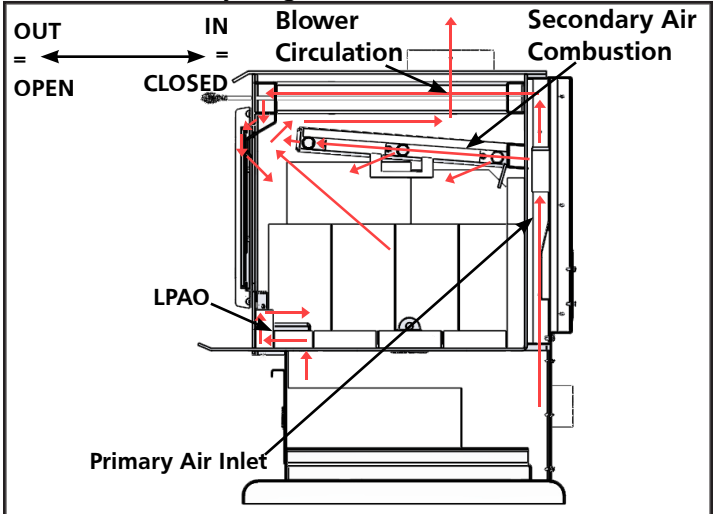


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

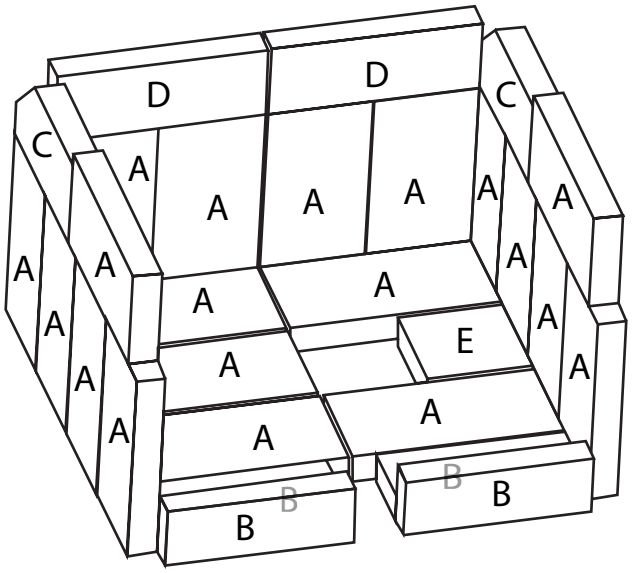


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes.

The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page <?>.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings. Immediately close the load door and set the air control to maximum open (all the way out).
5. After 5 minutes set the control to the medium air flow position which is 3/8 pulled from fully closed.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase a Cleveland Ironworks Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE CLEVELAND IRONWORKS WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

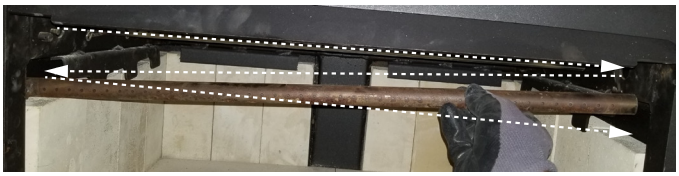


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

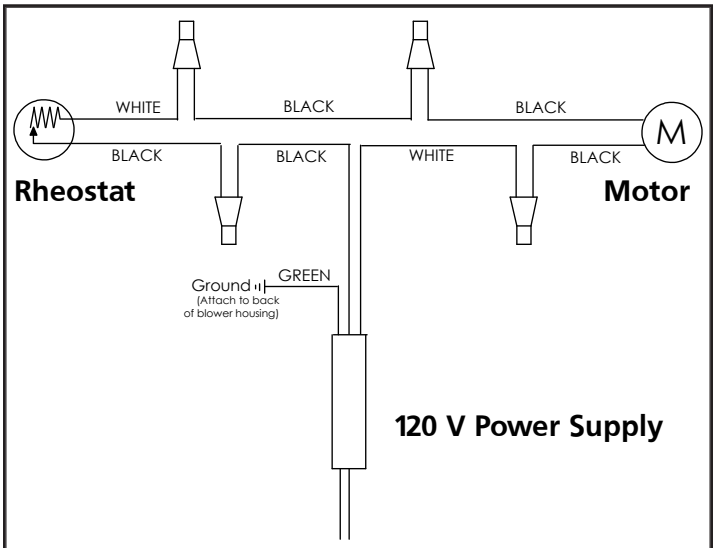
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



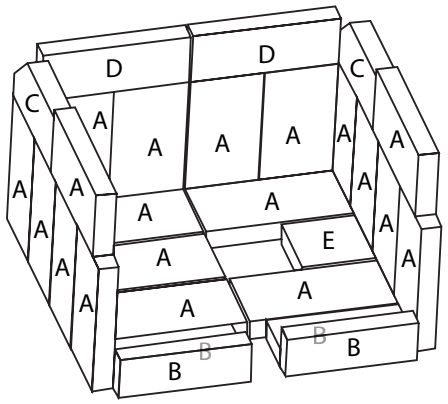
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

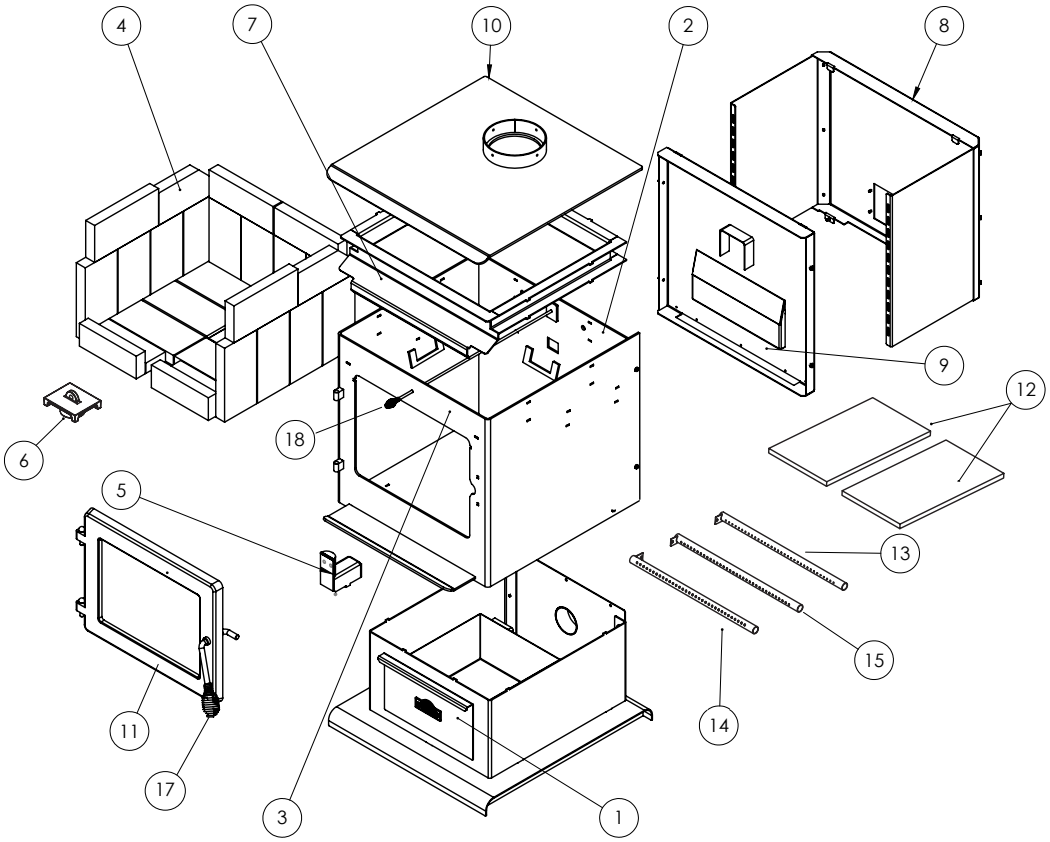
SERVICE PARTS MODEL H110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66914	8" x 2.5" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	66835	Ash Pan
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields
9	N/A	Blower Panel
10	N/A	Top

ITEM NO.	PART NUM.	DESCRIPTION
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)
17	66836	Spring Handle
18	66853	Flue Spring Handle
*	66860	Door Pin (Not Shown)

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CLEVELAND IRON WORKS

OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

H110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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INSTALLER: LEAVE THIS MANUAL WITH THE APPLIANCE. CONSUMER: SAVE THESE INSTRUCTIONS.

Grand Teton COLLECTION By Enerco Heater	**OPERATING INSTRUCTIONS AND OWNER'S MANUAL**	Model #
		T110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

YELLOWSTONE WOOD FIRE STOVE



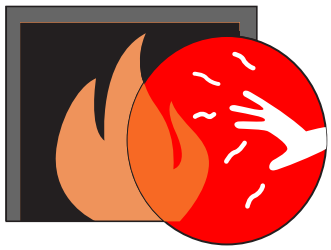
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-866-740-2497/1-800-251-0001
66772 REV H

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SPECIFICATIONS

Model #	T110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Heat Transfer Efficiency (HHV)	75% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.
** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

Wood Stove Efficiency Reference:
1. Measured per CSA B415.1-10
2. Higher Heating Value of the fuel
3. Lower Heating Value of the fuel
4. Low Burn Rate & Extended Burn Time
5. Heat transfer efficiency represents the appliance's ability to convert the energy contained in the solid fuels into energy transferred to the room in the form of heat and does not take into account the chemical losses during combustion.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

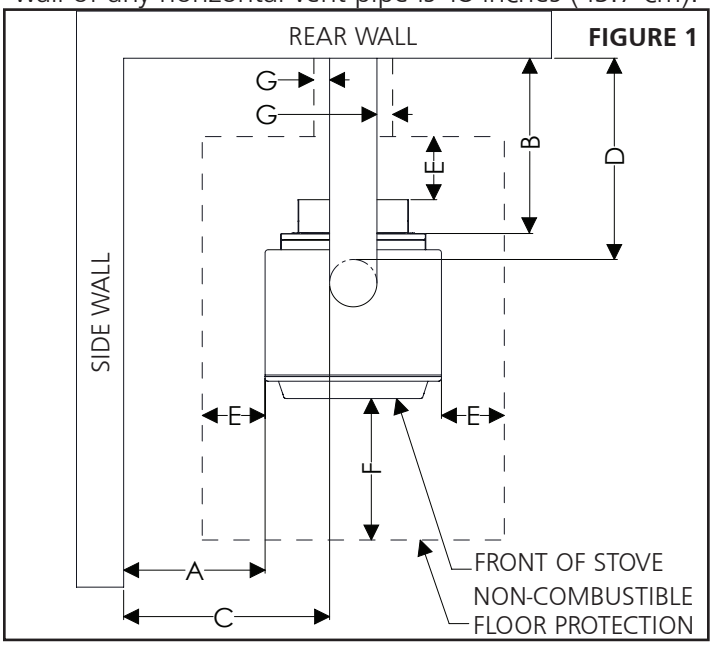
The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

FIGURE 1



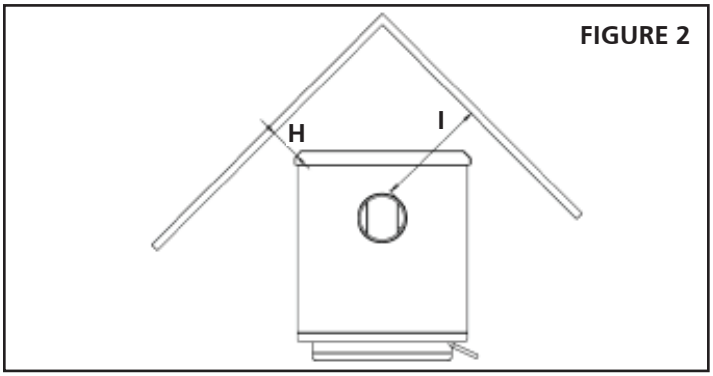
	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

FIGURE 2



FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500360) (Not Included)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

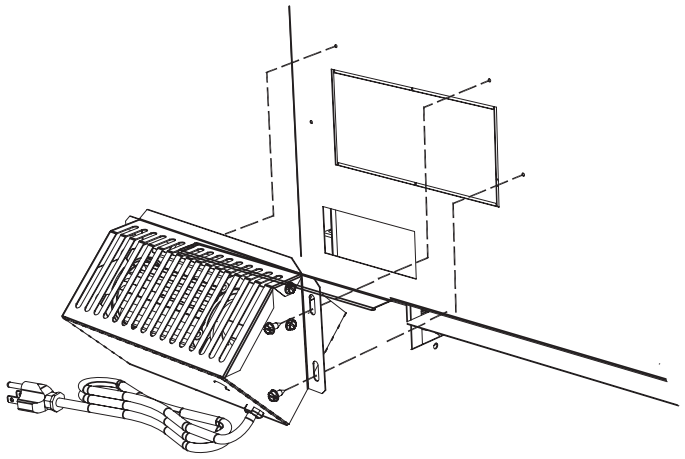


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Grand Teton with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-866-740-2497/1-800-251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: For Canadian residential and transportable homes or structures installations, where passage through a wall, or partition of combustible construction is desired, the installation must conform to CAN/CSA-B365. See Figure 4.

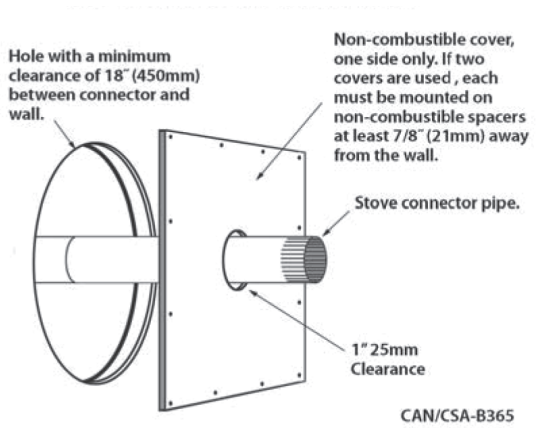


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

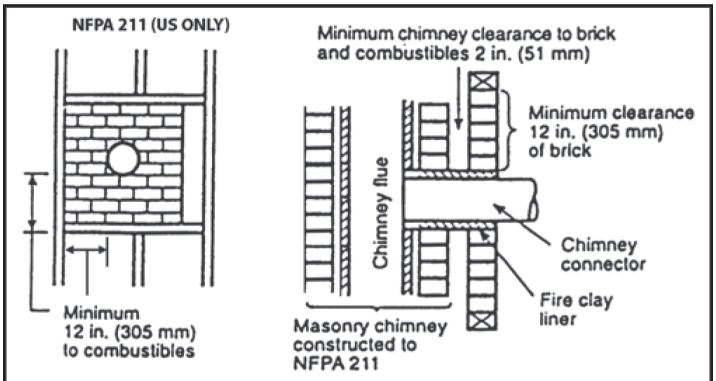


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

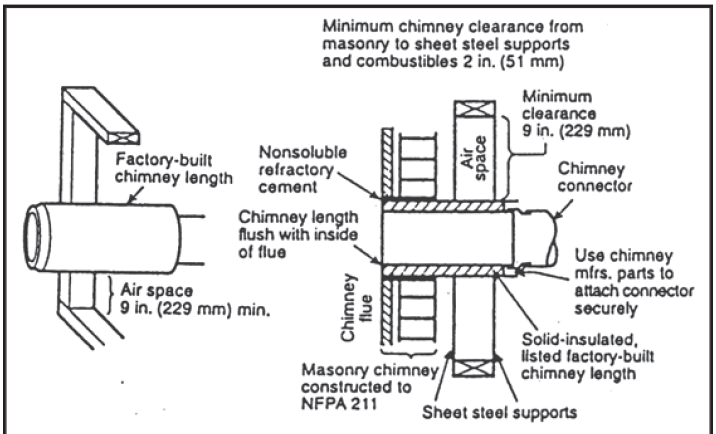


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

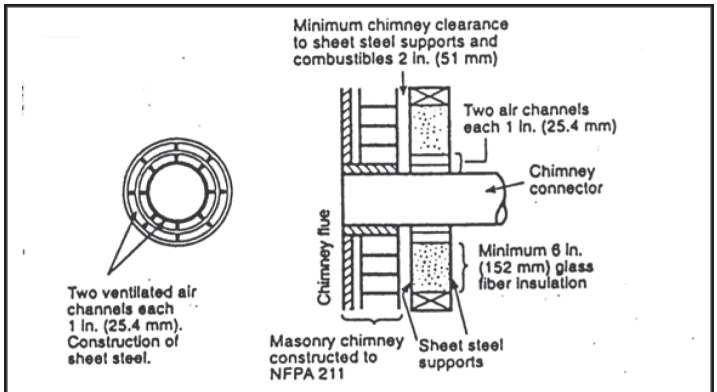


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

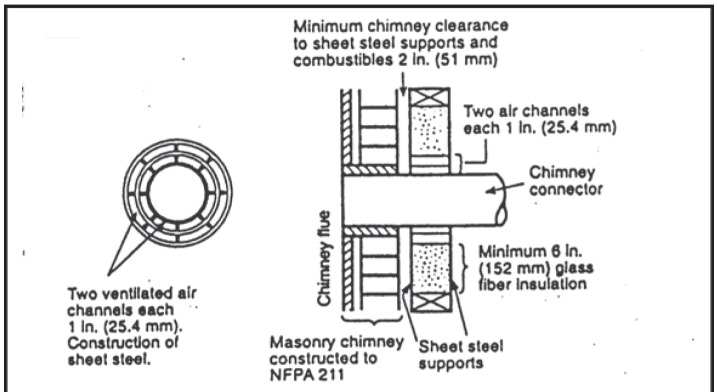


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Enerco Group, Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - The duct must have a minimum diameter of 4 inches (10.2 cm).
  - The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

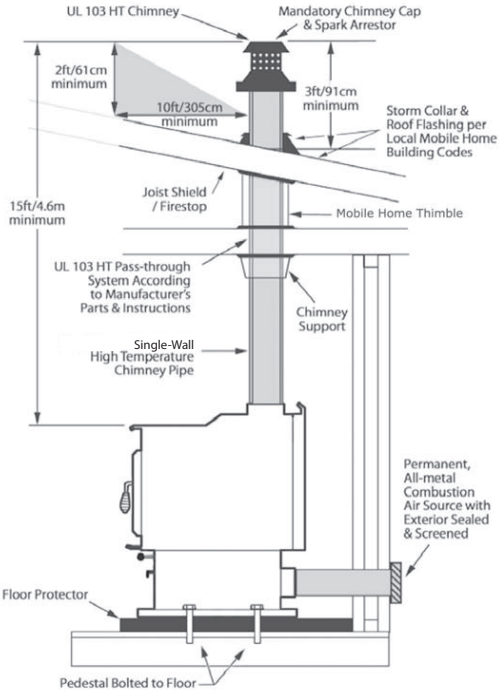


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

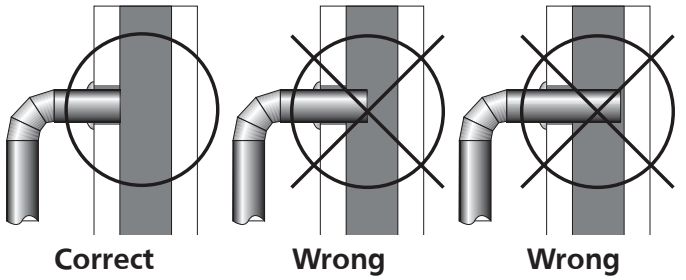


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

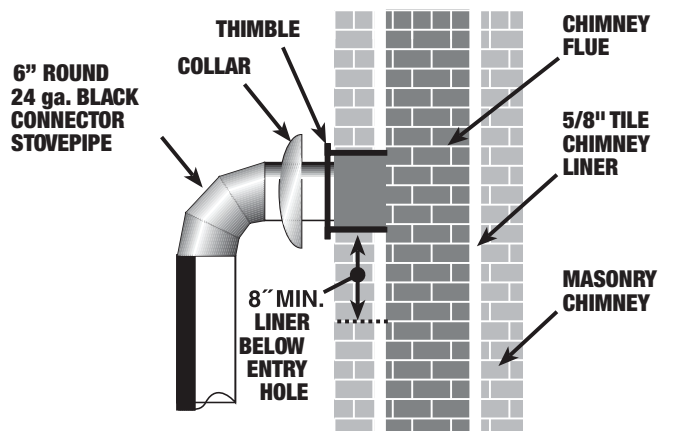


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

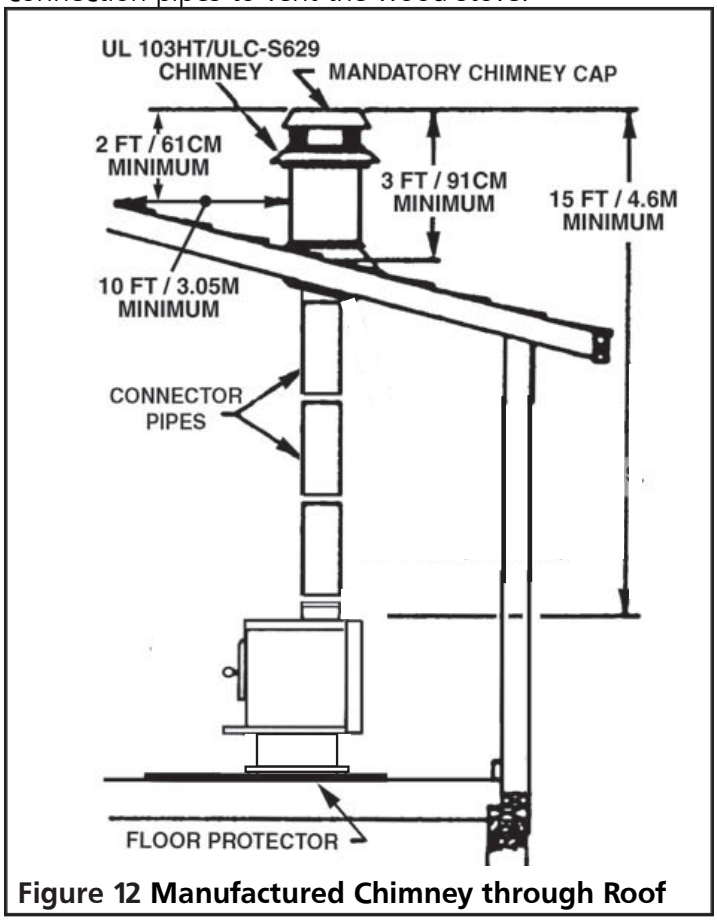


Figure 12 Manufactured Chimney through Roof

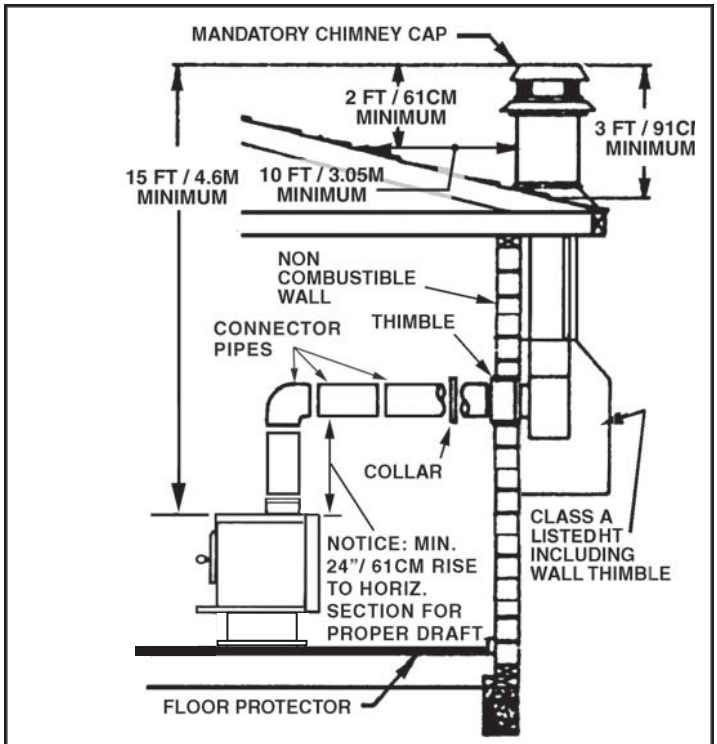


Figure 13
Manufactured Chimney through Masonry Wall

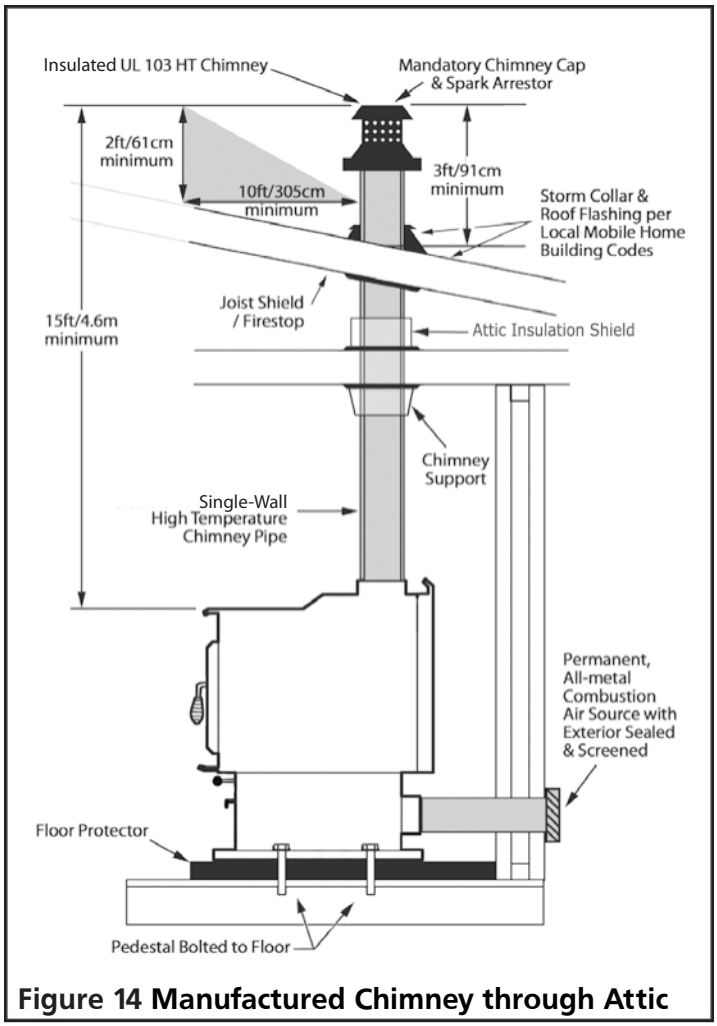


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

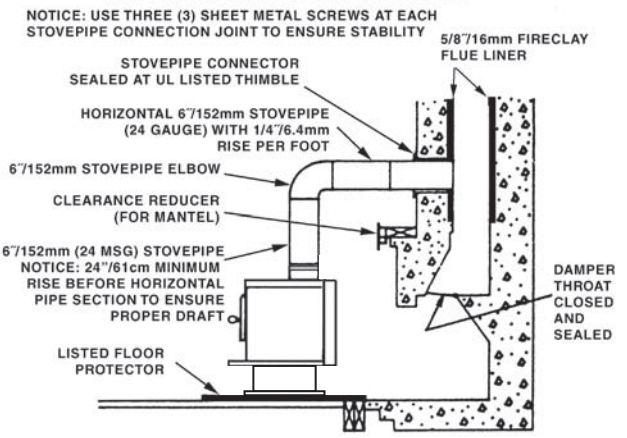


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

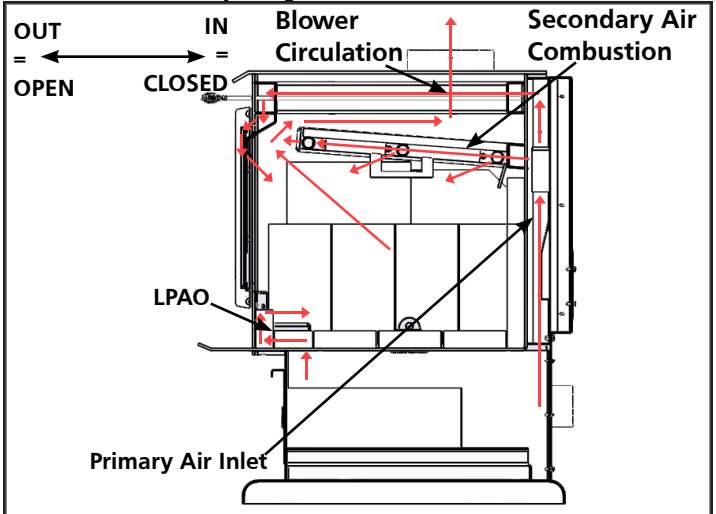


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

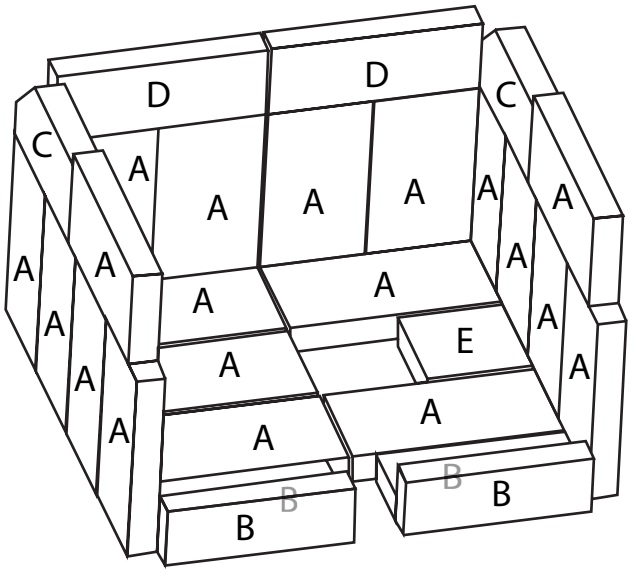


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes. The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page 18.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.
2. GET OUT OF THE HOUSE OR BUILDING.
3. CALL THE FIRE DEPARTMENT.

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase an Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be

safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY

TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

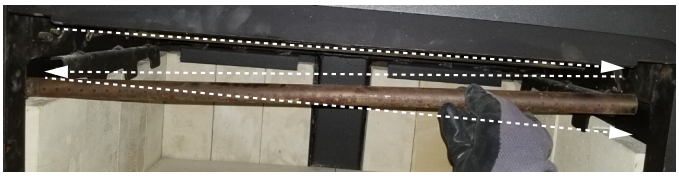


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

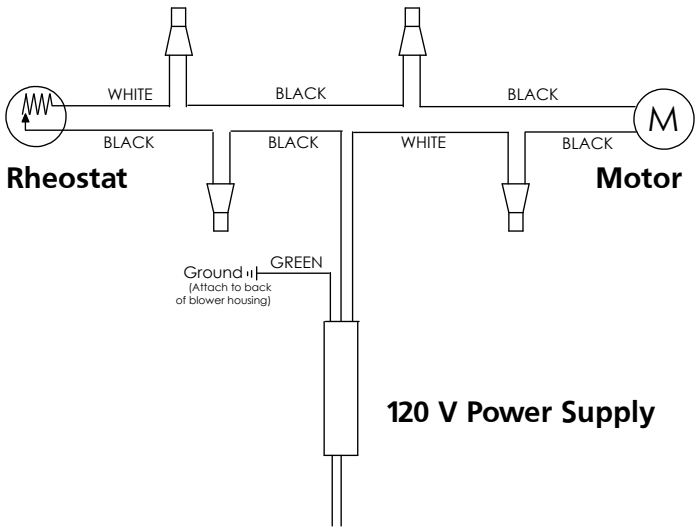
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



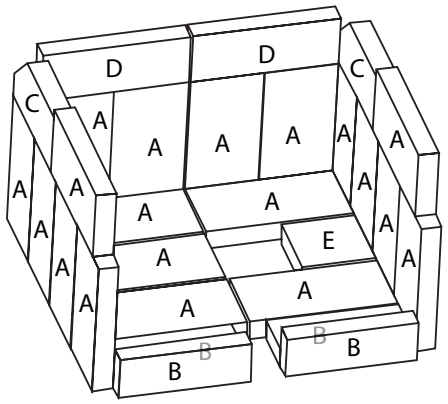
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

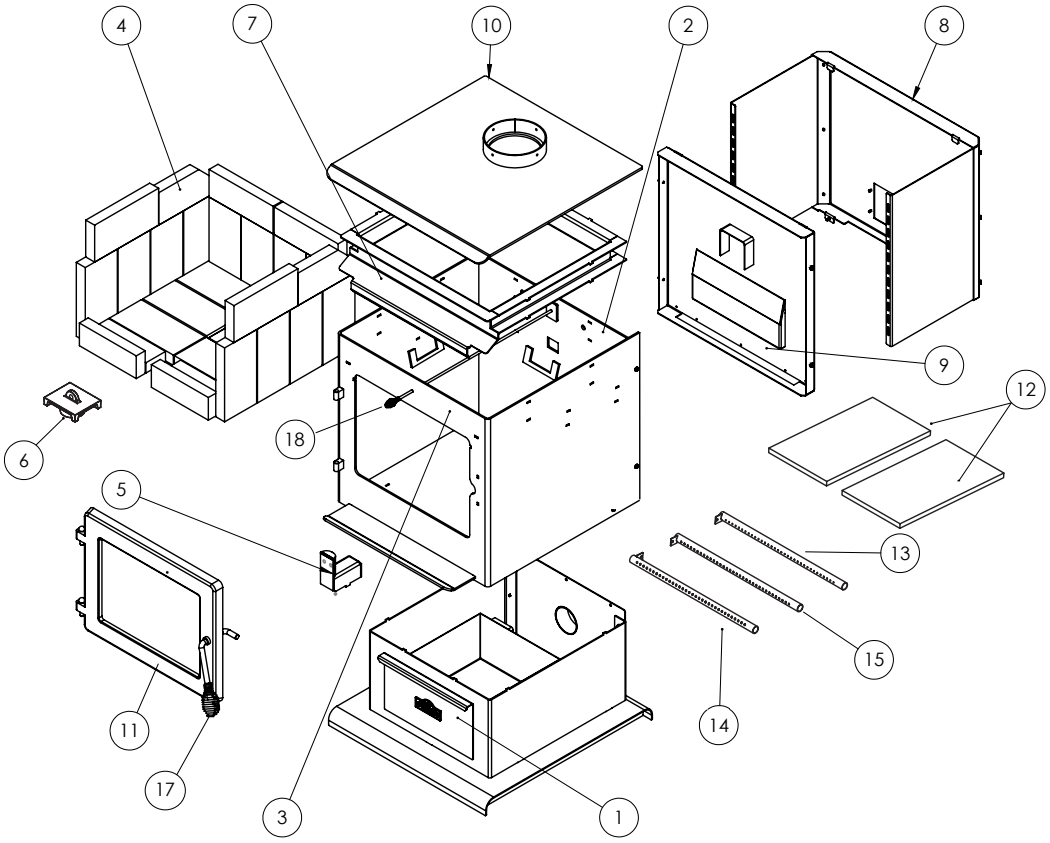
SERVICE PARTS MODEL T110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66914	8" x 2.5" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	66835	Ash Pan
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields
9	N/A	Blower Panel
10	N/A	Top

ITEM NO.	PART NUM.	DESCRIPTION
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)
17	66836	Spring Handle
18	66853	Flue Spring Handle
*	66860	Door Pin (Not Shown)

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OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

T110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY GRAND TETON LOCAL DEALER OR DIRECT FROM THE FACTORY.

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-866-740-2497/1-800-251-0001 • Weekends/After Hours 423-488-6316 • grandtetoncollection.com

Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.

Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-866-740-2497/1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-866-740-2497/1-800-251-0001
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INSTALLER: LEAVE THIS MANUAL WITH THE APPLIANCE. CONSUMER: SAVE THESE INSTRUCTIONS.

	OPERATING INSTRUCTIONS AND OWNER'S MANUAL	Model #
		N110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD FIRE STOVE



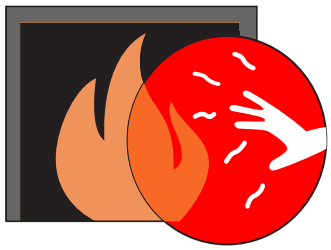
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-800-251-0001

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION.....7
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SPECIFICATIONS

Model #	N110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.

** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

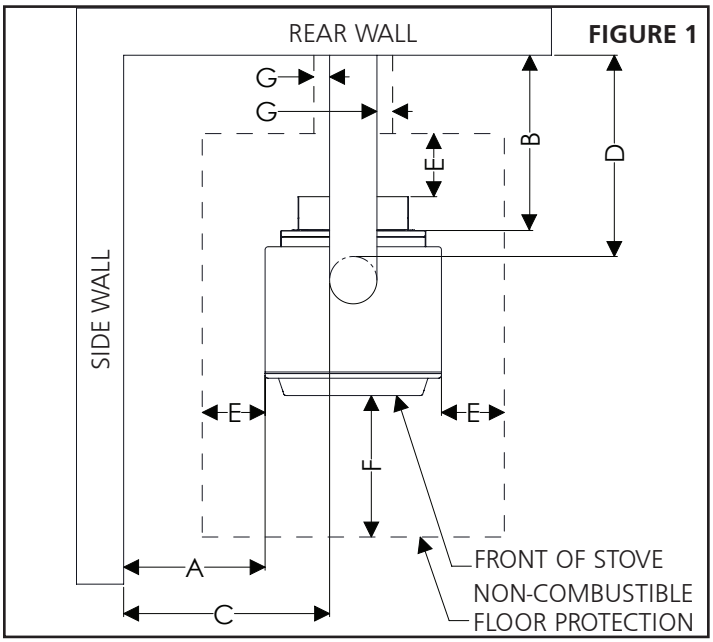


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

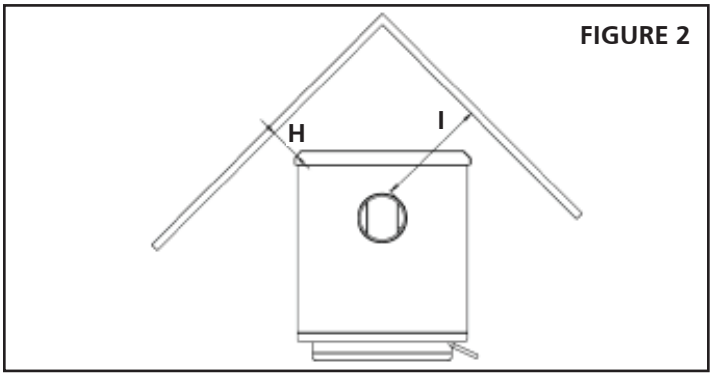


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated. Check inside the stove to find the blower contained in protective packaging.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

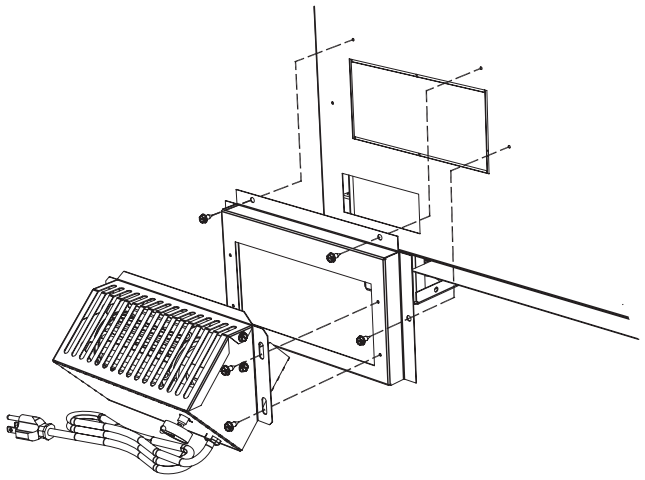


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Enerco Group with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: In Canada, installation must conform to CAN/CSA-B365 when passing through combustible construction, illustrated in Figure 4 on next page.

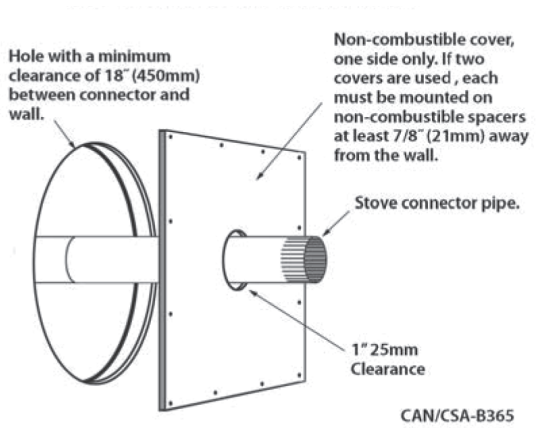


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

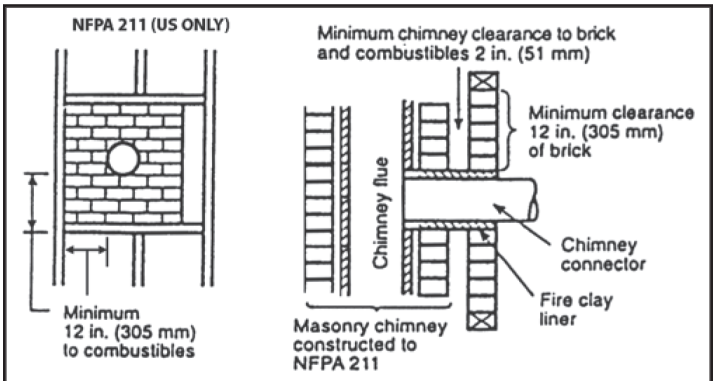


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

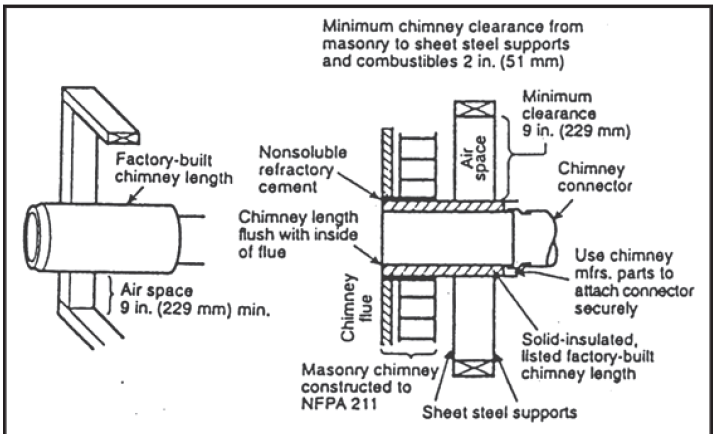


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

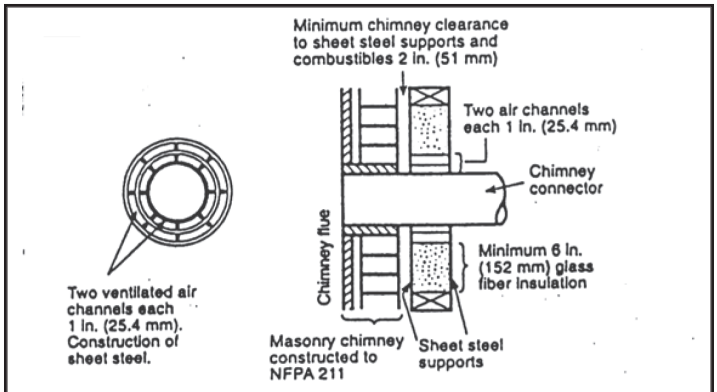


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

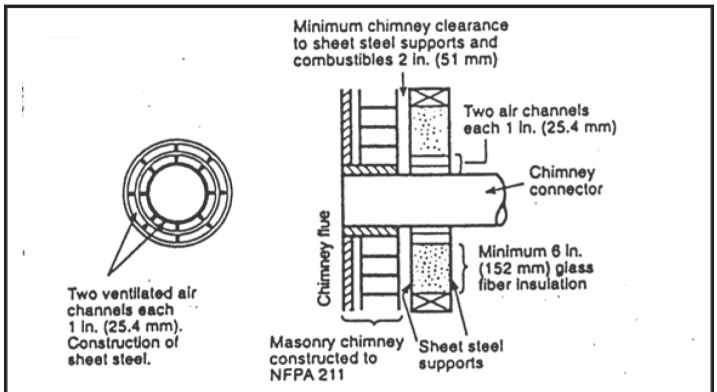


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - — The duct must have a minimum diameter of 4 inches (10.2 cm).
  - — The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - — The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - — The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - — A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

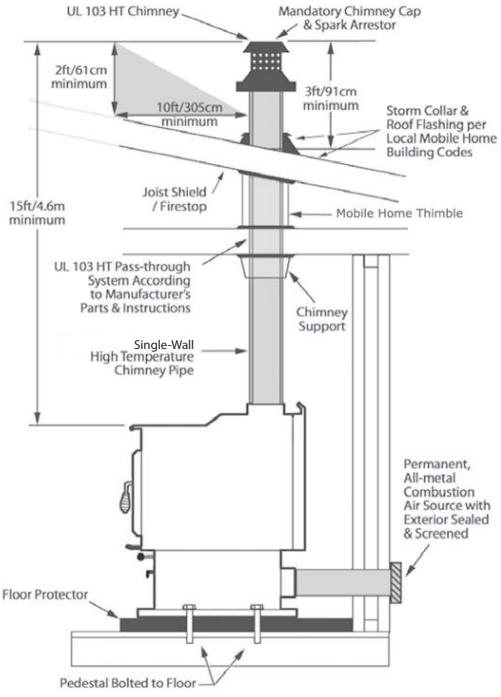


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

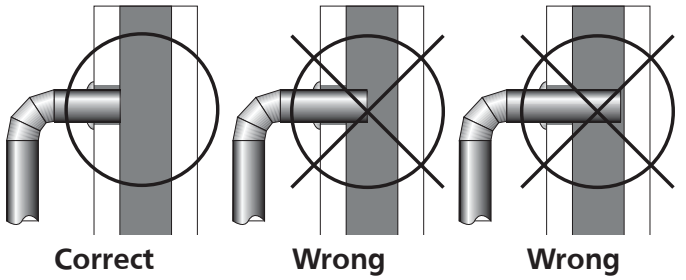


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

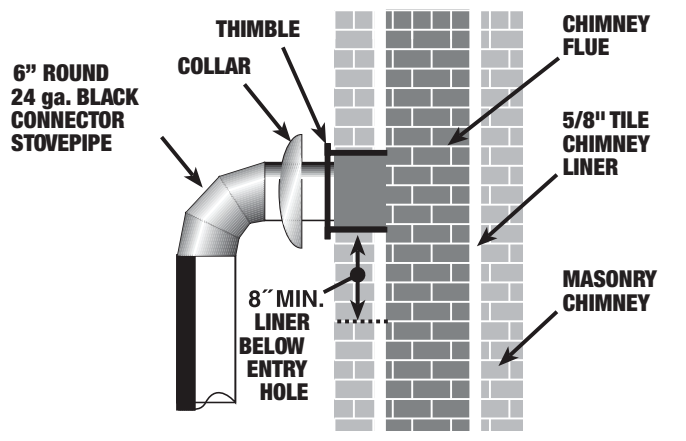


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

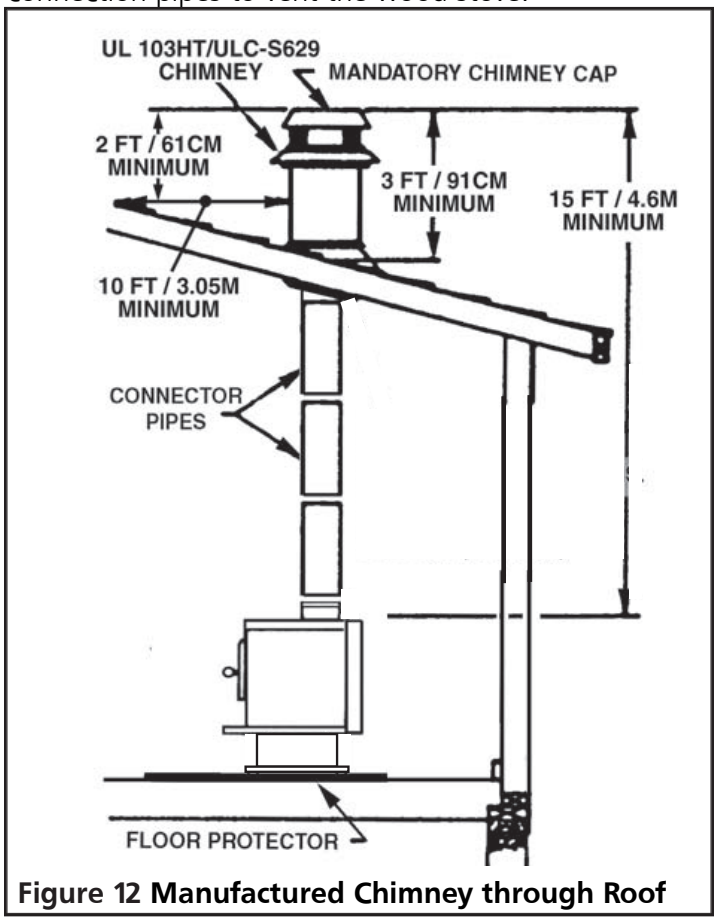


Figure 12 Manufactured Chimney through Roof

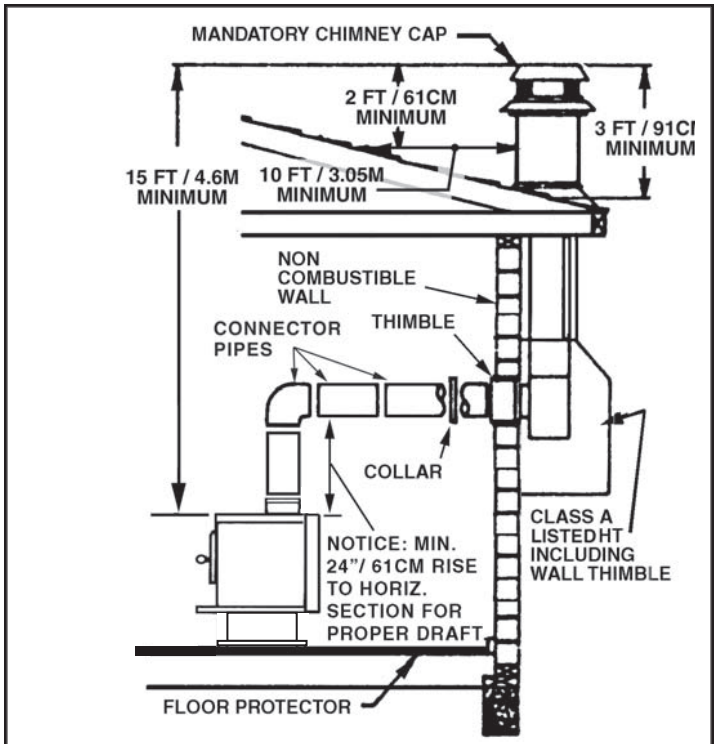


Figure 13
Manufactured Chimney through Masonry Wall

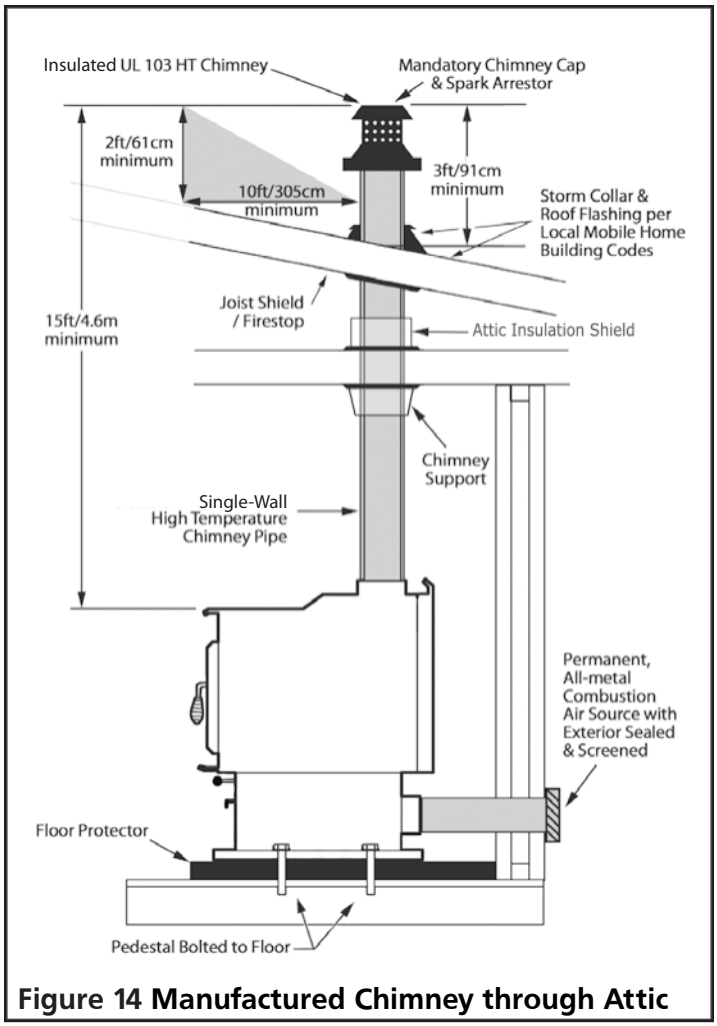


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

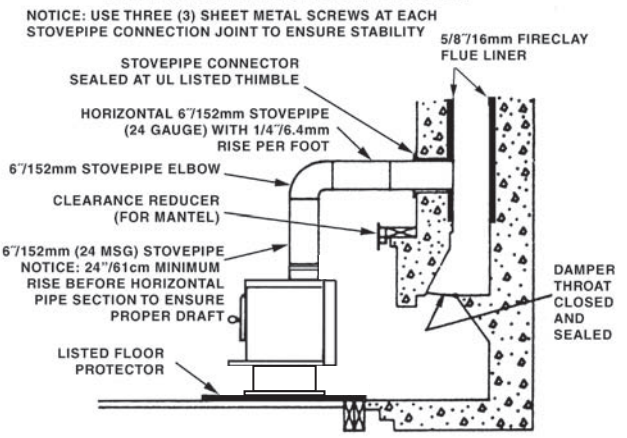


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

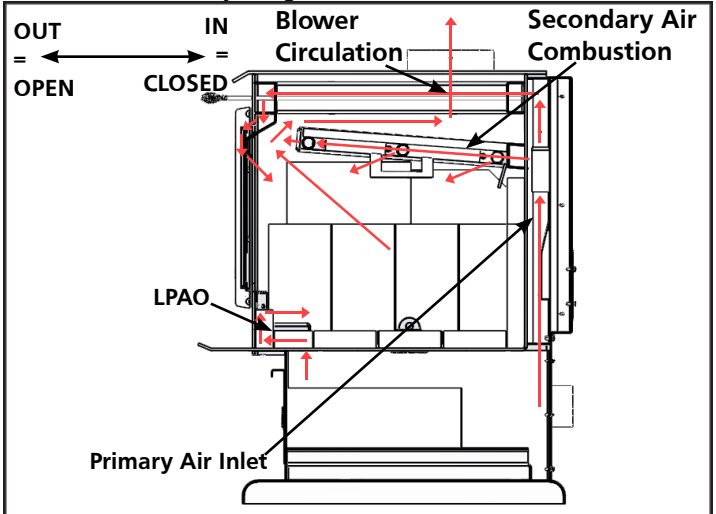


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

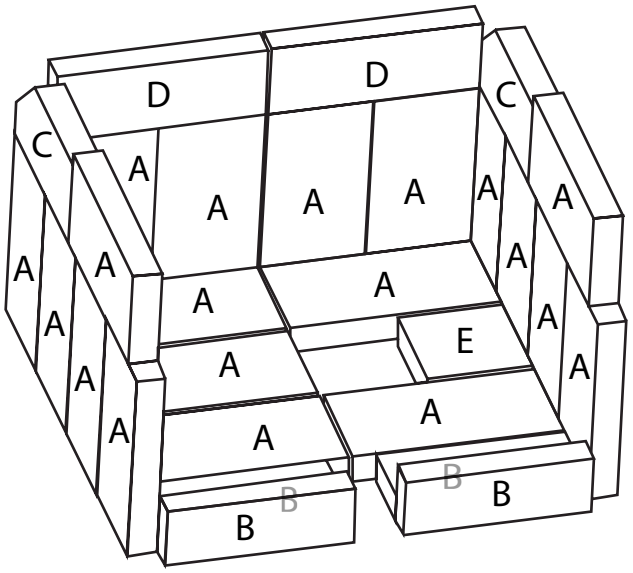


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes.

The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page <?>.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..

Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.
2. GET OUT OF THE HOUSE OR BUILDING.
3. CALL THE FIRE DEPARTMENT.

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase an Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

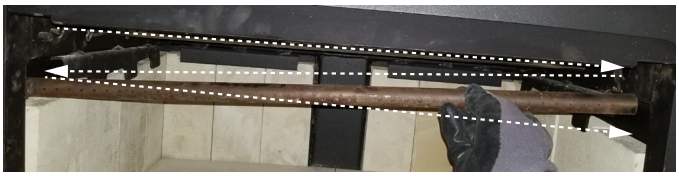


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

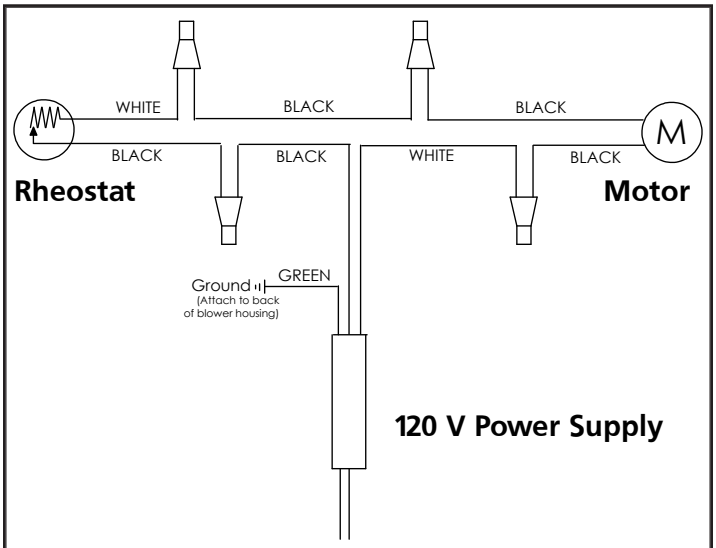
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



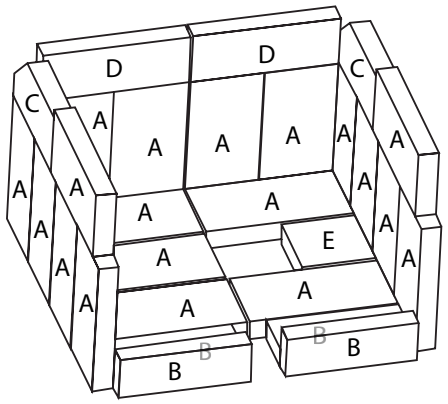
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

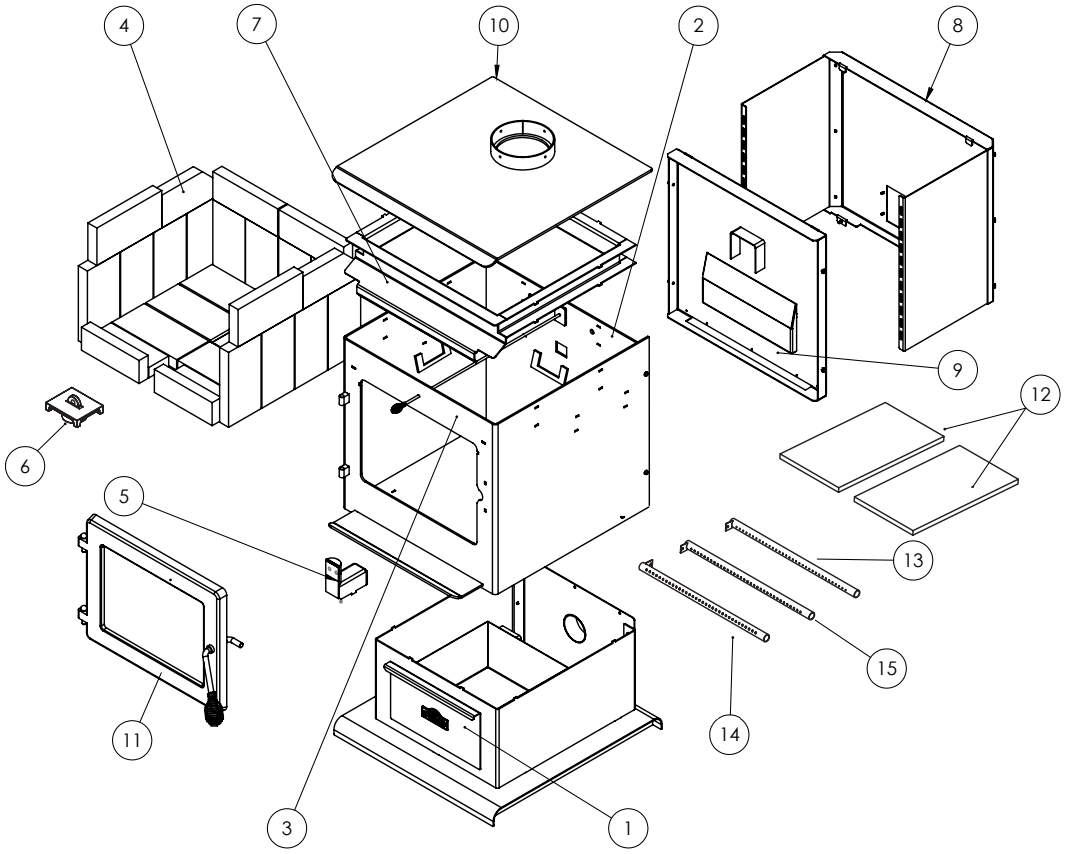
SERVICE PARTS MODEL N110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66711	8" x 2.75" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	N/A	Ash Bin
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields

ITEM NO.	PART NUM.	DESCRIPTION
9	N/A	Blower Panel
10	N/A	Top
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)

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OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

N110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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INSTALLER: LEAVE THIS MANUAL WITH THE APPLIANCE. CONSUMER: SAVE THESE INSTRUCTIONS.

	OPERATING INSTRUCTIONS AND OWNER'S MANUAL	Model #
		R110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD FIRE STOVE



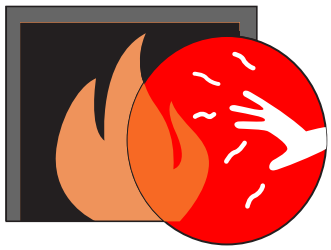
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-800-251-0001
REV B 66770

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SPECIFICATIONS

Model #	R110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.

** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

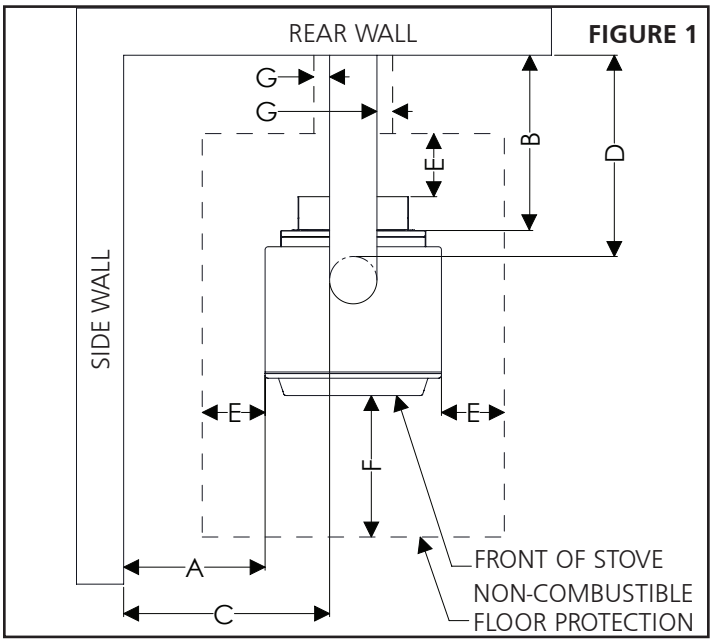


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

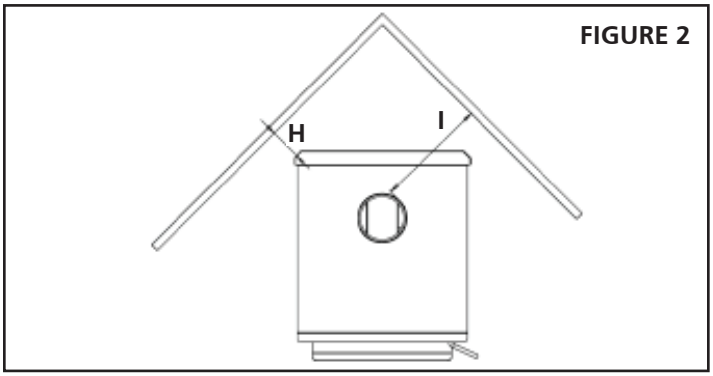


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated. Check inside the stove to find the blower contained in protective packaging.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

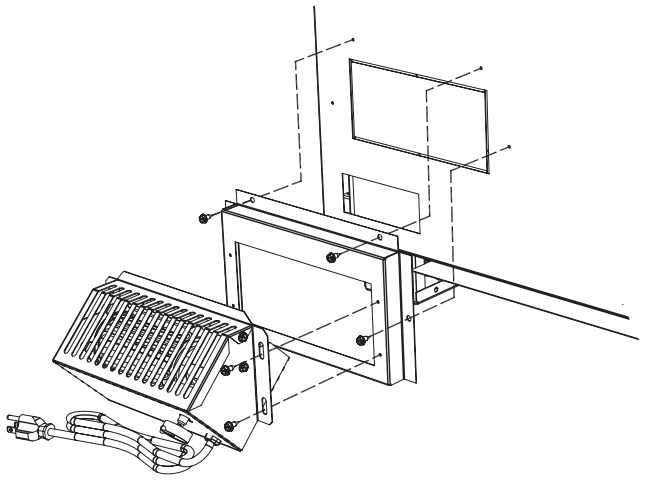


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Enerco Group with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: In Canada, installation must conform to CAN/CSA-B365 when passing through combustible construction, illustrated in Figure 4 on next page.

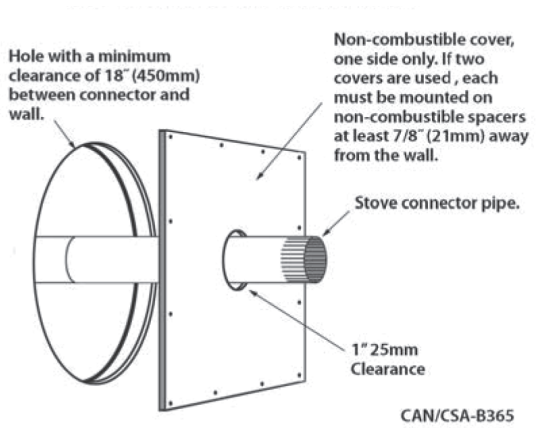


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

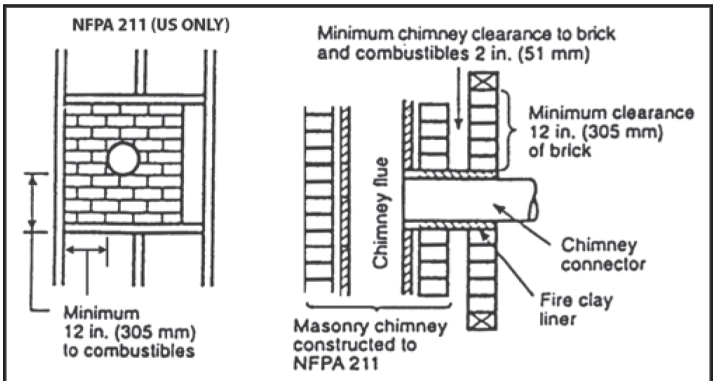


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

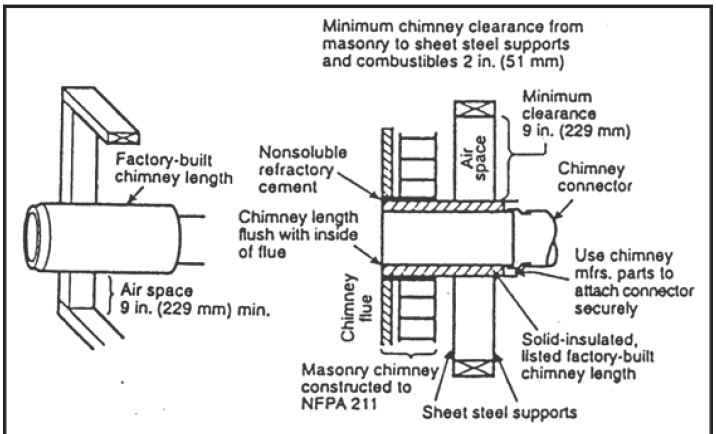


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

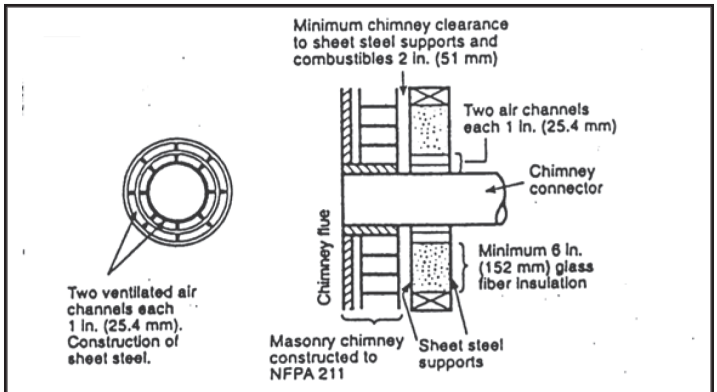


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

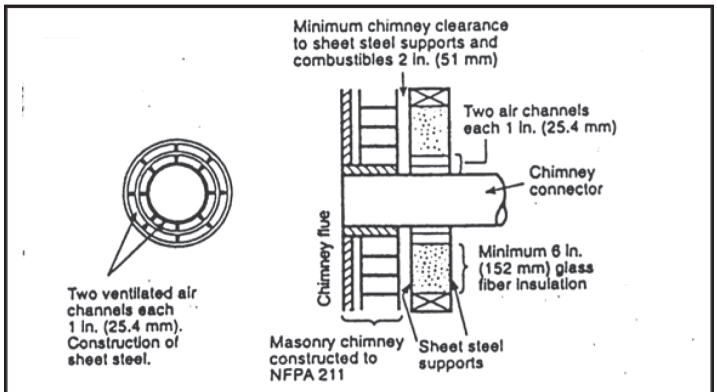


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - — The duct must have a minimum diameter of 4 inches (10.2 cm).
  - — The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - — The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - — The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - — A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

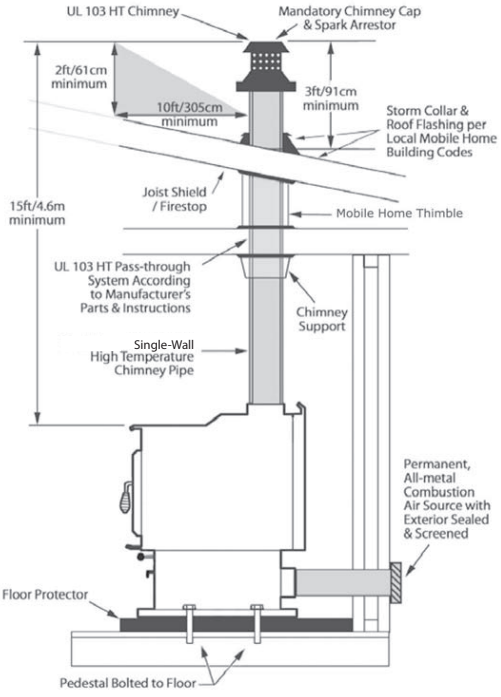


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

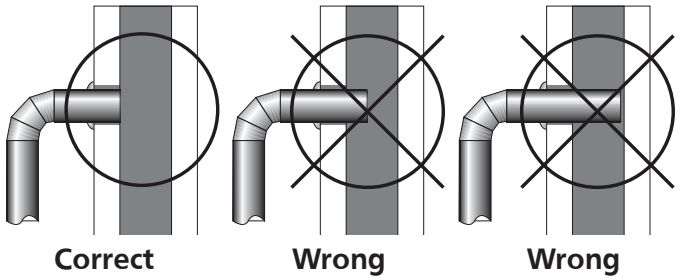


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

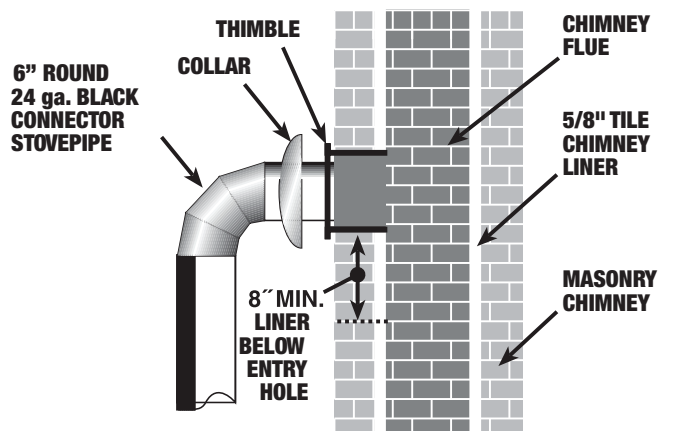


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

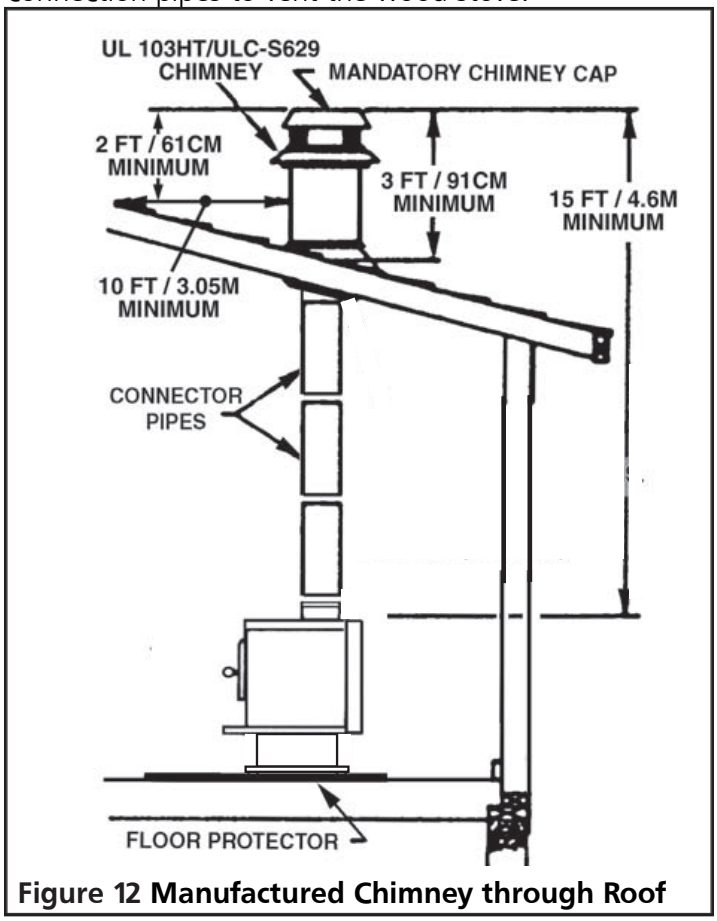


Figure 12 Manufactured Chimney through Roof

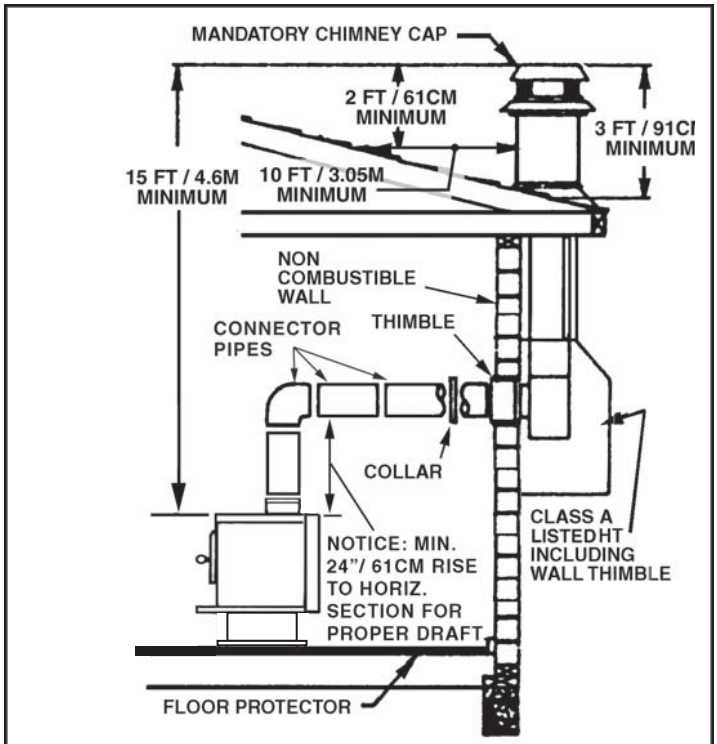


Figure 13
Manufactured Chimney through Masonry Wall

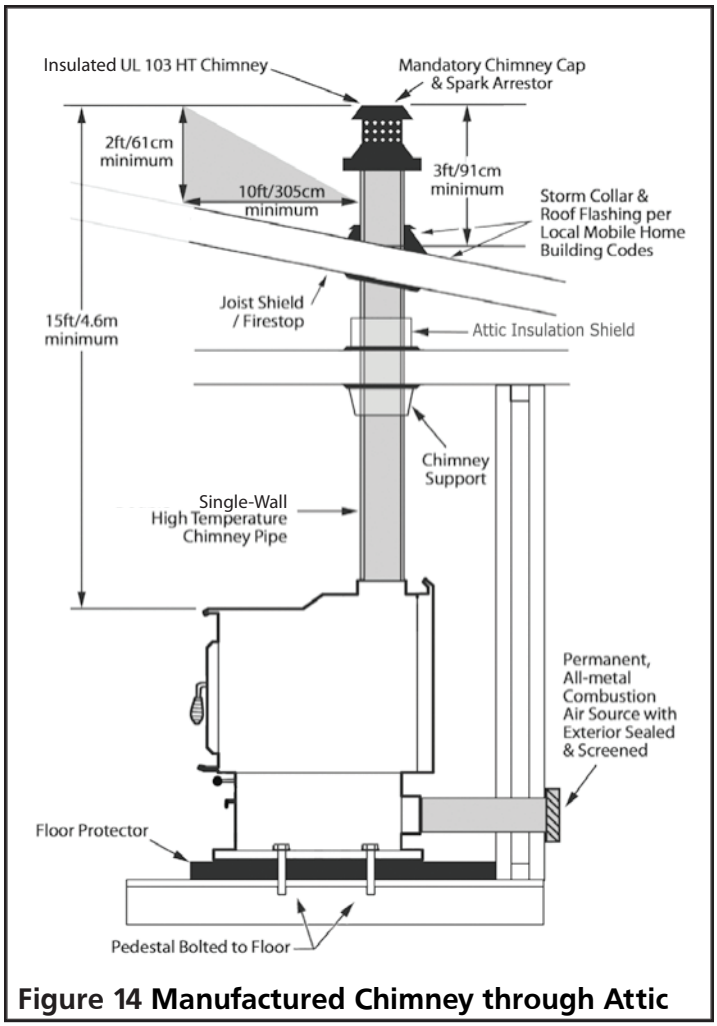


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

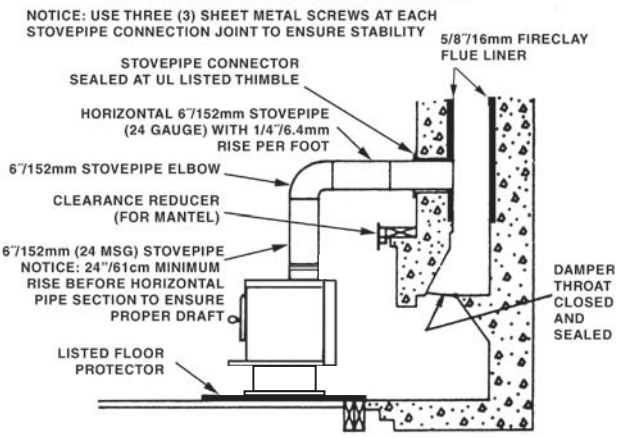


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

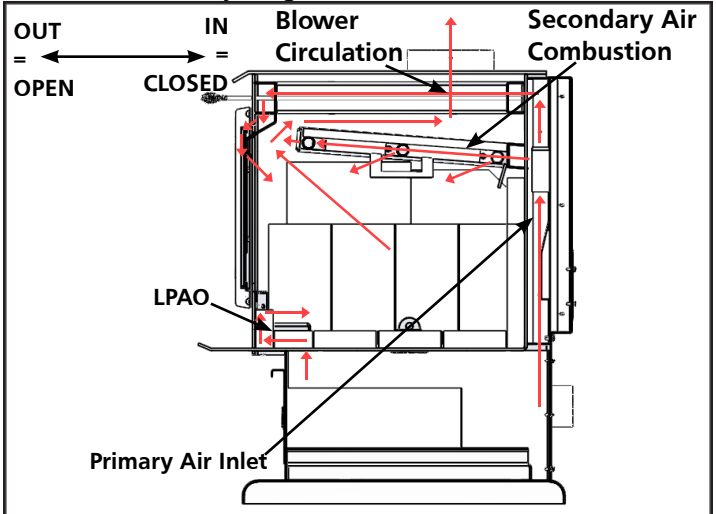


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

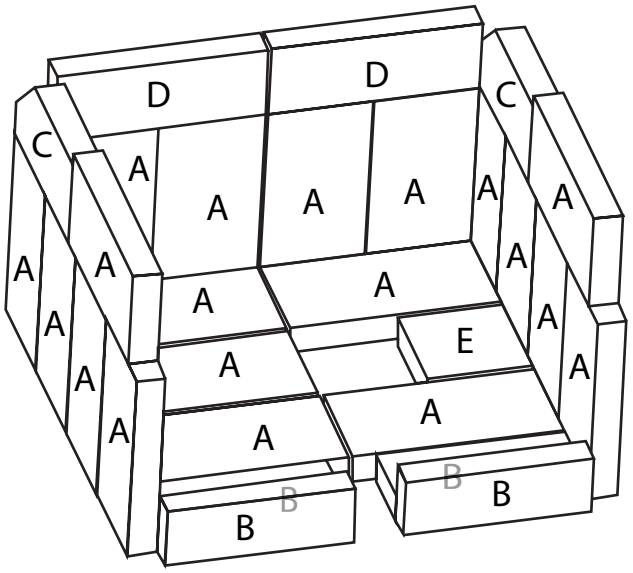


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5.

Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes. The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance section.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds.

8. Close the door fully, and secure 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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.
5. Immediately close the load door and set the air control to maximum open (all the way out).
6. After 5 minutes set the control to the medium air flow position which is 3/8 pulled from fully closed.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase an Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.
2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

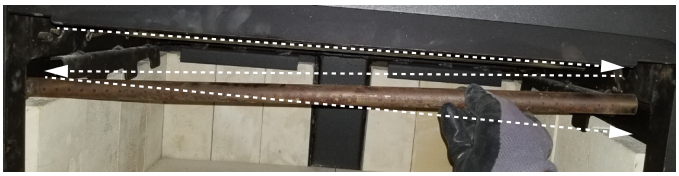


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

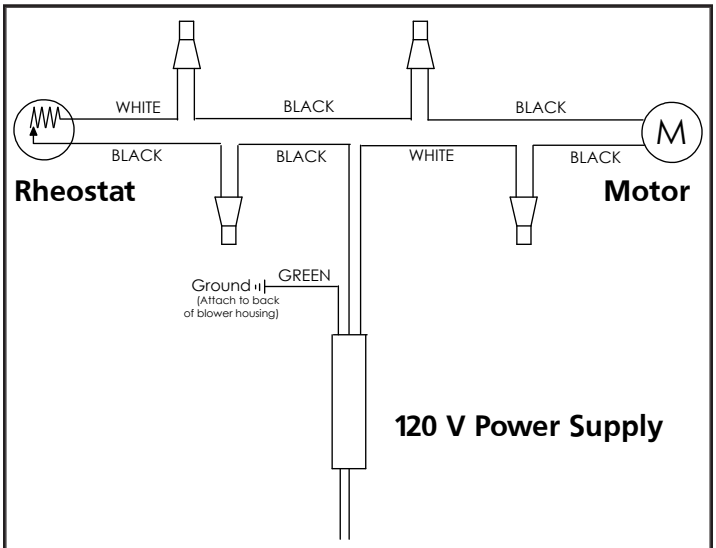
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



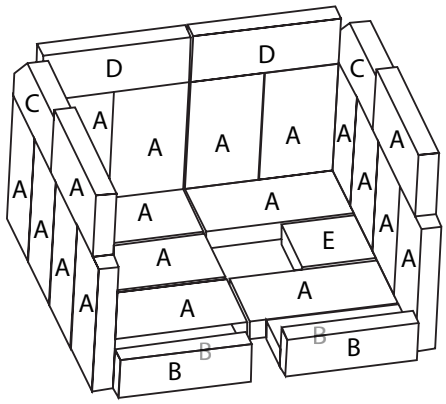
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

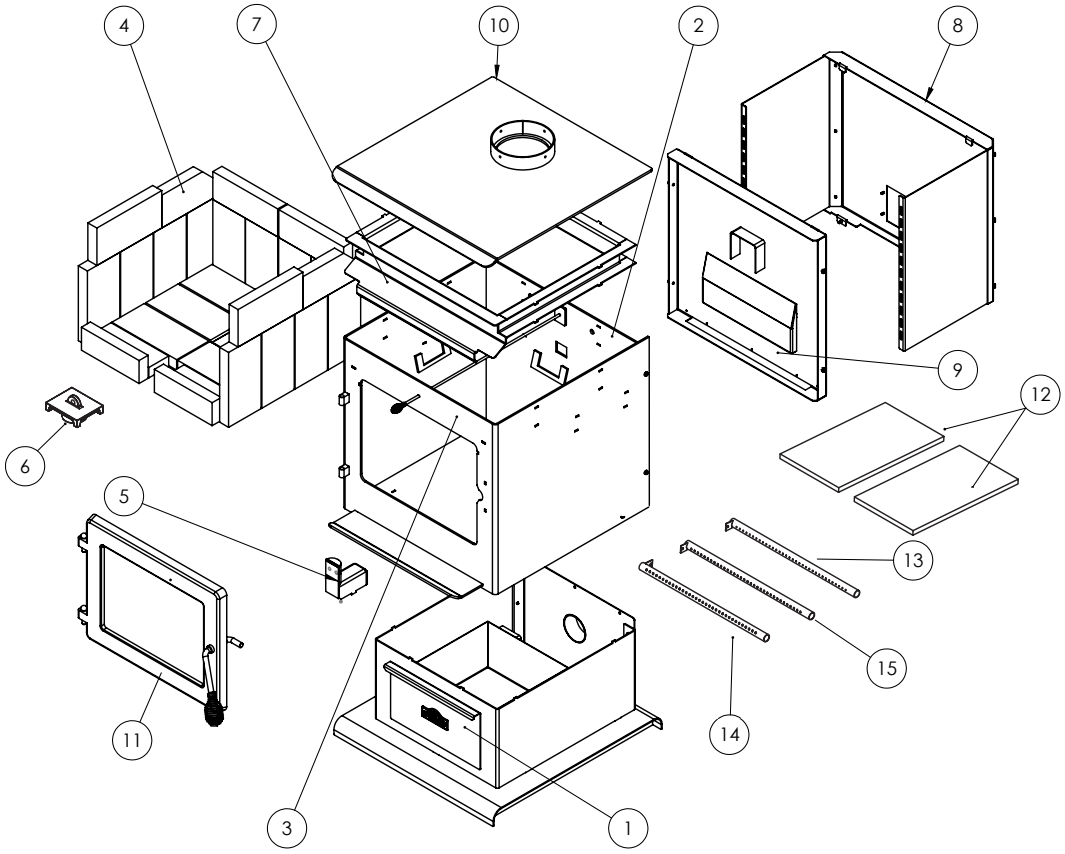
SERVICE PARTS MODEL R110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66711	8" x 2.75" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	N/A	Ash Bin
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields

ITEM NO.	PART NUM.	DESCRIPTION
9	N/A	Blower Panel
10	N/A	Top
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)

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OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

R110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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	OPERATING INSTRUCTIONS AND OWNER'S MANUAL	Model #
		V110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.

WOOD FIRE STOVE



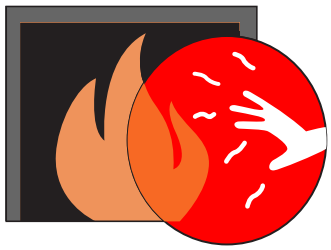
THE AUTHORITY HAVING JURISDICTION (SUCH AS MUNICIPAL BUILDING DEPARTMENT, FIRE DEPARTMENT, FIRE PREVENTION BUREAU, ETC.) SHOULD BE CONSULTED BEFORE INSTALLATION TO DETERMINE ANY NEED TO OBTAIN A PERMIT. OBSERVE ALL LOCAL BUILDING CODES.

⚠ **WARNING: IN CASE OF CHIMNEY FIRE:**

1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

⚠ **CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.**

⚠ DANGER



HOT GLASS WILL CAUSE BURNS.

DO NOT TOUCH GLASS UNTIL COOLED.

NEVER ALLOW CHILDREN TO TOUCH THE GLASS.

- Due to the high surface temperatures this unit should be located an appropriate distance from any and all combustible materials. Comply with all clearances to combustibles, see page 5.
- Assembled stove must be connected to a flue vented to the outdoors in accordance with local guidelines, see installation requirements & guidelines page 6 through page 12.
- Only use with permitted fuels, see page 14. **DO NOT BURN GARBAGE.**

Enerco Group Inc.
4560 West 160th st Cleveland, Ohio 44135 1-800-251-0001

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.

GENERAL HAZARD WARNING:

⚠ FAILURE TO COMPLY WITH THE PRECAUTIONS AND INSTRUCTIONS PROVIDED WITH THIS STOVE, CAN RESULT IN DEATH, SERIOUS BODILY INJURY AND PROPERTY LOSS OR DAMAGE FROM HAZARDS OF FIRE, EXPLOSION, BURN, ASPHYXIATION, CARBON MONOXIDE POISONING, AND/OR ELECTRICAL SHOCK.

⚠ ONLY PERSONS WHO CAN UNDERSTAND AND FOLLOW THE INSTRUCTIONS SHOULD USE OR SERVICE THIS STOVE.

⚠ IF YOU NEED ASSISTANCE OR STOVE INFORMATION SUCH AS AN INSTRUCTIONS MANUAL, LABELS, ETC. CONTACT THE MANUFACTURER.

CAUTION:

⚠ IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT ALL AIR CONTROLS (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

CAUTION:

⚠ DO NOT CONNECT A WOOD BURNING STOVE TO AN ALUMINUM TYPE B GAS VENT. Use only the exhaust ventilation systems specified in these instructions.

WARNING:

⚠ FIRE, BURN, INHALATION, AND EXPLOSION HAZARD. KEEP SOLID COMBUSTIBLES, SUCH AS BUILDING MATERIALS, PAPER OR CARDBOARD, A SAFE DISTANCE AWAY FROM THE STOVE AS RECOMMENDED BY THE INSTRUCTIONS NEVER USE THE STOVE IN SPACES WHICH DO OR MAY CONTAIN VOLATILE OR AIRBORNE COMBUSTIBLES, OR PRODUCTS SUCH AS GASOLINE, SOLVENTS, PAINT THINNER, DUST PARTICLES OR UNKNOWN CHEMICALS.

⚠**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information visit www.P65Warnings.ca.gov

CAUTION:

⚠ A DRAFT READING OF 0.05 TO 0.06 INCHES WATER COLUMN OF NEGATIVE PRESSURE IN THE CHIMNEY IS REQUIRED FOR PROPER BURNING OF THIS STOVE. OTHER APPLIANCES, ENVIRONMENTAL FACTORS, CHIMNEY TEMPERATURE, AND CHIMNEY INSTALLATION CAN AFFECT AND ALTER DRAFT. BE ATTENTIVE TO YOUR STOVE'S OPERATION.

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SPECIFICATIONS

Model #	V110
	DIMENSIONS
Stove Dimensions WxLxH [in (cm)]	22.75 x 28 x 31.5 (57.8 x 71.1 x 80)
Flue Colar	6.0 in. Round
	OPERATION SPECIFICATIONS
Fuel	Wood
Maximum Burn Time (Mins.)*	583
	EPA and SAFETY COMPLIANCE SPECIFICATIONS
EPA Compliance**	Certified
Heat Output Range (BTU/HR)	15,536 to 58,030
Particulate Emissions (g/hr)	2.1
Avg Overall Efficiency (HHV)	72% (1)(2)
Avg Overall Efficiency (LHV)	78% (1)(3)
Optimal Efficiency (LHV)	78% (3)(4)
Optimal Heat Transfer Energy (HHV)	77% (2)(4)(5)
Tested To	UL-1482 7th ed. Standard for solid-fuel type room heater
	ULCS-627-00 Standard for Space Heaters for use with Solid Fuels

*Maximum burn times are heavily dependent on the type of wood burned in the stove, so these numbers may vary.

** U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.

PLEASE READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR NEW STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR FOR PROPER OPERATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH OPERATING INSTRUCTIONS IN THIS MANUAL.

SAFETY PRECAUTIONS

HAVE AN ESTABLISHED PLAN FOR WHAT TO DO IN THE EVENT OF A FIRE. CONTACT YOUR LOCAL FIRE AUTHORITY TO ACQUIRE INFORMATION AND A PLAN FOR WHAT TO DO IN THE EVENT OF A CHIMNEY FIRE.

⚠ **WARNING: FOR INSTALLATIONS IN A MOBILE HOME, DO NOT INSTALL IN A SLEEPING ROOM. OBEY ALL ADDITIONAL REQUIREMENTS. SEE PAGE 9.**

⚠ **CAUTION: DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.**

⚠ **CAUTION: DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.**

⚠ **CAUTION: DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**

⚠ **CAUTION: HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

⚠ **CAUTION: DO NOT STORE FLAMMABLE VAPORS, LIQUIDS, OR SOLID FUELS WITHIN THE VICINITY OF THIS STOVE, NEAR ELECTRICITY SOURCES, OR NEAR ASH REMOVAL SITES.**

⚠ **CAUTION: THIS STOVE HAS ONLY BEEN TESTED WITH FIRES BUILT DIRECTLY ON THE PROVIDED FIRE BRICKS AT BOTTOM OF FIREBOX. DO NOT USE ANY ACCESSORY TO ELEVATE FIRE.**

⚠ **WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCK WISE UNTIL THE DOOR IS SECURELY LATCHED.**

⚠ **WARNING: NEVER LEAVE CHILDREN NEAR THE STOVE UNATTENDED WHILE THE STOVE IS OPERATING.**

⚠ **WARNING: OTHER THAN THE DESIGNED AIR CONTROL WITH THE PRIMARY AIR INLET AIR CONTROL, DO NOT TAMPER WITH AIR SUPPLY IN CHIMNEY OR INLET DUCT AS AN ATTEMPT TO INCREASE FIRING RATE.**

CARBON MONOXIDE

WARNING:
⚠ WHEN USED WITHOUT ADEQUATE COMBUSTION AND VENTILATION AIR OR WITH PROHIBITED FUELS, THIS STOVE MAY GIVE OFF EXCESSIVE CARBON MONOXIDE, AN ODORLESS, POISONOUS GAS.

WARNING:
⚠ EARLY SIGNS OF CARBON MONOXIDE POISONING RESEMBLE THE FLUE, WITH HEADACHE, DIZZINESS AND/OR NAUSEA. IF YOU HAVE THESE SIGNS, STOVE MAY NOT BE WORKING PROPERLY. GET FRESH AIR AT ONCE! HAVE STOVE SERVICED.

SOME PEOPLE - PREGNANT WOMEN, PERSONS WITH HEART OR LUNG DISEASE, ANEMIA, THOSE UNDER THE INFLUENCE OF ALCOHOL, THOSE AT HIGH ALTITUDES - ARE MORE AFFECTED BY CARBON MONOXIDE THAN OTHERS.

Regardless of how safe this stove is, every fuel burning appliance creates Carbon Monoxide. It is strongly recommended to reduce risk to you and your loved ones as much as possible by installing a Carbon Monoxide detector. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector.

SMOKE DETECTORS

Have at least 1 smoke detector on each floor of your building. Follow the installation, operation, & maintenance instructions provided by the manufacturer of your detector. Avoid nuisance alarms by not placing the detector outside the immediate vicinity of the stove. Typically a good installation location for smoke detectors is near bedrooms.

FOR MORE SAFETY INFORMATION

For auxiliary information regarding wood stove safety and operation information contact the National Fire Protection Association (NFPA) by mail at:
NFPA, Batterymarch Park, Quincy, MA 02269
or visit the NFPA website:
https://www.nfpa.org/

CLEARANCE TO COMBUSTIBLES
(Refer to Figure 1 and Table 1)

The following stated clearances represent the minimum distances between the stove and any other object. No objects should encroach into this space. This includes but is not limited to carpet, furniture, children, pets, clothing, fuel, or any other object. These clearances may not be reduced by any means or regulatory authority within United States or Canada.

The stove shall not be less than 17 inches (43.2 cm) (A) from a side wall and 8.25 inches (21 cm) (B) from the back wall. The wall of a vertical vent pipe must not be less than 25 inches (63.5 cm) (C) from the back wall.

The Minimum floor-to-ceiling distance of the room is 84 inches (213.4 cm).

The minimum distance between the ceiling and the wall of any horizontal vent pipe is 18 inches (45.7 cm).

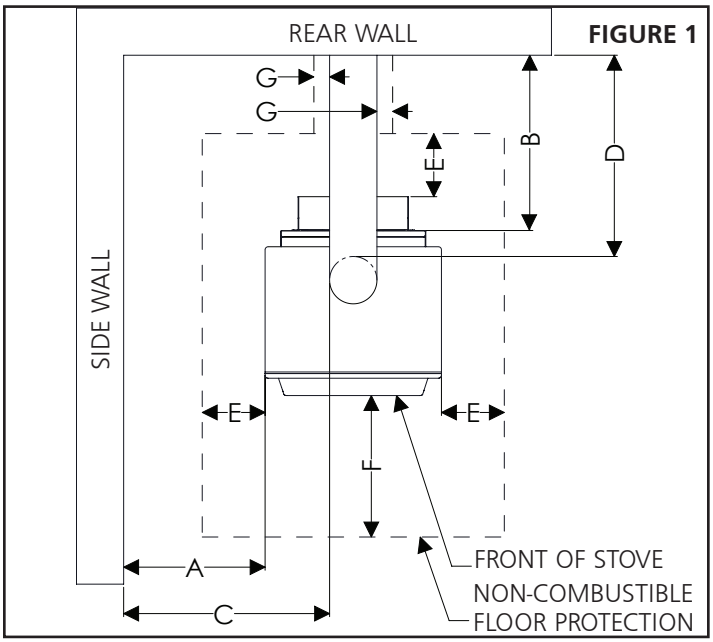


FIGURE 1

	USA	CANADA
A	17 in. (43.2 cm)	17 in. (43.2 cm)
B	8.25 in. (21 cm)	8.25 in. (21 cm)
C	25 in. (63.5 cm)	25 in. (63.5 cm)
D	14 in. (35.6 cm)	14 in. (35.6 cm)
E	8 in. (20.3 cm)	8 in. (20.3 cm)
F	16 in. (40.6 cm)	18 in. (45.7 cm)
G	2 in. (5.1 cm)	2 in. (5.1 cm)
H	6.5 in. (16.5 cm)	6.5 in. (16.5 cm)
I	16 in. (40.6 cm)	16 in. (40.6 cm)

Table 1

CORNER INSTALLATION

The stove shall not be less than 6.5 inches (16.5 cm) (H) from a corner. The wall of a vertical vent pipe must not be less than 16 inches (40.6 cm) (I) from any corner.

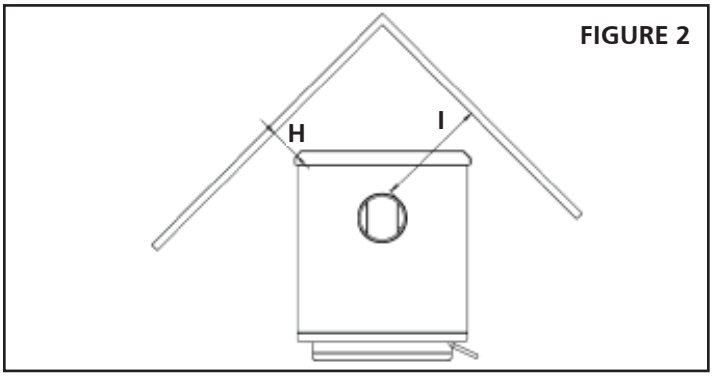


FIGURE 2

FLOORING SPACE (Refer to Figure 1 and Table 1)

The floor protector must extend at least [in U.S. - 16 in. (40.6 cm); in Canada - 18 in. (45.7 cm)] (F) to the front and at least 8 in. (20.3 cm) (E) beyond each side of the fuel loading and ash removal opening. The floor protection must extend under the flue connector and extend 2 in. (5.1 cm) (G) beyond each side of the pipe.

FLOORING MATERIAL

The stove may be installed on solid concrete or solid masonry flooring. If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board.

ACCESSORY INSTALLATION

BLOWER KIT (F500308)

The blower may be mounted to the rear of the stove. When plugged in and while the stove is in use this blower will propagate air along the outside of the fire box, warming the air before it is then circulated into the area to be heated. Check inside the stove to find the blower contained in protective packaging.

⚠ WARNING: BLOWER MUST BE DISCONNECTED FROM POWER SUPPLY BEFORE INSTALLING. IT IS ONLY INTENDED FOR USE WITH THIS STOVE.

Using a 5/16" open end or socket wrench, remove the 4 screws holding the rear panel. Attach the blower mounting box to the rear of the unit using 4 of the supplied #10 screws. Mount the blower assembly to the mounting box with the 4 remaining #10 screws.

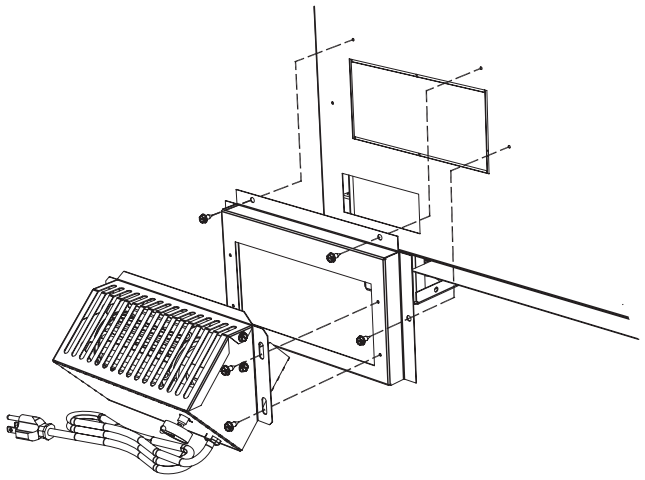


Figure 3 Blower Accessory Installation

ELECTRICAL CONSIDERATIONS

The Blower Motor requires 120V, 60 Hz AC and will draw 0.26 amps of current. If you plan to ever use the blower, the rear of the stove will need to be within power cord distance, which is roughly 65 inches (165 cm) of an electrical outlet. Lay the power cord out such that it will not come into contact with the stove's surface. Keep power cord at least 12 inches from stove surfaces.

INSTALLATION

Take measurements of your space and plan for your chimney system as detailed in the following instructions.

This stove may also be installed for use in a mobile home in the U.S. ONLY. In addition to the following instructions, review and adhere to the mandatory requirements on page 9.

⚠ WARNING: When this stove is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area.

TOOLS REQUIRED (NOT SUPPLIED)

- Safety Glasses
- Gloves
- Pencil
- Tape Measure
- Tin Snips
- Phillips Screwdriver or comparable electric screw driver & drill bit.
- A friend (the stove is heavy, do not attempt to move the stove without assistance)

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

- Floor Protection (see "FLOORING SPACE" and "FLOORING MATERIAL" on page 5)
- If for use not in a mobile home: 24 MSG (minimum standard gauge) black, or 26 MSG blue steel, Chimney Connector single wall stove pipe having 6" (152mm) diameter.
  If for use in a mobile home: see MOBILE HOME REQUIREMENTS
- UL 103HT (US)/ULC-S629 (CAN) listed manufactured chimney or approved lined masonry chimney. Must have a minimum 6" (152mm) diameter to maximum 10" (254mm) or otherwise maximum 85 sq. in. (550 sq. cm) area. Install per chimney manufacturer's instructions.
- Furnace Cement (manufacturer recommends Rutland Code 78 or equivalent)

⚠ CAUTION: ANY DEVIATION OR ALTERATION FROM THESE INSTALLATION INSTRUCTIONS MAY RESULT IN DAMAGE TO YOU, THE STOVE, YOUR CHIMNEY, AND YOUR HOME. YOUR WARRANTY MAY BECOME VOID. READ AND FOLLOW ALL INSTRUCTIONS. Contact Enerco Group with any comments, concerns, or questions.

POSITIONING THE STOVE

When deciding on a location for the stove, choose a location that will favor the most efficient heat distribution possible throughout the house. Install the stove in the room where the most time is spent and in the most spacious room possible. A stove installed in an open living room will have a higher efficiency than one placed in a basement or outdoors in sub-freezing temperatures. Burning dry wood will also make the stove more efficient than burning wet wood.

When deciding on the position and orientation of the stove be sure to obey all clearance to combustibles, have the stove on smooth level floor and not raised up, and if using the blower accessory have the stove within 65 inches (165 cm) distance of a 120v electrical supply.

⚠ WARNING: DO NOT INSTALL NEAR EXITS OR STAIRS. ENSURE STOVE CAN NOT BLOCK AN EVACUATION IN THE EVENT OF A FIRE.

CHIMNEY CONNECTORS REQUIREMENTS AND INSTALLATION

If you have any questions regarding ventilation options of your stove, contact either:

- The manufacturer Enerco Group, Inc. at 1-800–251-0001. Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
- The National Fire Protection Association (NFPA) and request a copy of the latest editions of NFPA Standard 211 and NFPA Standard 908. The mailing address of the NFPA is Battery March Park, Quincy, MA 02269.

⚠ CAUTION: THIS STOVE SHALL NOT BE INSTALLED IN A BEDROOM OR BATHROOM

The chimney connector must be stove pipe meeting these requirements:

- Have a 6 inch (152 mm) diameter
- Single wall (double wall for mobile homes)
- Be made of 24 MSG (minimum standard gauge) blue steel.

Insert the chimney pipe's crimped edge into the stove's exhaust at the top of the stove. Secure the pipe in place with three sheet metal screws through three evenly spaced holes.

Any additional connector pipes or elbows should be installed with crimped end on the stove end of the path (not on the chimney end) and should be secured with three evenly spaced sheet metal screws.

The following venting pipe precautions need to be adhered to:

- At least 2 feet (61 cm) of vertical pipe coming out of the stove is required, at minimum, before the system is permitted to have a horizontal section of venting.
- Horizontal vent pipe must be sloped downward away from the chimney 1/4" (0.6 cm) for every 1' (0.3m).
- Minimum clearance between the highest point of horizontal vent pipe and the ceiling is 18" (45.7 cm)
- A total of two (2) elbows are permitted for venting installation. Do not exceed two elbows as this may result in inadequate draft and cause leakage of smoke. When using elbows the integrity of the draft can be best protected by using non adjustable corrugated elbows.

⚠ CAUTION: THE JOINTS OF ANY AND ALL CONNECTIONS FOR ANY VENTILATION SYSTEMS (COMBUSTION EXHAUST AND OPTIONAL INLET AIR DUCT) MUST BE SEALED WITH HIGH TEMPERATURE SILICONE.

⚠ CAUTION: A CHIMNEY CONNECTOR SHALL NOT PASS THROUGH AN ATTIC OR ROOF SPACE, CLOSET OR SIMILAR CONCEALED SPACE, OR A FLOOR, OR CEILING. WHERE PASSAGE THROUGH A WALL, OR PARTITION OF COMBUSTIBLE CONSTRUCTION IS DESIRED, THE INSTALLATION SHALL CONFORM TO CAN/CSA-B365, INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT.

⚠ CAUTION: DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.

Where passage through a wall or partition of combustible construction is desired, the installation shall conform to chimney manufacturer's instructions.

NOTE: In Canada, installation must conform to CAN/CSA-B365 when passing through combustible construction, illustrated in Figure 4 on next page.

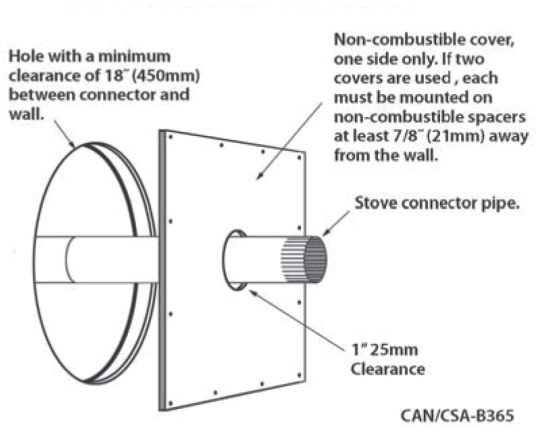


Figure 4
ONLY APPROVED CANADIAN WALL PASS THROUGH

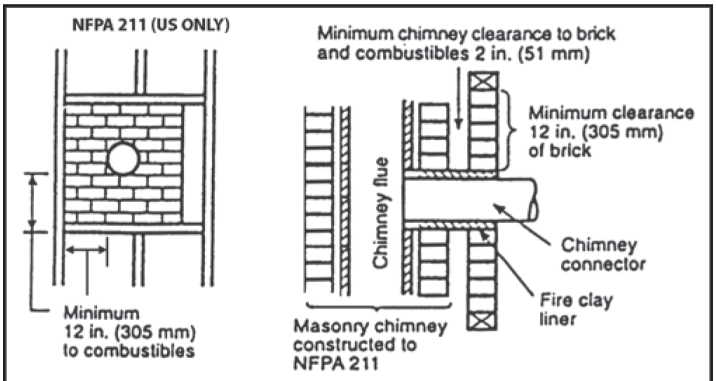


Figure 5 (US ONLY)
Brick Masonry: Minimum 3.5 inch (89 mm)thick brick masonry all framed into combustible wall with a minimum of 12 inch (305 mm) brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.

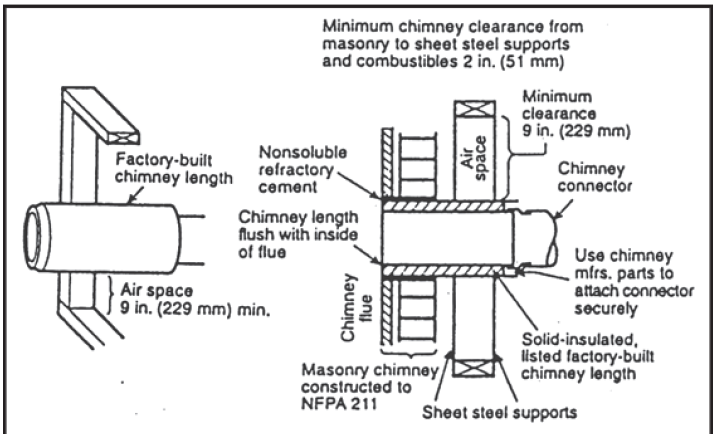


Figure 6 (US ONLY)
Insulated Sleeve: Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 inch (25.4 mm) or more of insulation with a minimum 9 inch (229 mm) air space between the outer wall of the chimney length and combustibles.

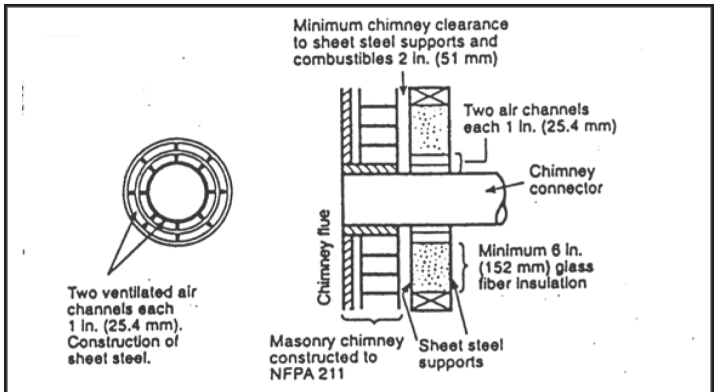


Figure 7 (US ONLY)
Ventilated Thimble: Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated thimble, minimum 24 gauge in thickness, having two 1 inch (25.4 mm) air channels, separated from combustibles by a minimum of 6 inches (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gauge in thickness.

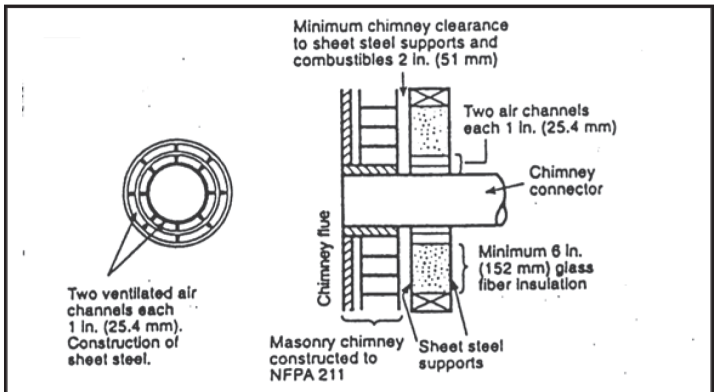


Figure 8 (US ONLY)
Chimney Section Pass-through: Solid insulated, listed factory-built chimney length with an inside diameter 2 inches (51 mm) larger than the chimney connector and having 1 inch (25.4 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2 inches (51 mm) of air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12 inches (305 mm) chimney section spaced 1 inch (25.4 mm) away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel support securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

ADDITIONAL MOBILE HOME REQUIREMENTS

NOTE: Only approved for US mobile home, not approved for mobile home in Canada.

All mobile home installations must be made in accordance to Manufactured Home and Safety Standard (HUD), CFR 3280, part 24.

PARTS & MATERIALS REQUIRED (NOT SUPPLIED)

⚠ WARNING: USE OF SINGLE WALL CONNECTOR PIPE ANYWHERE IN MOBILE HOME INSTALLATION IS NOT PERMITTED.

⚠ CAUTION: IT IS IMPORTANT TO USE ONLY THE SPECIFIED COMPONENTS. USE OF COMPONENTS OTHER THAN SPECIFIED COMPONENTS MAY RESULT IN INCREASED RISK TO YOU, YOUR STOVE, AND YOUR HOME.

- #8 grounding wire.
- Two (2) National Electrical Code (NEC) approved grounding device.
- A paint penetrating washer, such as a star washer.

All components of the ventilation system listed below must be of the HT type and listed to UL 103 HT. Install per chimney manufacturer's instructions.

- Double wall stove pipe having 6" (152mm) diameter and made of either 24 MSG (minimum standard gauge) black or 26 MSG blue steel.
- Ceiling thimble suitable for use in mobile home.
- Roof thimble suitable for use in mobile home.
- Spark arrestor suitable for use in mobile home.
- Roof flashing suitable for use in mobile home.
- Chimney cap which does not permit the entrance of a 1/2" (13 mm) diameter rod.
- A factory-built chimney, minimum 15 ft (4.6m) tall which conforms to ULC-S629, Standard for 650˚C Factory-Built Chimneys.

ADDITIONAL INSTALLATION REQUIREMENTS

⚠ CAUTION: THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, CEILING, AND ROOF MUST BE MAINTAINED.

- The stove must be on installed on a level surface which can support the weight of the stove.
- The stove must be bolted to the level surface so that it permanently secured and can not be moved, tipped, or have ventilation seals compromised.
- The stove must be grounded with #8 grounding wire and terminated at each end with a National Electrical Code (NEC) approved grounding device. A paint penetrating washer such as a star washer shall be installed where connected to steel frame of the Mobile Home.
- The use of outside combustion air is mandatory when installing this wood stove in a mobile or manufactured home.
- The outside air connection pipe protrudes from the bottom center of the stove; a kit (F500313) is available from Inc. designed for connecting this unit to outside combustion air.
- If it is not feasible to use the F500313 outside air hookup kit in your stove installation, other materials may be used, provided the following rules are followed:
  - — The duct must have a minimum diameter of 4 inches (10.2 cm).
  - — The duct must be made of metal exclusively, not other materials such as plastic.

  The end of this duct on the outside of the mobile home must meet the following requirements:
  - — The duct hole must be equipped with a screen which prevents rodents from infiltrating.
  - — The duct hole must be kept free of leaves, snow, ice, or other debris that could restrict air supply when the appliance is in operation.
- If the chimney exits the mobile home at any location besides the roof and if that location is less than 7 feet (2.13 m) from the ground that the mobile home is settled on, then the system must meet the following requirements:
  - — A guard from the exit location up to a height of 7 feet (2.13 m) from the ground that the mobile home is settled on.

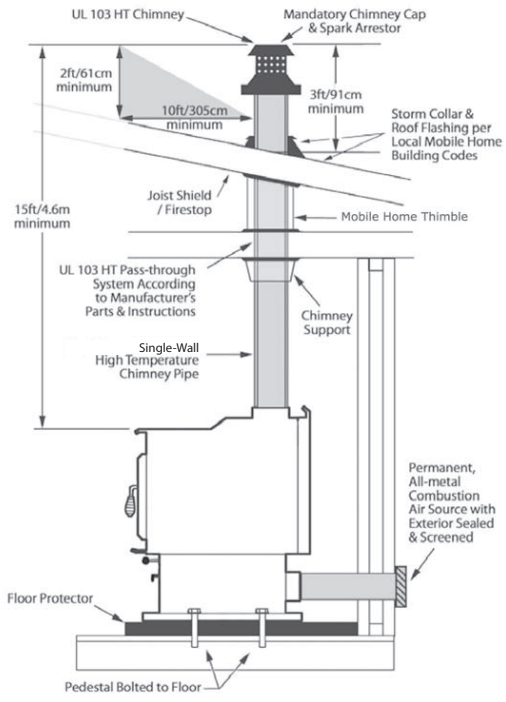


Figure 9 Mobile Home Installation Visual

- The joints of any and all connections for both of ventilation systems (the inlet air and the combustion exhaust) must be sealed with high temperature silicone.
- The chimney must comply with all applicable codes and requirements of the authority having jurisdiction.
- The chimney must be removed for any mobile home transportation, and reinstalled per all instructions after transportation.

CHIMNEY REQUIREMENTS

GENERAL

⚠ CAUTION: DO NOT USE MAKESHIFT COMPROMISES WHEN INSTALLING THE VENTING SYSTEM; HAVE EXISTING CHIMNEY SYSTEMS INSPECTED BEFORE USE AND BE CERTAIN ALL NEW CHIMNEY SYSTEMS ARE INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS AND WITH ONLY UL LISTED COMPONENTS (ULC IF CANADA).

For the sake of exhausting combustion products and also establishing a draft which provides oxygen for combustion, the stove must be installed for use in conjunction with one of the following approved chimney systems:

- A chimney complying with the requirements for Type HT (2100˚F) chimneys in the Standard for Chimneys, Factory-Built, Residential Type and Building Heating Appliance, UL 103 or ULC S629 or a code-approved masonry chimney with a flue liner.
- The chimney size should not be less than or more than three times greater than the cross-sectional area of the flue collar.
- An existing fireplace that is structurally sound, incorporates flue liner (clay tile which protects chimney), has its damper closed and sealed, and has been approved for conversion by a qualified expert.

Any/All chimney systems:

- Must meet the following minimum requirements:
  - —Be at least 15 feet (4.6 m) tall, measured from the top of the stove to the tip of the chimney cap
  - —Must be at least 3 feet above the roof, measured from the highest point of contact with the roof and the tip of the chimney cap.
  - —Must be at least 2 feet (61 cm) above the highest point of the slope of the roof within 10 feet (305 cm) horizontally.
- Must have a negative pressure of 0.05 to 0.06 inches water column to create an appropriate draft.
- Must not be stove pipe material. Instead, only the three structures specified above may be used.
- Must not be installed for the purposes of venting a cellar or basement.
- Must not be used for this stove if it also serves any other appliance.
- Must not be obstructed by the chimney connector pipes, such as the Figure 10 below illustrates.

Contact your local building authority for approved methods of installation and any necessary permits and/or inspections.

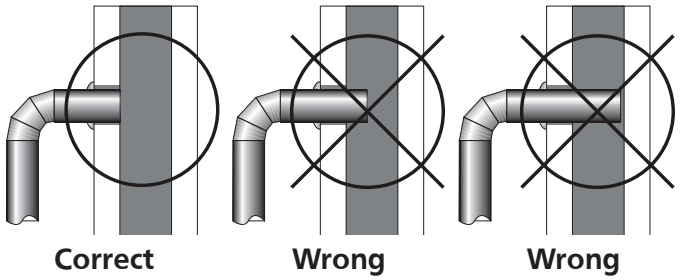


Figure 10 Connection Pipe & Chimney Connection

LINED MASONRY CHIMNEY INSTRUCTIONS & DIAGRAM

This stove is designed to be vented through a masonry chimney with flue liner (clay tile which protects chimney) which conforms to local building codes, fire codes, and latest edition of NFPA 211 US or CAN/CSA-B365.

1. Clean the code-approved lined masonry chimney
2. Inspect the lining of the chimney and make any required repairs.
3. If the connection piping from the stove to a masonry chimney is made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.

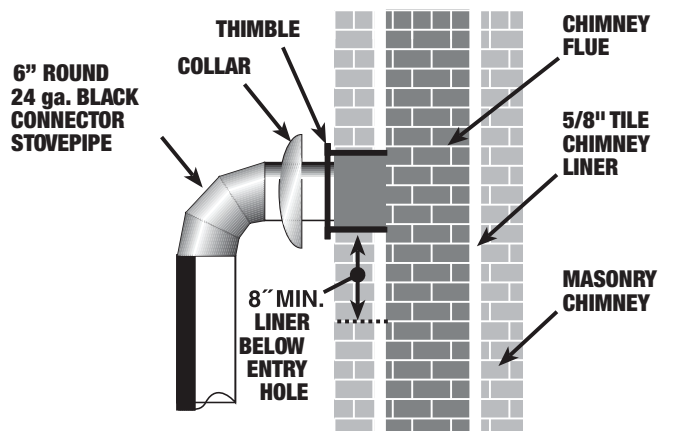


Figure 11 Connection to Masonry Chimney

If there is an opening at the base of the chimney it must be closed tightly.

MANUFACTURED CHIMNEY INSTRUCTIONS & DIAGRAM

⚠ WARNING: DO NOT USE SINGLE-WALL CONNECTION PIPE AS A CHIMNEY.

This stove is designed to be used with either a UL 103 or ULC S629 (CAN) listed manufactured chimney or an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry chimney. Not all manufactured chimney are UL 103 or ULC S629 (CAN). Home centers, hardware stores, HVAC supply stores, and the Online websites of chimney manufacturers will be able to provide stove pipe that is rated to these standards.

This listing indicates that the Chimney is rated for high temperatures up to 2100˚F (1149˚C).

Only use components that all come from the same manufacturer. Do not mix brands of components for the same ventilation system.

The following figures illustrate various methods and requirements of using a manufactured chimney and connection pipes to vent the wood stove.

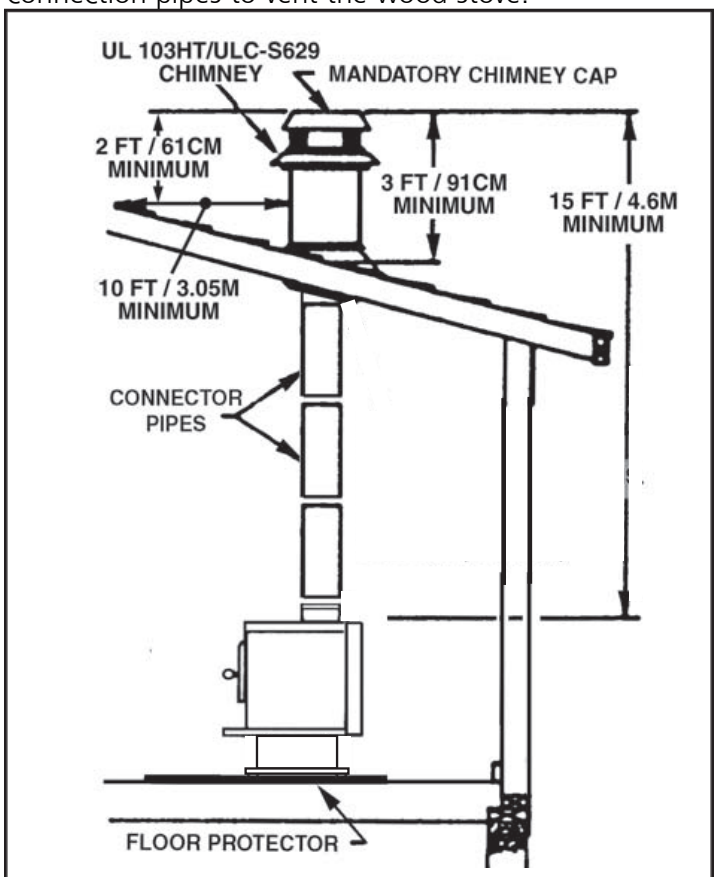


Figure 12 Manufactured Chimney through Roof

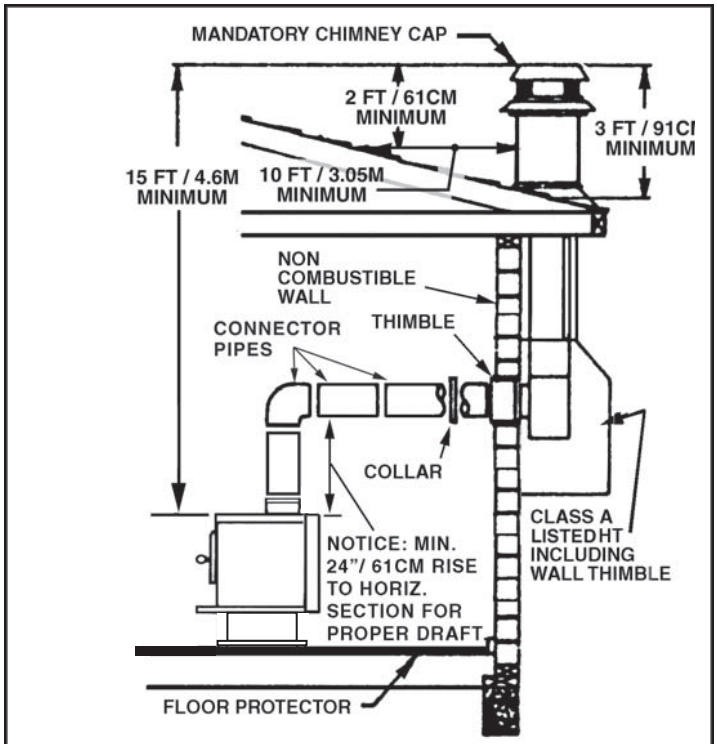


Figure 13
Manufactured Chimney through Masonry Wall

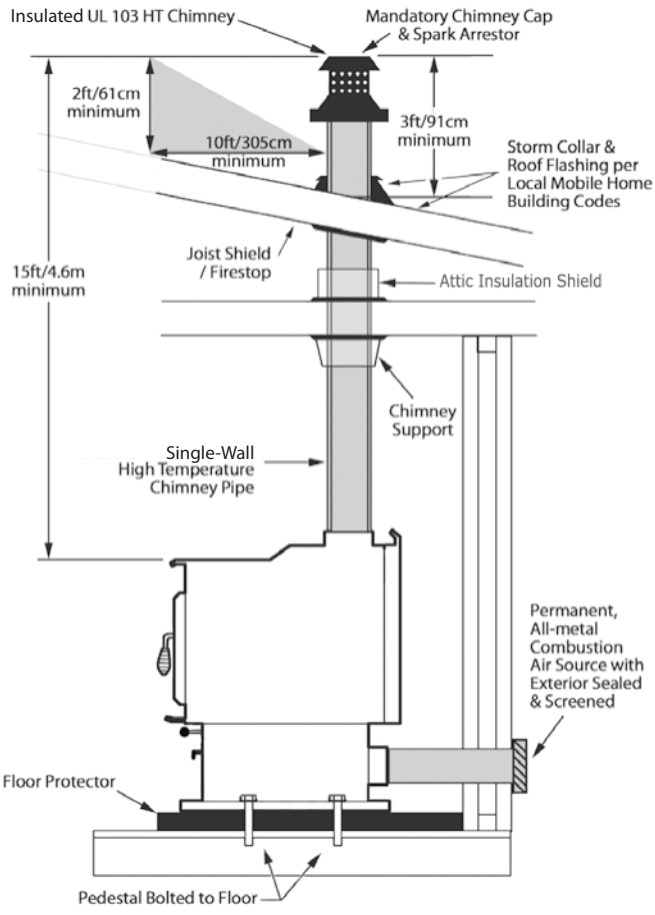


Figure 14 Manufactured Chimney through Attic

EXISTING FIREPLACE INSTRUCTIONS & DIAGRAM

This stove may be vented through a fireplace with flue liner (clay tile which protects chimney) only if all of the warnings, requirements and processes below are obeyed. Installation should be executed so that the system can be dismantled for periodic cleaning and inspection.

⚠ WARNING: VENTING A STOVE INTO A FIREPLACE BY ANY METHOD NOT EXPLICATIVELY COVERED, OR WHICH OTHERWISE DOES NOT SATISFY LOCAL CODES, SHOULD NOT BE ATTEMPTED. DOING SO WILL VOID THE WARRANTY ON THIS STOVE, AND MAY CREATE A HAZARD IN YOUR HOME.

⚠ CAUTION: HAVE A QUALIFIED EXPERT INSPECT THE FIREPLACE CHIMNEY AND APPROVE IT FOR CONVERSION FOR USE WITH A WOOD STOVE.

NOTE: MANY FIREPLACES ARE DESIGNED TO WITHSTAND CONTACT WITH COMBUSTIBLES AT THE FLOOR BUT MAY NOT HAVE BEEN TESTED FOR USE WITH A WOOD STOVE. CONNECTION OF A WOOD STOVE TO FIREPLACE CHIMNEY MAY VOID EXISTING WARRANTY ON THE FIREPLACE CHIMNEY.

1. Inspect the chimney. Any questions regarding the condition of the chimney may be directed at a qualified licensed contractor, qualified engineer, competent mason, certified Chimney Sweep, or knowledgeable inspector. The chimney must be:
   - Structurally sound
   - Equipped with flue liner that is in good condition. **If the chimney is unlined or damaged it can not be approved for conversion for use with this wood stove.**
   - Able to be secured and sealed at the throat damper and (if present) clean out or other openings at the base of the chimney which could leak the pressure seal.
2. If the connection piping from the stove to a masonry chimney is to be made through a combustible wall, consult a qualified mason or chimney dealer for consultation. To ensure safety, the installation should only be done by a qualified installer. The installation must conform to the regulations established by local fire codes and building codes.
3. The stove pipe must enter the chimney at least 8 inches higher than the bottom of the chimney liner. The distance between the ceiling and the vent pipe edge closest to the ceiling must be at least 18 inches (46 cm).
4. Install a thimble into the created opening. The thimble must:
   - Be made of clay
   - Be at least 5/8 inch (16 mm) thick
   - Be oversized for stovepipe so that there is approximately a ½ inch (13 mm) air gap. This is a requirement so that the pipe can safely expand and contract as it warms and cools.
   - Be located so that it will be surrounded by either 12 inches (305 mm) or masonry brickwork or 24 inches (61 cm) of stone.
   - Be installed so that its butt is flush with the chimney lining (see Figure 11 page 10)
5. Secure the thimble with refractory mortar.
6. Install the stove pipe so that it is as far as possible into the thimble without protruding passed the flue lining (again, see Figure 11 page 10)
7. Seal the airspace between the stove pipe and the thimble with either high temperature sealant or ceramic wool.
8. Using either high-temperature caulk, ceramic wool, or furnace cement secure and seal the throat damper and (if present) any clean out or other openings at the base of the chimney.

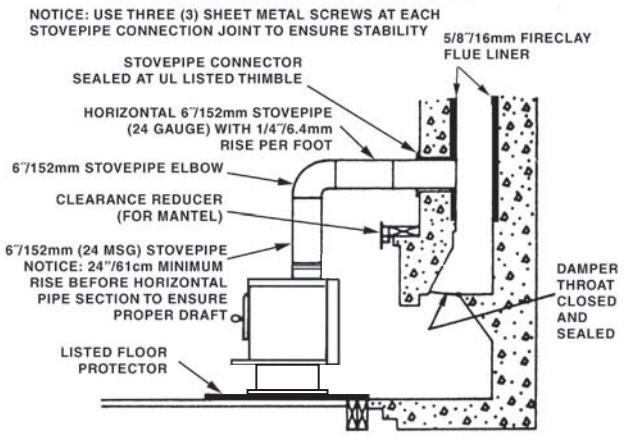


Figure 15
Fireplace converted to Chimney

VENTILATION

Air introduction to stove happens in three locations:

1. The Lower Primary Air Orifice (LPAO), behind the door.
2. The primary air inlet.
3. The secondary stage air tubes.

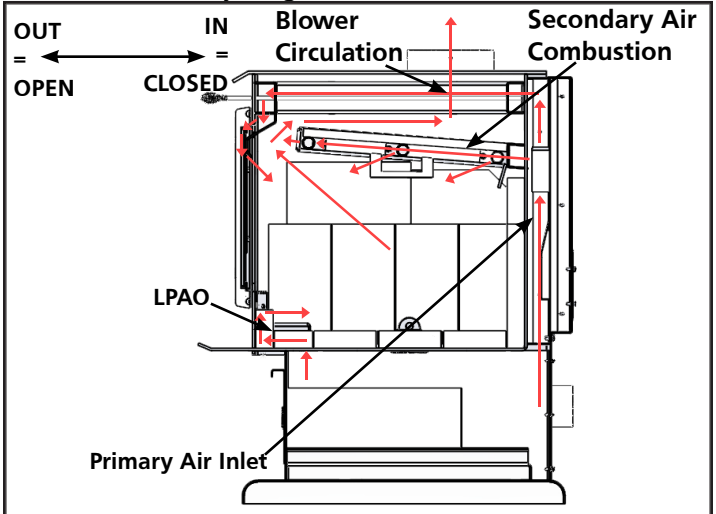


Figure 16 Stove Air Flow

- By pushing the air control (on the front of the stove) into the stove the primary air inlet hole at the back of the stove is closed.
- Pulling the primary air inlet air control away from the stove increases the size of the opening for air to enter the firebox.

In general, the further the air control is pulled out the hotter the stove will get. The best position for the air control will depend on the chimney specifications, weather, and fuel.

In order to find the best position for the air control in your installation, start a stove fire as this manual details. For 15 to 20 minutes have the air control pulled away from the stove to fully open the Primary Air Inlet. At the secondary air combustion (top of the firebox) you should be able to observe a secondary combustion taking place. Push the air control in towards the stove to the desired heat setting. If the secondary combustion disappears, restart it by pulling the air control away from the stove. Move the air control to the desired heat setting by gradually pushing it in and ensuring that secondary air combustion is still being supported. Secondary air combustion is important for maximizing the heat transfer from the stove to you and minimizing the amount of smoke which can condense within your chimney as creosote.

NOTE: SECONDARY COMBUSTION MINIMIZES, BUT DOES NOT ELIMINATE, CREOSOTE FORMATION AND BUILD UP IN CHIMNEY.

⚠ WARNING: Additional combustion air should be provided from the outdoors if these or other indications suggest that infiltration air is inadequate:

- **The solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.**
- **Existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when opened, or back-draft, whether or not there is combustion present.**
- **Any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day.**
- **The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.**
- **There is excessive condensation on windows in the winter and**
- **A ventilation system is stalled in the house.**

CHIMNEY DRAFT CONSIDERATIONS

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst.

Inadequate draft will also cause the appliance to leak smoke into the room through appliance and chimney connector joints.

An uncontrollable burn or excessive temperature indicates excessive draft.

Please be mindful of installation location: Inversion and other air quality issues can arise in valleys or if unit is installed close to neighboring homes. To achieve and maintain the draft:

- After the fuel has burned out and you are finished with the stove, open the Primary Air Inlet all the way by pulling the air control away from the heater.
- Obey all chimney requirements, page 7 through page 12.
- Seal any and all connections of intake and exhaust piping.

- Avoid elbows and long horizontal runs of piping.
- Clean exhaust piping frequently.
- Warm the chimney up by building a large fire at the beginning of use of the stove. **DO NOT OVERFIRE THE STOVE. IT IS NEVER PERMITTED TO OVERFIRE THE STOVE.**
- If another appliance is venting air outside and creating a negative pressure, air can be sucked down your chimney in the reverse direction instead of exhausting out of the heater. Nullify that effect by opening a nearby door or window.

FIREBRICKS

Firebricks which line the firebox should already be installed in your wood burning stove. Inspect the firebricks inside your stove to ensure that they have not shifted or shattered during shipping or installation.

⚠ CAUTION: NEVER OPERATED STOVE WITHOUT FIREBRICKS IN PLACE AS SHOWN.

BEFORE FIRING, PUSH FIREBRICKS TOWARDS REAR OF THE STOVE. THERE SHOULD BE NO GAPS BETWEEN FIREBRICKS.

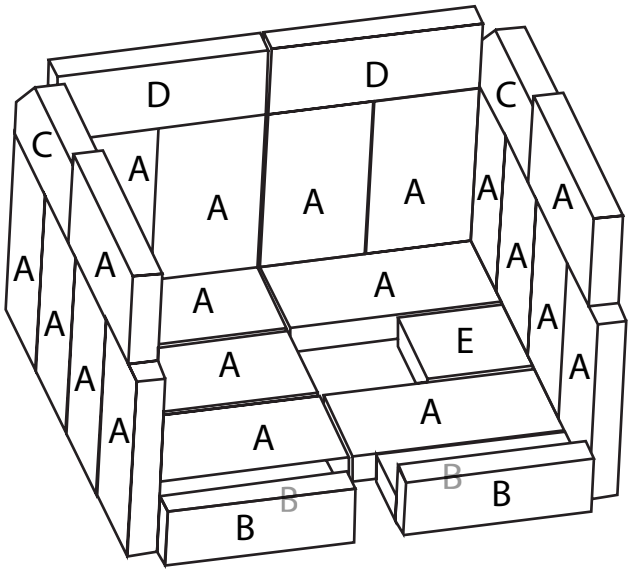


Figure 17
Medium Stove Firebrick Assembly Pattern

NOTE: WHEN REMOVING OR INSTALLING FIREBRICK BE SURE TO NOT DAMAGE THE FIREBRICKS.

- Once your wood-burning stove is properly installed, building an effective fire requires good firewood (using the correct wood in the correct amount) and good fire-building practices. The following section will help you obtain the best efficiency from your wood stove.

OPERATION

⚠ CAUTION: NEVER ATTEMPT TO USE ANY OF THE FOLLOWING MATERIALS AS FUEL.

- Unseasoned wood (green, wet, or freshly cut wood);
- Pressure treated wood;
- Paper products, cardboard, or particleboard;
- Salt water driftwood or other previously salt water saturated materials;
- Garbage;
- Animal remains or manures;
- Lawn clippings or yard waste;
- Waste petroleum products,
- Materials containing
  - —asbestos
  - —plastic
  - —rubber (including tires)
- Petroleum products such as
  - —paints
  - —paint thinners
  - —asphalt products

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

APPROVED FUEL:

⚠ CAUTION: BURN UNTREATED WOOD ONLY. OTHER MATERIALS SUCH AS WOOD PRESERVATIVES, METAL FOILS, COAL, PLASTIC, GARBAGE, SULPHUR, OR OIL, MAY DAMAGE THE CATALYST.

Natural cordwood is the only fuel approved for use with these wood burning stoves. Abide by the specifications below:

- Hardwood that has been air dried (seasoned) for at least 1 year. Properly seasoned wood is darker, has cracks in the end grain, and sounds hollow when smacked against another piece of wood.
- The wood should be 16 inches (41 cm) to 20 inches (50 cm) long.
- If a log has a diameter larger than 6 inches the log should be split.
- The humidity content of the wood must be less than 19%-25% of the weight of the log.
- Newly-cut logs can have a moisture content (MC) of 80% or more, depending on species. Since wood shrinks, and can also split, twist or otherwise change shape as it dries, most wood is dried before being used. Air drying, or 'seasoning,' is the most

common method used for cord wood. In most parts of the United States, the minimum moisture content that can be generally obtained in air drying is about 12 to 15 percent. Most air-dried material is usually closer to 20 percent moisture content when used.

- To test your firewood, simply push the pins into the wood and wait for a reading. Remember, don't just stick the meter into the ends of your firewood. To get the most accurate reading, split the wood and test the center. The center of the log will contain the most moisture.

⚠ CAUTION: Attempts to use wet or unseasoned wood will result in:

- **Ignition difficulty.**
- **Accelerated creosote build-up resulting in chimney fire.**
- **Incomplete combustion.**
- **Low heat yield.**
- **Blackening of the glass in door.**

Some fire starters may be used at the very beginning to help wood catch fire. Examples of potentially effective fire starters include paper wads, cardboard, saw dust, wax, and similar products marketed explicitly for the purpose of starting fires. Burning these materials may result in the release of toxic fumes, rendering the stove ineffective, and causing smoke. Research and understand the guidelines and risks for your chosen fire starter(s).

⚠ CAUTION: NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS STOVE. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE STOVE WHILE IT IS IN USE.

Do not store fire wood or fire starting materials on floor protector, underneath stovepipe, or anywhere withing minimum clearances from combustible surfaces specified on page 5. Wood should be stored in a dry, well ventilated area.

OPERATING PRECAUTIONS

⚠ CAUTION: A CHIMNEY FIRE MAY CAUSE IGNITION OF WALL STUDS OR RAFTERS WHICH WERE ASSUMED TO BE A SAFE DISTANCE FROM THE CHIMNEY. IF A CHIMNEY FIRE HAS OCCURRED, HAVE YOUR CHIMNEY INSPECTED BY A QUALIFIED EXPERT BEFORE USING AGAIN.

1. Inspect stovepipe at the start of the season and at least once every 60 days. Replace immediately if stovepipe is rusting or leaks smoke into room.
2. Use only the approved fuel.

⚠ WARNING: BURNING FUELS OTHER THAN CORDWOOD, PARTICULARLY COAL AND CHARCOAL, CAN RESULT IN HAZARDOUS CONCENTRATIONS OF CARBON MONOXIDE BEING EMITTED INTO THE DWELLING. FOR THESE REASONS, NEVER BURN COAL OR CHARCOAL IN THIS CORDWOOD STOVE. INSTALLING A CARBON MONOXIDE DETECTOR AND BEING AWARE OF THE SYMPTOMS OF CARBON MONOXIDE POISONING CAN HELP REDUCE THE RISK OF CARBON MONOXIDE RELATED ISSUES.

3. Inspect the glass door. ***CAUTION:*** Do not operate if the glass is cracked or broken. Never load fuel to a height that could present a hazard when opening the door again later.
4. Do not position fuel against the glass.

⚠ WARNING: THIS UNIT WAS DESIGNED FOR OPERATION ONLY WITH THE DOOR CLOSED AND TIGHTLY LATCHED. OPERATING THIS UNIT WITH THE DOOR LATCHED LOOSELY OR OPEN WILL ALLOW EXCESSIVE COMBUSTION AIR TO REACH THE FIRE AND WILL RESULT IN DANGEROUSLY HIGH UNIT TEMPERATURES. HIGH UNIT TEMPERATURES "OVERFIRING" CAN DAMAGE THE UNIT, VOID THE WARRANTY OR IGNITE CREOSOTE DEPOSITED IN THE CHIMNEY SYSTEM BY PREVIOUS, SLOW BURNING FIRES.

5. Do not obstruct the lower air inlet (bottom of the firebox by door) or the secondary air tubes (along the top of the firebox).

PAINT CURING

NOTE: BECAUSE OF HIGH OPERATING TEMPERATURES, THIS STOVE USES A SPECIAL HIGH-TEMPERATURE PAINT. TO ENABLE THE PAINT TO BOND DURABLY TO THE STOVE, FOLLOW THE FOLLOWING PROCEDURE:

1. Build a small fire in the stove for 20 minutes.
2. Build another small fire in the stove which lasts 20 minutes.
3. Build a final medium sized fire in the stove which lasts 20 minutes. The paint curing process is now complete. Provide cross ventilation to eliminate odors or smoke cause by curing process.

HIGH FIRE WITH A COLD START

To start the fire from a "cold" stove:

1. Inspect that all seals on the door, ash drawer, and ash plug are in good condition. Close the ash drawer. Plug ash hole. Inspect the chimney and chimney connector, see maintenance on page <?>.

⚠ CAUTION: DO NOT OPERATE STOVE IF THE GLASS IS BROKEN.

⚠ WARNING: THE CHIMNEY CONNECTOR MUST BE IN GOOD CONDITION AND BE KEPT CLEAN TO SAFELY USE THIS STOVE.

2. Cut and split approximately 15 kindling pieces 15 inches long. Half of them should be approximately inch square, the rest ½ inch square. The kindling should be very dry and weigh approximately 4.5 lbs.

⚠ WARNING: DO NOT USE GRATE OR ELEVATE FIRE – BUILD WOOD FIRE DIRECTLY ON HEARTH. DO NOT OPERATE WITH THE MAIN DOOR OPEN – OPERATING THE STOVE WITH THE MAIN DOOR OPEN WILL CREATE AN OVER-FIRE.

3. Cut and split approximately 15 start-up fuel pieces 15 inches long. Half of the pieces should be larger cross-section (approximately 1 ½ inches square) and the rest smaller cross-section (approximately 1 inch's 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 6.8 lbs.

⚠ CAUTION: WHEN TENDING THE STOVE ALWAYS WEAR FIRE RETARDANT CLOTHING AND PROTECTIVE EYEWARE.

4. Arrange the start-up fuel pieces in a grid as shown in the figures. Place two of the larger pieces about six inches apart going front to back. Next, two more pieces the same size left to right about six inches apart. Place about seven of the small pieces front to back on top of the grid. See Figure 18. Place the remaining start up fuel sideways on top.



Figure 18 Start Up Fuel

5. Next, arrange the kindling pieces in a similar alternation grid pattern with the larger pieces first followed by the smallest with a layer of three pieces going left to right as shown with six or seven pieces on the top. See Figure 19.



Figure 19

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

⚠ WARNING: NEVER LEAVE A RUNNING STOVE UNATTENDED WHILE DOOR IS OPEN. THE DOOR MAY ONLY BE OPEN FOR FIRE STARTING AND FIRE TENDING. TO CLOSE: FIRMLY ROTATE DOOR HANDLE CLOCKWISE UNTIL THE DOOR IS SECURELY LATCHED. DO NOT SLAM THE DOOR.

6. To start make sure the air control is pulled all the way out.

7. Using a propane torch, light the top front of the kindling grid. The torch should be operated for 60 seconds

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 3/4, rake the remaining coals and fuel pieces forward until they are equally distributed and level.
2. Place the wood so there is space on either side for good airflow. All Fuel pieces should be in a front-to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the air control all the way in.

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 wood so there is space on either side for good airflow. All fuel pieces should be in front-to-back orientation.
3. Immediately close the load door and set the air control to maximum open (all the way out)..
4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push the air control halfway between the high and low settings.

⚠ CAUTION: IF THE STOVE OR STOVE PIPE GLOWS RED THE UNIT IS OVERFIRING. CLOSE STOVE DOOR AND IMMEDIATELY SHUT AIR CONTROL (PUSH AIR CONTROL TO THE "IN" POSITION) TO REDUCE AIR SUPPLY AND SLOW DOWN COMBUSTION.

⚠ WARNING: IN CASE OF CHIMNEY FIRE:
1. **CLOSE AIR INLET CONTROL BY PUSHING AIR CONTROL IN TOWARDS STOVE.**
2. **GET OUT OF THE HOUSE OR BUILDING.**
3. **CALL THE FIRE DEPARTMENT.**

MINIMIZING CREOSOTE FORMATION

See "MAINTENANCE" on page 18 for an explanation on Creosote formation and removal. To slow the build up of creosote within your chimney, comply with the following guidelines:

- Burn only the recommended fuel "APPROVED FUEL" on page 14.
- Do not mix green or wet wood with the approved fuel. Wood that does not ignite but instead hisses, sizzles, and blackens is definitely too wet. It will cause accelerated creosote build up in chimney and will also reduce the heat output of the stove.
- Only add to ½ the fuel capacity of the fire box at a time to ensure thorough combustion and temper the amount of smoke produced.
- Every time fuel is added, fully open the Primary Air Inlet by pulling the air control away from the stove.
- Periodically throughout the day, fully open the Primary Air Inlet by pulling the air control away from the stove for a few minutes. This will help keep the chimney at a warm temperature and subsequently reduce the condensation of creosote.

DISPOSAL OF ASHES

Whenever ash accumulates within the fire box or ash pan to a height of 3-4 inches:

1. After ashes have cooled, remove ash plug and carefully sweep ashes down into the ash bin.
2. Replace ash plug,remove ash bin, and empty into a suitable container.
   NOTE: You may also purchase an Ash Vacuum, model# AV65GALB/AV65GALSS.
3. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.
4. Other waste shall not be placed in ash containers.

MAINTENANCE

DAILY MAINTENANCE

- Inspect the firebox for ash accumulation; remove excess ash and follow instructions below regarding disposal.

MONTHLY MAINTENANCE

- Check the blower for dust accumulation (if installed); check the door handle for proper operation and to be certain an airtight seal is still being made by the door.
- Inspect the chimney system and chimney connector and sweep if necessary. Although cleaning may be required less than monthly, ALWAYS inspect the venting system monthly to decrease the chance of a chimney fire.
- Visually inspect the ceramic fiberboards in the firebox for cracks and/or breakage. Slight surface cracks will not affect the performance of the boards, but cracked or crumbling boards should be replaced immediately.
- Visually inspect the secondary combustion pipes for cracks, warping and corrosion. Although these tubes are constructed from stainless steel, they operate at very high temperatures and can eventually wear out from normal use.

YEARLY MAINTENANCE

- Check all gaskets (window and door) for wear and to be certain they still maintain an airtight seal. See the following page for instructions.
- Thoroughly clean the chimney system and the chimney connector system. Since the chimney connector is generally exposed to high exhaust temperatures, inspect it carefully for leaks and weak spots; replace any questionable pieces. In the case of straight through the roof chimney system, be certain to remove the ceramic fiberboards before pushing the chimney sweeping brush down into the firebox. Forcefully hitting the top of the board with a cleaning brush or rod can damage or destroy the boards.
- Remove all ash from the stove. Leave the air control open during the non-heating months to allow some air to flow through the stove to help prevent corrosion.

⚠ WARNING: DO NOT ATTEMPT TO CLEAN OR SERVICE WHILE THE STOVE IS HOT. BEFORE OPENING THE WOOD FIRE STOVE DOOR FOR ANY TYPE OF SERVICE, BE SURE THAT THE STOVE IS COOL AND THAT THE BLOWER IS UNPLUGGED.

⚠ WARNING: USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH.

CREOSOTE - FORMATION AND NEED FOR REMOVAL

Failure to remove creosote may result in a dangerous chimney fire.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (eighth of an inch, 3 mm, or more) it should be removed to reduce the risk of a chimney fire.

Establish a routine for the fuel, wood burner and firing technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited, and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local municipal or provincial fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.

CLEANING GLASS

Be certain the stove and the glass are completely cool. The build-up on the glass will generally be light and water is normally sufficient to remove the deposits. If stubborn soot persists, use a cleaner made specifically for this purpose. Rinse the glass with clean water and dry the glass before resuming normal operation. These cleanings help prevent the accumulation of acidic ash build up which can weaken the glass and result in cracks. It is not acceptable to operate the stove with cracked or broken glass.

⚠ WARNING: DO NOT CLEAN GLASS WITH ABRASIVE CLEANERS OR BY ANY OTHER PROCESS WHICH MAY SCRATCH OR DAMAGE THE GLASS. DO NOT CLEAN WHEN HOT!

REPLACING GLASS

⚠ WARNING: DO NOT ABUSE THE GLASS DOOR BY STRIKING IT OR SLAMMING THE DOOR SHUT.

Replace the door glass only with 5 mm high-temperature ceramic single-pane glass. The glass size is 15 in.(381 mm) x 11.25 in.(285.75 mm). DO NOT use substitute materials! Never replace ceramic glass with tempered or any other type of glass. Contact the manufacturer for more information on ordering factory original or equivalent parts.

1. Remove the door from the stove and rest it face down on a firm work surface.
2. Using a 5/16" wrench, remove the ten window bracket retaining screws.
3. Remove the four window tabs from the door. Take extra care to avoid shards of glass if the glass window has been broken.
4. Lift the old glass panel out of the door and discard.
5. The glass panel must be wrapped with a self-adhesive fiberglass rope gasket. If you purchased a new glass, it will come already wrapped. If reusing the same piece of glass, remove old gasket, scrape off old adhesive and wrapped with the new gasket. This gasket serves to cushion the glass from the cast iron door.
6. Reinstall the window retaining tabs using the ten screws previously removed. Do not over-tighten the screws.

REMOVING DAMAGED GASKETS

Over time the sealing gaskets along the glass (3mm x 16mm flat, fiberglass rope) and door (9/16" dia. fiberglass rope) may lose their rigidity. These seals are essential for providing a seal which allows the stove to operate safely. Inspect the gaskets periodically, and if they become worn contact the manufacturer for information on original or equivalent gasket.

To replace the gasket:

1. Ensure that all coals and fuel are extinguished and that the stove is cool to the touch.
2. Remove old gasket and clean the gasket gutter.
3. Apply a thin coat of high temperature gasket cement along the inside of the gasket gutter.
4. Press the beginning of the replacement gasket into the most up and most left position of the prepared gasket gutter.
5. Continue pressing the replacement gasket clockwise along the gasket gutter until it has wrapped back to where the gasket was pressed in initially.
6. Trim any excess replacement gasket away ,and press the remaining butt into the gutter to complete the seal.
7. Close the door, drawer, or ash plunger and allow 3 to 4 hours for the cement to set before operating the stove.

Replacing Air Tubes

NOTE: HANDLE THE FRONT AIR TUBE DELICATELY TO AVOID DAMAGING IT OR DAMAGING THE STOVE ITSELF.

1. Use a 5/16" open end or socket wrench to remove the screw securing the air tube.

2. Remove the air tube by sliding it into the space to the right, followed by sliding the tube left and partially forward, and finally remove the tube by sliding to the right and out of the firebox. Overall this pattern looks like the letter Z. See Figure 20.

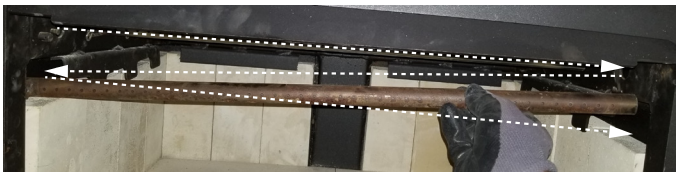


Figure 20 Front Air Tube Removal

3. Installation of the same, or a replacement, front air tube is step 1 done in reverse. The other air tubes may be removed and replaced by the same manner.

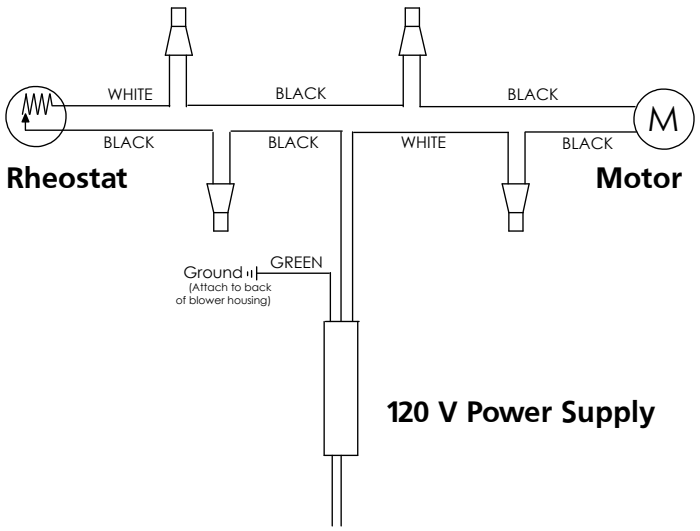
CERAMIC FIBERBOARD REPLACEMENT

To replace a cracked or broken board, first remove the front burner tube as descibed above. Then tilt the front of the board down and slide out the board you need to replace. Install the new board (the two boards should sit flush on the tubes side by side). Replace the tube previously removed.

To replace the ceramic blanket, follow the previous steps to remove the ceramic boards, then pull out the blanket. Replace with new blanket following the previous steps in reverse order.

BLOWER CLEANING

To remove debris such as dust and dirt, lightly vacuum the outside of the enclosure of the 120 Volt / 60 Hz / 0.26 Amp blower. Be sure that the motor is unplugged before vacuuming, or before preforming any other stove maintenance.



NOTE: IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105˚C AND RATED FOR 600V.

Figure 21 Blower Wiring Diagram

DOOR LATCH

When opening and closing the door repeatedly it is possible to unintentionally move the door handle thread so that the door no longer latches shut. If this happens, open the door and inspect the position of the door handle thread. Adjust the door handle until it is possible to close and seal the door tightly with the latch by rotating the handle counterclockwise.

- Rotate the door handle clockwise to extend the latch further into the firebox to allow the door latch to catch the inside frame of the stove.
- Rotate the door handle counterclockwise to decrease the distance between the latch and the stove.

Figure 22 Door Handle Latch Gap



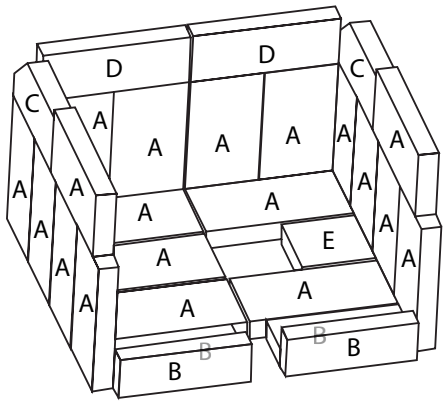
TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Stove smokes into room	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Negative Pressure in the Home.	Add an outside combustion air hookup to the unit.
Fire is difficult to start	Weak Draft.	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10. If necessary, add additional height to chimney.
	Cold Chimney	Heat the flue by burning crumbled newspaper in the stove.
		Install an insulated chase around external chimney.
	Downdraft in Chimney	Be certain chimney is sufficiently tall. Refer to Chimney Requirements on Page 10.
		Try heating the flue with a hair dryer to correct the draft.
Glass is dirty	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow..
	Operating Stove at Low Burn Rate.	Operate the stove at higher burn rates to help keep the glass clean.
	Wood Loaded too Close to Glass.	Never load wood so that it is touching the glass viewing window.
Coals build up in firebox	Operating Stove at High Burn Rates.	Reduce combustion air control and allow coals to burn down before reloading.
Fire burns out of control	Excessive Draft.	Reduce chimney height.
	Air Leakage.	Inspect window and door gaskets and replace if necessary.
	Burning Excessively Dry Wood.	Only burn seasoned cord wood. Do not burn kiln dried or pallet wood.
Excessive smoke from stack	Operating Stove at Low Burn Rate.	Operate the stove at a higher burn rate which will create secondary combustion.
	Wet or Green Wood.	Only burn wood that is seasoned for at least one year and that is dry and free of ice and snow.
	Not Charring Fresh Wood Load	Char the fresh wood load until it is completely ignited and active secondary combustion is present in the firebox.

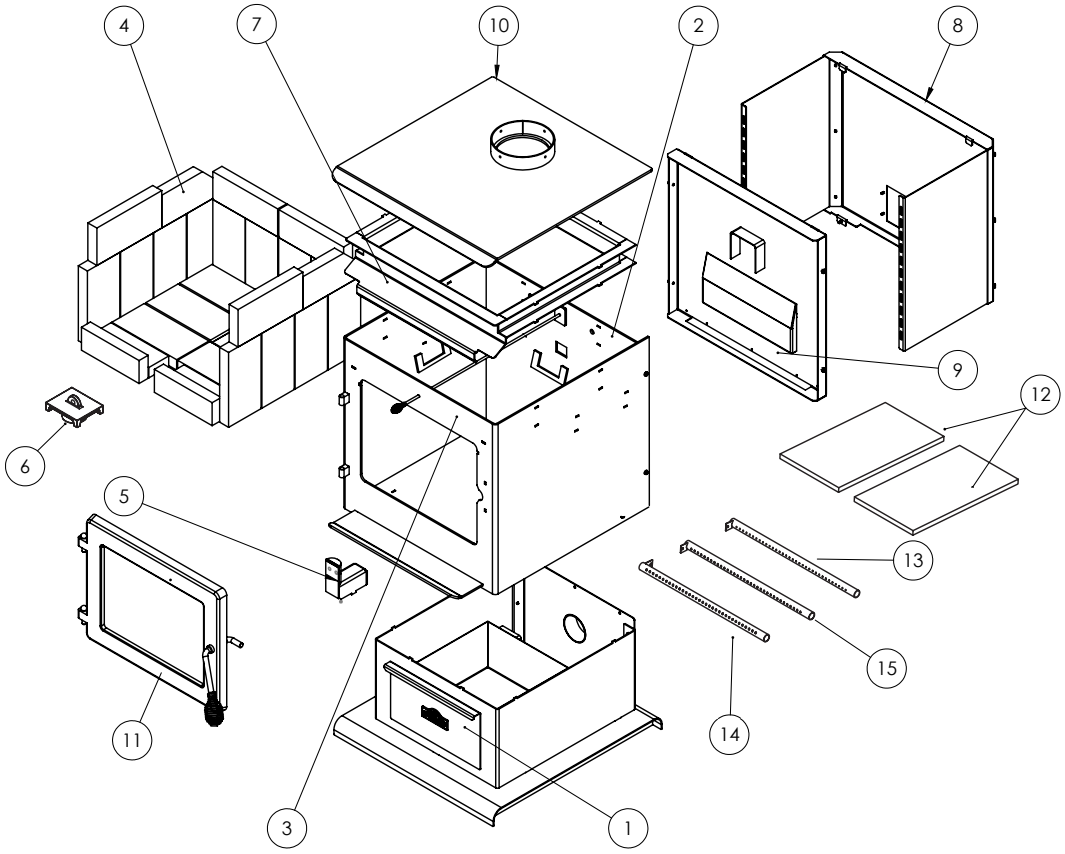
SERVICE PARTS MODEL V110

NOTE: Not all parts available. For questions contact Manufacturer.

ITEM NO.	PART NUM.	BRICK SIZE
A	66710	9" x 4.5" x 1.25"
B	66711	8" x 2.75" x 1.25"
C	66712	8" x 4" x 1.25"
D	66713	9" x 3.35" x 1.25"
E	66714	4.5" x 4.5" x 1.25"



Firebrick Pattern



⚠ WARNING: Failure to position the parts in accordance with these diagrams or failure to use only parts specifically approved with this stove may result in property damage or personal injury.

ITEM NO.	PART NUM.	DESCRIPTION
1	N/A	Ash Bin
2	N/A	Back & Base Panel
3	N/A	Main Housing & Air Control
4	*	Fire Bricks - See Table Above
5	N/A	Igniter
6	66715	Ash Plug
7	N/A	Primary Manifold
8	N/A	Back Panel & Heat Shields

ITEM NO.	PART NUM.	DESCRIPTION
9	N/A	Blower Panel
10	N/A	Top
11	66716	Door
12	66717	Ceramic Board
13	66718	Rear Air Tube
14	66719	Front Air Tube
15	66720	Middle Air Tube
16	66721	Ceramic Blanket (Not Shown)

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OPERATING INSTRUCTIONS AND OWNER'S MANUAL

Model #

V110

READ INSTRUCTIONS CAREFULLY: YOUR SAFETY IS IMPORTANT TO YOU AND TO OTHERS. Read and follow all instructions. Place instructions in a safe place for future reference. Do not allow anyone who has not read these instructions to assemble, light, adjust or operate the stove.



WARNING:

USE ONLY MANUFACTURER'S REPLACEMENT PARTS. USE OF ANY OTHER PARTS COULD CAUSE INJURY OR DEATH. REPLACEMENT PARTS ARE ONLY AVAILABLE DIRECT FROM THE FACTORY AND MUST BE INSTALLED BY A QUALIFIED SERVICE AGENCY.

PARTS ORDERING INFORMATION:

PURCHASING: ACCESSORIES MAY BE PURCHASED AT ANY LOCAL DEALER OR DIRECT FROM THE FACTORY

FOR INFORMATION REGARDING SERVICE:

Please call Toll-Free 1-800-251-0001
Our office hours are 8:00 AM – 5:00 PM, EST, Monday through Friday.
Please include the model number, date of purchase, and description of problem in all communication.

LIMITED WARRANTY:

The company warrants this product (excluding firebricks) to be free from imperfections in material or workmanship, under normal and proper use in accordance with instructions of The Company, for a period of 5 years from the date of delivery to the buyer. The Company, at its option, will repair or replace products returned by the buyer to the factory, transportation prepaid within said five year period and found by the Company to have imperfections in material or workmanship.

If a part is damaged or missing, call our Technical Support Department at 1-800-251-0001.

Address any Warranty Claims to the Service Department, Enerco Group, Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135. Include your name, address and telephone number and include details concerning the claim. Also, supply us with the purchase date and the name and address of the dealer from whom you purchased our product.

The foregoing is the full extent of the responsibility of the Company. There are no other warranties, express or implied. Specifically there is no warranty of fitness for a particular purpose and there is no warranty of merchantability. In no event shall the Company be liable for delay caused by imperfections, for consequential damages, or for any charges of the expense of any nature incurred without its written consent. The cost of repair or replacement shall be the exclusive remedy for any breach of warranty. There is no warranty against infringement of the like and no implied warranty arising from course of dealing or usage of trade. This warranty will not apply to any product which has been repaired or altered outside of the factory in any respect which in our judgment affects its condition or operation.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Enerco Group, Inc. reserves the right to make changes at any time, without notice or obligation, in colors, specifications, accessories, materials and models.

Enerco Group Inc., 4560 W. 160TH ST., CLEVELAND, OHIO 44135 • 1-800-251-0001
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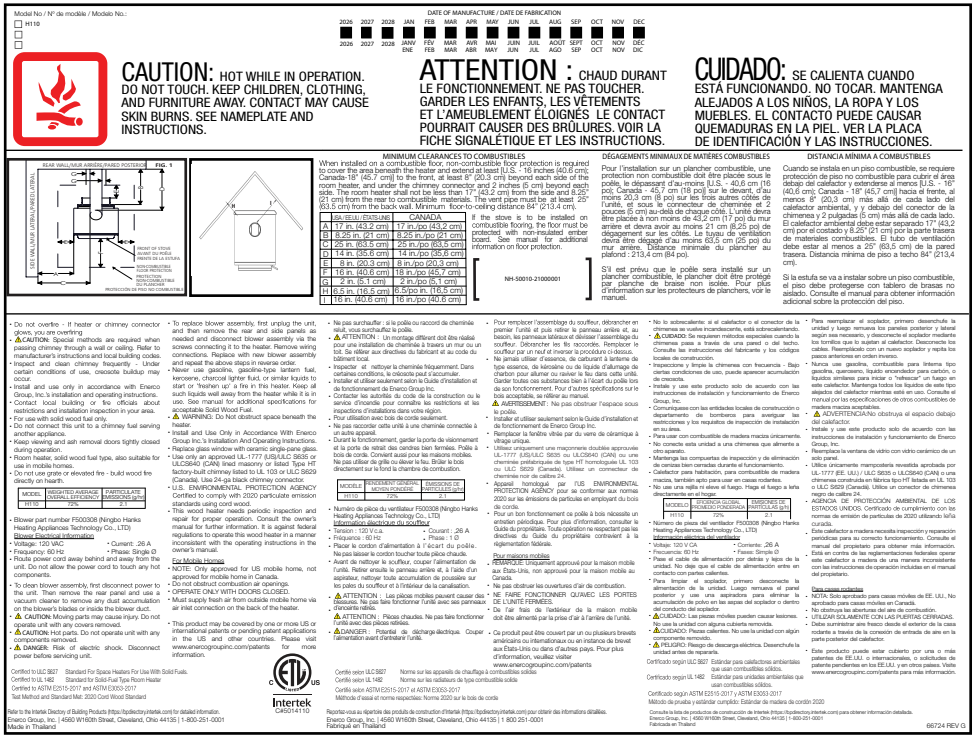
REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2021.06.15	CZ
B	Added 2022 to Date of Manufacture	2021.12.30	CZ
C	Changed model number to H110 and remove CIW	2022.01.26	CZ
D	Added Material Specs to Technical Requirements	2022.03.17	CZ
E	Made In Thailand	2025.10.22	CZ
F	Updated vent language and rates	2026.05.01	JEB
G	Updated rates	2026.06.16	JEB

F500110 | H110

USED ON

260 mm

197 mm



Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Fire Caution Symbol: Red
- Background: Silver Metal
- Text: Black
- Dimensions: 197 mm H x 260 mm W
- PE Protective Film
- Film Thickness: 0.03 mm ± 0.003 mm
- Adhesive: Acrylate
- Material: Aluminum Plate
- Thickness: 0.6 mm
- Printing Process: UV Printing
- Adhesive: 3M 9448A
- Faceside 1 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)
- Backside 2 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2021.06.15
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

enerco group inc.

Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM

SIZE: A4	DWG.NO. 66724	REV G
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ H110

☐

☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2026	2027	2028	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

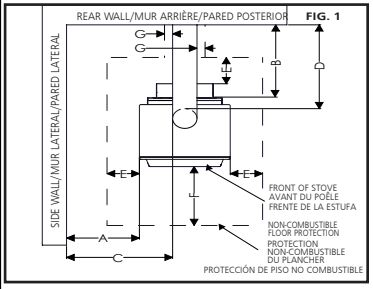
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

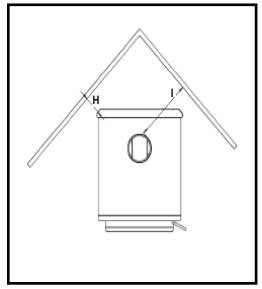
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least [U.S. - 16 inches (40.6 cm); Canada-18" (45.7 cm)] to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board. See manual for additional information on floor protection.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins [U.S. - 40,6 cm (16 po); Canada - 45,7 cm (18 po)] sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

S'il est prévu que le poêle sera installé sur un plancher combustible, le plancher doit être protégé par planche de braise non isolée. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos [U.S. - 16" (40,6 cm); Canada - 18" (45,7 cm)] hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

Si la estufa se va a instalar sobre un piso combustible, el piso debe protegerse con tablero de brasas no aislado. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
H110	72%	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ **CAUTION:** Hot parts. Do not operate unit with any components removed.
- ⚠ **DANGER:** Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Intertek C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDÉRÉ	ÉMISSIONS DE PARTICULES (g/hr)
H110	72%	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
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Fabriqué en Thailand

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ **CUIDADO:** Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
H110	72%	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
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Fabricada en Thailand

66724 REV G

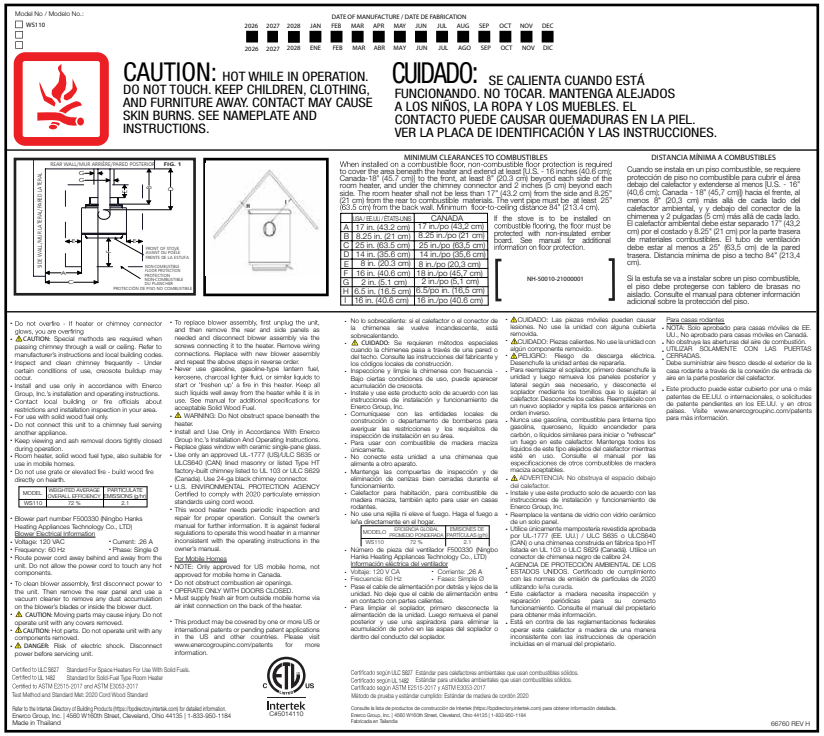
REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.01.10	CZ
B	CHANGED TO WS110	2022.01.26	CZ
C	CHANGED 800# & UPDATED TECH REQUIREMENTS	2022.03.18	CZ
D	UPDATED BLOWER F#	2022.05.12	CZ
E	REMOVED FRENCH PER LOWES	2024.03.05	CZ
F	MADE IN THAILAND	2026.03.13	CZ
G	UPDATE RATE LABEL & VENT LANGUAGE	2026.04.30	JEB
H	UPDATE RATE LABEL & VENT LANGUAGE	26-06-16	JEB

F500112	WS110

USED ON

217 mm

197 mm



Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Fire Caution Symbol: Red
- Background: Silver Metal
- Text: Black
- Dimensions: 197 mm H x 260 mm W
- PE Protective Film
- Film Thickness: 0.03 mm ± 0.003 mm
- Adhesive: Acrylate
- Material: Aluminum Plate
- Thickness: 0.6 mm
- Printing Process: UV Printing
- Adhesive: 3M 9448A
- Faceside 1 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)
- Backside 2 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2022.01.10
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

enerco group inc.

Mr. Heater HEATSTAR ENERCO FLEX-TEK

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, MASTER FORGE

SIZE: A4	DWG.NO. 66760	REV
		G

SCALE: N/A | WEIGHT: N/A | SHEET 1 OF 1

Model No / Modelo No.:

☐ WS110

☐

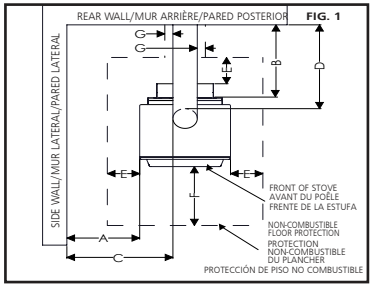
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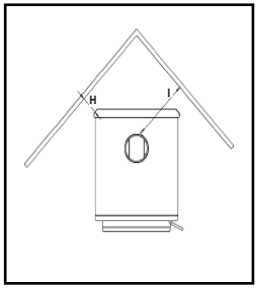
DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2026	2027	2028	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC

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

CUIDADO: SE CALIENTA CUANDO ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least [U.S. - 16 inches (40.6 cm); Canada-18" (45.7 cm)] to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board. See manual for additional information on floor protection.

NH-50010-21000001

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos [U.S. - 16" (40,6 cm); Canada - 18" (45,7 cm)]) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

Si la estufa se va a instalar sobre un piso combustible, el piso debe protegerse con tablero de brasas no aislado. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ CAUTION: Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
WS110	72 %	2.1

- Blower part number F500330 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ CAUTION: Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ CAUTION: Hot parts. Do not operate unit with any components removed.
- ⚠ DANGER: Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.

- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ CUIDADO: Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
WS110	72 %	2.1

- Número de pieza del ventilador F500330 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA: No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.

- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-833-950-1184
Made in Thailand

C ETL US LISTED
Intertek
C#5014110

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-833-950-1184
Fabricada en Tailandia

66760 REV H

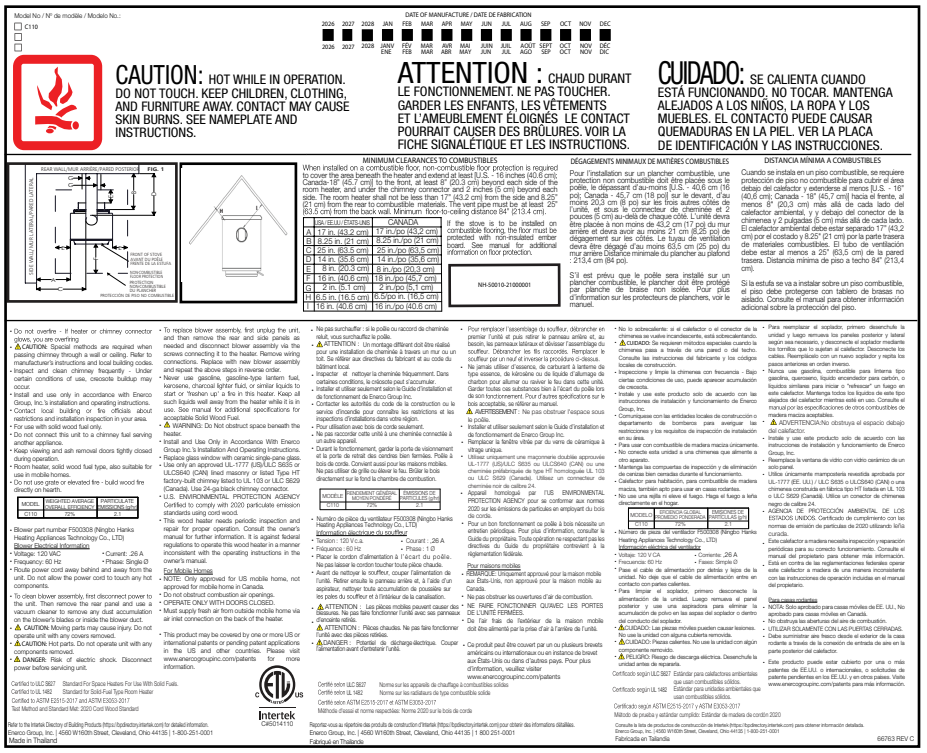
REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2024.01.12	CZ
B	RATE UPDATES & VENTING	2026.05.01	JEB
C	RATE UPDATES	2026.06.16	JEB

F500820	C110

USED ON

10.25”

7.85”



Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Fire Caution Symbol: Red
- Background: Silver Metal
- Text: Black
- Dimensions: 197 mm H x 260 mm W
- PE Protective Film
- Film Thickness: 0.03 mm ± 0.003 mm
- Adhesive: Acrylate
- Material: Aluminum Plate
- Thickness: 0.6 mm
- Printing Process: UV Printing
- Adhesive: 3M 9448A
- Faceside 1 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)
- Backside 2 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2024.01.12
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

enerco group inc.

Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, CANYON LODGE

SIZE: A4	DWG.NO. 66763	REV C
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / N° de modèle / Modelo No.:

☐ C110

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☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2026	2027	2028	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

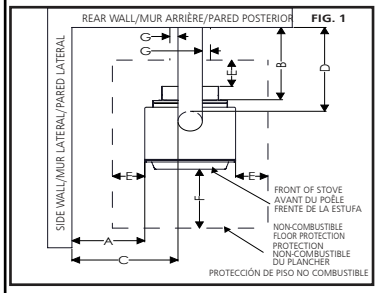
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

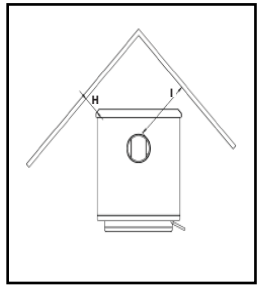
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least [U.S. - 16 inches (40.6 cm); Canada-18" (45.7 cm)] to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8,25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board. See manual for additional information on floor protection.

NH-50010-21000001

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins [U.S. - 40,6 cm (16 po); Canada - 45,7 cm (18 po)] sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière Distance minimale du plancher au plafond : 213,4 cm (84 po).

S'il est prévu que le poêle sera installé sur un plancher combustible, le plancher doit être protégé par planche de braise non isolée. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos [U.S. - 16" (40,6 cm); Canada - 18" (45,7 cm)] hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

Si la estufa se va a instalar sobre un piso combustible, el piso debe protegerse con tablero de brasas no aislado. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
C110	72%	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ **CAUTION:** Hot parts. Do not operate unit with any components removed.
- ⚠ **DANGER:** Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Intertek C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDÉRÉ	ÉMISSIONS DE PARTICULES (g/hr)
C110	72%	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contreviennent à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1 800 251-0001
Fabriqué en Thaïlande

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ **CUIDADO:** Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
C110	72%	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

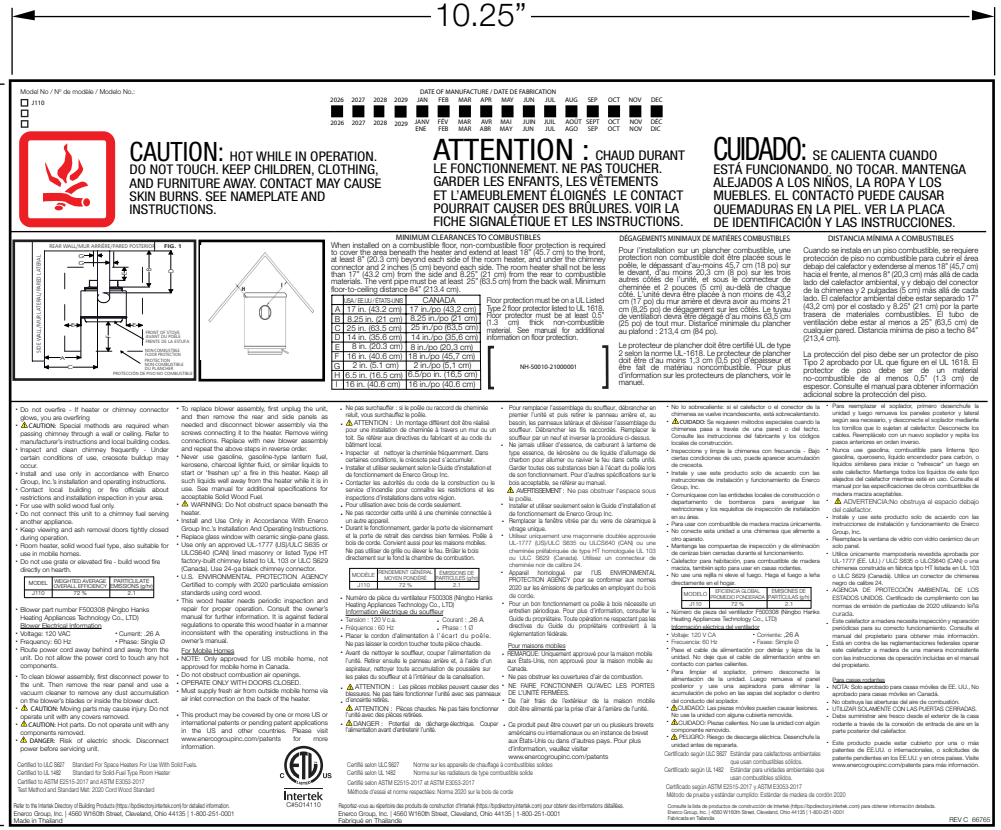
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Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Fabricada en Tailandia

66763 REV C

REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.01.24	CZ
B	Fix venting language and add Thailand and new Rates	2026.05.01	JEB
C	Updated New Rates	26-16-06	JEB

F500XXX	J110

USED ON



Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Material: Etched Metal
- Background: Silver Metal; Text: Black

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2022.01.24
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

EGI enerco group inc.
Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, J-SERIES

SIZE: A4	DWG.NO. 66765	REV C
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ J110

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DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	2029	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2026	2027	2028	2029	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

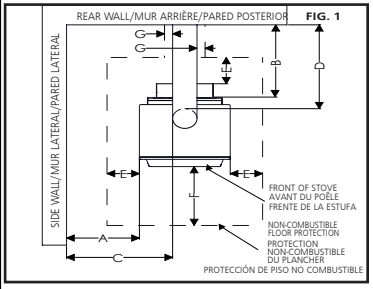
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

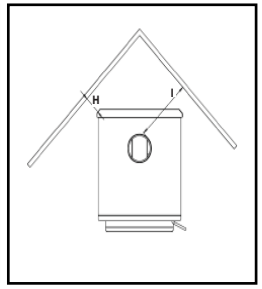
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (45.7 cm) to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protection.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins 45,7 cm (18 po) sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau noncombustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos 18" (45,7 cm) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no-combustible de al menos 0,5" (1.3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ CAUTION: Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
J110	72 %	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ CAUTION: Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ CAUTION: Hot parts. Do not operate unit with any components removed.
- ⚠ DANGER: Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

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Intertek
C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDERE	ÉMISSIONS DE PARTICULES (g/hr)
J110	72 %	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
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Fabriqué en Thaïlande

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ CUIDADO: Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
J110	72 %	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
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Fabricada en Tailandia

REV C 66765

REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.01.24	CZ
B	Fix Vent language and Rates. MADE IN THAILAND	2026.04.30	JEB
C	Updated Rates.	2026.06.16	JEB

F500XXX	N110

USED ON

10.25”

7.85”

Model No. / N° de modèle / Modelo No.:
☐ N110

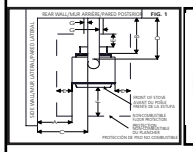
DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	2029	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2026	2027	2028	2029	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOUT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

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

ATTENTION : CHAUD DURANT LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS. LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (457 cm) to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	EN / EU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43.2 cm)
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Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protection.

NH-50010-21000001

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

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Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau noncombustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

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La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no combustible de al menos 0,5" (1,3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

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- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney flue serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS g/hr
N110	72%	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information
- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
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- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ CAUTION: Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ CAUTION: Hot parts. Do not operate unit with any components removed.
- ⚠ DANGER: Risk of electric shock. Disconnect power before servicing unit.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Made in Thailand

- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULC/S640 (CAN) lined masonry or listed type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes
- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.

- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Intertek CI6014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Made in Thailand

- Ne pas surchauffer - si la poêle ou raccord de cheminée rouge, vous surchauffez le poêle.
- ⚠ ATTENTION : Les montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un plafond. Référez aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles.
- Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDÉRÉ	ÉMISSIONS DE PARTICULES g/hr
N110	72%	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du ventilateur
- Tension : 120 V c.a.
- Courant : .26 A
- Fréquence : 60 Hz
- Phase : 1 ⊖
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer la soufflerie, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du soufflerie et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec les panneaux démontés retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Risque de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.

Conformé selon l'ULC S627 Norme sur les appareils de chauffage à combustibles solides
Conformé selon UL 1482 Norme sur les radiateurs de type combustible solide
Conformé selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Fabriqué en Thaïlande

- Pour remplacer l'assemblage du soufflerur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et déraser l'assemblage du soufflerur. Débrancher les fils raccordés. Remplacer le soufflerur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULC/S640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement du poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la réglementation fédérale.

Pour maisons mobiles
- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE PAS FAIRE FONCTIONNER QUAVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.

- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon l'ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme appliquée: Norme 2020 sur le bois de corde

Consulte la liste de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Fabricada en Tailandia

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ CUIDADO: Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PONDERADA / PONDERADA	EMISIONES DE PARTÍCULAS g/hr
N110	72 %	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador
- Voltaje: 120 V CA
- Corriente: .26 A
- Frecuencia: 60 Hz
- Fases: Simple ⊖
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.

Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras está en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULC/S640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea directamente en el hogar.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes
- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

REV C 66767

Technical Requirements
- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Material: Etched Metal
- Background: Silver Metal; Text: Black

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2022.01.24
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

EGI enerco group inc.
Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, N-SERIES

SIZE: A4	DWG.NO. 66767	REV C
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ N110

☐

☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	2029	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2026	2027	2028	2029	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

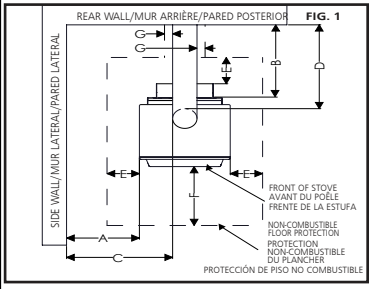
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

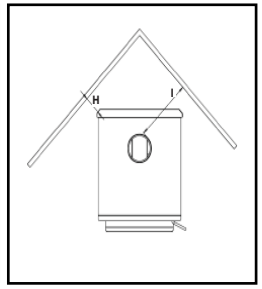
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (45.7 cm) to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protection.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins 45,7 cm (18 po) sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau noncombustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos 18" (45,7 cm) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no-combustible de al menos 0,5" (1.3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
N110	72%	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ **CAUTION:** Hot parts. Do not operate unit with any components removed.
- ⚠ **DANGER:** Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

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Test Method and Standard Met: 2020 Cord Wood Standard

Intertek C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDERE	ÉMISSIONS DE PARTICULES (g/hr)
N110	72%	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
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Fabriqué en Thaïlande

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ **CUIDADO:** Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
N110	72 %	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
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Fabricada en Tailandia

REV C 66767

REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.01.24	CZ
B	VENT LANGUAGE AND	2026.05.01	JEB
C	Rate Updates	2026.06.16	JEB

F500XXX	D110

USED ON

10.25”

7.85”

Model No. / N° de modèle / Modelo No.:

☐ D110

☐

☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	2029	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2026	2027	2028	2029	JANV FEV ENE FEB		MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOUT AGO	SEPT SEP	OCT OCT	NOV NOV	DEC DIC

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

ATTENTION : CHAUD DURANT LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS. LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO ESTÁ FUNCIONANDO, NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.

REAR WALL/MUR ARRIÈRE/PARED POSTERIOR — FIG. 1

FRONT OF STOVE / AVANT DU POÊLE / FRENTE DE LA ESTUFA

NON-COMBUSTIBLE FLOOR PROTECTION / PROTECTION DE PISO NO COMBUSTIBLE

MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (45.7 cm) to the front, at least 8" (20,3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43,2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213,4 cm).

	USA / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8,25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6,5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protector.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au moins 45,7 cm (18 po) sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau non-combustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos 18" (45,7 cm) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8,25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no-combustible de al menos 0,5" (1,3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS g/hr
D110	72 %	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- **CAUTION:** Hot parts. Do not operate unit with any components removed.
- **DANGER:** Risk of electric shock. Disconnect power before servicing unit.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULC/S640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

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Intertek
C#5014110

- Ne pas surchauffer : si le poêle ou raccord de cheminée rougit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles.
- Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDÉRÉ	EMISSIONS DE PARTICULES g/hr
D110	72 %	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du ventilateur

- Tension : 120 V c.a.
- Courant : .26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle.
- Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le ventilateur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du ventilateur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec des panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
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Fabriqué en Thailand

- Pour remplacer l'assemblage du soufleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et déviseur l'assemblage du soufleur. Débrancher les fils raccordés. Remplacer le soufleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utiliser uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULC/S640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utiliser un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contreviant à la réglementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE PAS FONCTIONNER QUAVEC LES PORTES DE L'UNITE FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certificado según UL 1482 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Fabricado en Tailandia

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ CUIDADO Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera macizo únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PONDERADO PONDERADA	EMISIONES DE PARTÍCULAS g/hr
D110	72%	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: .26 A
- Frecuencia: 60 Hz
- Fase: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.

Certificado según UL 1482 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-251-0001
Fabricado en Tailandia

- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustibles para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras está en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULC/S640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

REV C 66769

Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Material: Etched Metal
- Background: Silver Metal; Text: Black

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2022.01.24
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

EGI enerco group inc.

Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, D-SERIES

SIZE: A4	DWG.NO. 66769	REV C
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ D110

☐

☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	2029	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2026	2027	2028	2029	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

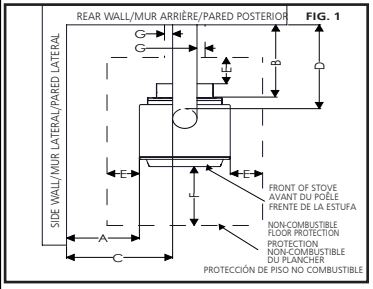
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

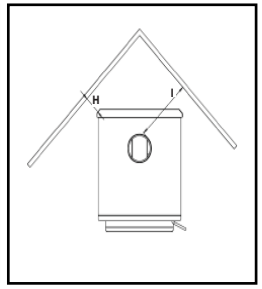
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (45.7 cm) to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protection.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins 45,7 cm (18 po) sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau noncombustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos 18" (45,7 cm) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no-combustible de al menos 0,5" (1.3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
D110	72 %	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ **CAUTION:** Hot parts. Do not operate unit with any components removed.
- ⚠ **DANGER:** Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

C ETL LISTED US
Intertek
C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDERE	ÉMISSIONS DE PARTICULES (g/hr)
D110	72 %	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
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Fabriqué en Thailand

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ **CUIDADO:** Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
D110	72%	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
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- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

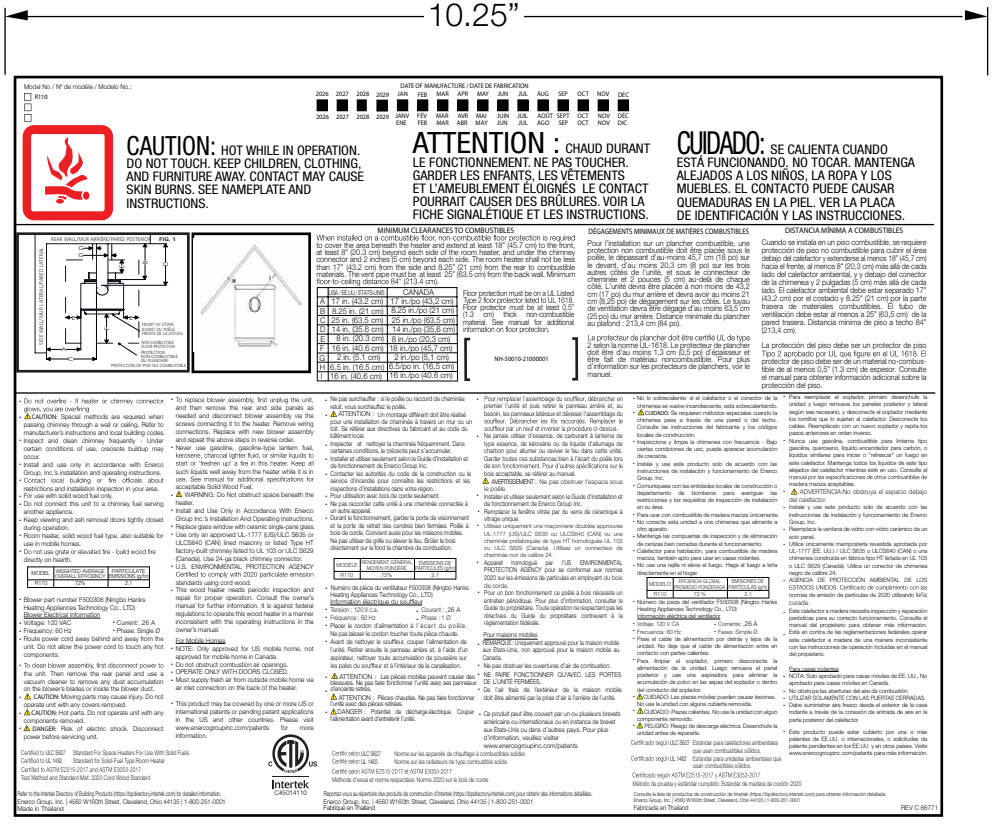
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Fabricada en Thailand

REV C 66769

REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.01.24	CZ
B	Venting Info & Rates	2022.01.24	JEB
C	Update To Rates	26-06-16	JEB

F500XXX	R110

USED ON



Technical Requirements

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- For color requirements refer to the provided electronic data.
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UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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MATERIAL **SEE NOTES**			
FINISH			
DO NOT SCALE DRAWING			

EGI enerco group inc.

Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, R-SERIES

SIZE: A4	DWG.NO. 66771	REV C
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ R110

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DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	2029	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2026	2027	2028	2029	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

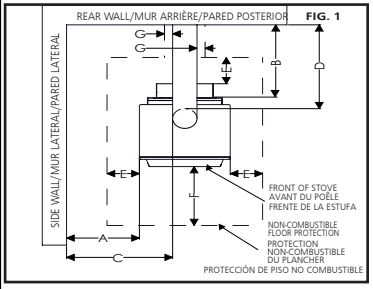
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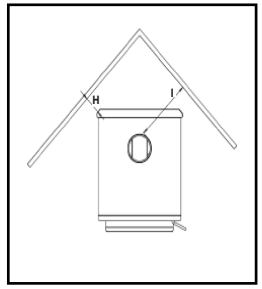
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (45.7 cm) to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protection.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins 45,7 cm (18 po) sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau noncombustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos 18" (45,7 cm) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no-combustible de al menos 0,5" (1.3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
R110	72%	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ **CAUTION:** Hot parts. Do not operate unit with any components removed.
- ⚠ **DANGER:** Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

C ETL LISTED US
Intertek
C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDERE	ÉMISSIONS DE PARTICULES (g/hr)
R110	72%	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
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Fabriqué en Thailand

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ **CUIDADO:** Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
R110	72 %	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

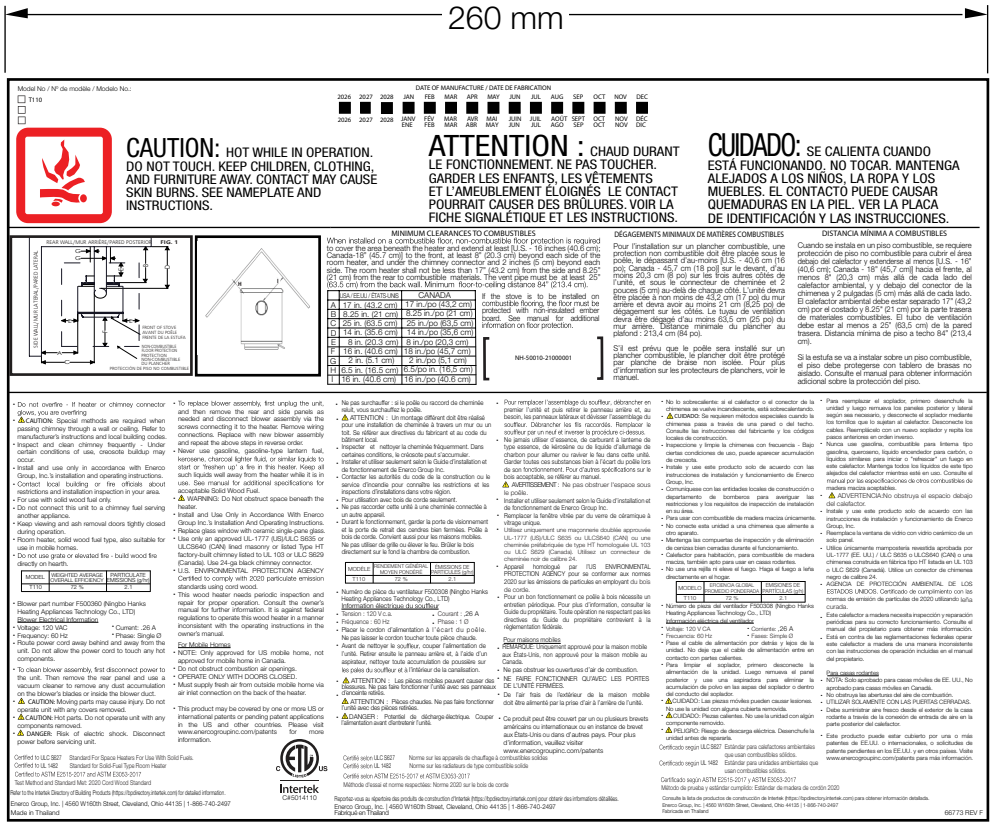
Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
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Fabricada en Thailand

REV C 66771

REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.09.13	CZ
B	UPDATED BLOWER F#	2024.03.11	CZ
C	UPDATED MANUFACTURE YEARS	2025.04.14	CZ
D	Made In Thailand	2025.12.10	CZ
E	Made In Thailand Vent info Rates	2025.12.10	JEB
F	Changed Rates	26-6-16	JEB

F500160	T110

USED ON



Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Fire Caution Symbol: Red
- Background: Silver Metal
- Text: Black
- Dimensions: 197 mm H x 260 mm W
- PE Protective Film
- Film Thickness: 0.03 mm ± 0.003 mm
- Adhesive: Acrylate
- Material: Aluminum Plate
- Thickness: 0.6 mm
- Printing Process: UV Printing
- Adhesive: 3M 9448A
- Faceside 1 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)
- Backside 2 Adhesive Type/Thickness: Acrylate / 0.003” (0.076MM)

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2022.09.13
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

enerco group inc.

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM, GRAND TETON

SIZE: A4	DWG.NO. 66773	REV
		F
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ T110

☐

☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2026	2027	2028	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

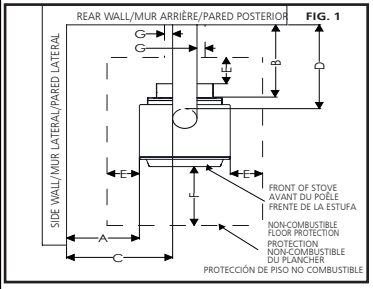
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

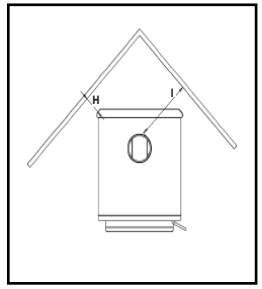
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least [U.S. - 16 inches (40.6 cm); Canada-18" (45.7 cm)] to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

If the stove is to be installed on combustible flooring, the floor must be protected with non-insulated ember board. See manual for additional information on floor protection.

[NH-50010-21000001]

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins [U.S. - 40,6 cm (16 po); Canada - 45,7 cm (18 po)] sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière. Distance minimale du plancher au plafond : 213,4 cm (84 po).

S'il est prévu que le poêle sera installé sur un plancher combustible, le plancher doit être protégé par planche de braise non isolée. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos [U.S. - 16" (40,6 cm); Canada - 18" (45,7 cm)] hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

Si la estufa se va a instalar sobre un piso combustible, el piso debe protegerse con tablero de brasas no aislado. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ CAUTION: Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
T110	72 %	2.1

- Blower part number F500360 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ CAUTION: Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ CAUTION: Hot parts. Do not operate unit with any components removed.
- ⚠ DANGER: Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.

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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDÉRÉ	ÉMISSIONS DE PARTICULES (g/hr)
T110	72 %	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.

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- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ CUIDADO: Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
T110	72 %	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.

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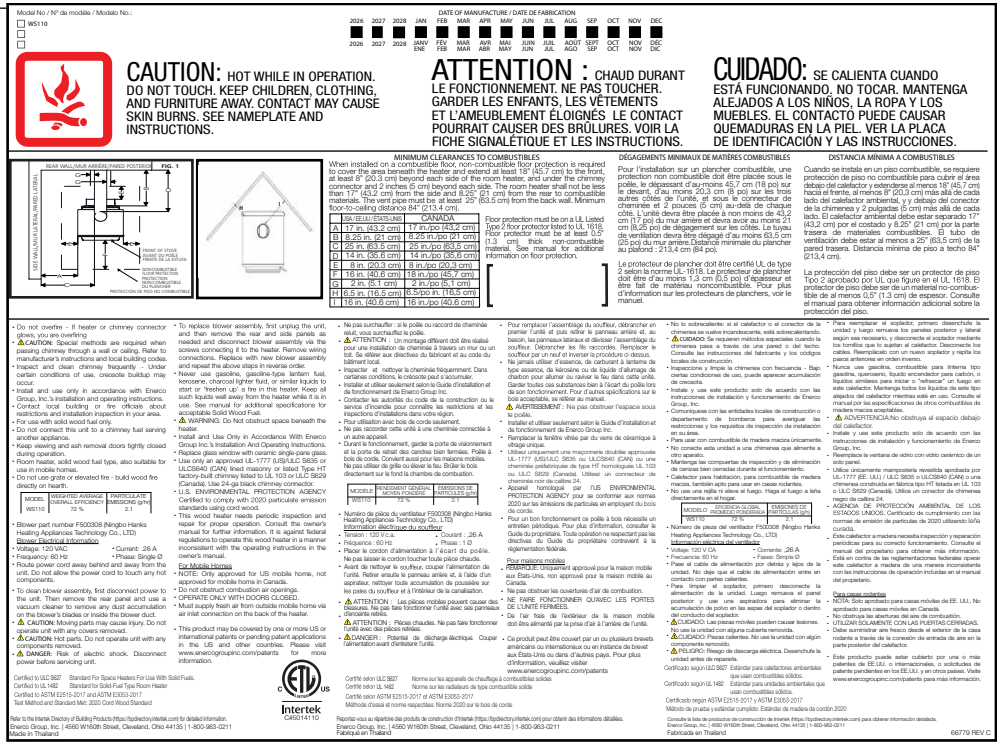
66773 REV F

REV	DESCRIPTION OF CHANGE	DATE	CHANGED BY
A	NEW RELEASE	2022.02.02	CZ
B	Added MFG yr and Venting info	2026.01.05	JEB
C	Added Rate Updates	2026.06.16	JEB

F500110	WS110
USED ON	

260 mm

197 mm



Technical Requirements

- Refer to the title block for all unspecified dimensional tolerances.
- For color requirements refer to the provided electronic data.
- The same batch must have color uniformity throughout and must be free of curling and other defects.
- The label must have clear fonts, be free of curling, missing marks, chromatic aberration, and flow marks.
- Fire Caution Symbol: Red
- Background: White
- Text: Black
- Dimensions: 197 mm H x 260 mm W
- Product: FLEXcon® DPM® PWS
- Liner Material: Gloss white polyester
- Liner: 6.9 mil +/-10%
- Adhesive: Pressure-Sensitive Acrylic
- Adhesive Thickness: 0.9 - 1.0 mil
- Film Thickness: 2 mil +/-10%
- UL Recognized under UL 969 - UL File No. PGGU2.MH10170 Marking and Labeling System Materials - Component
- CSA accepted under CSA File No. 99214

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: TWO PLACE DECIMAL: ± .030 THREE PLACE DECIMAL:± .005 HOLES: ± .004 ANGULAR: ± 1 DEG. FRACTIONAL DIMENSIONS: ± 1/64	CREATED	CZ	2022.02.02
INTERPRET GEOMETRIC TOLERANCING PER: N/A	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENERCO GROUP, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENERCO GROUP, INC. IS PROHIBITED.		
MATERIAL SEE NOTES			
FINISH			
DO NOT SCALE DRAWING			

enerco group inc.
Mr. Heater HEATSTAR ENERCO FLEX-TECH

TITLE:

LABEL, RATE, WOOD STOVE, MEDIUM

SIZE: A4	DWG.NO. 66779	REV
		C
SCALE: N/A	WEIGHT: N/A	SHEET 1 OF 1

Model No / Nº de modèle / Modelo No.:

☐ WS110

☐

☐

DATE OF MANUFACTURE / DATE DE FABRICATION

2026	2027	2028	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2026	2027	2028	JANV ENE	FÉV FEB	MAR MAR	AVR ABR	MAI MAY	JUIN JUN	JUIL JUL	AOÛT AGO	SEPT SEP	OCT OCT	NOV NOV	DÉC DIC

CAUTION: HOT WHILE IN OPERATION.

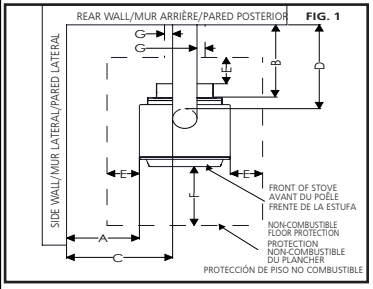
DO NOT TOUCH. KEEP CHILDREN, CLOTHING, AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS.

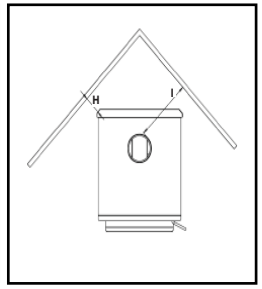
ATTENTION : CHAUD DURANT

LE FONCTIONNEMENT. NE PAS TOUCHER. GARDER LES ENFANTS, LES VÊTEMENTS ET L'AMEUBLEMENT ÉLOIGNÉS LE CONTACT POURRAIT CAUSER DES BRÛLURES. VOIR LA FICHE SIGNALÉTIQUE ET LES INSTRUCTIONS.

CUIDADO: SE CALIENTA CUANDO

ESTÁ FUNCIONANDO. NO TOCAR. MANTENGA ALEJADOS A LOS NIÑOS, LA ROPA Y LOS MUEBLES. EL CONTACTO PUEDE CAUSAR QUEMADURAS EN LA PIEL. VER LA PLACA DE IDENTIFICACIÓN Y LAS INSTRUCCIONES.





MINIMUM CLEARANCES TO COMBUSTIBLES

When installed on a combustible floor, non-combustible floor protection is required to cover the area beneath the heater and extend at least 18" (45.7 cm) to the front, at least 8" (20.3 cm) beyond each side of the room heater, and under the chimney connector and 2 inches (5 cm) beyond each side. The room heater shall not be less than 17" (43.2 cm) from the side and 8.25" (21 cm) from the rear to combustible materials. The vent pipe must be at least 25" (63.5 cm) from the back wall. Minimum floor-to-ceiling distance 84" (213.4 cm).

	USA / EE.UU / ÉTATS-UNIS	CANADA
A	17 in. (43.2 cm)	17 in./po (43,2 cm)
B	8.25 in. (21 cm)	8.25 in./po (21 cm)
C	25 in. (63.5 cm)	25 in./po (63,5 cm)
D	14 in. (35.6 cm)	14 in./po (35,6 cm)
E	8 in. (20.3 cm)	8 in./po (20,3 cm)
F	16 in. (40.6 cm)	18 in./po (45,7 cm)
G	2 in. (5.1 cm)	2 in./po (5,1 cm)
H	6.5 in. (16.5 cm)	6.5/po in. (16,5 cm)
I	16 in. (40.6 cm)	16 in./po (40.6 cm)

Floor protection must be on a UL Listed Type 2 floor protector listed to UL 1618. Floor protector must be at least 0.5" (1.3 cm) thick non-combustible material. See manual for additional information on floor protection.

DÉGAGEMENTS MINIMAUX DE MATIÈRES COMBUSTIBLES

Pour l'installation sur un plancher combustible, une protection non combustible doit être placée sous le poêle, le dépassant d'au-moins 45,7 cm (18 po) sur le devant, d'au moins 20,3 cm (8 po) sur les trois autres côtés de l'unité, et sous le connecteur de cheminée et 2 pouces (5 cm) au-delà de chaque côté. L'unité devra être placée à non moins de 43,2 cm (17 po) du mur arrière et devra avoir au moins 21 cm (8,25 po) de dégagement sur les côtés. Le tuyau de ventilation devra être dégagé d'au moins 63,5 cm (25 po) du mur arrière.Distance minimale du plancher au plafond : 213,4 cm (84 po).

Le protecteur de plancher doit être certifié UL de type 2 selon la norme UL-1618. Le protecteur de plancher doit être d'au moins 1,3 cm (0,5 po) d'épaisseur et être fait de matériau noncombustible. Pour plus d'information sur les protecteurs de planchers, voir le manuel.

DISTANCIA MÍNIMA A COMBUSTIBLES

Cuando se instala en un piso combustible, se requiere protección de piso no combustible para cubrir el área debajo del calefactor y extenderse al menos 18" (45,7 cm) hacia el frente, al menos 8" (20,3 cm) más allá de cada lado del calefactor ambiental, y y debajo del conector de la chimenea y 2 pulgadas (5 cm) más allá de cada lado. El calefactor ambiental debe estar separado 17" (43,2 cm) por el costado y 8.25" (21 cm) por la parte trasera de materiales combustibles. El tubo de ventilación debe estar al menos a 25" (63,5 cm) de la pared trasera. Distancia mínima de piso a techo 84" (213,4 cm).

La protección del piso debe ser un protector de piso Tipo 2 aprobado por UL que figure en el UL 1618. El protector de piso debe ser de un material no-combustible de al menos 0,5" (1.3 cm) de espesor. Consulte el manual para obtener información adicional sobre la protección del piso.

- Do not overfire - If heater or chimney connector glows, you are overfiring
- ⚠ **CAUTION:** Special methods are required when passing chimney through a wall or ceiling. Refer to manufacturer's instructions and local building codes.
- Inspect and clean chimney frequently - Under certain conditions of use, creosote buildup may occur.
- Install and use only in accordance with Enerco Group, Inc.'s installation and operating instructions.
- Contact local building or fire officials about restrictions and installation inspection in your area.
- For use with solid wood fuel only.
- Do not connect this unit to a chimney fuel serving another appliance.
- Keep viewing and ash removal doors tightly closed during operation.
- Room heater, solid wood fuel type, also suitable for use in mobile homes.
- Do not use grate or elevated fire - build wood fire directly on hearth.

MODEL	WEIGHTED AVERAGE OVERALL EFFICIENCY	PARTICULATE EMISSIONS (g/hr)
WS110	72 %	2.1

- Blower part number F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Blower Electrical Information

- Voltage: 120 VAC
- Current: .26 A
- Frequency: 60 Hz
- Phase: Single Ø
- Route power cord away behind and away from the unit. Do not allow the power cord to touch any hot components.
- To clean blower assembly, first disconnect power to the unit. Then remove the rear panel and use a vacuum cleaner to remove any dust accumulation on the blower's blades or inside the blower duct.
- ⚠ **CAUTION:** Moving parts may cause injury. Do not operate unit with any covers removed.
- ⚠ **CAUTION:** Hot parts. Do not operate unit with any components removed.
- ⚠ **DANGER:** Risk of electric shock. Disconnect power before servicing unit.
- To replace blower assembly, first unplug the unit, and then remove the rear and side panels as needed and disconnect blower assembly via the screws connecting it to the heater. Remove wiring connections. Replace with new blower assembly and repeat the above steps in reverse order.
- Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use. See manual for additional specifications for acceptable Solid Wood Fuel.
- ⚠ WARNING: Do Not obstruct space beneath the heater.
- Install and Use Only in Accordance With Enerco Group Inc.'s Installation And Operating Instructions.
- Replace glass window with ceramic single-pane glass.
- Use only an approved UL-1777 (US)/ULC S635 or ULCS640 (CAN) lined masonry or listed Type HT factory-built chimney listed to UL 103 or ULC S629 (Canada). Use 24-ga black chimney connector.
- U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using cord wood.
- This wood heater needs periodic inspection and repair for proper operation. Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual.

For Mobile Homes

- NOTE: Only approved for US mobile home, not approved for mobile home in Canada.
- Do not obstruct combustion air openings.
- OPERATE ONLY WITH DOORS CLOSED.
- Must supply fresh air from outside mobile home via air inlet connection on the back of the heater.
- This product may be covered by one or more US or international patents or pending patent applications in the US and other countries. Please visit www.enercogroupinc.com/patents for more information.

Certified to ULC S627 Standard For Space Heaters For Use With Solid Fuels.
Certified to UL 1482 Standard for Solid-Fuel Type Room Heater
Certified to ASTM E2515-2017 and ASTM E3053-2017
Test Method and Standard Met: 2020 Cord Wood Standard

Intertek C#5014110

Refer to the Intertek Directory of Building Products (https://bpdirectory.intertek.com) for detailed information.
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Made in Thailand

- Ne pas surchauffer : si le poêle ou raccord de cheminée reluit, vous surchauffez le poêle.
- ⚠ ATTENTION : Un montage différent doit être réalisé pour une installation de cheminée à travers un mur ou un toit. Se référer aux directives du fabricant et au code du bâtiment local.
- Inspecter et nettoyer la cheminée fréquemment. Dans certaines conditions, le créosote peut s'accumuler.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Contacter les autorités du code de la construction ou le service d'incendie pour connaître les restrictions et les inspections d'installations dans votre région.
- Pour utilisation avec bois de corde seulement.
- Ne pas raccorder cette unité à une cheminée connectée à un autre appareil.
- Durant le fonctionnement, garder la porte de visionnement et la porte de retrait des cendres bien fermées. Poêle à bois de corde. Convient aussi pour les maisons mobiles. Ne pas utiliser de grille ou élever le feu. Brûler le bois directement sur le fond la chambre de combustion.

MODÈLE	RENDEMENT GÉNÉRAL MOYEN PONDERE	ÉMISSIONS DE PARTICULES (g/hr)
WS110	72 %	2.1

- Numéro de pièce du ventilateur F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Information électrique du souffleur

- Tension : 120 V c.a.
- Courant : ,26 A
- Fréquence : 60 Hz
- Phase : 1 Ø
- Placer le cordon d'alimentation à l'écart du poêle. Ne pas laisser le cordon toucher toute pièce chaude.
- Avant de nettoyer le souffleur, couper l'alimentation de l'unité. Retirer ensuite le panneau arrière et, à l'aide d'un aspirateur, nettoyer toute accumulation de poussière sur les pales du souffleur et à l'intérieur de la canalisation.
- ⚠ ATTENTION : Les pièces mobiles peuvent causer des blessures. Ne pas faire fonctionner l'unité avec ses panneaux d'enceinte retirés.
- ⚠ ATTENTION : Pièces chaudes. Ne pas faire fonctionner l'unité avec des pièces retirées.
- ⚠ DANGER : Potentiel de décharge électrique. Couper l'alimentation avant d'entretenir l'unité.
- Pour remplacer l'assemblage du souffleur, débrancher en premier l'unité et puis retirer le panneau arrière et, au besoin, les panneaux latéraux et dévisser l'assemblage du souffleur. Débrancher les fils raccordés. Remplacer le souffleur par un neuf et inverser la procédure ci-dessus.
- Ne jamais utiliser d'essence, de carburant à lanterne de type essence, de kérosène ou de liquide d'allumage de charbon pour allumer ou raviver le feu dans cette unité. Garder toutes ces substances bien à l'écart du poêle lors de son fonctionnement. Pour d'autres spécifications sur le bois acceptable, se référer au manuel.
- ⚠ AVERTISSEMENT : Ne pas obstruer l'espace sous le poêle.
- Installer et utiliser seulement selon le Guide d'installation et de fonctionnement de Enerco Group Inc.
- Remplacer la fenêtre vitrée par du verre de céramique à vitrage unique.
- Utilisez uniquement une maçonnerie doublée approuvée UL-1777 (US)/ULC S635 ou ULCS640 (CAN) ou une cheminée préfabriquée de type HT homologuée UL 103 ou ULC S629 (Canada). Utilisez un connecteur de cheminée noir de calibre 24.
- Appareil homologué par l'US ENVIRONMENTAL PROTECTION AGENCY pour se conformer aux normes 2020 sur les émissions de particules en employant du bois de corde.
- Pour un bon fonctionnement ce poêle à bois nécessite un entretien périodique. Pour plus d'information, consulter le Guide du propriétaire. Toute opération ne respectant pas les directives du Guide du propriétaire contrevient à la règlementation fédérale.

Pour maisons mobiles

- REMARQUE: Uniquement approuvé pour la maison mobile aux États-Unis, non approuvé pour la maison mobile au Canada.
- Ne pas obstruer les ouvertures d'air de combustion.
- NE FAIRE FONCTIONNER QU'AVEC LES PORTES DE L'UNITÉ FERMÉES.
- De l'air frais de l'extérieur de la maison mobile doit être alimenté par la prise d'air à l'arrière de l'unité.
- Ce produit peut être couvert par un ou plusieurs brevets américains ou internationaux ou en instance de brevet aux États-Unis ou dans d'autres pays. Pour plus d'information, veuillez visiter www.enercogroupinc.com/patents

Certifié selon ULC S627 Norme sur les appareils de chauffage à combustibles solides
Certifié selon UL 1482 Norme sur les radiateurs de type combustible solide
Certifié selon ASTM E2515-2017 et ASTM E3053-2017
Méthode d'essai et norme respectées: Norme 2020 sur le bois de corde

Reportez-vous au répertoire des produits de construction d'Intertek (https://bpdirectory.intertek.com) pour obtenir des informations détaillées.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-963-0211
Fabriqué en Thailand

- No lo sobrecaliente: si el calefactor o el conector de la chimenea se vuelve incandescente, está sobrecalentando.
- ⚠ **CUIDADO:** Se requieren métodos especiales cuando la chimenea pasa a través de una pared o del techo. Consulte las instrucciones del fabricante y los códigos locales de construcción.
- Inspeccione y limpie la chimenea con frecuencia - Bajo ciertas condiciones de uso, puede aparecer acumulación de creosota.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Comuníquese con las entidades locales de construcción o departamento de bomberos para averiguar las restricciones y los requisitos de inspección de instalación en su área.
- Para usar con combustible de madera maciza únicamente.
- No conecte esta unidad a una chimenea que alimente a otro aparato.
- Mantenga las compuertas de inspección y de eliminación de cenizas bien cerradas durante el funcionamiento.
- Calefactor para habitación, para combustible de madera maciza, también apto para usar en casas rodantes.
- No use una rejilla ni eleve el fuego. Haga el fuego a leña directamente en el hogar.

MODELO	EFICIENCIA GLOBAL PROMEDIO PONDERADA	EMISIONES DE PARTÍCULAS (g/h)
WS110	72 %	2.1

- Número de pieza del ventilador F500308 (Ningbo Hanks Heating Appliances Technology Co., LTD)

Información eléctrica del ventilador

- Voltaje: 120 V CA
- Corriente: ,26 A
- Frecuencia: 60 Hz
- Fases: Simple Ø
- Pase el cable de alimentación por detrás y lejos de la unidad. No deje que el cable de alimentación entre en contacto con partes calientes.
- Para limpiar el soplador, primero desconecte la alimentación de la unidad. Luego remueva el panel posterior y use una aspiradora para eliminar la acumulación de polvo en las aspas del soplador o dentro del conducto del soplador.
- ⚠ CUIDADO: Las piezas móviles pueden causar lesiones. No use la unidad con alguna cubierta removida.
- ⚠ CUIDADO: Piezas calientes. No use la unidad con algún componente removido.
- ⚠ PELIGRO: Riesgo de descarga eléctrica. Desenchufe la unidad antes de repararla.
- Para reemplazar el soplador, primero desenchufe la unidad y luego remueva los paneles posterior y lateral según sea necesario, y desconecte el soplador mediante los tornillos que lo sujetan al calefactor. Desconecte los cables. Reemplácelo con un nuevo soplador y repita los pasos anteriores en orden inverso.
- Nunca use gasolina, combustible para linterna tipo gasolina, queroseno, líquido encendedor para carbón, o líquidos similares para iniciar o "refrescar" un fuego en este calefactor. Mantenga todos los líquidos de este tipo alejados del calefactor mientras esté en uso. Consulte el manual por las especificaciones de otros combustibles de madera maciza aceptables.
- ⚠ ADVERTENCIA:No obstruya el espacio debajo del calefactor.
- Instale y use este producto solo de acuerdo con las instrucciones de instalación y funcionamiento de Enerco Group, Inc.
- Reemplace la ventana de vidrio con vidrio cerámico de un solo panel.
- Utilice únicamente mampostería revestida aprobada por UL-1777 (EE. UU.) / ULC S635 o ULCS640 (CAN) o una chimenea construida en fábrica tipo HT listada en UL 103 o ULC S629 (Canadá). Utilice un conector de chimenea negro de calibre 24.
- AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS. Certificado de cumplimiento con las normas de emisión de partículas de 2020 utilizando leña curada.
- Este calefactor a madera necesita inspección y reparación periódicas para su correcto funcionamiento. Consulte el manual del propietario para obtener más información.
- Está en contra de las reglamentaciones federales operar este calefactor a madera de una manera inconsistente con las instrucciones de operación incluidas en el manual del propietario.

Para casas rodantes

- NOTA: Solo aprobado para casas móviles de EE. UU., No aprobado para casas móviles en Canadá.
- No obstruya las aberturas del aire de combustión.
- UTILIZAR SOLAMENTE CON LAS PUERTAS CERRADAS.
- Debe suministrar aire fresco desde el exterior de la casa rodante a través de la conexión de entrada de aire en la parte posterior del calefactor.
- Este producto puede estar cubierto por una o más patentes de EE.UU. o internacionales, o solicitudes de patente pendientes en los EE.UU. y en otros países. Visite www.enercogroupinc.com/patents para más información.

Certificado según ULC S627 Estándar para calefactores ambientales que usan combustibles sólidos.
Certificado según UL 1482 Estándar para unidades ambientales que usan combustibles sólidos.
Certificado según ASTM E2515-2017 y ASTM E3053-2017
Método de prueba y estándar cumplido: Estándar de madera de cordón 2020

Consulte la lista de productos de construcción de Intertek (https://bpdirectory.intertek.com) para obtener información detallada.
Enerco Group, Inc. | 4560 W160th Street, Cleveland, Ohio 44135 | 1-800-963-0211
Fabricada en Thailand

66779 REV C

APPENDIX 8: Photographs of test set up

Dilution picture Dia 12 no. EG-031

Polytests Services Inc. 695 B rue Gaudette,St-Jean-sur-Richelieu Québec, Canada, J3B 7S7



Velocity ports at 90 degrees and tunnel temperature location

All pipe joints are sealed.

Particulate sample extraction ports located 60 inches under velocity ports (requirement 4D=48 inches minimum) and 30 inches above downstream Tee. (Requirement 2D=24 inches minimum)

Adjustable damper for flow adjustments

Extraction blower

POLYTESTS
TESTING THROUGH YOUR REALITY



Total length between hood and sampling port: 29 feet.

POLYTESTS
TESTING THROUGH YOUR REALITY



Two 12 inches elbow with horizontal mixing section.

90 inches horizontal run between two elbows. Mixing section, No mixing baffle. 12inches diameter pipe

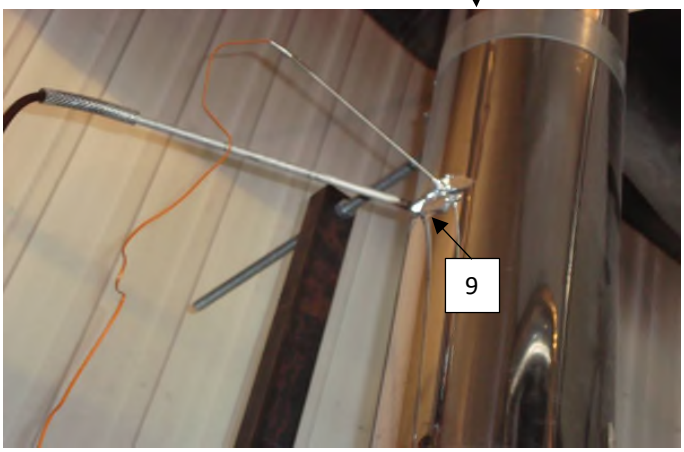
Hood diameter 48 inches (requirement 4D=48 inches minimum) and height of 36 inches (requirement 3D=36 inches minimum)

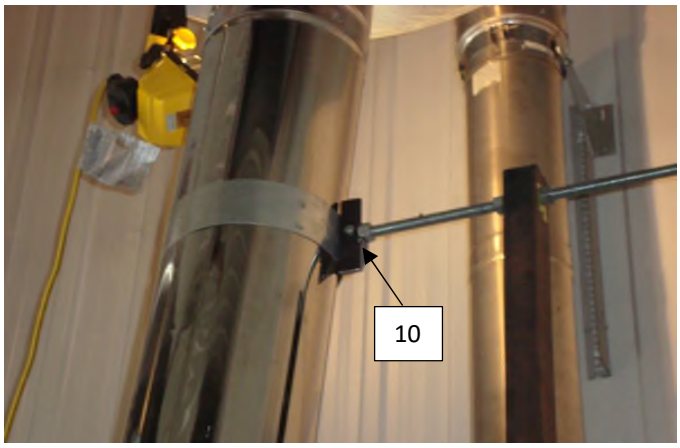
Stack sampling



Gas analysis and temperature probe

chimney support

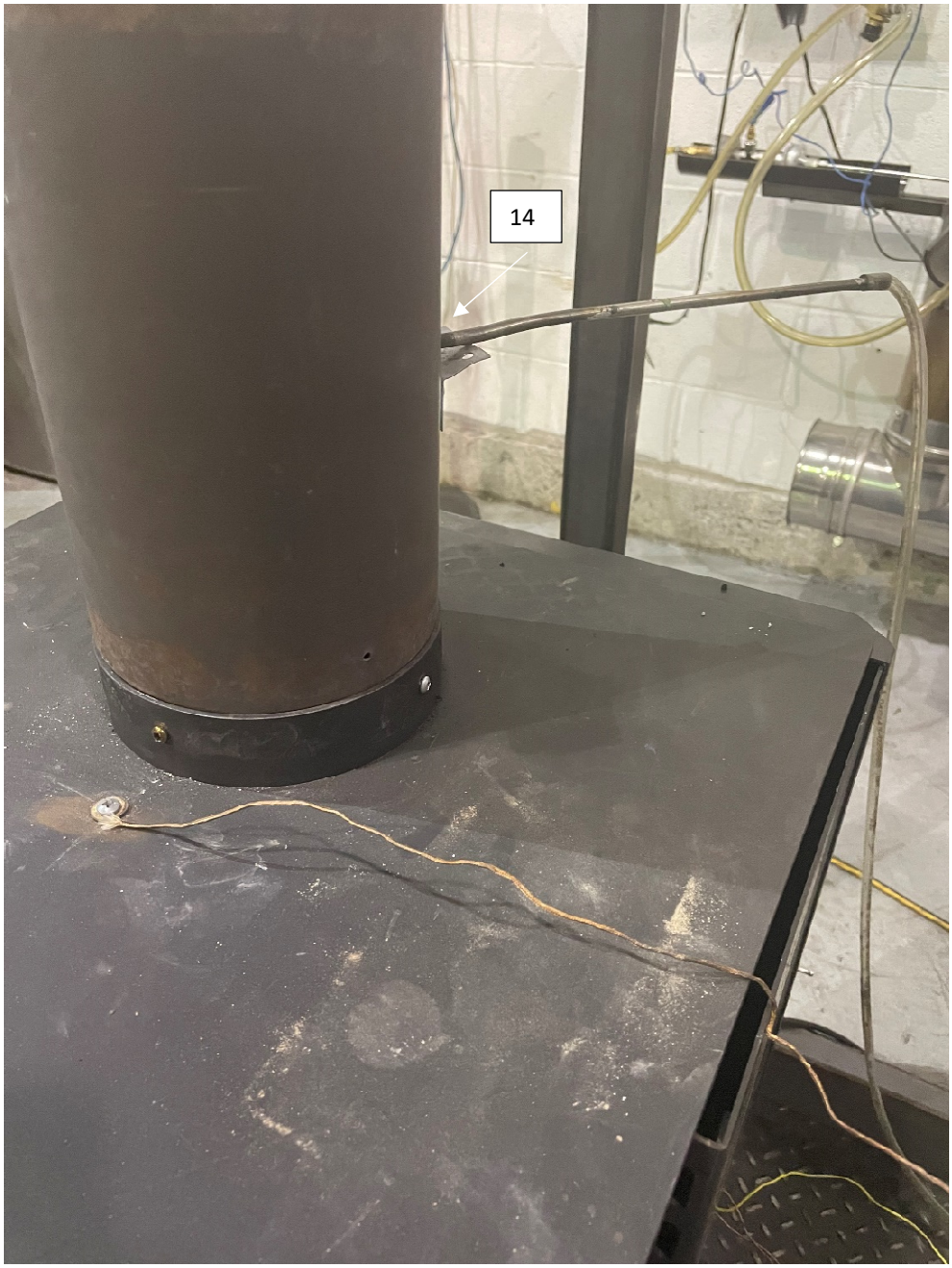




9 : Temperature and gas analyser sampling ports located 9 feet above platform

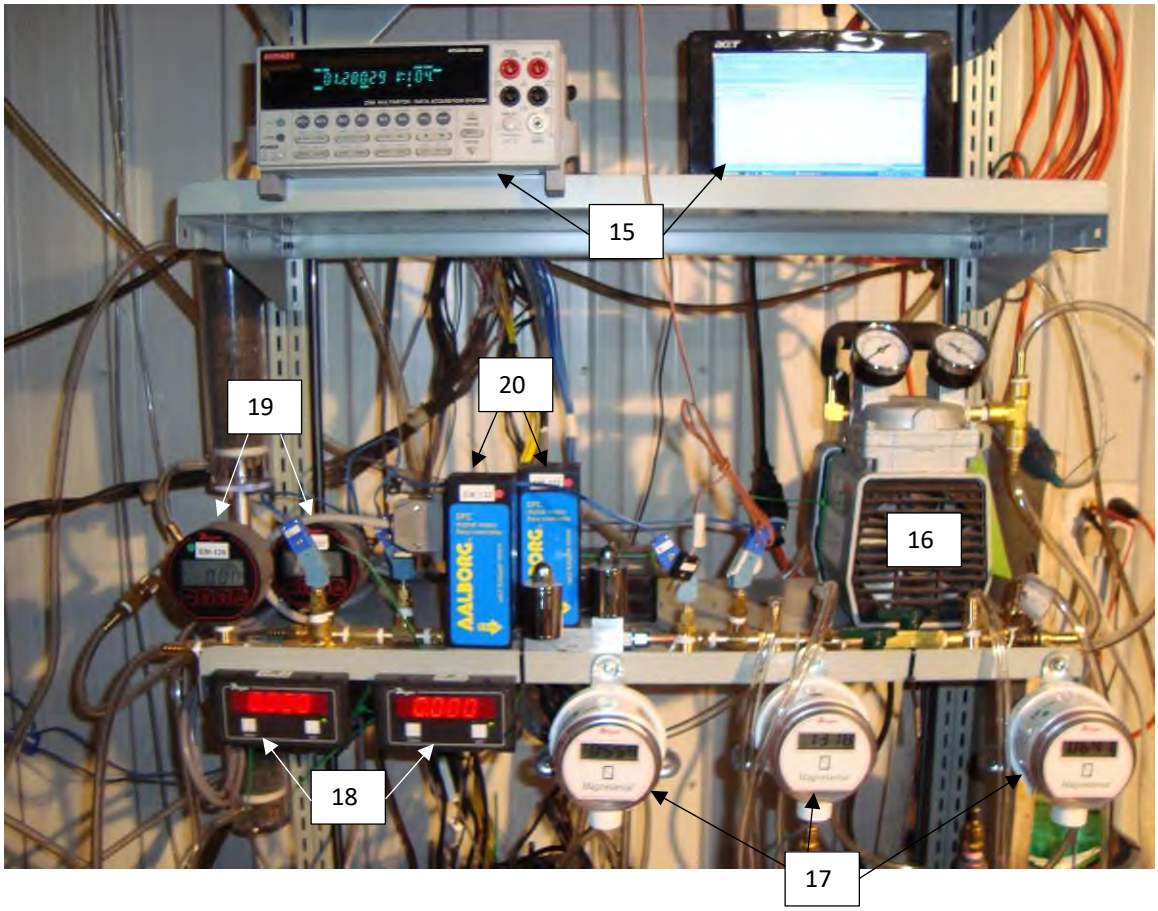
10 : Exhaust system support bracket

Draft sampling



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

Equipment's



15 : Acquisition system

16 : Vacuum pump

17 : Digital manometer

18 : Digital read out for mass flow meter

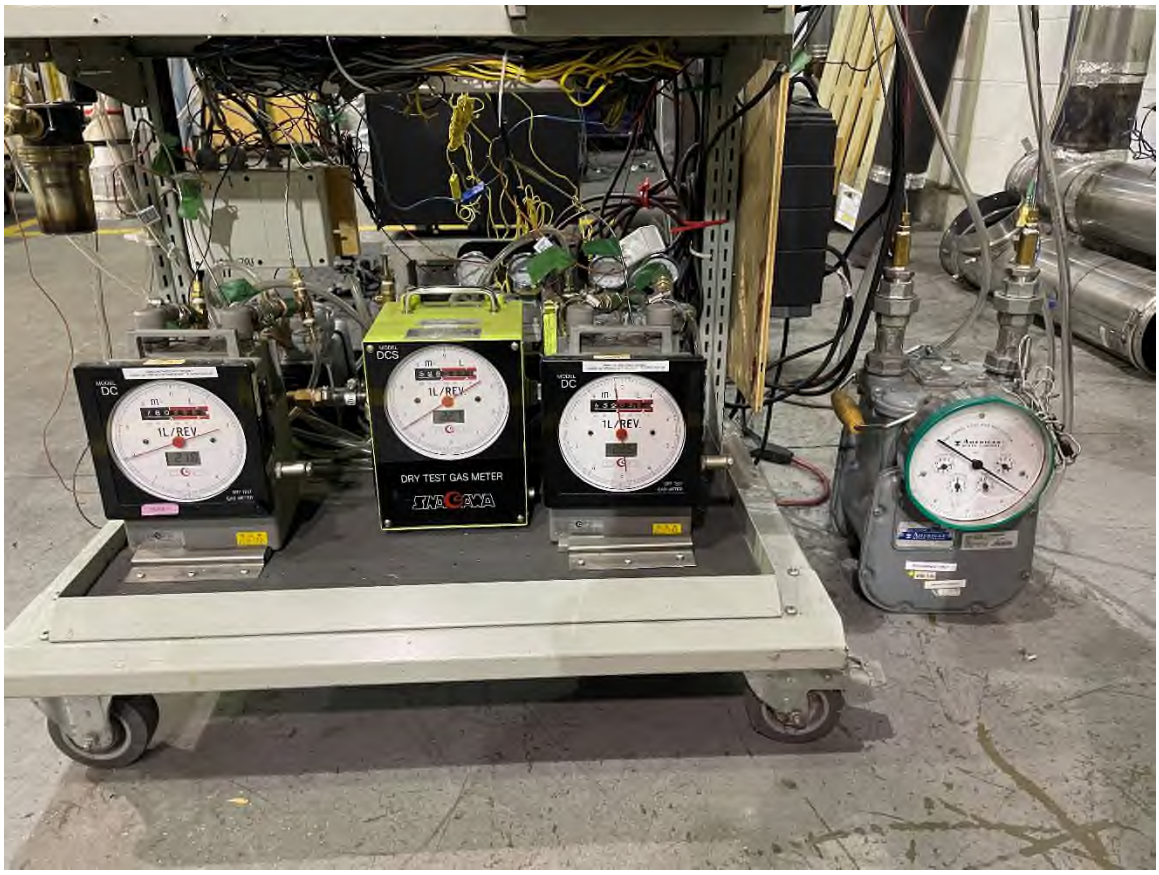
19 : Digital vacuum gage

20 : Mass flow meter

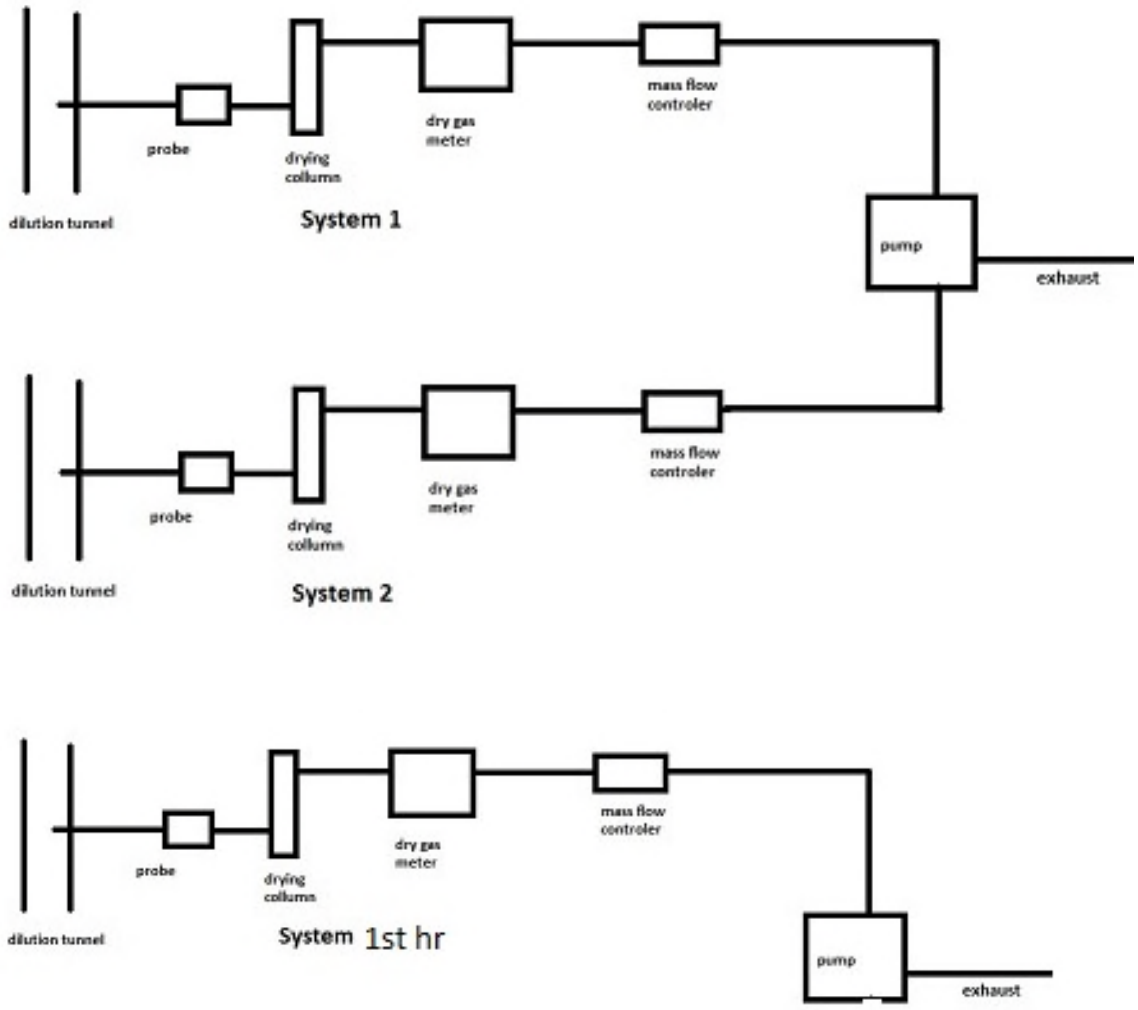
Gaz analyser



Dry gas meter for 1st hour, train 1, train 2 and room filter.



Dilution tunnel sample system



Dilution tunnel

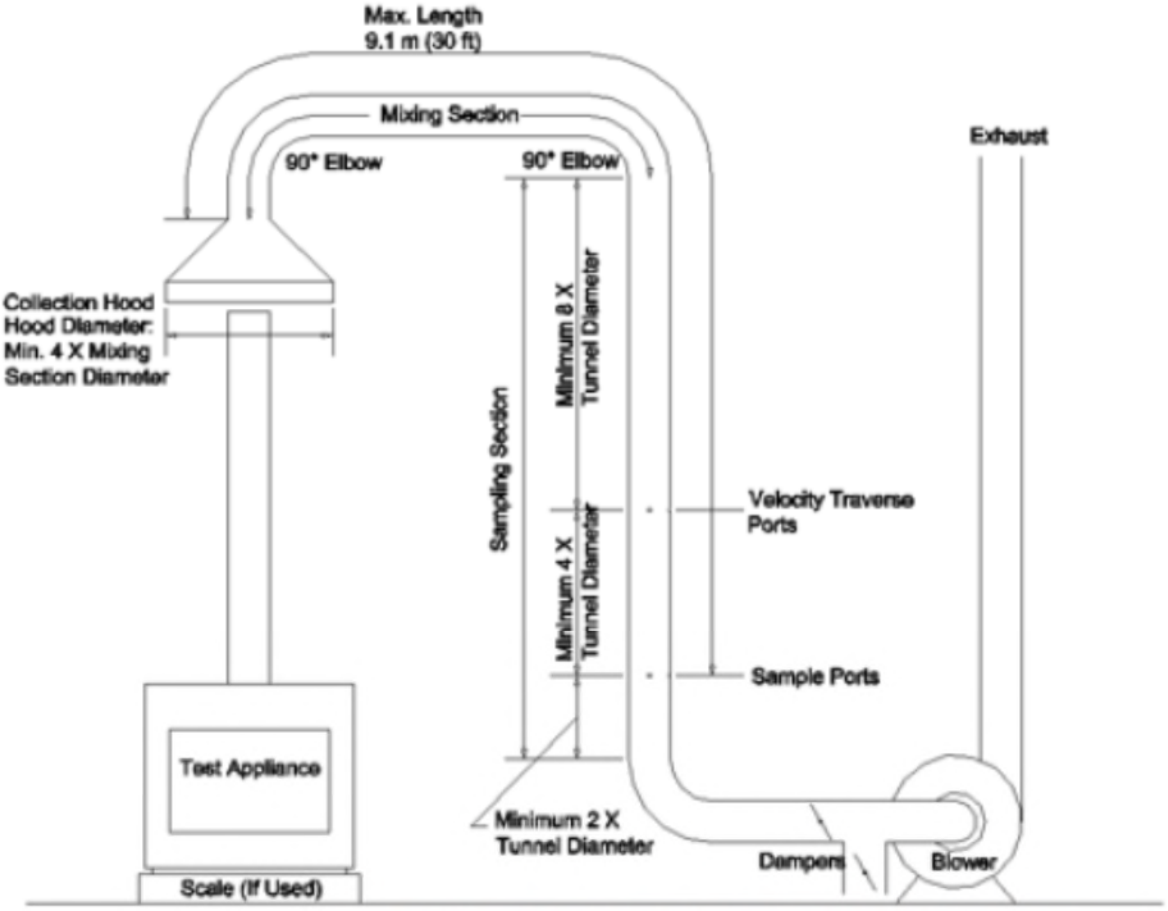


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

Sampling filter holders	
	Back filer holder The Pall (Gelman) 1119, polycarbonate Thermocouple Front filter holder The Pall (Gelman) 1235 Aluminium Seamless stainless steel probe corrosion resistant, 12in. long, ¼ (O.D.)

The test facility temperature monitor is located on the horizontal plane that includes the primary air intake opening for the test appliance. Locate the temperature monitor 1 to 2 m (3.3 to 6.6 ft) from the front of the test appliance in the 90° sector in front of the test Appliance

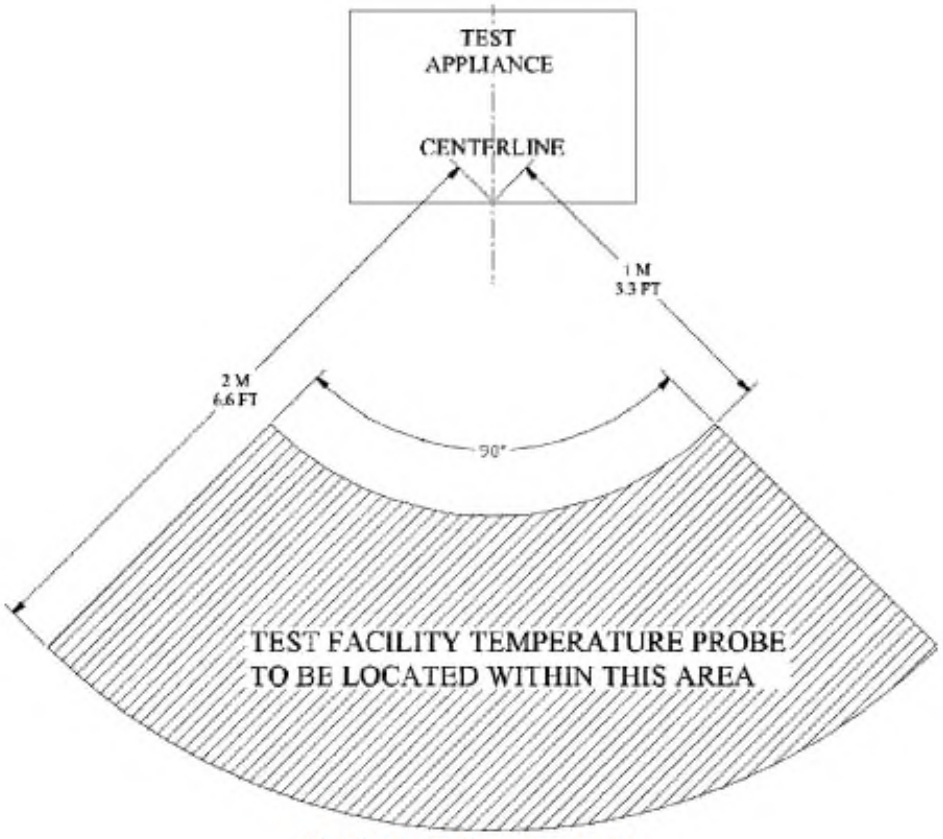


FIG. 8 Test Facility Temperature Monitor

APPENDIX 9: Test load photographs

overall view stove setup	Left side view of the Stove
	
Back side view of the stove	Right side view of the stove
	

Run 1, April 21th 2026 maximum output test	
Kindling & startup fuel	Kindling & startup fuel in the firebox
	
Kindling & startup fuel residual	Coal bed for high burn load
	

Run 1, April 21th 2026 maximum output test	
Testing load	Testing load in the firebox
	
Testing load	Load in stove
	

Run 1, April 21th 2026 minimum output test	
high burn load residual	Coal bed for min burn load
	
Testing load	Load in stove
	

Run 2, April 23rd 2026 High output test	
Kindling & startup fuel	startup fuel
	
Kindling & startup fuel in the firebox	high burn load residual
	

Run 2, April 23rd 2026 high output test	
Testing load	Testing load in the firebox
	
Coal bed for high burn load	Testing Load
	

Run 2, April 23rd 2026 medium output test	
high burn load residual	Coal bed for min burn load
	
Testing load	Load in stove
	

Run 2, April 23rd 2026 medium output test	
Testing load	Testing load
	
Empty firebox	Empty firebox
	

Air setting maximum burn rate	Air setting medium burn rate
	
Air setting minimum burn rate	
	

Sealed Testing heater	Sealed Testing heater
	

APPENDIX 10: Laboratory Operating Procedures

POLYTESTS Services inc.

SFBA EMISSIONS AND EFFICIENCY TESTING LABORATORY OPERATING PROCEDURE

INTRODUCTION

This document provides a step-by-step guide for the technician conducting tests to EPA standard requirements. Procedures outlined here, when followed, will result in tests in conformance with EPA Methods 28R, ASTME2780, ASTME2515, ASTM E2618, Method 28WHH, Method 28 PTS, Method ALT-125, ASMTE 3053, ALT-134, ASTME2779

The primary measurements to be made are particulate emissions rates. The technician's duties include the following steps.

1. Incoming inspection of test units.
2. Set-up of test units.
3. Preliminary testing to establish unit operating procedures and familiarity with operating controls.
4. Calibration of test equipment.
5. Set-up, checking and operation of sampling apparatus.
6. Conduct of tests including complete record keeping and data recording for non-automated functions.
7. Operation of hardware and software included in automatic data acquisition system.
8. Review and analysis of data at test completion to ensure test validity.

The technician running this test must be familiar with the following documents, which are to be kept in the laboratory at all, times.

EPA METHODS

1. EPA METHODS 28R
2. ASTME2780
3. ASTME2515
4. ASTM E2618
5. METHOD 28WHH
6. METHOD 28 PTS
7. ALT-125
8. ASMTE 3053
9. ALT-134
10. ASTME2779

I. APPLIANCE INSPECTION AND SET-UP

A. INCOMING INSPECTION

1. Check for completeness of unit including parts, accessories, installation and operating instructions, drawings and specifications etc. Note any discrepancies or missing parts or information.
2. Check for shipping damage. If damage has occurred, notify the laboratory manager. In some cases, repairs may be made, provided the manufacturer and laboratory manager concur that repairs will not affect the unit's performance. If damage is irrepairable, a new unit will need to be obtained.
3. Note whether unit is catalytic of non-catalytic.
4. Mark unit with manufacturer's name, model number, work order number and date received.
5. If unit is safety listed, note label data including listing agency and serial number. If unit is not listed, mark all data sheets "UNLISTED". Test results will not be released until unit passes safety tests without modification unless authorized by laboratory manager.

B. UNIT SET-UP

1. All new units must be operated for a breaking in period as follows.

    a) Fifty (50) hours at medium burn rate with Douglas Fir scrap or cordwood. Between 18% and 25% MC.

During these break-in runs the unit may be connected to a lab chimney and fuel additions noted into the corresponding data acquisition file. For catalytic units, a thermocouple must be installed in the catalyst.

Record catalyst temperature at 1-hour intervals or on chart recorder. Operating should continue until data shows at least fifty (50) hours of operation with catalyst temperature in excess of 500 degrees Fahrenheit (active range).

For non-catalytic units a stack thermocouple should be installed and stack temperature recorded at 1-hour intervals. 50 hours minimum burn time with a stack temperature of at least 250 degrees Fahrenheit is required.

Once break-in is completed, allow unit to cool. Clean unit thoroughly.

2. Unit is to be placed on scale for testing. Prior to proceeding with verification process, scale should be turned on and allowed to warm up for one (1) hour minimum. Zero scale and check calibration with standard weights. One (1) 1 kg weight and one (1) 2 kg weight are provided for this purpose. Use scale verification test form no. EPA-7-TP to record results. If scale fails to reproduce weights within tolerance, check with laboratory manager before proceeding.
3. If scale checks out, place unit on scale and align so chimney will be centered in hood.
4. Attach chimney connector and chimney. Be sure all joints are sealed below sampling points. Chimney and connector should be cleaned with a wire brush. Be sure chimney connector terminates and chimney starts at proper level above scale platform. Chimney must be supported from scale so that it does not touch test enclosure or hood walls.
5. Thermocouples should be attached to surfaces of unit prior to testing. EPA requires a thermocouple on the bottom of the firebox. This must be installed prior to putting the unit on the scale. In some cases, the required thermocouple locations will be inaccessible on finished units. These units should have thermocouples installed by the manufacturer during construction. Check with the laboratory manager if problems are encountered in proper thermocouple attachment.
6. Measure firebox dimensions and record on data forms nos. EPA-2-TP. Make a three-dimensional sketch of the firebox including firebrick, baffles and obstructions. Calculate firebox volume in cubic feet with both addition and subtraction methods using forms nos. EPA-3-TP and EPA-4-TP. See Section 6.2.4 of EPA Method 28 for details of firebox volume determination.
7. If unit is catalytically equipped, additional thermocouples must be installed upstream and downstream of catalyst. Thermocouples should also be placed in the primary and secondary combustion chambers of all units.
8. Plug thermocouples into data acquisition system jacks making a check of locations and jack numbers for each test on data form no. EPA-5-TP.
9. Note that inserts are tested as if they are freestanding stoves.
10. Dilution tunnel should be cleaned prior to each certification test series and at anytime a higher burn rate follows a lower test burn rate.

II. SAMPLING SYSTEM – SET-UP

A. GAS ANALYSIS

1. Instruments should be turned on and allowed to warm up for one (1) hour minimum.

2. Calibrate analyzers as follows:

   NOTE: Prior to proceeding with calibration, make sure to use NIST traceable calibration gas bottles. Adjust flow meter, if necessary, at each instrument to required flow value.

   a) Using span gas, adjust span control to values specified on calibration gas label.
   b) Using nitrogene, adjust zero controls to provide a 0.00 analyzer readout.
   c) Repeat a) and b) until no further adjustment is required.
   d) Check readout vs. calibration gases (2) labels.

   The CO_2 and CO analyzers are "ZEROED" on nitrogen. The O_2 analyzer is spanned on air and set for 20.9%. It is zeroed on nitrogen as well.

3. Check for response time synchronization.

   a) With no fire in unit, allow reading to stabilize (O_2 should be 20.93, CO and CO_2 should equal O).
   b) Flow the calibration gas in the unit and start stop watch. Note the time required for each unit to reach .90 of the calibration gas bottle value. If all three analyzers reach this value within 15 seconds of each other, synchronization is adequate. If not, contact the laboratory manager. Synchronization is adjusted by internal instrument setting.

4. Set-up sample clean-up and water collection train as follows.

   a) Load impingers as follows:
   Impinger #1: 100 ml distilled water and 5 ml H_2SO_4
   Impinger #2: 100 ml distilled water and 5 ml H_2SO_4
   Impinger #3: Empty
   Impinger #4: 200 – 300 grams silica gel (dry)

   b) Place impingers in container and connect with "U TUBES". Grease carefully on bottom half of ball joint so that grease will not get into tubes.

c) Connect filter to first impinger and sample line to last impinger.

e. Leak check system as follows.

1) Plug probe.
2) Turn on sample system.
3) Observe sample flow rotometer and vacuum gauge. If necessary, use vacuum; adjust valve to set vacuum to the maximum inches Hg.
4) If the float in rotometer does not stabilize below 10 on scale, system must be resealed.
5) Repeat leak check procedure until satisfactory results are obtained.

f) Just prior to starting test, fill impinger container with water and ice and record ambiant conditions on data form no. EPA-8-TP.

B. DILUTION TUNNEL SAMPLE TRAIN SET-UP

1. Filters and holders.

a) Clean probes and filter holder front housings carefully and desiccate for at least 48 hours prior to use.
b) Filters should be numbered and filter and probe combinations labeled prior to use.
c) Weigh desiccated filters and probe-filter units on analytical balance. Record weights data form no. EPA-10-TP. Note that probe and front half of front filter are to be weighed as a unit.
d) Carefully assemble filter holder units and connect to sampling systems. Check "DRIERITE" columns for adequate dry absorbent (blue).

2. Leak checking.

a) Each sample system is to be checked for leakage prior to inserting probes in tunnel.
b) Plug probes and start samplers, adjust pump bypass valve to produce a vacuum reading of 10 inches Hg. (NOTE: During test, vacuum must not exceed 10 inches unless posttest leak check shows acceptable results.)
c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (DGM_1) and (DGM_2) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM_3, DGM_4).

NOTE: If mark, system is leaking too much and all seals should be checked.

d) Calculate leakage rate as follows.

1) System 1: $\frac{(DGM_3 - DGM_1)}{10} = CFM_1$

2) System 2: $\frac{(DGM_4 - DGM_2)}{10} = CFM_2$

If CFM_1 or CFM_2 is greater than .02 CFM, leakage is unacceptable and system must be resealed.

If CFM_1 or CFM_2 is greater than 0.04 X sample rate, leakage is unacceptable. For most tests, the sample rate will be about 0.15 CFM, thus leakage rates in excess of 0.04 X 0.15 = 0.006 CFM are not acceptable. Record leakage rates on form no. EPA-5-TP

e) Once leakage check is satisfactory, unplug probe and set flow to appropriate rate for test. This should be done in the minimum amount of time necessary and with the probes in ambient air. Do not insert probes in tunnel until the start of the test run. When flow is established, replug probes to prevent contamination.

III. TEST CONDUCT

A. FUEL LOAD

1. Determine optimum load weight by multiplying firebox volume in cubic feet by 7 or (10 and 12 for cordwood method). This is the load weight on an as-fired basis.
2. Determine piece size to obtain the requested load configuration and meet the test load weight criteria. The load should consist of the following: **TO BE DETERMINED**
3. Weigh out test load and adjust weight by shortening all pieces equally if necessary. Record individual piece load on form no. EPA-11-TP.

4. Measure and record moisture content of each fuel piece using Delmhorst moisture meter. Determine if fuel load moisture content is in required range. If not, construct new load using wood with required moisture content. All wood in the humidity chamber should be within range. Contact project manager if you cannot find suitable pieces. Record moisture of each individual piece load on form no. EPA-11-TP.

B. UNIT START-UP

1. Before lighting a fire, turn on dilution tunnel and set tunnel velocity to 500ft/min Record readings on data form no. EPA-9-TP.
2. Check draft imposed on cold stove with all inlets closed and a draft gauge in the chimney. If draft is greater than 0.005 inches water column, adjust tunnel to stack gap until draft is less than 0.005.
3. Check for ambient airflow around unit with hot wire anomometer. Must be less than 50 ft/min.
4. Check all equipment for proper operation. Analyzers should be on and in sample mode. Computer should be loaded with test program and awaiting test start command.
5. Zero scale and start fire with uncolored newspaper and kindling representing 10 % of test load with the same type of fuel.
6. Once kindling is burning well after 5 minutes, add splitted pieces having a bottom surface around 4 sq. inches and representing 25% of test load weight. Operate at high fire for 15 minutes. Then adjust settings to intended test run levels as per the manufacturers.
7. Following addition of pretest fuel load (splitted pieces), start computer for data logging.
8. All fuel additions, air intake settings and operational characteristics shall be noted with associated time stamp on form no. EPA-1-TP.

C. TEST RUN

1. Once the targeted test fuel bed weight is obtained, the test is to be started as follows:

   a) Insert the sample probes into the tunnel being careful not to hit sides of tunnel with probe tip.
   b) Check tunnel pitot tube for proper position. (Pitot should be carefully cleaned prior to each test.)
   c) Turn on probe sample systems and stack sampler.
   d) Open stove door, rake coals and load stove as follows: **TO BE DETERMINED**
   e) Close door or follow manufacturer's start-up procedures. (Five (5) minutes maximum time before all doors and controls must be set to final positions for duration of test. 15 minutes or 15% of lad burned allowed for ALT-125 method))
   f) An alarm will sound an audible signal at the (10) minutes intervals. This signals a reading interval. You must verify at each interval that the following readings are correctly logged by the data acquisition system and make observations of any unusual or non-routine events that could occur.

      1) Rotometer readings.
      2) Tunnel pitot tube reading.

(Zero regularly between readings)

      3) Gas meter readings.
      4) Temperature readings.
      5) Draft reading
      6) Test laod weight
      7) CO, CO_2 and O_2 readings
      8) Observations of any unusual or non-routine events.

   g) During the test, any condition approaching unacceptable limits will be noted. The filter probes and housings are installed in small holders just outside the tunnel. If the filter temperature gets too high, you will have to increase the water flow through the cooling unit until acceptable temperatures are obtained. In between readings, check on other equipment. Be sure dryers and filters are working and monitor impinger train for proper water and ice levels etc.

   h) When the fuel charge is consumed, it will signal end of test and shut down the sampling systems. When this occurs,

remove filter holder and probes from tunnel and impingers from sample line.

IV. POST TEST PROCEDURES

A. SAMPLE RECOVERY – FILTER TRAINS

1. Carefully clean outside of probes and filter housings with alcohol.
2. Disassemble filter holder and transfer filters to clean petri dish. Scrape gasket with scalpel and collect any loose material on filters.
3. Place probe and front half of first filter holders (still assembled) and filters in desiccator. Allow 48-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at six (6) hour intervals minimum until weight change between weightings is less than 0.2 mg. Record all weights taken on data form no. EPA-10-TP.

B. CALCULATION OF RESULTS

The computer program carries out all final calculations. When run, it will ask for data from forms used during the test. Enter data as called for.

GENERAL

This guide cannot cover every possible contingency, which may develop during a particular test program. Many questions, which may arise, can be answered by a complete understanding of the test standards and their intent. When in doubt on any detail, check with the laboratory manager and be sure you understand the procedures involved.

It is critical that all spaces on the data forms be properly filled in. Each test must be represented by a complete record of what was done and when.

APPENDIX 11: Sample calculations

Validation du fichier de calcul avec les équations provenant des normes:
ASTM E2515-11
ASTME3053-17

Equation 9,2 (1) $$M_{fldb} = \sum (M_{flnwb})\,(100)/(100 + MC_{fln}))$$

Nomenclature

M_{FLdb}	Weight of test fuel load, dry basis lb (kg)
M_{FLnwb}	Weight of each test fuel pieces, n, in test fuel load per 8,4,1, wet basis, lb (kg)
MC_{FLn}	Average fuel moisture of test fuel piece, n , in test fuel load % dry basis
n	individual test fuel pieces that comprise the test fuel load, as applicable

Sample calculation

Data

M_{FLnwb}	22,59	lbs
MC_{FLn}	20,64	%
n		
M_{FLdb}	18,73	lbs

Equation 9,2 (2) $$M_{SUdb} = \sum (M_{SUnwb})\,(100)/(100 + MC_{SUn}))$$

Nomenclature

M_{SUdb}	Weight of startup fuel, dry basis, lb (Kg)
M_{SUnwb}	Weight of each start-up fuel pieces, n, per 8,5,7, wet basis, lb (Kg)
MC_{SUn}	Average fuel moisture of start-up fuel piece, n % bry basis
n	individual startup fuel pieces, as applicable

Sample calculation

Data

M_{SUnwb}	6,60	lbs
MC_{SUn}	20	%
n		
M_{SUdb}	5,50	lbs

Equation 9,2 (3) $$M_{kdb} = (M_{kwb})(100)/(100 + MC_k)$$

Nomenclature

M_{kdb} Weight of kindling, dry basis lb (kg)

M_{kwb} Weight of kindling per 8,5,6, wet basis, lb (kg)

MC_k Average moisture of kindling % dry basis

Sample calculation

Data

M_{kwb}	4,51 lbs
MC_k	9,00 %
M_{kdb}	4,14 lbs

Equation 9,2 (4) $$M_{FREHdb} = M_{RSUBdb} + M_{FLEHdb}$$

Nomenclature

M_{FREHdb} Total weight of all remaining fuel at end of high fire test run, lb (kg)

M_{RSUBDb} Weight of risidual start-up fuel bed when high fire test load added, lb(kg)

M_{FLEHdb} Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation

Data

M_{RSUBDb}	2,90 lbs
M_{FLEHdb}	2,10 lbs
M_{FREHdb}	5,00 lbs

Equation 9,2 (5) $$M_{TFBHdb} = M_{Kdb} + M_{SUdb} + M_{FLdb} - M_{FREHdb}$$

Nomenclature

M_{TBFHdb}	Total weight of all fuel burned during high fire test run lb (kg), dry basis
M_{FREHdb}	Total weight of all remaining fuel at end of high fire test run, lb (kg)
M_{FLdb}	Weight of test fuel load, dry basis lb (kg)
M_{SUdb}	Weight of startup fuel, dry basis, lb (Kg)
M_{kdb}	Weight of kindling, dry basis lb (kg)

Sample calculation

Data

M_{FREHdb}	5,00	lbs
M_{FLdb}	18,73	lbs
M_{SUdb}	5,50	lbs
M_{kdb}	4,14	lbs
M_{TBFHdb}	23,37	lbs

Equation 9,2 (6) $$BR_H = 60(M_{FLdb} - M_{FLEHdb})/\theta_{H1}$$

Nomenclature

BR_H	Dry burn rate for high fire test run, from time when test fuel load added to end of test run
θ_{H1}	Total duration of high fire test run, from time when test fuel load is added to end of test r
M_{FLdb}	Weight of test fuel load, dry basis lb (kg)
M_{FLEHdb}	Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation

Data

θ_{H1}	120	min
M_{FLdb}	18,73	lbs
M_{FLEHdb}	2,10	lbs
BR_H	3,77	kg/hr

For low and medium burn fire test run
Equation 9,2 (7) $$M_{TFBdb} = M_{FLdb} - M_{FREdb}$$

Nomenclature

M_{TFBdb}	Total weight of fuel burned during low or medium fire test run, lb (kg),dry basis
M_{FREdb}	Weight of remaining fuel at end of low or medium fire test run, lb (kg)
M_{FLdb}	Weight of test fuel load, dry basis lb (kg)

Sample calculation

Data

M_{FREdb}	0,00	lbs
M_{FLdb}	23,83	lbs
M_{TFBdb}	23,83	lbs

Equation 9,2 (8) $$BR = 60(M_{MTBdb})/\theta$$

Nomenclature

BR	Dry burn rate for low and medium fire test run. lb/hr (kg/hr)
θ	Total duration of low or medium fire test run, min.
M_{TFBdb}	Total weight of fuel burned during low or medium fire test run, lb (kg),dry basis

Sample calculation

Data

θ	583	min
M_{TFBdb}	23,83	lbs
BR_H	1,11	kg/hr

For high test run
Equation 9,2 (9) $$PM_{RH} = 60(E_{TH}/\theta_{H2})$$

Nomenclature

PM_{RH}	Paticulate emission rate for high fire test run, gr/hr
E_{TH}	Total particulate emissions for high fire test run including kindling and start-uo
θ_{H2}	Total test duration of high fire test run, from ignition of kindling to end of test run

Sample calculation

Data

E_{TH}	9	gr
θ_{H2}	160,00	min
PM_{RH}	3,31	kg/hr

Equation 9,2 (10) $$PM_{FH} = E_{TH}/M_{TFBHdb}$$

Nomenclature

PMF_H	Paticulate emission rate for high fire test run, gr/hr

Sample calculation

Data

E_{TH}	9	gr
M_{TFBHdb}	23,37	dry lb
PM_{RH}	0,83	gr/dry kg

for high fire test run
Equation 9,2 (11)

$$PM_{btuH} = E_{TH} / (M_{TFBHdb} * (HHV)\left(\frac{n_1}{100}\right)) * (10^6)$$

Nomenclature

PM_{btuH}	Particulate per heat output unit for high fire test run, lb/ MMbtu
HHV	Higher heating value of test fuel, dry basis, btu/lb
n_r	CSA B415,1 overall Efficiency, HHV (hot to hot)

Sample calculation

Data

E_{TH}	8,8	gr
M_{TFBHdb}	23,37	dry lb
HHV	8690	btu/lb
n_r	70,91%	
PM_{btuH}	0,1351	lb/Mmbtu

Equation 9,2 (12)

$$PM_R = 60(E_T/\theta)$$

Nomenclature

PM_R	Paticulate emission rate for low or medium fire test run, gr/hr
E_T	Total particulate emission for low or medium fire test run, from ASTME 2515 (g)
θ	Total duration of low or medium fire test run, min.

Sample calculation

Data

E_T	12	gr
θ	583	min
PM_{RH}	1,21	gr/hr

Equation 9,2 (13) $$PM_F = E_T / M_{TFBdb}$$

Nomenclature

PM_F Paticulate emission factor rate for low or medium fire test run, gr/dry kg

Sample calculation

Data

E_T	11,8	gr
M_{TFBdb}	23,83	dry lb
PM_F	1,09	gr/dry kg

for high fire test run
Equation 9,2 (14) $$PM_{btu} = E_T / (M_{TFBdb}(HHV)(\frac{n_r}{100})) * (10^6)$$

Nomenclature

Pmbtu Particulate per heat output unit for low and medium test run, lb/ MMbtu
HHV Higher heating value of test fuel, dry basis, btu/lb
n_r CSA B415,1 overall Efficiency, HHV (hot to hot)

Sample calculation

Data

E_{TH}	11,8	gr
M_{TFBHdb}	23,83	dry lb
HHV	8690	btu/lb
n_r	72,82%	
PM_{btuH}	0,1721	lb/Mmbtu

Volume of gas sample corrected to dry standard conditions ($V_{m(std)}$)

Equation used

ASTM 2515, equation 6

$$V_{m\,(std)} = K_1 V_m Y \left[\frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{T_m}\right]$$

Nomenclature

$V_{m\,(std)}$	Volume of gas sample , corrected to standard conditions, $dscm^3$ (dscf)
K_1	17.64 R/in Hg
V_m	Volume of gas sample
Y	DGM calibration factor
P_{bar}	Barometric pressure mmHg (in Hg)
ΔH	Average pressure at the outlet of the dry gas meter mm water (in. Water)
T_m	Absolute average dry gas meter temperature K (R)

Sample calculation

Data

V_m	116,30	dcf
Y	1,01	
P_{bar}	30,05	in Hg
ΔH	-0,9868	in Hg
T_m	536,8	R

Calculation

$V_{m(std)}$	112,18	dscf

Calculation based of train 2 data Low fire

Total amount of particulate matter collected (m_n)

Equation used

ASTM 2515, equation 12

$$m_n = F_1 + F_2 + \Delta PF$$

Nomenclature

m_n	Total amount of particulate matter collected, mg
F_1	Particulate matter collected on front filter, mg
F_2	Particulate matter collected on second filter, mg
ΔPF	Post-test weight gain of probe and filter holder assembly, mg

Sample calculation

Data

F_1	0,0024	g	ALT-154 filters weigthed in pair
F_2		g	
ΔPF	0,0011	g	

Calculation

m_n	3,500	mg

Calculation based of train 2 data Low fire

Particulate concentration (C_S)

Equation used

ASTM 2515, equation 13

$$C_S = (0{,}001\ g/mg) \times \left(\frac{m_n}{V_{m\,(std)}}\right)$$

Nomenclature

C_S	Concentration of particulate matter in stack gas or dilution tunnel, dry basis, corrected to standard conditions, g/dsm^3 (g/dscf)
m_n	Total amount of particulate matter collected in the sampling train, mg
$V_{m(std)}$	Volume of gas sample measured corrected to dry standard conditions, dsm^3 (dscf)

Sample calculation

Data

m_n	3,500	mg
$V_{m(std)}$	112,18	dscf

Calculation

C_s	0,000031	g/dscf

Calculation based of train 2 data Low fire

Particulate concentration for room air (C_r)

Equation used

ASTM 2515, equation 14

$$C_r = (0{,}001\ g/mg) \times \left(\frac{m_r}{V_{mr\,(std)}}\right)$$

Nomenclature

C_r	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm^3 (g/dscf)
m_r	Total amount of particulate matter collected in the sampling train, mg
$V_{mr(std)}$	Volume of room air sample measured corrected to dry standard conditions, dsm^3 (dsc

Sample calculation

Data

m_r	0,100	mg
$V_{mr(std)}$	115,14	dscf

Calculation

C_r	0,000001	g/dscf

Calculation based of train 2 data low

Adjustment factor for alternative pitot tube placement (FP)

Equation used

ASTM 2515, equation 1

$$F_P = \frac{V_{strav}}{V_{scent}}$$

Nomenclature

V_{strav}	Average gas velocity caclulated after the Pitot tube traverse
V_{scent}	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
F_P	Adjustment factor for center of tunnel pitot tube placement

Sample calculation

Data

V_{strav}	0,253713209
V_{scent}	0,253713209

Calculation

F_P	1,000000

Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

$$V_S = F_p K_P C_P \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
C_P	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
F_P	Pitot tube correction factor
$\left(\sqrt{\Delta P}\right)_{avg}$	Average square root of each individual velocity head (ΔP)
P_{bar}	Barometric pressure at measurement site, mm H_2O (in. H_2O)
P_g	Stack static pressure, mm Hg (in. Hg)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
M_S	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78 or 29 for CSA B415
t_S	Dilution tunnel temperature, °C (°F)
T_S	Absolute dilution tunnel temperature, °K (°R), or 273 + t_s for metric units, 460 + t_s for English units

Sample calculation

Data

K_P	85,49	
C_P	0,99	
F_P	1,000	
$\left(\sqrt{\Delta P}\right)_{avg}$	0,2671	in $H_20^{1/2}$
P_{bar}	30,05	in Hg
P_g	0,27	in H_20
P_S	30,07	in Hg
M_S	29	lb/lb-mol
t_S	81,85	F
T_S	541,85	R

Calculation

V_S	17,8187	ft/s

Calculation based of data low

Average dilution tunnel gas flow rate (Qstd)

Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{WS})V_S A\left(\frac{T_{std}}{T_S}\right)\left(\frac{P_S}{P_{std}}\right)$$

Nomenclature

Q_{std}	Total gas flow rate corrected to dry standard conditions, dsm^3/min (dscf/min)
60	Conversion factor minutes per hour
B_{WS}	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V_S	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m^2 (ft^2)
T_{std}	Standard absolute temperature, 293 °K (528°R)
T_S	Absolute average dilution tunnel temperature, °K (°R), or 273 + t_s for metric units, 460 + t_s for English units
t_S	Dilution tunnel temperature, °C (°F)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or P_{bar} + P_g
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{WS}	0,02	
V_S	17,819	
A	0,785	ft^2
T_{std}	528	R
T_S	541,85	R
P_S	30,066	in Hg
P_{std}	29,92	in Hg

Calculation

Q_{std}	805,78	dscf/min

Calculation based of data low

Particulate emission rate (E)

Equation used

$$E = (C_S - C_r)Q_{std}$$

Nomenclature

E	Particulate emission rate, g/hr
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)

Sample calculation

Data

C_S	0,000031	g/dscf
C_r	0,000001	g/dscf
Q_{std}	805,78	dscf/min

Calculation

E	0,02	g/min
E	1,47	g/h

Calculation based on train 2 data low

Total particulate emission rate (E_T)

Equation used

ASTM 2515, equation 15

$$E_T = (C_S - C_r)Q_{std}\theta$$

Nomenclature

E_T	Total particulate emission, g
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)
θ	Total sampling time, min

Sample calculation

Data

C_S	0,000031	g/dscf
C_r	0,000001	g/dscf
Q_{std}	805,78	dscf/min
θ	583	min

Calculation

E	14,25	g

Calculation based on train 2 data Low

Average gas velocity in dilution tunnel during each min interval, i, of the test run

Equation used

ASTM 2515, equation 10

$$v_{si} = F_p K_p C_p \sqrt{\Delta p_i} \sqrt{\frac{T_{si}}{P_s M_s}}$$

Nomenclature

v_{si}	Average gas velocity in dilution tunnel during each min interval, i of the test run m/sec (ft/sec)
F_P	Pitot tube correction factor
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g\text{-}mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb\text{-}mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
C_P	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
Δp_i	interval, i, of the test run
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i^{th} minutes
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
M_S	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78

Sample calculation

Data

i=1			**i=2**		
F_P	1,000		F_P	1,000	
K_P	85,49		K_P	85,49	
C_P	0,99		C_P	0,99	
Δp_i	0,071	in H_20	Δp_i	0,069	in H_20
T_{Si}	544,4	R	T_{Si}	544,1	R
P_S	30,07	in Hg	P_S	30,07	in Hg
M_S	29	lb/lb-mol	M_S	29	lb/lb-mol

Calculation

i=1			**i=2**		
v_{si}	17,77	ft/sec	v_{si}	17,50	ft/sec

Percent of proportional sampling rate (PR)

Equation used

B415, equation 13.1

$$PR = \left(\frac{\theta V_{mi(std)} V_S T_m T_{Si}}{\theta_i V_m V_{Si} T_{mi} T_S} \right) \times 100$$

Nomenclature

PR	Percent of proportional sampling rate (%)
θ	Total sampling time, min
θ_i	Time of interval, 1 min
V_m	Volume of gas sample measured by the DGM, dsm^3 (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i^{th} 1 minutes interval, dsm^3 (dscf)
V_S	Average gas velocity in the dilution tunnel, ft/min
V_{Si}	Average gas velocity in the dilution tunnel during the i^{th} 10 minutes interval, ft/min
T_m	Absolute average digital mass flow controller temperature, K (R)
T_{mi}	Absolute average digital mass flow controller temperature during the i^{th} 1 minutes
T_S	Absolute average gas temperature in the dilution tunnel, K (R)
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i^{th} 1 minutes

Sample calculation

Data

train =1			train =2		
θ	583	min	θ	583	min
θ_i	1,00	min	θ_i	1,00	min
V_m	110,56	dcf	V_m	112,34	dcf
$V_{mi(std)}$	0,190	cuft	$V_{mi(std)}$	0,194	cuft
V_S	16,30	ft/sec	V_S	16,30	ft/sec
V_{Si}	16,265	ft/sec	V_{Si}	16,265	ft/sec
T_m	534,8	R	T_m	536,8	R
T_{mi}	534,55	R	T_{mi}	535,85	R
T_S	541,85	R	T_S	541,85	R
T_{Si}	544,4	R	T_{Si}	544,4	R

Calculation

train=1		**train=2**	
PR	101,1 %	PR	101,6 %

Filter face velocity check

Equation used

$$FV_{max} = \frac{V_{mL}}{1} \times \frac{1}{F_A}$$

Nomenclature

FV_{max}	Maximum filter face velocity during the test run, m/min (ft/min)
V_{mL}	Largest 1 minute interval metered gas volume value recorded during the test run, dm^3 (dcf)
F_A	Filter area exposed to gas sample during train operation, m2 (ft^2)

Sample calculation

Data

V_{mL}	0,194	dcf
F_A	0,0116	ft^2

Calculation

FV_{max}	16,74	ft/min

Dual train precision

Equation used

$$\frac{Train\ 1 - average\ train\ 1\ and\ train\ 2}{average\ train\ 1\ and\ train\ 2} \times 100 \leq 7.5\%$$

Nomenclature

Dual train precision	Deviation between emission's train 1 and 2
Train 1	Total emission for train 1
Train 2	Total emission for train 2

Sample calculation

Data

Train 1	12,06 g
Train 2	11,48 g

Calculation

Dual train precision	2,46 %

Analyzer drift checks

Equation used

$$Drift = \frac{\Delta R}{span} \times 100$$

Nomenclature

Drift	The change in analyzer response to calibration gas over the duration of the test run
∆R	The difference between the analyzer response at the end of the test run and the
Span	The upper limit of the instrument range, ppmv or %

Sample calculation

Data

∆R	0,015 %
Span	5 %

Calculation

Drift	0,30 %

Calculated with CO concentration values.

Validation du fichier de calcul avec les équations provenant des normes:

ASTM E2515-11
ASTME3053-17

Equation 9,2 (1) $$M_{fldb} = \sum (M_{flnwb})\,(100)/(100 + MC_{fln}))$$

Nomenclature

M_{FLdb}	Weight of test fuel load, dry basis lb (kg)
M_{FLnwb}	Weight of each test fuel pieces, n, in test fuel load per 8,4,1, wet basis, lb (kg)
MC_{FLn}	Average fuel moisture of test fuel piece, n , in test fuel load % dry basis
n	individual test fuel pieces that comprise the test fuel load, as applicable

Sample calculation

Data

M_{FLnwb}	22,98	lbs
MC_{FLn}	20,94	%
n		
M_{FLdb}	19,00	lbs

Equation 9,2 (2) $$M_{SUdb} = \sum (M_{SUnwb})\,(100)/(100 + MC_{SUn}))$$

Nomenclature

M_{SUdb}	Weight of startup fuel, dry basis, lb (Kg)
M_{SUnwb}	Weight of each start-up fuel pieces, n, per 8,5,7, wet basis, lb (Kg)
MC_{SUn}	Average fuel moisture of start-up fuel piece, n % bry basis
n	individual startup fuel pieces, as applicable

Sample calculation

Data

M_{SUnwb}	6,62	lbs
MC_{SUn}	20	%
n		
M_{SUdb}	5,52	lbs

Equation 9,2 (3) $$M_{kdb} = (M_{kwb})(100)/(100 + MC_k)$$

Nomenclature

M_{kdb}	Weight of kindling, dry basis lb (kg)
M_{kwb}	Weight of kindling per 8,5,6, wet basis, lb (kg)
MC_k	Average moisture of kindling % dry basis

Sample calculation

Data

M_{kwb}	4,30 lbs
MC_k	9,00 %
M_{kdb}	3,94 lbs

Equation 9,2 (4) $$M_{FREHdb} = M_{RSUBdb} + M_{FLEHdb}$$

Nomenclature

M_{FREHdb}	Total weight of all remaining fuel at end of high fire test run, lb (kg)
M_{RSUBDb}	Weight of risidual start-up fuel bed when high fire test load added, lb(kg)
M_{FLEHdb}	Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation

Data

M_{RSUBDb}	2,90 lbs
M_{FLEHdb}	2,10 lbs
M_{FREHdb}	5,00 lbs

Equation 9,2 (5) $$M_{TFBHdb} = M_{Kdb} + M_{SUdb} + M_{FLdb} - M_{FREHdb}$$

Nomenclature

M_{TBFHdb}	Total weight of all fuel burned during high fire test run lb (kg), dry basis
M_{FREHdb}	Total weight of all remaining fuel at end of high fire test run, lb (kg)
M_{FLdb}	Weight of test fuel load, dry basis lb (kg)
M_{SUdb}	Weight of startup fuel, dry basis, lb (Kg)
M_{kdb}	Weight of kindling, dry basis lb (kg)

Sample calculation

Data

M_{FREHdb}	5,00	lbs
M_{FLdb}	19,00	lbs
M_{SUdb}	5,52	lbs
M_{kdb}	3,94	lbs
M_{TBFHdb}	23,46	lbs

Equation 9,2 (6) $$BR_H = 60(M_{FLdb} - M_{FLEHdb})/\theta_{H1}$$

Nomenclature

BR_H	Dry burn rate for high fire test run, from time when test fuel load added to end of test run
θ_{H1}	Total duration of high fire test run, from time when test fuel load is added to end of test r
M_{FLdb}	Weight of test fuel load, dry basis lb (kg)
M_{FLEHdb}	Weight of unburned portion of test fuel load at the end of the high fire test run, lb (kg)

Sample calculation

Data

θ_{H1}	109	min
M_{FLdb}	19,00	lbs
M_{FLEHdb}	2,10	lbs
BR_H	4,22	kg/hr

For low and medium burn fire test run

Equation 9,2 (7) $$M_{TFBdb} = M_{FLdb} - M_{FREdb}$$

Nomenclature

M_{TFBdb}	Total weight of fuel burned during low or medium fire test run, lb (kg),dry basis
M_{FREdb}	Weight of remaining fuel at end of low or medium fire test run, lb (kg)
M_{FLdb}	Weight of test fuel load, dry basis lb (kg)

Sample calculation

Data

M_{FREdb}	0,00	lbs
M_{FLdb}	23,13	lbs
M_{TFBdb}	23,13	lbs

Equation 9,2 (8) $$BR = 60(M_{MTBdb})/\theta$$

Nomenclature

BR	Dry burn rate for low and medium fire test run. lb/hr (kg/hr)
θ	Total duration of low or medium fire test run, min.
M_{TFBdb}	Total weight of fuel burned during low or medium fire test run, lb (kg),dry basis

Sample calculation

Data

θ	244	min
M_{TFBdb}	23,13	lbs
BR_H	2,58	kg/hr

For high test run
Equation 9,2 (9) $$PM_{RH} = 60(E_{TH}/\theta_{H2})$$

Nomenclature

PM_{RH}	Paticulate emission rate for high fire test run, gr/hr
E_{TH}	Total particulate emissions for high fire test run including kindling and start-uo
θ_{H2}	Total test duration of high fire test run, from ignition of kindling to end of test run

Sample calculation

Data

E_{TH}	6	gr
θ_{H2}	146,00	min
PM_{RH}	2,31	kg/hr

Equation 9,2 (10) $$PM_{FH} = E_{TH}/M_{TFBHdb}$$

Nomenclature

PMF_H	Paticulate emission rate for high fire test run, gr/hr

Sample calculation

Data

E_{TH}	6	gr
M_{TFBHdb}	23,46	dry lb
PM_{RH}	0,53	gr/dry kg

for high fire test run
Equation 9,2 (11)

$$PM_{btuH} = E_{TH} / (M_{TFBHdb} * (HHV)\left(\frac{n_1}{100}\right)) * (10^6)$$

Nomenclature

PM_{btuH}	Particulate per heat output unit for high fire test run, lb/ MMbtu
HHV	Higher heating value of test fuel, dry basis, btu/lb
n_r	CSA B415,1 overall Efficiency, HHV (hot to hot)

Sample calculation

Data

E_{TH}	5,6	gr
M_{TFBHdb}	23,46	dry lb
HHV	8690	btu/lb
n_r	71,26%	
PM_{btuH}	0,0853	lb/Mmbtu

Equation 9,2 (12)

$$PM_R = 60(E_T/\theta)$$

Nomenclature

PM_R	Paticulate emission rate for low or medium fire test run, gr/hr
E_T	Total particulate emission for low or medium fire test run, from ASTME 2515 (g)
θ	Total duration of low or medium fire test run, min.

Sample calculation

Data

E_T	11	gr
θ	244	min
PM_{RH}	2,82	gr/hr

Equation 9,2 (13) $$PM_F = E_T / M_{TFBdb}$$

Nomenclature

PM_F Paticulate emission factor rate for low or medium fire test run, gr/dry kg

Sample calculation

Data

E_T	11,5	gr
M_{TFBdb}	23,13	dry lb
PM_F	1,09	gr/dry kg

for high fire test run
Equation 9,2 (14) $$PM_{btu} = E_T / (M_{TFBdb}(HHV)(\frac{n_r}{100})) * (10^6)$$

Nomenclature

Pmbtu Particulate per heat output unit for low and medium test run, lb/ MMbtu
HHV Higher heating value of test fuel, dry basis, btu/lb
n_r CSA B415,1 overall Efficiency, HHV (hot to hot)

Sample calculation

Data

E_{TH}	11,5	gr
M_{TFBHdb}	23,13	dry lb
HHV	8690	btu/lb
n_r	72,43%	
PM_{btuH}	0,1739	lb/Mmbtu

Volume of gas sample corrected to dry standard conditions ($V_{m(std)}$)

Equation used

ASTM 2515, equation 6

$$V_{m\,(std)} = K_1 V_m Y \left[\frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{T_m}\right]$$

Nomenclature

$V_{m\,(std)}$	Volume of gas sample , corrected to standard conditions, $dscm^3$ (dscf)
K_1	17.64 R/in Hg
V_m	Volume of gas sample
Y	DGM calibration factor
P_{bar}	Barometric pressure mmHg (in Hg)
ΔH	Average pressure at the outlet of the dry gas meter mm water (in. Water)
T_m	Absolute average dry gas meter temperature K (R)

Sample calculation

Data

V_m	48,99	dcf
Y	1,01	
P_{bar}	29,72	in Hg
ΔH	-1,0690	in Hg
T_m	537,1	R

Calculation

$V_{m(std)}$	46,56	dscf

Calculation based of train 2 data Low fire

Total amount of particulate matter collected (m_n)

Equation used

ASTM 2515, equation 12 $$m_n = F_1 + F_2 + \Delta PF$$

Nomenclature

m_n	Total amount of particulate matter collected, mg
F_1	Particulate matter collected on front filter, mg
F_2	Particulate matter collected on second filter, mg
ΔPF	Post-test weight gain of probe and filter holder assembly, mg

Sample calculation

Data

F_1	0,003	g	ALT-154 filters weigthed in pair
F_2		g	
ΔPF	0,000	g	

Calculation

m_n	3,100	mg

Calculation based of train 2 data Low fire

Particulate concentration (C_S)

Equation used

ASTM 2515, equation 13

$$C_S = (0{,}001\ g/mg) \times \left(\frac{m_n}{V_{m\,(std)}}\right)$$

Nomenclature

C_S	Concentration of particulate matter in stack gas or dilution tunnel, dry basis, corrected to standard conditions, g/dsm^3 (g/dscf)
m_n	Total amount of particulate matter collected in the sampling train, mg
$V_{m(std)}$	Volume of gas sample measured corrected to dry standard conditions, dsm^3 (dscf)

Sample calculation

Data

m_n	3,100	mg
$V_{m(std)}$	46,56	dscf

Calculation

C_s	0,000067	g/dscf

Calculation based of train 2 data Low fire

Particulate concentration for room air (C_r)

Equation used

ASTM 2515, equation 14

$$C_r = (0{,}001\ g/mg) \times \left(\frac{m_r}{V_{mr\,(std)}}\right)$$

Nomenclature

C_r	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm^3 (g/dscf)
m_r	Total amount of particulate matter collected in the sampling train, mg
$V_{mr(std)}$	Volume of room air sample measured corrected to dry standard conditions, dsm^3 (dsc

Sample calculation

Data

m_r	0,100	mg
$V_{mr(std)}$	47,69	dscf

Calculation

C_r	0,000002	g/dscf

Calculation based of train 2 data low

Adjustment factor for alternative pitot tube placement (FP)

Equation used

ASTM 2515, equation 1

$$F_P = \frac{V_{strav}}{V_{scent}}$$

Nomenclature

V_{strav}	Average gas velocity caclulated after the Pitot tube traverse
V_{scent}	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
F_P	Adjustment factor for center of tunnel pitot tube placement

Sample calculation

Data

V_{strav}	0,257287557
V_{scent}	0,257287557

Calculation

F_P	1,000000

Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

$$V_S = F_p K_P C_P \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
C_P	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
F_P	Pitot tube correction factor
$\left(\sqrt{\Delta P}\right)_{avg}$	Average square root of each individual velocity head (ΔP)
P_{bar}	Barometric pressure at measurement site, mm H_2O (in. H_2O)
P_g	Stack static pressure, mm Hg (in. Hg)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
M_S	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78 or 29 for CSA B415
t_S	Dilution tunnel temperature, °C (°F)
T_S	Absolute dilution tunnel temperature, °K (°R), or 273 + t_s for metric units, 460 + t_s for English units

Sample calculation

Data

K_P	85,49	
C_P	0,99	
F_P	1,000	
$\left(\sqrt{\Delta P}\right)_{avg}$	0,2719	in $H_20^{1/2}$
P_{bar}	29,72	in Hg
P_g	0,27	in H_20
P_S	29,74	in Hg
M_S	29	lb/lb-mol
t_S	93,86	F
T_S	553,86	R

Calculation

V_S	18,4375	ft/s

Calculation based of data low

Average dilution tunnel gas flow rate (Qstd)

Equation used

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{WS})V_S A\left(\frac{T_{std}}{T_S}\right)\left(\frac{P_S}{P_{std}}\right)$$

Nomenclature

Q_{std}	Total gas flow rate corrected to dry standard conditions, dsm^3/min (dscf/min)
60	Conversion factor minutes per hour
B_{WS}	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
V_S	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m^2 (ft^2)
T_{std}	Standard absolute temperature, 293 °K (528°R)
T_S	Absolute average dilution tunnel temperature, °K (°R), or 273 + t_s for metric units, 460 + t_s for English units
t_S	Dilution tunnel temperature, °C (°F)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or P_{bar} + P_g
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{WS}	0,02	
V_S	18,438	
A	0,785	ft^2
T_{std}	528	R
T_S	553,86	R
P_S	29,742	in Hg
P_{std}	29,92	in Hg

Calculation

Q_{std}	806,88	dscf/min

Calculation based of data low

Particulate emission rate (E)

Equation used

$$E = (C_S - C_r)Q_{std}$$

Nomenclature

E	Particulate emission rate, g/hr
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)

Sample calculation

Data

C_S	0,000067	g/dscf
C_r	0,000002	g/dscf
Q_{std}	806,88	dscf/min

Calculation

E	0,05	g/min
E	3,12	g/h

Calculation based on train 2 data low

Total particulate emission rate (E_T)

Equation used

ASTM 2515, equation 15

$$E_T = (C_S - C_r)Q_{std}\theta$$

Nomenclature

E_T	Total particulate emission, g
C_S	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)
θ	Total sampling time, min

Sample calculation

Data

C_S	0,000067	g/dscf
C_r	0,000002	g/dscf
Q_{std}	806,88	dscf/min
θ	244	min

Calculation

E	12,70	g

Calculation based on train 2 data Low

Average gas velocity in dilution tunnel during each min interval, i, of the test run

Equation used

ASTM 2515, equation 10

$$v_{si} = F_p K_p C_p \sqrt{\Delta p_i} \sqrt{\frac{T_{si}}{P_s M_s}}$$

Nomenclature

v_{si}	Average gas velocity in dilution tunnel during each min interval, i of the test run m/sec (ft/sec)
F_P	Pitot tube correction factor
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
C_P	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
Δp_i	interval, i, of the test run
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i^{th} minutes
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
M_S	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78

Sample calculation

Data

i=1			**i=2**		
F_P	1,000		F_P	1,000	
K_P	85,49		K_P	85,49	
C_P	0,99		C_P	0,99	
Δp_i	0,074	in H_20	Δp_i	0,072	in H_20
T_{Si}	550,6	R	T_{Si}	556,4	R
P_S	29,74	in Hg	P_S	29,74	in Hg
M_S	29	lb/lb-mol	M_S	29	lb/lb-mol

Calculation

i=1			**i=2**		
v_{si}	18,34	ft/sec	v_{si}	18,20	ft/sec

Percent of proportional sampling rate (PR)

Equation used

B415, equation 13.1

$$PR = \left(\frac{\theta V_{mi(std)} V_S T_m T_{Si}}{\theta_i V_m V_{Si} T_{mi} T_S} \right) \times 100$$

Nomenclature

PR	Percent of proportional sampling rate (%)
θ	Total sampling time, min
θ_i	Time of interval, 1 min
V_m	Volume of gas sample measured by the DGM, dsm^3 (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i^{th} 1 minutes interval, dsm^3 (dscf)
V_S	Average gas velocity in the dilution tunnel, ft/min
V_{Si}	Average gas velocity in the dilution tunnel during the i^{th} 10 minutes interval, ft/min
T_m	Absolute average digital mass flow controller temperature, K (R)
T_{mi}	Absolute average digital mass flow controller temperature during the i^{th} 1 minutes
T_S	Absolute average gas temperature in the dilution tunnel, K (R)
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i^{th} 1 minutes

Sample calculation

Data

train =1			train =2		
θ	244	min	θ	244	min
θ_i	1,00	min	θ_i	1,00	min
V_m	46,00	dcf	V_m	46,60	dcf
$V_{mi(std)}$	0,190	cuft	$V_{mi(std)}$	0,194	cuft
V_S	16,88	ft/sec	V_S	16,88	ft/sec
V_{Si}	16,789	ft/sec	V_{Si}	16,789	ft/sec
T_m	535,1	R	T_m	537,1	R
T_{mi}	532,92	R	T_{mi}	534,27	R
T_S	553,86	R	T_S	553,86	R
T_{Si}	550,6	R	T_{Si}	550,6	R

Calculation

train=1		**train=2**	
PR	101,3 %	PR	101,8 %

Filter face velocity check

Equation used

$$FV_{max} = \frac{V_{mL}}{1} \times \frac{1}{F_A}$$

Nomenclature

FV_{max}	Maximum filter face velocity during the test run, m/min (ft/min)
V_{mL}	Largest 1 minute interval metered gas volume value recorded during the test run, dm^3 (dcf)
F_A	Filter area exposed to gas sample during train operation, m2 (ft^2)

Sample calculation

Data

V_{mL}	0,192	dcf
F_A	0,0116	ft^2

Calculation

FV_{max}	16,59	ft/min

Dual train precision

Equation used

$$\frac{Train\ 1 - average\ train\ 1\ and\ train\ 2}{average\ train\ 1\ and\ train\ 2} \times 100 \leq 7.5\%$$

Nomenclature

Dual train precision	Deviation between emission's train 1 and 2
Train 1	Total emission for train 1
Train 2	Total emission for train 2

Sample calculation

Data

Train 1	11,36 g
Train 2	11,60 g

Calculation

Dual train precision	1,03 %

Analyzer drift checks

Equation used

$$Drift = \frac{\Delta R}{span} \times 100$$

Nomenclature

Drift	The change in analyzer response to calibration gas over the duration of the test run
ΔR	The difference between the analyzer response at the end of the test run and the
Span	The upper limit of the instrument range, ppmv or %

Sample calculation

Data

ΔR	0,015 %
Span	5 %

Calculation

Drift	0,30 %

Calculated with CO concentration values.

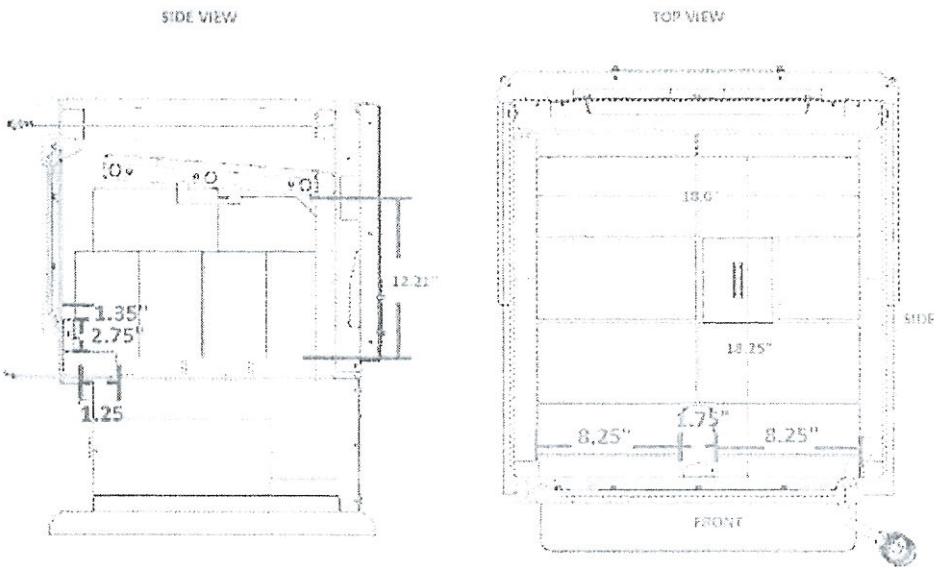
APPENDIX 12: Volume calculations

Total Firebox Volume:
18.25 in. x 18.0 in. x 12.21 in. = 4010.985 cubic in.

Unusable Firebox Volume:
2.75 in. x 1.25 in. x 18.0 in. = 61.875 cubic in.
1.75 in. x 1.25 in. x 1.35 in. = 2.9531 cubic in.

61.875 cubic in. + 2.9531 cubic in. = 64.828 cubic in.

Usable Firebox Volume:
4010.985 cubic in. – 64.828 cubic in. = 3946.057 cubic in.
3946.057 cubic in. / 1728 cubic in. per cubic ft = 2.2835 cubic ft.



5. Section 8.4.2.1-Additional Requirements:
    a. Oak/Maple will be used as the fuel species.
    b. If the test fuel pieces have adhered bark, the bark will not be removed. Specifically, the bark side of the fuel species shall not be split off parallel to the bark when fuel weight adjustments are being made to achieve piece or load weight requirements.

6. Section 8.4.2.6-Additional Requirements
    a. The test fuel will not be thermally dried to achieve the target moisture range for the test fuel.

APPENDIX 13: Operating instruction

Enerco Medium Stove January 20th 2021

High Fire with a Cold Start

To start the fire from a "cold" stove:

1. Cut and split approximately 15 kindling piece. The kindling should weigh

approximately 4.5 lbs.

2. Cut and split approximately 15 start-up fuel pieces. The total weight of the start-up fuel should be approximately 6.8 lbs.

3. Arrange the start-up fuel pieces in a grid. Place about seven of the small pieces front to back on top of the grid. Place the remaining start up fuel sideways on top.

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 three pieces going left to right as shown with six or seven pieces on the top.

5. To start make sure the air control is pulled all the way out.

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 fully, and secure door latch.

8. 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 3/4, rake the

remaining coals and fuel pieces forward until they are equally distributed and level.

2. Place the wood so there is space on either side for good airflow. All fuel pieces should be in a

front- to-back orientation. Air control should be set to maximum open (all the way out).

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 wood so there is space on either side for good airflow.

3. Immediately close the door and open the air control to maximum open (all the way out).

4. Leave the air control on the max setting for up to 15min or min allowable weight. Then push the

air control all the way in.

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 wood so there is space on either side for good airflow. 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 (all the way out).

4. Leave the air control on the max setting for up to 12 min or min allowable weight. Then push

the air control halfway between the high and low settings.

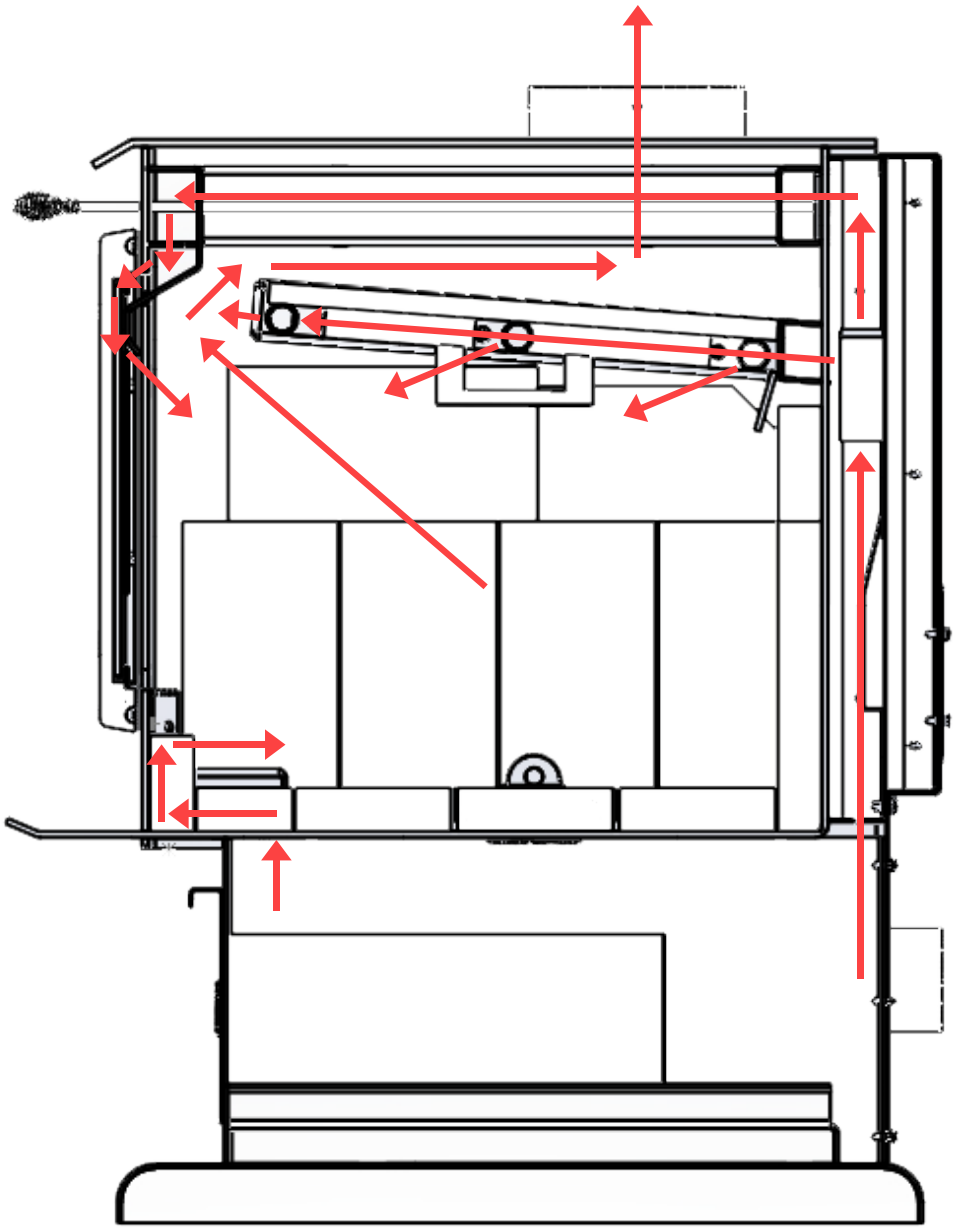
Blower Settings for all tests

High Fire Cold Start: Blower on HIGH

Medium Fire: Blower on HIGH

Low Fire: Blower on HIGH

APPENDIX 14: Drawing Air flow pattern



APPENDIX 15: WHA, CoC, 30 Day notice, Other

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
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

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 and 60.5475. 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 [redacted].

- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to [redacted].**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

GENERAL INFORMATION

Manufacturer's Name:
Enerco Group, Inc.

Appliance 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 Type:	Crib	Pellet	Cordwood	Other:		

Model Name and Number:
WS110, C110, D110, H110, J110, N110, R110, T110, V110

Catalyst: Yes_____ No__X__

Mailing Address:
4560 West 160th Street, Cleveland, OH 44135

Street Address:
Same as above

City: Cleveland	**State:** OH	**ZIP Code:** 44135
Phone: 800.251.0001	**Fax:**	**Web Site:** www.cleveland-ironworks.com

Address of Manufacturing Facility:
4560 West 160th Street

City: Cleveland	**State** Ohio	**ZIP Code:** 44135

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
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

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- **This notice must be received by the EPA at least 30 days before the start of testing.**

EPA APPROVED TEST LABORATORY

Name and Title of Authorized Representative: Danick Power – Vice President Operations		
Company: Polytests Services Inc.		
Phone: 450.741.3636	**E-mail:** dpower@polytests.com	**Fax:**
City: St-Jean-sur-Richelieu	**State:** Quebec, Canada	**ZIP Code:** J3B 7S7

EPA APPROVED THIRD-PARTY CERTIFIER

Name and Title of Authorized Representative: Jean-Phillippe Kayl – Vice President – Global Certification		
Company: Intertek		
Phone: 630-481-3114	**E-mail:** Jp.kayl@intertek.com	**Fax:**
City: Arlington Heights	**State:** IL	**ZIP Code:** 60005

COMPLIANCE TEST INFORMATION

Test Method(s):

Per EPA Method 28R
ASTM E2515
ASTM ~~E2780~~ E3053 (modified version per EPA Approval Letter 3/24/26)
CSA B415.1-22

- ATM Approval Letter attached.
- Correspondence Letter attached.

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
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

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 and 60.5475. 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 [redacted].

- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to [redacted].**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

Date(s) of Proposed Test:
The week of ~~January 12, 2026~~ ~~January 19, 2026~~ April 20, 2026
JB JB

Testing Location:
Polytests Services Inc.
695-B rue Gaudette
St-jean-sur-Richelieu, QC, J3B 7S7

JEFF BUNSEY SENIOR MANAGER
Print Name and Title of Authorized Official

Signature

12/12/25
Date

Remarks:

1. Retest (ALT-125 has been withdrawn)
2. WOOD STOVE (WS110, C110, D110, H110, J110, N110, R110, T110, V110)
3. EPA Emissions Testing and Safety Testing to be performed by: Polytests
4. Verified by third party certifier: Intertek

v1

United States
Environmental Protection
Agency

RESIDENTIAL WOOD HEATER CERTIFICATE OF COMPLIANCE APPLICATION

INSTRUCTIONS

Pursuant to the 2015 Clean Air Act Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces, 40 CFR Part 60 Subparts AAA and QQQQ (2015 Wood Heater Rule), any manufacturer of an affected residential wood heater must apply to the EPA for a certificate of compliance for each model line. Without applying for and obtaining a certificate of compliance, a manufacturer may not manufacture, advertise for sale, offer for sale, or sell affected residential wood heaters in the United States.

Under Subpart AAA, affected residential wood-burning room heaters currently include, but are not limited to, adjustable burn rate stoves, catalytic adjustable burn rate stoves; hybrid adjustable burn rate stoves; single burn rate stoves; and pellet stoves.

Under Subpart QQQQ, affected residential wood-burning central heaters currently include, but are not limited to, indoor hydronic heaters ("wood boilers"); outdoor hydronic heaters ("outdoor wood boilers"); and forced-air furnaces ("warm air furnaces").

By completing and submitting this application to EPA, you will satisfy the requirement to apply for a certificate of compliance. To submit a complete application, this application must include the following:

(1) Certification test report prepared by an EPA-approved test laboratory
(2) Certification of conformity by an EPA-approved third-party certifier
(3) Quality assurance plan
(4) All required supporting documentation and manufacturer statements pursuant to the 2015 Wood Heater Rule (Sections 60.533 or 60.5475)

This application must be signed by a responsible representative of the manufacturer or an authorized representative. Once completed with all required information/documentation included, this application must be submitted to **WoodHeaterReports@epa.gov**.

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 or regulation itself. In the event of a discrepancy, please refer to Part 60 Subparts AAA AND QQQQ, Sections 60.537, and 60.5479. If you have additional questions, please contact Rafael Sanchez, Residential Wood Heater Compliance Program Manager, via email at **sanchez.rafael@epa.gov** or **WoodHeaterReports@epa.gov**.

MANUFACTURER INFORMATION

Manufacturer's Name: Enerco Group, Inc.

Manufacturer's Physical Address: 4560 West 160th Street, Cleveland, OH 44135

Manufacturer's Mailing Address (if different from physical address): Click or tap here to enter text.

Name and Title of Manufacturer's Responsible/Authorized Representative Submitting this Application:

Jeff Bunsey, Senior Manager

Manufacturer's Contact E-mail: jeff.bunsey@us-egi.com

Manufacturer's Phone Number: 216.588.0870

Manufacturer's Website Address: www.cleveland-ironworks.com

Manufacturer's Website Address where the test report and owner's manual will be posted, if known: Click or tap here to enter text.

AFFECTED WOOD HEATER MODEL INFORMATION

Model Name(s) (as appearing on the certification test report). Please note: 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":

WS110 Model Line:

Model Number(s) (as appearing on the certification test report):

WS110, C110, D110, H110, J110, N110, R110, T110, V110

Heater Type Check one):	☒Adjustable Burn Rate Wood Stover	☐Pellet Stove	☐Single Burn Rate Wood Stove	☐Hydronic Heater	☐Forced-Air Furnace (FAF)
Hydronic Heater Type (Check one):	☐Full Storage	☐Partial Storage	☐Indoor	☐Outdoor	
Forced-Air Furnace Type (Check one):	☐Small (less than 65,000 BTU/hr heat output)		☐Large (greater than 65,000 BTU/hr heat output)		
Fuel Tested (Check one):	☐Crib	☐Pellet	☒Cordwood	☐Wood Chips	☐Other:
Certification Step:	☐ 2020 (ALL HEATERS)				

Was this heater tested using an EPA-approved Alternative Test Method (ATM)? ☒Yes ☐No

If yes, provide the date of EPA approval and attach copy of EPA approved ATM letter):
3/24/2026

If not, what Test Method(s) did the test laboratory use for the certification test? (List all applicable test methods):
Click or tap here to enter text.

Heater equipped with a catalytic combustor? ☐Yes ☒No

Date of submission of 30-Day Notice to the EPA: 12/10/2025

What was the proposed date(s) of testing? The original proposed date was the week of January 12, 2026

What was the actual date(s) of testing? April 20-23, 2026

Was the compliance test postponed or suspended? ☒Y ☐N **If yes, date of EPA notification of postponement or suspension:** (1/6/26) and (4/2/26).

Explain the reason for postponing or suspending the certification test:
(1/6/26) Shipping delay.
(4/2/26) The EPA Measurement Technology Branch will no longer provide approval letters referencing the NYSERDA ATM. We needed to wait for an EPA Approval Letter for an ATM (modified version of E3053) from them.

5 Year Renewal Request: ☐ Yes ☒ No

Comments: Retest

EPA-APPROVED TEST LABORATORY

Name of EPA-Approved Test Laboratory:

Polytests Services Inc.

Name(s) of Person(s) Authorized and/or Responsible for Conducting Certification Test:
Danick Power

Position/Title: Vice President Operations

Address:
695-B rue Gaudette

City: St-Jean-sur-Richelieu	**State:** Quebec, Canada	**ZIP Code:** J3B 7S7
Phone: 450.741.3636	**Email:** dpower@polytests.com	

EPA-APPROVED THIRD-PARTY CERTIFIER

Name of EPA-Approved Third-Party Certifier: Intertek

Name(s) of Person(s) Authorized and/or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity:
Jean Phillippe Kayl

Position/Title: Vice President Global Certification

Address: 545 E Algonquin Rd

City: Arlington Heights	**State:** IL	**ZIP Code:** 60005
Phone: (630) 481-3114	**Email:** Jp.kayl@intertek.com	

REQUIRED SUPPORTING DOCUMENTATION/MANUFACTURER STATEMENTS

NOTE: TO COMPLETE THIS APPLICATION, ALL REQUIRED DOCUMENTATION AND MANUFACTURER STATEMENTS MUST ACCOMPANY THIS APPLICATION.

1. Engineering Drawings

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). 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. Manufacturers must identify 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 drawings must identify how the emission-critical parts, such as air tubes and catalyst, can be readily inspected and replaced.

– Enerco Group, Inc. confirms.

2. Firebox Statement Requirement

A statement whether 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, a description of any such differences and demonstration that any such differences may not reasonably be anticipated to adversely affect emissions or efficiency.

– Enerco Group, Inc. confirms that the firebox and firebox components will not be composed of material different from what was used during the certification testing.

3. Confidential Business Information

Clear identification of any claimed confidential business information (CBI). Submit such information under separate cover to the EPA CBI Office; via email at: WoodHeaterReports@epa.gov. **Note that all emissions data, including all information necessary to determine emission rates in the format of the standard, cannot be claimed as CBI.**

– Enerco Group, Inc. confirms.

4. All Documentation Pertaining to a Valid Certification Test

All documentation 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 must include the items specified in the applicable test methods. Documentation must include discussion of each test run and its appropriateness and validity, and must include 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 must be 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 must include a summary table that clearly presents the individual and overall emission rates, efficiencies and heat outputs. Submit the test report and all associated required information, according to the procedures for electronic reporting specified in § 60.537(f) and 60.5475(f).

– Enerco Group, Inc. confirms all documentation is being provided.

5. Warranties

A copy of the warranties for the model line, which must include a statement 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.

– Enerco Group, Inc. confirms this information is in the manual.

6. Quality Assurance Program Statement

A statement that the manufacturer will conduct a quality assurance program for the model line that satisfies the requirements of § 60.533(m).

– Enerco Group, Inc. will conduct a quality assurance program and test our line of stoves to satisfy the above requirements.

7. Laboratory Sealing of Unit

A statement describing how the tested unit was sealed by the laboratory after the completion of certification testing and asserting that such unit will be stored by the manufacturer in the sealed state until 5 years after the certification test.

– Enerco Group, Inc. confirms each model was sealed and will be sent to Enerco for storage.

8. Statements that the Wood Heaters Manufactured under this Certificate will be:

(i) Similar in all material respects that would affect emissions as defined in § 60.531 to the wood heater submitted for certification testing, and

(ii) Labeled as prescribed in § 60.536 and 60.5478, and

(iii) 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 must be submitted to the EPA and be available to the public on the manufacturer's web site.

- Enerco Group, Inc. confirms all stoves will comply with this section.

9. Third Party Certification Statement
A statement that the manufacturer has entered into contracts with an approved laboratory and an approved third-party certifier that satisfy the requirements of § 60.533(f).

– Enerco Group, Inc. confirms that an approved laboratory and approved third-party certifier was used.

10. Approved Laboratory/Third Party Statement
A statement that the approved laboratory and approved third-party certifier are allowed to submit information on behalf of the manufacturer, including any claimed to be CBI.

– Enerco Group, Inc. confirms that the approved laboratory and approved third-party certifier are allowed to submit information on our behalf, including that claimed to be CBI.

11. Manufacturer's Website Certification Test Reports Availability Statement
A statement that the manufacturer will place a copy of the certification test report and summary on the manufacturer's web site available to the public within 30 days after the EPA issues a certificate of compliance.

– Enerco Group, Inc. will place a copy of the certification test report and summary on our website within 30 days after the EPA issues our certificate of compliance.

12. Transferability Acknowledgement Statement
A statement of acknowledgment that the certificate of compliance cannot be transferred to another manufacturer or model line without written approval by the EPA.

– Enerco Group, Inc acknowledges that the certificate of compliance cannot be transferred to another manufacture or model line without written approval by the EPA.

13. Statement about Selling Wood Heaters without an EPA Certificate
A statement acknowledging that it is unlawful to sell, distribute or offer to sell or distribute an affected wood heater without a valid certificate of compliance.

– Enerco Group, Inc. acknowledges that it will not sell, distribute or offer to sell a wood heater without a valid certificate of compliance at the time the Rate Label is affixed to a wood heater.

PLEASE ACKNOWLEDGE THAT ALL REQUIRED SUPPORTING DOCUMENTATION AND MANUFACTURER STATEMENTS ACCOMPANY THIS APPLICATION.

Initials JB

SIGNATURE OF RESPONSIBLE OFFICER OR AUTHORIZED REPRESENTATIVE OF THE MANUFACTURER CERTIFYING THE ACCURACY AND COMPLETENESS OF THIS APPLICATION:

Signature: JM Bunsey

Print Name: JEFF BUNSEY

Title: SENIOR MANAGER

Date: 5/15/26

The responsible officer or authorized representative of the manufacturer whose signature is above is certifying that the manufacturer has complied with all requirements of the 2015 Wood Heater Rule for compliance certification and will continue to do so. The manufacturer remains responsible for compliance regardless of any error by the EPA-approved test laboratory or third-party certifier.

Attachments

WEIGHTED AVERAGE SUMMARY

Model name / number	WS110		
Usable Firebox volume	2.28		
Convection air Fan (no, Standard, option)	Optional		
average for each test run category	L	M	H
burn rate kg/h DB	1,11	2,58	4,22
PM Emission rate - g/h	1,21	2,82	2,31
PM Emission rate - output gr/Mj	0,074	0,086	0,051
Co emission rate - g/h	94,77	107,23	76,28
PM Emission 1-hr Rate - g/h	5,63	9,52	5,66
Overall Efficiency - CSA B 415,1			
% HHV Basis	72,8%	72,4%	71,3%
% LHV Basis	78,4%	77,9%	76,7%
Heat output - Btu/hr	15 536	31 131	58 030
Category weighting	0,4	0,4	0,2

WEIGHTED AVERAGE FINAL RESULTS

ASTM E 3053 Weighted averages			
PM Emission Rate - g/h	2,1		
Emission Rate - g/Mj	0,074		
CO Emission Rate g/h	96		
PM Emission 1-hr Rate - g/h	7,2		
Overall Efficiency - CSA B415,1			
% HHV Basis	72%		
% LHV Basis	78%		
Heat output range - Btu/h	15 536	to	58 030
Co Arithmetic average g/min	0,95		

ASSISTANT ADMINISTRATOR FOR AIR AND RADIATION
WASHINGTON, D.C. 20460

April 29, 2026

Jeff Bunsey
Senior Manager, Global Processes & Engineering Changes
Enerco Group, Inc.
4560 West 160th Street
Cleveland, OH 44135

Dear Mr. Bunsey,

I am writing in response to your letter received on February 23, 2026, in which you request approval of an alternative test method for demonstrating compliance with 40 CFR part 60, Subpart AAA, Standards of Performance for New Residential Wood Heaters (Subpart AAA) under the provisions found in section 60.8(b) of 40 CFR part 60, Subpart A. The U.S. Environmental Protection Agency's (EPA) Office of Air and Radiation is the delegated authority for approval/disapproval determinations on any major alternatives to test methods and other compliance determination procedures required under 40 CFR parts 59, 60, 61, 63, and 65. As required by section 60.534(a)(2) of Subpart AAA, when using the 2020 cord wood alternative compliance option, a manufacturer must use an EPA-approved test laboratory to test their appliance using an alternative cord wood test method approved by the EPA Administrator or their delegated authority to establish the certification test conditions and the particulate matter (PM) emission values.

Based on the information provided in your correspondence letter dated February 23rd, 2026, EPA approves your request to use an alternative test method and testing procedures when conducting certification testing as required by Subpart AAA, section 60.534(a)(2) on the Enerco Group, Inc. Medium Wood Stove (Model Line WS110) room heater. A copy of this letter and your correspondence letter of February 23rd, 2026, (Enclosure 1) must be included in any certification test report where this alternative test method determination is used for compliance with Subpart AAA requirements.

If you have additional questions regarding this approval, please contact Ashley Akins at akins.ashley.s@epa.gov.

Sincerely,

Aaron Szabo
Assistant Administrator
Office of Air and Radiation

Enclosures

1. Request for alternative cord wood test method on Medium Wood Stove (Model Line WS110) Series wood heaters (February 23, 2026; Letter)

cc:

Ashley Akins, EPA
Kim Garnett, EPA
Amara Holder, EPA
Sharyn Lie, EPA

Jeff Bunsey
Senior Manager, Global Processes & Engineering Changes
Enerco Group, Inc.
4560 West 160th Street
Cleveland, OH 44135

February 23, 2026 (Revision 2)

Measurement Technology Branch
U.S. Environmental Protection Agency
ATTN: Aaron Szabo, US EPA Office of Air and Radiation, Assistant Administrator

Dear Mr. Szabo,

I am writing this letter to request approval for an Alternative Test Method based on modifications to ASTM E3053 from 2022 Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel for the **retest** of our free-standing Medium Wood Stove (Model Line WS110).

EPA-Certified Wood Stove Database:

Model (sort)	Manufacturer (sort)	Firebox Volume (Cubic Feet) (sort)	Emission Rate (grams/hr) (sort)	Heat Output (BTUs) (sort)	Overall Efficiency-HHV (%) (sort)	Type (sort)	Subtype (sort)	Certified Fuel Type (sort)	CO (g/min) (sort)	NSPS Compliance 2020 (sort)
WS110, C110, D110, H110, J110, N110, R110, T110, V110	Enerco Group, Inc.	2.280	0.99	17400-49138	70	Wood Stove	Non-Catalytic Stove	Cord Wood	1.500	Yes

Wood heaters are subject to 40 CFR Part 60, subpart AAA, Standards of Performance for New Residential Wood Heaters; Final Rule, Section §60.534(a)(ii) which states that certification testing may be conducted using cord wood with an alternative test method on a room heater if approved by the Administrator.

The proposed modifications below were provided by the Measurement Technology Branch.

Items in RED text were customized for our Medium Wood Stove (Model Line WS110).

ASTM E3053-18 *Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters Using Cordwood Test Fuel* with several modifications

1. Section 3.2.3-Additional requirements:
    a. No square or near-square fuel pieces will be used. A variety of test fuel piece shapes in each load is allowed.
    b. The top of any trapezoidal shaped piece will not be greater in dimension than 70% of the base dimension of the trapezoid.

2. Sections 3.2.6 and 8.4.2.8-Modification to the requirements:
    a. Fuel length will represent 80% to 95% of the longest length of the usable firebox volume. Of that range, we will use fuel length of 15 inches. This represents 83.3% of the firebox length. All test fuel used must be the same nominal length ± 0.5 inch.
    b. **There will be no additional ± 1 inch allowance to the nominal length as stated in the ASTM method.**

3. Sections 8.1.4,8.1.5,8.1.6 and 8.1.7-Additional requirements
    a. We will Conduct 50 hours of pre-conditioning at multiple burn rates (high, medium and low).
    b. Pre-conditioning data shall include all the fuel parameters (species, moisture content, load weights, number of pieces and the fuel length), air setting used, time spent in each air setting, and the amount of fuel burned at each of the three burn rate settings.
    c. Pre-conditioning fuel length can be different than the required testing fuel length. (e.g., 16 inches long is acceptable even if not in the 80% to 95% of longest firebox dimension range.)
    d. Photo documentation shall be included in the test report highlighting each air setting during the pre-conditioning.

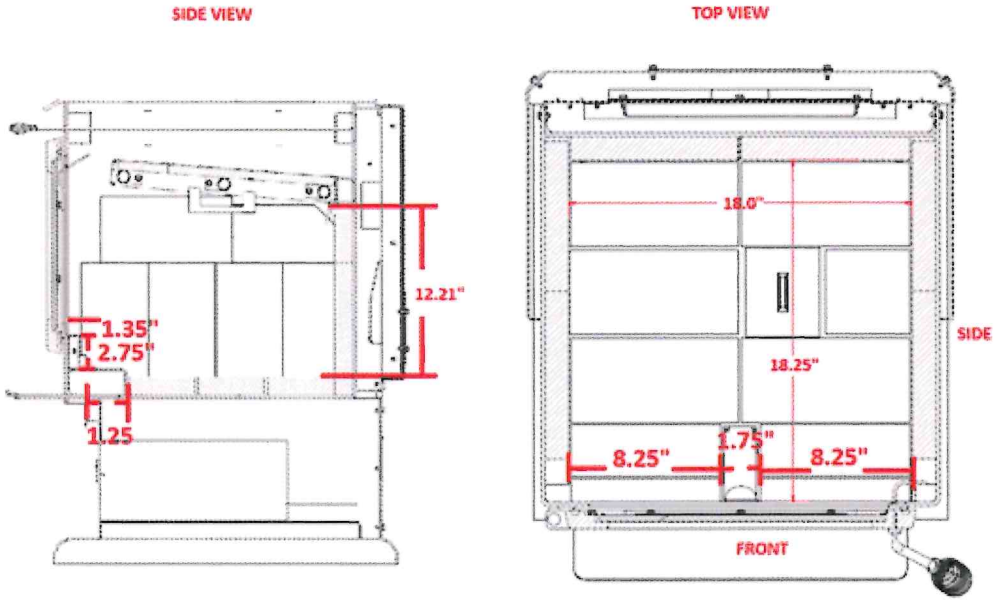
4. Section 8.3 – Additional Requirements
    a. Overall firebox volume and usable firebox volume will be reported in the test report, including drawings and calculations where appropriate, and must agree with dimensions stated in this letter and illustrated in the Owner's manual with instructions to the end user on appropriate fueling/loading.
    b.

Total Firebox Volume:
18.25 in. x 18.0 in. x 12.21 in. = 4010.985 cubic in.

Unusable Firebox Volume:
2.75 in. x 1.25 in. x 18.0 in. = 61.875 cubic in.
1.75 in. x 1.25 in. x 1.35 in. = 2.9531 cubic in.

61.875 cubic in. + 2.9531 cubic in. = 64.828 cubic in.

Usable Firebox Volume:
4010.985 cubic in. – 64.828 cubic in. = 3946.057 cubic in.
3946.057 cubic in. / 1728 cubic in. per cubic ft = **2.2835 cubic ft.**



5. Section 8.4.2.1-Additional Requirements:
    a. Oak/Maple will be used as the fuel species.
    b. If the test fuel pieces have adhered bark, the bark will not be removed. Specifically, the bark side of the fuel species shall not be split off parallel to the bark when fuel weight adjustments are being made to achieve piece or load weight requirements.

6. Section 8.4.2.6-Additional Requirements
    a. The test fuel will not be thermally dried to achieve the target moisture range for the test fuel.

7. Section 8.5 - Additional Requirements:
    a. Emissions will be measured and reported from all start-up/high fire test runs.
    b. First hour emissions will be included for every test run.
    c. The sampling trains will not be disassembled until after a post-test leak check is performed.
    d. The blower of the WS110 is operated manually. If the blower is operated manually, after the high fire test load has been loaded in the stove and the door has been closed as per instructions in ASTM E3053 Section 8.5.9.4, the manual blower must be immediately engaged on the highest setting.
    e.
8. Sections 8.5.4 and 8.6.3 - Additional Requirements:
    a. Fuel load density will be based on usable firebox dimensions shown in this letter.
    b. Test fuel load density for the high fire test must not be less than 10.0 lb/ft3 the usable firebox volume. For the low and medium fire test, the test fuel load density will not be less than 12.0 lb/ft3 of the usable firebox volume.

9. Sections 8.5.5, 8.5.6 and 8.5.7-Additional Requirements
    a. Manufacturer's instructions to the test lab will all be in writing and all these documents will be included in the test report.
    b. Kindling and start up instructions will be included to the test lab, without any discussion regarding fuel spacing and piece size. Number of pieces can be part of the instructions.

10. Section 8.5.9.3 and 8.6.9.1 and 8.6.9.2 - Additional requirements:
    a. The fuel pieces will be loaded in an North-South orientation, parallel to the longest dimension of the usable firebox.
    b. When test fuel is loaded no effort shall be made to stack fuel pieces either tightly or loosely with respect to one another.

11. Sections 8.5.9.5 (1), (2) and 8.6.8 (1),(2)- Additional Requirements
    a. Documentation will be provided in the test report of all test fuel load adjustments made during the test.
    b. Documentation will include photos of the fuel load before and after any test fuel load adjustments are made and the time of the adjustment.

12. Sections 8.5.2, 8.5.3, -Additional Requirements:
    a. The air control setting will be at the full open (maximum) setting for the high fire test. The test report and the Owner's Manual will illustrate where the air control is set to achieve the high fire condition.

b. Photos must be taken of the air control set point for each test run and provided in the test report.

c. Follow Owner's Manual on how to properly operate the secondary air control, if applicable.

13. Sections 8.6.7 through 8.7.1.2-Additional Requirements:

a. The low fire air control setting will be the lowest setting at which the user can operate the unit. The test report and the Owner's Manual will illustrate where the air control is set to achieve the low fire condition.

b. Photos will be taken of the air control set point for each test run and provided in the test report.

c. Follow Owner's Manual on how to properly operate the secondary air control, if applicable.

d. The manual blower will be operated on its highest setting and engaged as soon as the combustion air control adjustment period has elapsed.

14. Sections 8.6.7 through 8.8.1.3-Additional Requirements and Modifications of Requirements:

a. The medium fire test combustion air control setting will be set halfway between the lowest and the highest primary air control settings as measured on the control actuator (lever, knob, etc.).

b. Photos will be taken of the air control set point for each test run and provided in the test report.

c. Follow Owner's Manual on how to properly operate the secondary air control, if applicable.

d. The provisions that would require retesting of the medium fire test category per section 8.8.1 do not apply.

e. The manual blower must be operated on its highest setting and engaged as soon as the combustion air control adjustment period has elapsed.

15. Sections 8.2.7 through 8.6.9.1-Additional Requirements

a. Clear and representative (close-up) photos must be in the report (no photos from across the room or signs that are illegible).

b. This includes photos of the collective fuel loads from multiple angles showing front and side view.

c. Photos of the complete installation including venting, front view, rear view and side view of stove.

d. Photo of the empty firebox.

e. Photo of kindling and start-up fuel before it is placed in the firebox

f. Photo of kindling and start-up fuel in the firebox before ignition.

g. Photo of residual start-up fuel bed before and after raking.

h. Photo of test fuel before it is placed in the firebox.

i. Photo of residual fuel bed before and after raking (after high fire test)

j. If there are any fuel adjustments, provide a description and before and after photos.

16. Rounding convention - Additional requirements: a. Follow Technical Information Document 024 - Memo on Rounding and Significant Figures for rounding conventions: https://www.epa.gov/emc/technical-information-document-024-memo-rounding-and-significant-figures
17. Coal Bed Conditions-Modification of Requirement:
    a. Coal bed conditions prior to loading test fuel. The coal bed shall be a level plane without any valleys or ridges for all test runs in the high, low, and medium burn rate categories.

When using ASTM E2515-11 to conduct PM sampling as required by 60.534(c), these changes
and modifications must be made:

1) Sections 10.2.1 and 11.7 - Additional requirements:
   a) The filter temperature must be maintained between 80 and 90°F during testing.
   b) Filters must be weighed in pairs to reduce weighing error propagation using EPA ALT-154.
   c) Only one point is allowed outside the ± 10 percent proportionality range per test run.
   d) Non-desiccated post-test filter weights must be taken within an hour after the post-test leak check. These initial weights must be included in the test report.
   e) Oven drying or applying heat to the filter as a form of desiccation is not allowed.
   f) Dual train comparison (precision) must be calculated in terms of percent difference between the two sample trains and in terms of calculated emissions difference on a g/kg basis. These values must both be clearly reported for each test run.
   g) Negative filter weights must be discussed in the test report. Where negative mass (i.e., filter material left on O-rings and gaskets) is subtracted from the overall PM mass, the resultant PM mass must be reported with the mass subtracted and with the mass not subtracted for comparison purposes. If any negative values should be present, there must be a full discussion in the test report on how this may have come to be the case and what impact it may have on the measured emissions.

2) Sections 9.6.4 through 9.6.5.1 - Additional requirement per 60.534(c)(1) and (2),:
   a) Particulate matter emission concentrations must be measured with ASTM E2515-11 with the following exceptions, eliminate section 9.6.5.1 of ASTM E2515-11 and perform the post-test leak checks as specified below:
      i) Post-Test Leak Check: A leak check of each sampling train is mandatory at the conclusion of each sampling run before sample recovery. The leak check must be performed in accordance with the procedures of ASTM E2515-11 Section 9.6.4.1, except that it must be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.0003 m3/min (0.01 cfm) or 4% of the average sampling rate (whichever is less), the leak check results are acceptable. If a higher leakage rate is obtained, the sampling run is invalid and must not be used in the compliance average result.
   b) Additionally, if a component change of either sampling train is needed during sampling, then perform the leak check specified below:
      i) Leak Checks During Sample Run: If, during a sampling run, a component (e.g., filter assembly) change becomes necessary, a leak check must be conducted immediately before the change is made. Record the sample volume before and after the leak test. The sample volume collected during any leak checks must not be included in the total sample volume for the test run. The leak check must be done according to the procedure outlined in ASTM E2515-11, section 9.6.4.1, except that it must be done at a vacuum equal to or greater than the maximum value recorded up to that point in the sampling run. If the leakage rate is found to be no greater than 0.0003 m3/min (0.01 cfm) or 4% of the average sampling rate (whichever is less), the leak check results are acceptable. If a higher leakage rate is obtained, the sampling run is invalid and must not be used in the compliance average result.
   c) NOTE: Immediately after component changes, leak checks are optional but highly recommended. If such leak checks are done, the post-test leak check procedure referenced above shall be used.

When using ASTM E2515-11 to conduct first hour PM sampling as required by 60.534(d), these
changes and modifications must be made:

1) To conduct the alternative sampling procedure to determine the first hour PM emissions as

required by 60.534(d), the manufacturer and approved test laboratory must measure the first
hour of PM emissions for each test run by sampling with a third, identical and independent sampling train operated concurrently for the first hour of PM paired train compliance testing. The
manufacturer and approved test laboratory must report the test results from this third train separately as the first hour emissions. Filters must be recovered and weighed as a paired set.

All other requirements of ASTM E3053-18 and ASTM E2515-11 will be followed during the testing, and all requirements of 40 CFR part 60, Subpart AAA will be satisfied as described in the test report. Regarding, §60.534(a)(1) of Subpart AAA, the lowest heat output (Btu/hr) setting on the room heater available to the user will correspond to the lowest burn rate to be evaluated during certification testing and the test report will reflect that the certification testing was conducted as such. The WS110 is a freestanding model. Testing a freestanding model will meet the requirements of the 2015 New Source Performance Standards to test the heater in its least efficient design configuration.

Thank you for your consideration for the modifications to ASTM E3053 from 2022 listed above.

I look forward to your reply.

Kind Regards,
JB

Jeff Bunsey
Senior Manager, Global Processes & Engineering Changes

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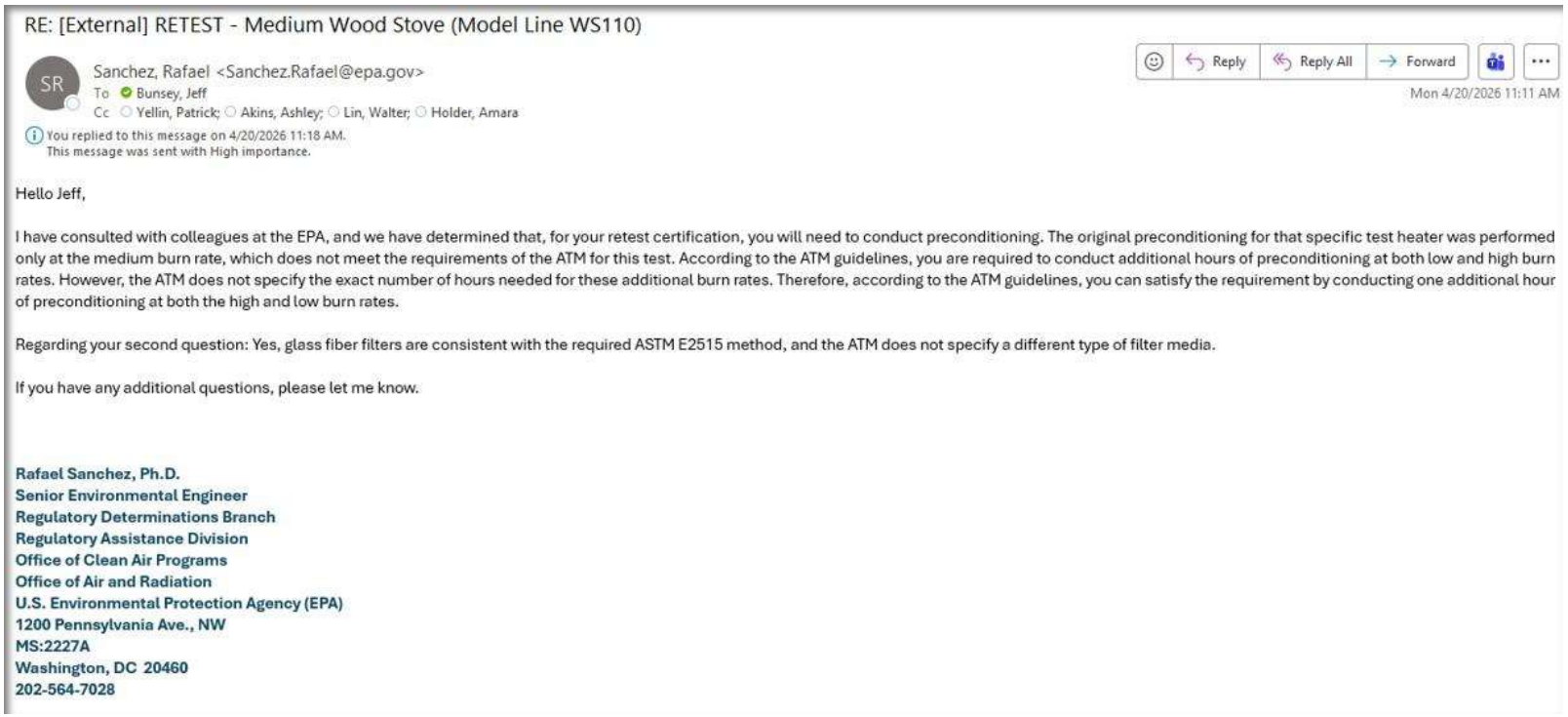
Danick Power

Objet: TR: last test results

De : Bunsey, Jeff <Jeff.Bunsey@us-egi.com>
Envoyé : 20 avril 2026 11:23
À : Danick Power <dpower@polytests.com>; Childs, Benjamin <Benjamin.Childs@us-egi.com>
Objet : RE: last test results

Danick,

Please see the below response from Rafael this morning.



RE: [External] RETEST - Medium Wood Stove (Model Line WS110)

SR Sanchez, Rafael <Sanchez.Rafael@epa.gov>
To Bunsey, Jeff
Cc Yellin, Patrick; Akins, Ashley; Lin, Walter; Holder, Amara

Reply | Reply All | Forward
Mon 4/20/2026 11:11 AM

You replied to this message on 4/20/2026 11:18 AM.
This message was sent with High importance.

Hello Jeff,

I have consulted with colleagues at the EPA, and we have determined that, for your retest certification, you will need to conduct preconditioning. The original preconditioning for that specific test heater was performed only at the medium burn rate, which does not meet the requirements of the ATM for this test. According to the ATM guidelines, you are required to conduct additional hours of preconditioning at both low and high burn rates. However, the ATM does not specify the exact number of hours needed for these additional burn rates. Therefore, according to the ATM guidelines, you can satisfy the requirement by conducting one additional hour of preconditioning at both the high and low burn rates.

Regarding your second question: Yes, glass fiber filters are consistent with the required ASTM E2515 method, and the ATM does not specify a different type of filter media.

If you have any additional questions, please let me know.

Rafael Sanchez, Ph.D.
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